

Vehicular Integration for C4ISR/EW Interoperability (VICTORY)

Briefing to the Training Community

I/ITSEC 2012

4 December 2012

Meeting Objectives

➤ Inform the Training Community

- What is VICTORY
- Why should Training Community care
- How to get involved

GOAL: Begin to establish an IPT (government & industry) to develop training portions of the VICTORY architecture and specification (2013 release)

VICTORY

Addressing Training



Vehicular Integration for C4ISR/EW Interoperability

Training Adds to Problems Driving VICTORY



Source: VICTORY Standards Support Office



- Hardware Redundancy
- Limited Information Sharing
- Complex cabling
- Large system re-set and life cycle costs
- Limited Ability to support CP mission sets

Addressing Training

- Two new sections of VICTORY specification address training
 - Mission Recorder – **how** data is recorded (included in latest release)
 - Embedded Training Interface – addresses **what** data is recorded (2013 release, AI_CP_076)
- Establishing IPT to develop Embedded Training Interface section
 - Government and Industry
- Multifunction Vehicle Port (MFVP) enables future interface to VICTORY Data Bus
 - MFVP Interface Standard v1.0 available at www.lt2portal.org

➤ Why should Training Community care about VICTORY?

- VICTORY is gaining momentum
 - VICTORY compliance included in recent acquisitions
 - Bradley and Abrams ECP's call out VICTORY compliance
 - PEO GCS guidance for training – leverage VICTORY
 - ~125 participants at December F2F meeting, 200+ members
 - Identified by COE as a critical enabler
 - Key role in Real Time Safety Critical Embedded CE
 - Mounted CE will be changing ICDs to be VICTORY compliant (reps at December VICTORY F2F)

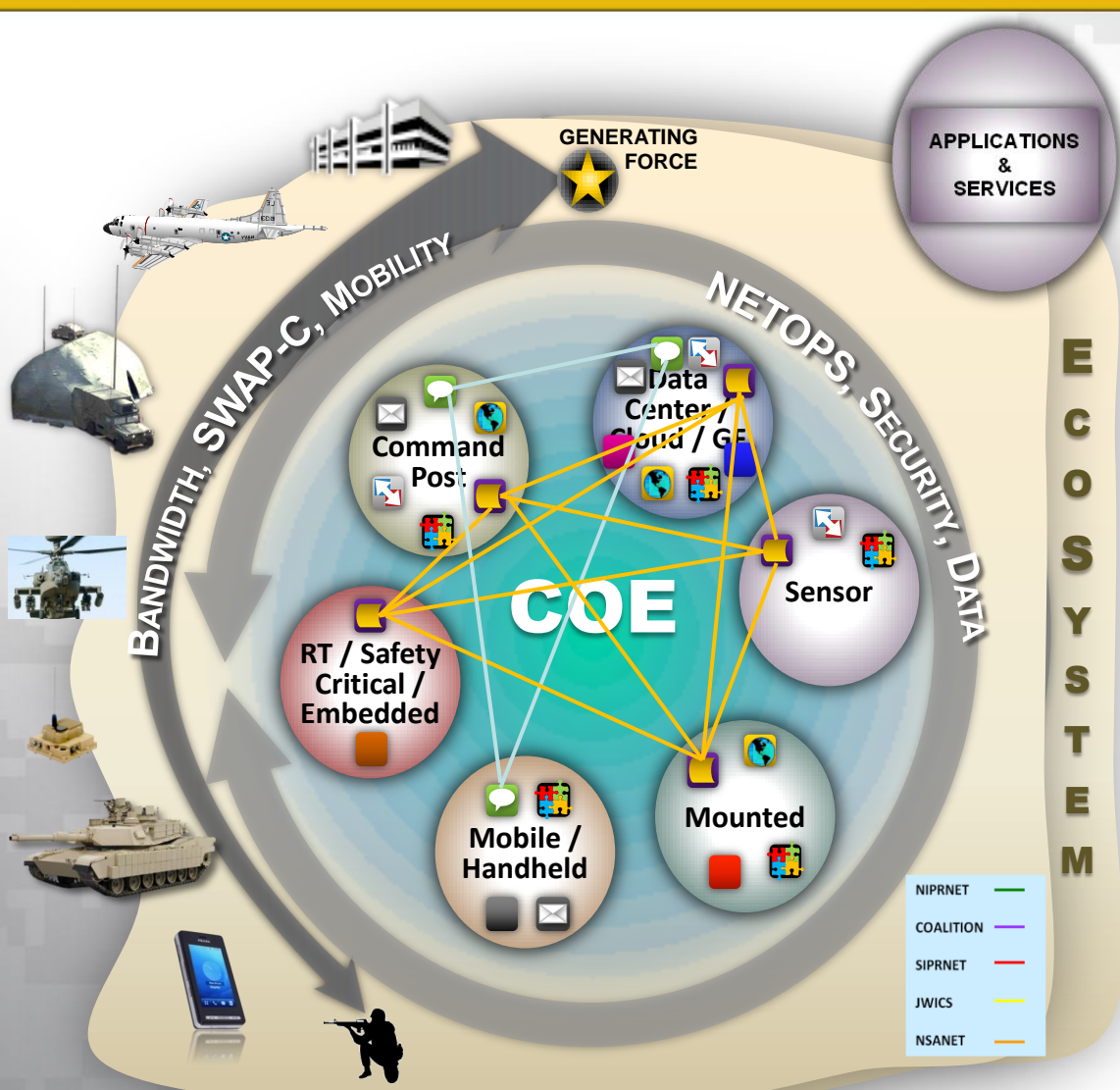
Army Common Operating Environment (COE)

I/ITSEC 2012

4 December 2012

COE: Apps & Services

Vision and Computing Environments (CE)



Organize Computing Environments

Clustering similar systems based on mission environments to facilitate implementation

- Data Center/Cloud/Generating Force CE: PEO EIS
- Command Post CE: PEO IEWS/PEO C3T
- Mounted CE : PEO C3T
- Mobile/Hand Held CE: PEO Soldier
- Sensor CE: PEO IEWS
- Real-time/Safety Critical/Embedded CE: PEO Aviation

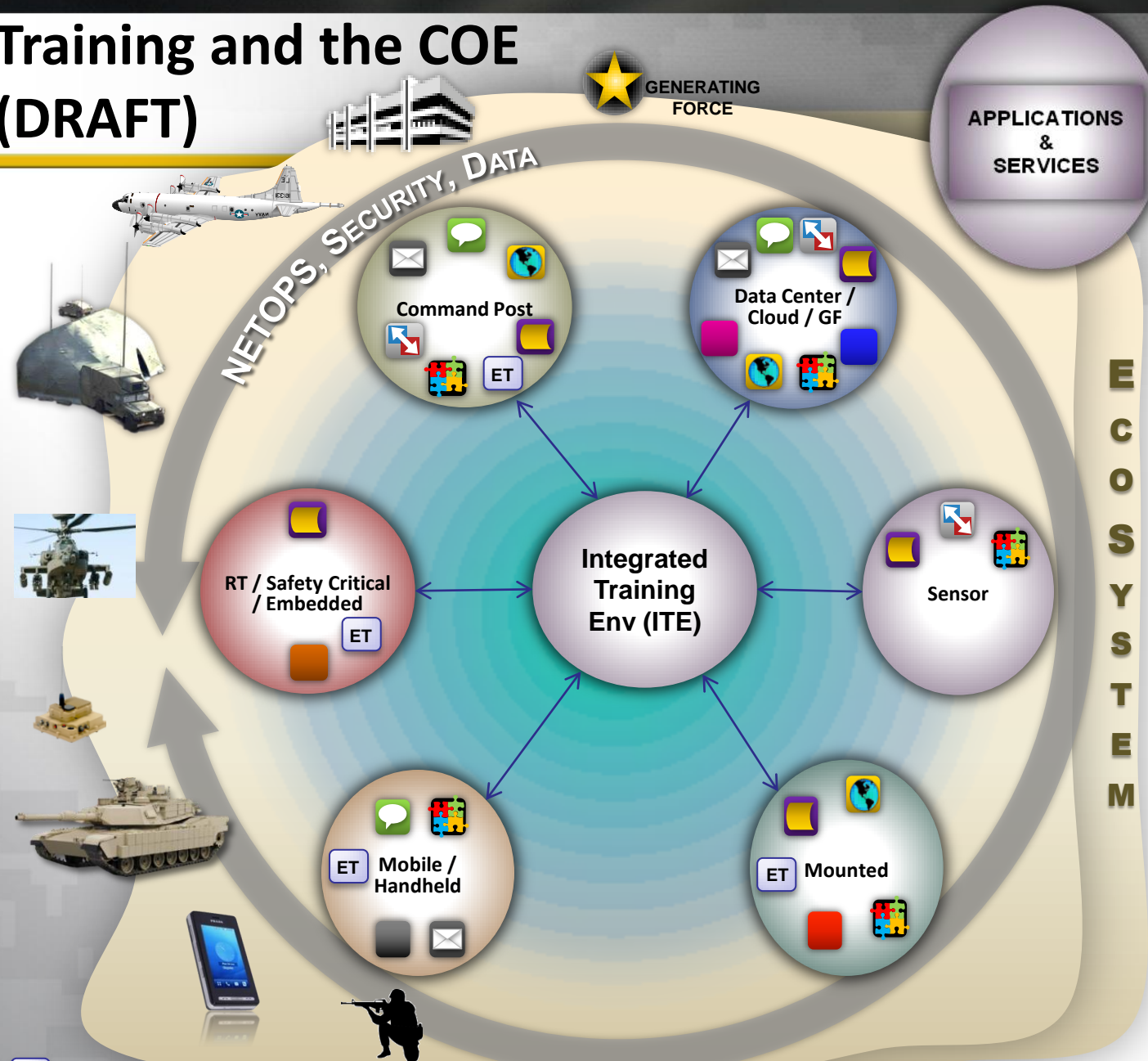
Establish the Platform IPT

What's being integrated on our platforms – when, how, by whom

- Soldier as a Platform: PEO, Soldier
- Aviation Platforms: PEO, Aviation
- Ground Platforms-Combat: PEO CS&CSS
- Ground Platforms-Tactical: PEO GCS
- Ground Platforms-Fires: PEO M&S
- Command Posts: PEO C3T
- Forward Operating Base Installation/Fixed Base: PEO EIS

Control Points (CPs) define interfaces between CEs

Training and the COE (DRAFT)



E C O S Y S T E M

APPLICATIONS & SERVICES

ITE Cross Cutting Capabilities:

- Virtual/Constructive Sim/Stim
- Scenario/Exercise Control
- Live Training Instrumentation Systems

Control Point/Interface Specs:

- Training/Test Instrumentation
- Appended TESS
- Instrumentation Interface with FACE
- Multifunction Vehicle Port (MFVP)
- Sim to Mission Command Interfaces
- MILES Comms Codes

CE Compliant/Embedded Capabilities:

- Target Control
- Training Standards/Capabilities in VICTORY:

- IS-TESS
- PAN
- MFVP

-TaaS – Training as a Service in the Cloud

ET Embedded Training in a Computing Env
 ↔ ITE to CE Control Point/Interface Spec

FACE: Future Airborne Capability Environment
 VICTORY: Vehicular Integration for C4ISR/EW Interoperability

Examples

Embedded Training



- Future Airborne Capability Environment (FACE)
- Standard for aviation systems



Vision For Embedded Training

12 June 2012
Version 37

- Software product line approach
- Software re-use
- Composibility
- Portable
- Modular
- Scalable
- Extendable
- Open standards



FACE & VICTORY are critical enablers for COE as part of the Real Time/Safety Critical/Embedded CE

- Vehicular Integration for C4ISR/EW Interoperability (VICTORY)
- Standard for ground vehicles
- Addresses Embedded Training
 - Mission Recorder (August 2012)
 - Embedded Training (Spring 2013)
- PEO STRI Initiatives
 - Multifunction Vehicle Port Standard
 - Live Training Engagement Composition



Vehicular Integration for C4ISR/EW Interoperability (VICTORY)

Kase Saylor

I/ITSEC 2012

4 December 2012



VICTORY 101 – Background

28 June 2012

A converged modular architecture for vehicle/electronic systems interoperability in a modular expeditionary Army at War

VICTORY

Vehicular Integration for C4ISR/EW Interoperability



Motivation: problems driving VICTORY

Approach: how we are moving toward a solution

VICTORY framework: what we are producing

BACKGROUND



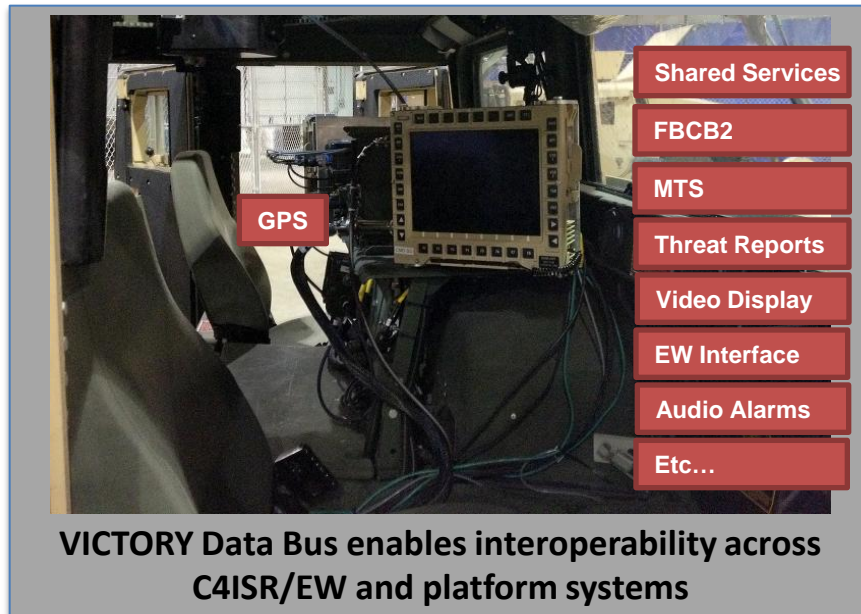
An Army SoS Problem:

C4ISR/EW Integration in Ground Vehicles

Traditional Approach



Proposed Approach



- 1) Reduces SWaP-C impact
- 2) Systems interoperate with each other via the VICTORY Data Bus (VDB)
- 3) Enables additional capabilities
- 4) Enabler for Commonality

VICTORY Goals



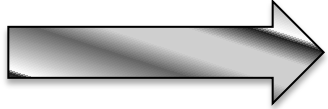
- Eliminate, where possible, the practice of “Bolt On” systems
- Significantly reduce SWaP-C
- Support new capabilities
- Reduce overall life cycle costs
- Maximize C4ISR/EW portability
- Support current & future IA requirements
 - Enable “defense in depth” security designs
 - Support many IA requirements and levels
- Integrate with current-force systems
 - Define a path toward network-centricity

VICTORY Initiative History



2006	2007	2008	2009	2010	2011	2012	2013	2014	...
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Late '06 – “In-Dash” Concept formed by PEO C3T, PEO CS&CSS and CERDEC – Loose Confederation of the Willing



Late '11 & Early '12 – Transition MOA signed and Management Directive signed to formally establish the VICTORY Executive Steering Group (ESG), the VICTORY Standards Support Office (VSSO) and cost share strategy

		Oct '09 Stryker Spiral 1 Demo	Jun/Jul '10 TWV Survivability ATO Demo	Apr '11 MRAP Digital Backbone Convergence Demo
		Apr '10 Architecture A Release	Jul '10 Experimental Spec V0.5 Release	Jan '12 Architecture A1 and Standard Spec V1.1 Release
			May '10 Standards Body Kick-Off	Jul '11 Standard Spec V1.0 Release
				Apr '12 Standard Spec V1.2 Release

Jul '07 JLTV Tech Dev Phase Specification		Sep '10 GCV RFP	Nov '10 Stryker RFP	Sep-Nov '11 RFPs for Abrams & Bradley ECPs
				Jan '12 JLTV EMD Phase
				Mar '12 mFoCS RFP

Management Formalization

Major Milestones

Acquisition Adoption





VICTORY Execution Strategy

VICTORY focuses on adopting/adapting/authoring, validating and managing a Single Authoritative Framework and Standards for vehicular integration

STRYKER

Abrams and Bradley ECPs

JLTV

CLOE

GCV

mFoCS and JBC-P

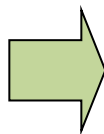
COE

Commonality

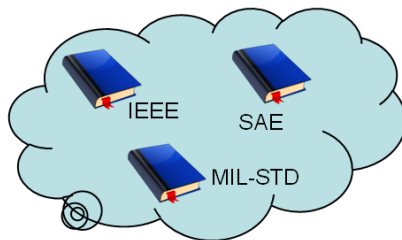
FACE

Others

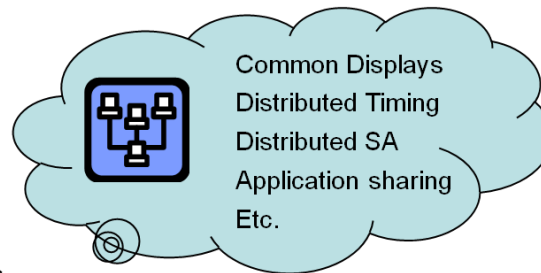
CONVERGING ON-GOING EFFORTS



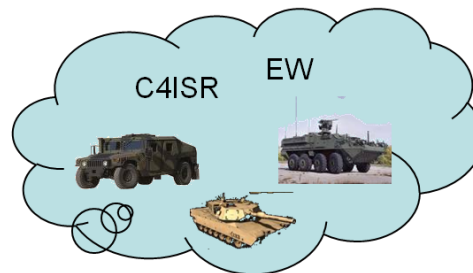
Develop Architecture
Baseline common components & standard interfaces to be applied to any tactical vehicle platform



PEO/PM Implementation
Strategize acquisition path forward



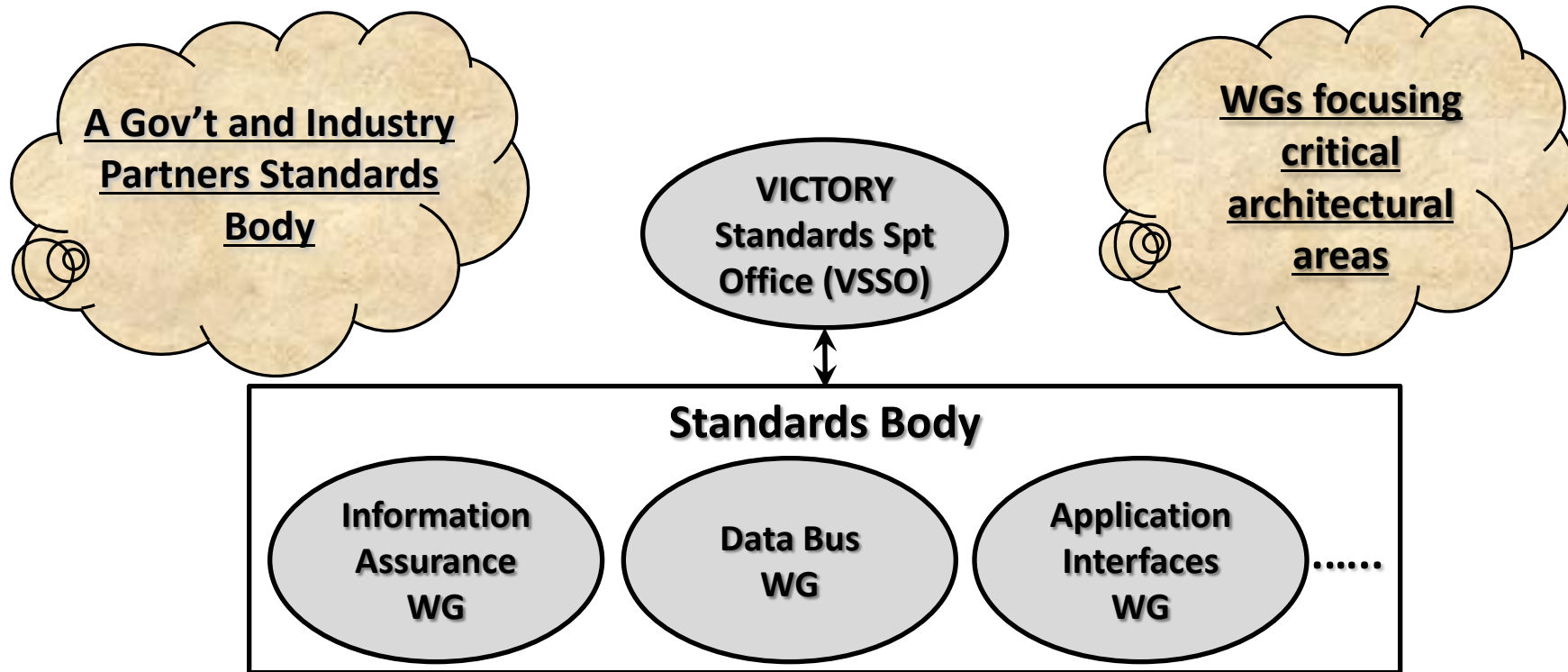
Adopt, Adapt and Create Open Standards
Accepted for publication by recognized standards body





Standards Body

Working Groups build the standards bottom up



- Draw on both Government and Industry expertise
- Adopt, adapt and author standards with formal definition and suitable use cases
- Reiterate standards to reach maturity
- Ensure standards are open

VICTORY Technical Approach



- Add a data bus (network) to vehicles
 - Integrate C4ISR/EW systems, interface with other electronic systems
 - Provide the plumbing for systems and components to interoperate (work together cooperatively)
- Provide shared hardware and services as part of the data bus
 - Shared processing and user interface hardware
 - Shared services
 - Management: configuration, control, health reporting
 - Position, orientation, direction of travel
- Define components with standard, open network-based messaging interfaces
 - IA components: protect data & control access
 - C4ISR/EW components: interoperate via network messages
 - Platform systems: interface with VDB via network messages

VICTORY Architectural Tenets

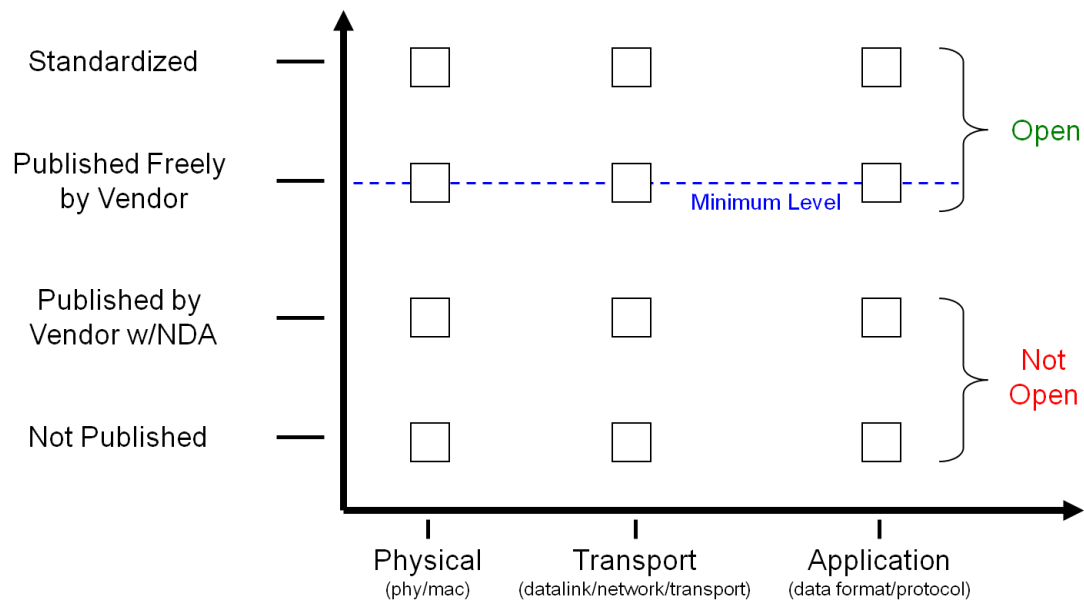


- Specify “on-the-wire” network-based interfaces
- Mature specifications into standards
 - Validate the architecture & standards through experiments
 - Prove that architecture and standards are reasonable and effective
- Keep specifications open to the ground vehicle community
- Treat Information Assurance (IA) as a vital
- Keep time critical processing integrated with sensors
 - Publication on data bus can be secondary (e.g. high-rate video)
- Enable open competition
- Identify roadmap from current to future architectures
 - Include current-force systems in the architecture
 - Evolve toward network-centric C4ISR/EW



Definition of Open

1. Not controlled by a single vendor
2. Not tied to a specific vendor's platform (platform independent)
3. Available for implementation by multiple sources
4. Usable without royalties or non-disclosure agreements (NDAs)
5. Published and managed by a standards body



Open places power in the procurement process with the Army

VICTORY Scope



- VICTORY provides enablers for integration and interoperability between electronics systems on Army ground vehicle platforms
 - Enables integration of C4ISR/EW systems
 - Interface to the sensors, many components and systems
 - Enables interfaces to (bridges) to platform systems
 - Interface to platform systems
- Scope / boundaries of current VICTORY framework
 - Stops at the edge of the platform network
 - Interface to satellite, terrestrial, dismounts, mobile sensors
 - Interface to data/voice radio
 - Stops at the edge of platform systems
 - Interface to automotive, weapons, power distribution, logistics, protection
 - Does not integrate safety critical systems
 - Does not define common physical components or software applications



What is VICTORY?

VICTORY *IS* or *DOES*

- Provide design guideline input
- Partnership
- Scalable leading to multiple price points for affordability
- Provide “build to” guidelines
- Seeking convergence
- A System of Systems Engineering (SoSE) initiative
- Provide input to platform and mission equipment PMs and Industry solicitations
- A framework providing an architecture, standard specifications, and reference designs

VICTORY *is NOT*

- A vehicle design
- A PEO C3T initiative
- Cost prohibitive
- Hardware
- In conflict with other efforts
- A Program of Record
- Solicited through VICTORY RFP/BAA
- A runtime environment, middleware library, or software package



Architecture Development Approach

- Goal: network-based architecture for integration of electronic systems on Army ground vehicles
- Took a bottom-up approach
 - Begin with current force C4ISR and EW systems and components
 - Identify emerging C4ISR & EW technologies, sensors, and applications
 - Identify key platform systems for which network interfaces are needed
 - Identify common functions and opportunities for consolidation
 - Develop conceptual framework
- First identified component types representing current force systems
 - Top-down, clean slate approach would not have been evolutionary
- Next identified component types representing new capabilities being integrated into vehicles (video, recording)



VICTORY Products and Services

Products

- Architecture
 - Version A1 released Jan 17, 2012
- Standard Specifications
 - Version V1.1 released Jan 31, 2012
- Reference Designs
 - First release scheduled May 2012
- Initial Validation Artifacts
 - Published as completed
- Reference Software Library
 - First release, March 2012
- Verification Toolkit
 - SW tools for compliance tests
 - First release scheduled June 2012

Services

- Lead/Coordinate the VICTORY Standards Body
- Coordination and Outreach Activities with PMs
 - Cross-walking program performance specification with VICTORY specifications
 - Drafting VICTORY-related PWS language for PM RFPs
 - Synchronizing other on-going initiatives (e.g. COE, FACE, CBM)



Terminology

- **“Architecture”**: a conceptual framework defining overall concepts and terms, identifying elements to be standardized, including component types, their interfaces, design patterns and common structures
- **“Specifications”**: a document containing specifications of varying maturity levels, which identify the technical details of system (application) and component interfaces
- **“Reference Designs”**: documents describing how the specifications could be deployed
- **“Standard”**: a specification at the “proposed standard” or higher level of maturity

• **“Maturity level”**: a label that identifies the level of maturity of a specification, which varies over time. Maturity levels include:

- Preliminary
- Informational
- Experimental
- Proposed Standard
- Draft Standard
- Final Standard

Specifications



VICTORY specifications document:

- Versioned [major].[minor] (e.g. 1.0)
- Aggregates many specifications
- Each specification has an independent maturity level

Specification Types include:

- Component Specifications
- Interface Specifications
- Reference Design Specs
- Application Profile Specs

VICTORY Background - Conclusions



- VSSO aims to reduce SW&P and increase capabilities
- VICTORY is creating a framework, consisting of
 - Network-based architecture
 - Validated interface specifications
 - Reference designs
 - Reference software library
 - Verification toolkit
- VSSO is working with programs of record to transition specifications into vehicles and products
- For more information contact:
 - Grace Xiang, Deputy Director, VSSO
 - qiping.xiang@us.army.mil
 - www.victory-standards.org



VICTORY 101 – Process

March 12, 2012

A converged modular architecture for vehicle/electronic systems interoperability in a modular expeditionary Army at War

VICTORY

Vehicular Integration for C4ISR/EW Interoperability



Top-level process: architecture and specification development

Working group process: change proposals

Maturation process: architecture and specifications validation

VICTORY DEVELOPMENT AND MATURATION PROCESS OVERVIEW

VICTORY Working Groups



- Three specification development working groups
 - Data bus working group (DBWG)
 - Information assurance working group (IAWG)
 - Application interfaces working group (AIWG)

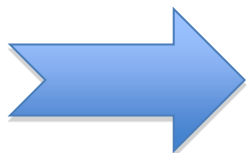
- Working groups are made up of
 - Government organizations
 - Product vendors
 - Vehicle and system integrators

- Working group tasks
 - Develop specifications for the interfaces identified by the architecture
 - Receive and address feedback from validation activities



Top-Level Specification Process

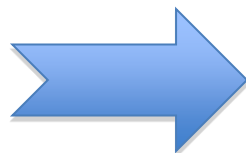
Architecture Document



Interfaces & Components To Specify

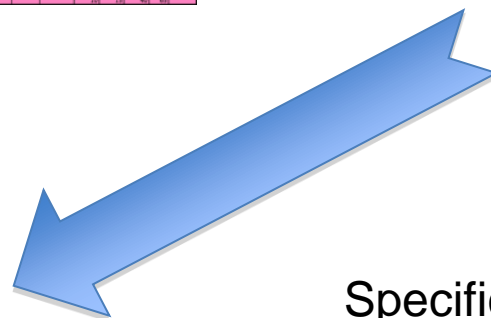
Interface Name	Maturity Aug 10	Maturity Dec 10	Maturity August 11	PCPs for Aug 10	# CPs for Aug 10	Total PCPs	Relative PCPs Priority
C4ISR Network Interconnection Data Interface	0%	0%	0%	1	1	1	0%
Network Management Interfaces	0%	0%	0%	1	1	1	0%
Network Management Interfaces	0%	0%	0%	1	1	1	0%
C4ISR Network Management Interfaces	0%	0%	0%	1	1	1	0%
Network Data Interface	0%	0%	0%	1	1	1	0%
Network Change and Processing Link Data Interface	0%	0%	0%	1	1	1	0%
Network Change and Processing Link Management Interface	0%	0%	0%	1	1	1	0%
Network Change and Processing Link Platform API	0%	0%	0%	1	1	1	0%
Network Processing Link Data Interface	0%	0%	0%	1	1	1	0%
Network Processing Link Management Interface	0%	0%	0%	1	1	1	0%
Network Processing Link Platform API	0%	0%	0%	1	1	1	0%
Network Service Data	0%	0%	0%	1	1	1	0%
Network Service Data Interface	0%	0%	0%	1	1	1	0%
Network Network Management Interfaces	0%	0%	0%	1	1	1	0%
C4ISR Data Interface	0%	0%	0%	1	1	1	0%
Link Interface	0%	0%	0%	1	1	1	0%
Network Adapter Data Interface	0%	0%	0%	1	1	1	0%
Network Adapter Management Interfaces	0%	0%	0%	1	1	1	0%
GR Total				10	10	10	0%

Priorities

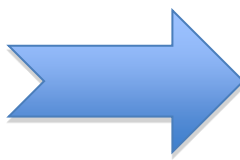


Change Proposal Plan

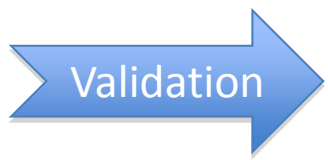
Item	Priority	Category	Phase	Status	Priority
1	High	Network Management	Design	Complete	High
2	High	Network Management	Design	Complete	High
3	High	Network Management	Design	Complete	High
4	High	Network Management	Design	Complete	High
5	High	Network Management	Design	Complete	High
6	High	Network Management	Design	Complete	High
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50	High	Network Management	Design	Complete	High



Working Groups Change Proposal Process



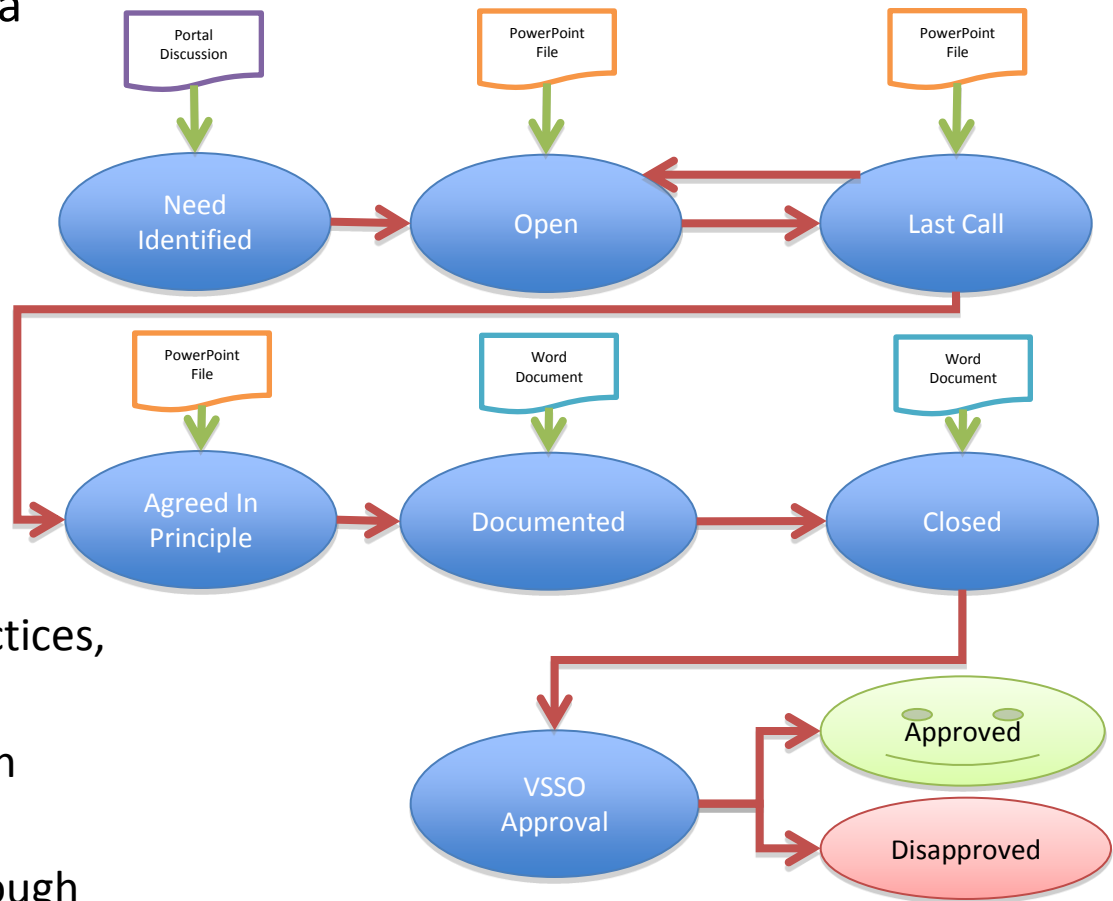
Specification Document





Working Group Change Proposal Process

- Specifications created through a Change Proposal (CP) process
- Creates specifications at the “experimental” maturity level
 - Even when adopting existing technologies
- “Experimental” maturity level
 - WG has leveraged research, previous experience, best practices, etc.
 - “Paper” level analysis has been done by working group
 - Specifications are detailed enough to develop a prototype





Maturation process: architecture and specifications validation

MATURATION OF SPECIFICATIONS



Definitions

- **VSSO:** VICTORY Standards Support Office
- **Validation:** The execution of experiments to determine whether a specification is mature enough for use in varying contexts
 - **Initial Validation:** Experiments to mature to proposed standard level
 - **Additional Validation:** Experiments to mature to draft standard level
- **Verification:** The determination of whether a particular hardware or software component complies with the VICTORY specifications
- **Certification:** The acceptance of the compliance by an authority



Specification Maturity

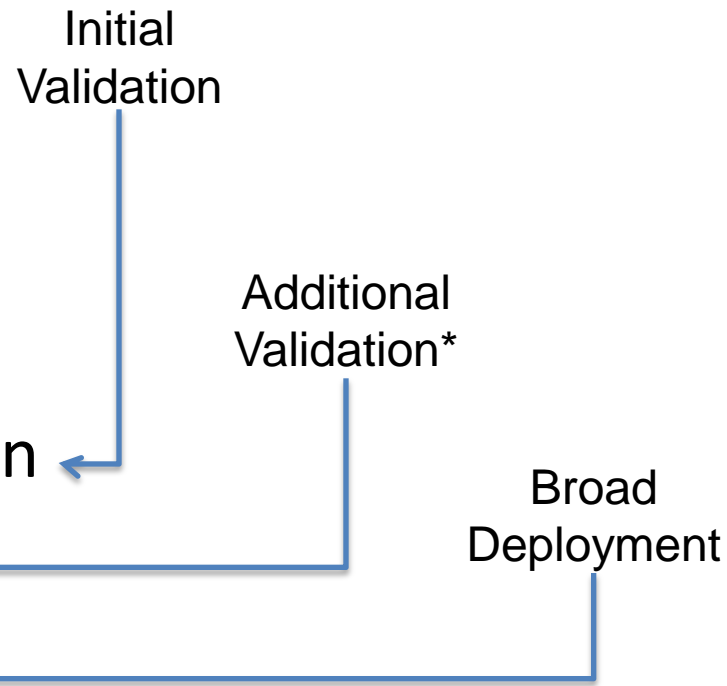
- **“Maturity Level”**: label identifying how “well proven” a specification is
 - Specifications are matured over time through **“validation”**
 - Maturity levels include:
 - **Preliminary Specification**
 - **Informational Specification**
 - **Experimental Specification**
 - **Proposed Standard Specification**
 - **Draft Standard Specification**
 - **VICTORY Standard Specification**
- Non-Standards Track Maturity Levels
- Standards Track Maturity Levels
- **“Standard”**: a specification at **“Standards Track”** level of maturity
 - Individual specifications have independent maturity levels
 - {Preliminary | Informational | Experimental} Specification
 - {Proposed | Draft | Final} Standard Specification



Specification Maturation

- Maturity levels include:

- Preliminary Specification
- Informational Specification
- Experimental Specification
- Proposed Standard Specification
- Draft Standard Specification
- Standard Specification



* Deployment by a program constitutes additional validation



VICTORY 101 – Architecture Overview

28 June 2012



Version A1 Content

VICTORY Data Bus

Component and System Types → Interface Specifications

VICTORY ARCHITECTURE OVERVIEW

VICTORY Architecture

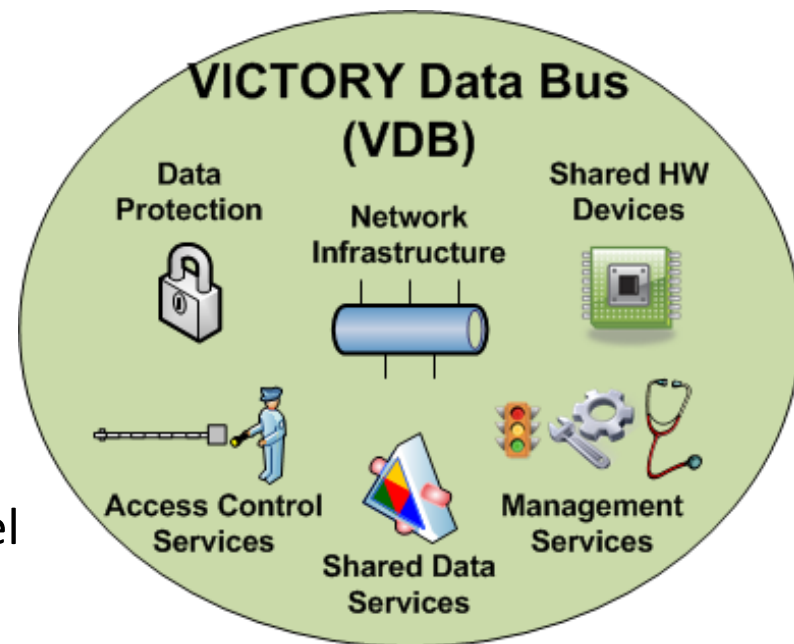


- The VICTORY architecture provides a managed framework onto which the specifications are developed
- Architecture defines
 - System types, component types, interfaces
- Current Documents
 - Version A1 of the architecture, published in January 2012
 - Aligned with version 1.1 of the specifications, published January 2012
- The following walks through Architecture A1
 - VICTORY Data Bus (VDB)
 - VDB component types
 - C4ISR/EW systems and component types
 - Platform system types



VICTORY Data Bus

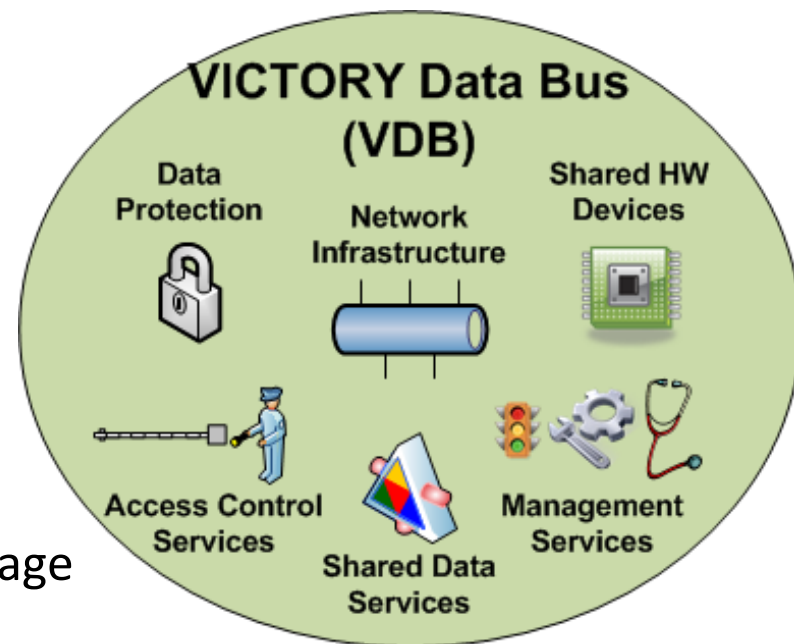
- VICTORY Data Bus (VDB)
 - Central structure of the VICTORY architecture
- An instance of a VDB provides...
- Network infrastructure
 - Data transport, routing, QoS
- Shared data services
 - Time synchronization
 - Position, orientation, direction of travel
- Shared HW
 - Processing resources
 - Displays and user interface devices





VICTORY Data Bus

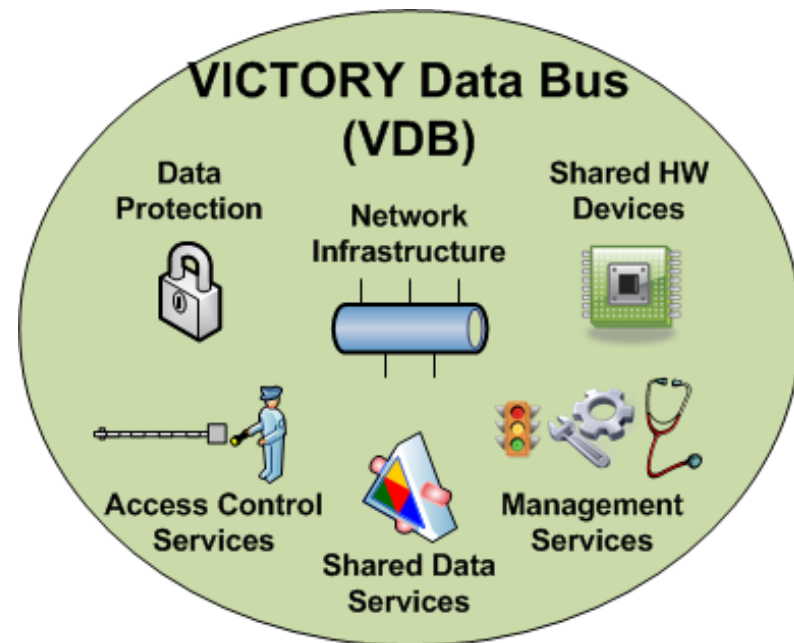
- VICTORY Data Bus (VDB)
 - Central structure of the VICTORY architecture
- An instance of a VDB provides...
- Management services
 - At VDB level: interfaces to manage system as a composite
 - At system level: interfaces to manage integrated and interfaced systems
 - At component level: interfaces to manage individual components





VICTORY Data Bus

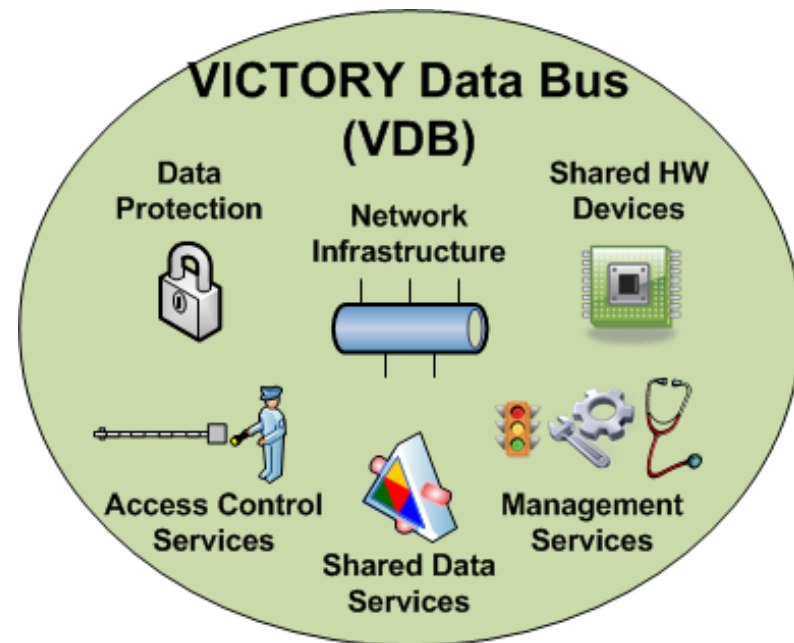
- VICTORY Data Bus (VDB)
 - Central structure of the VICTORY architecture
- An instance of a VDB provides...
- Information assurance
 - Standard components, interfaces, and patterns to support many IA styles
- Protection from network attacks
- Data protection
 - Protection of data at rest & in transit
- Policy-based access control
 - Authentication of entities and authorization for access to resources





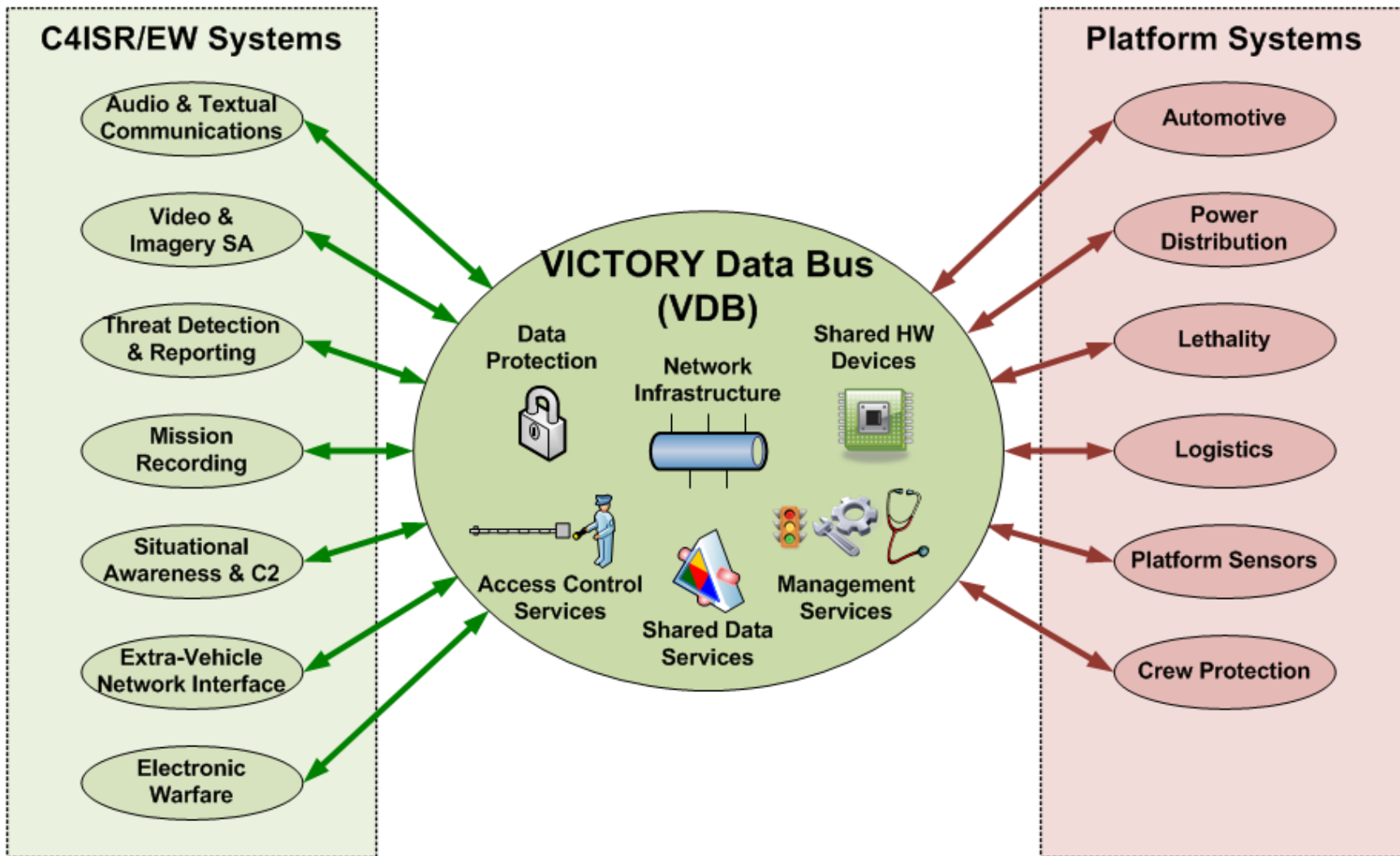
VICTORY Data Bus

- VICTORY Data Bus (VDB)
 - Central structure of the VICTORY architecture
- An instance of a VDB provides...
- Open network-based interfaces
 - Component level interfaces
 - C4ISR/EW system components
 - System level interfaces
 - C4ISR/EW systems
 - Platform systems



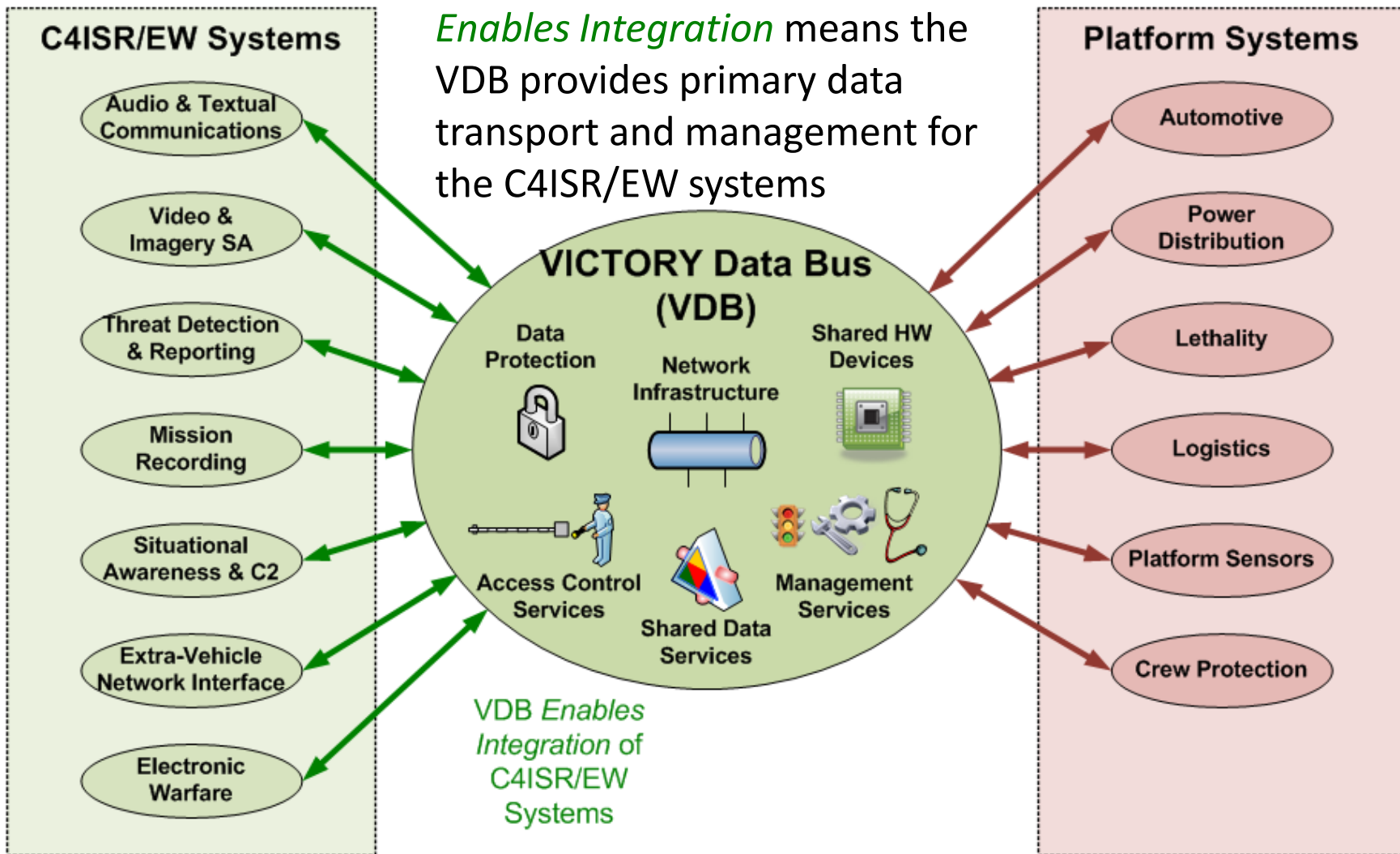


VDB Context



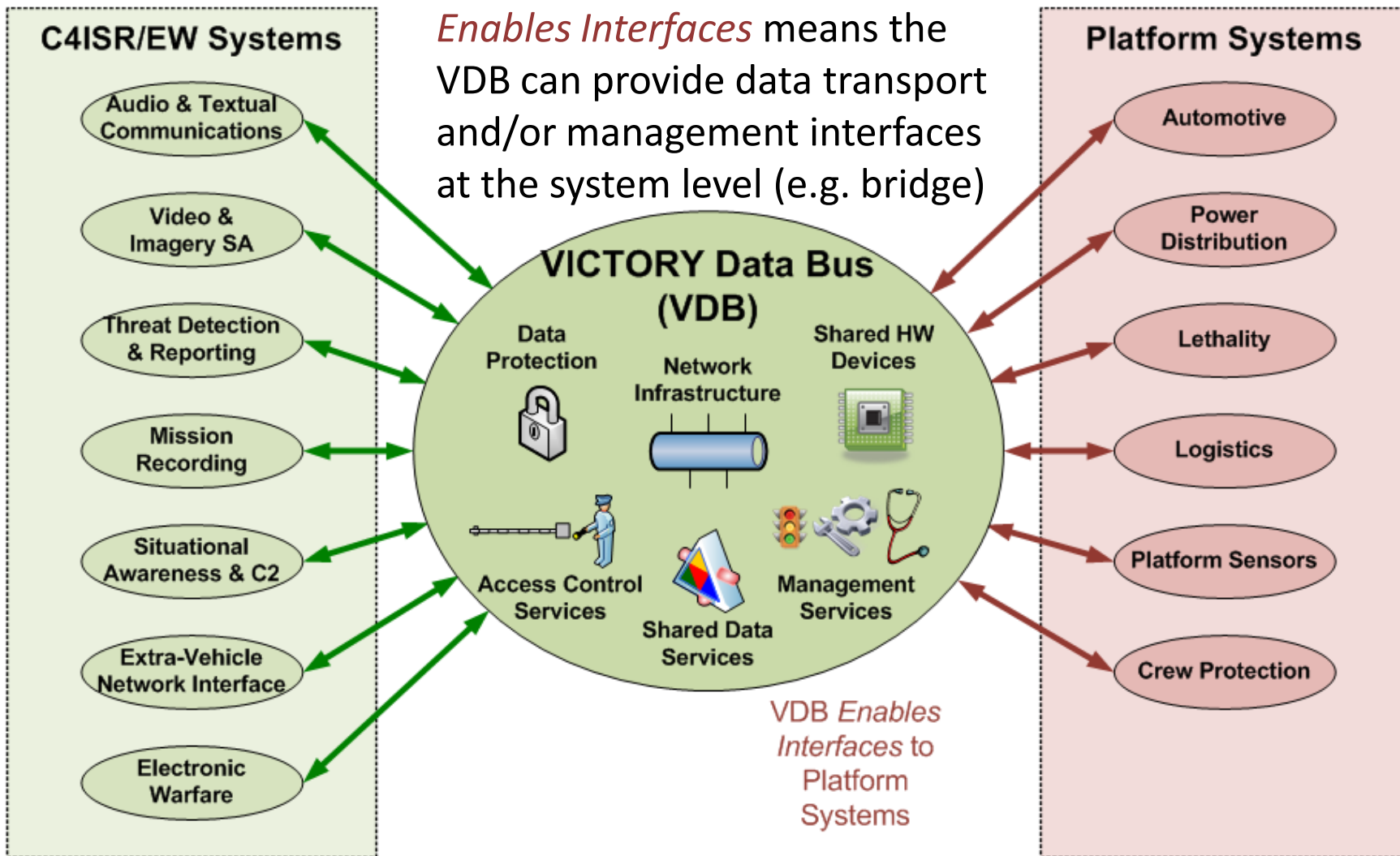


C4ISR/EW System Integration



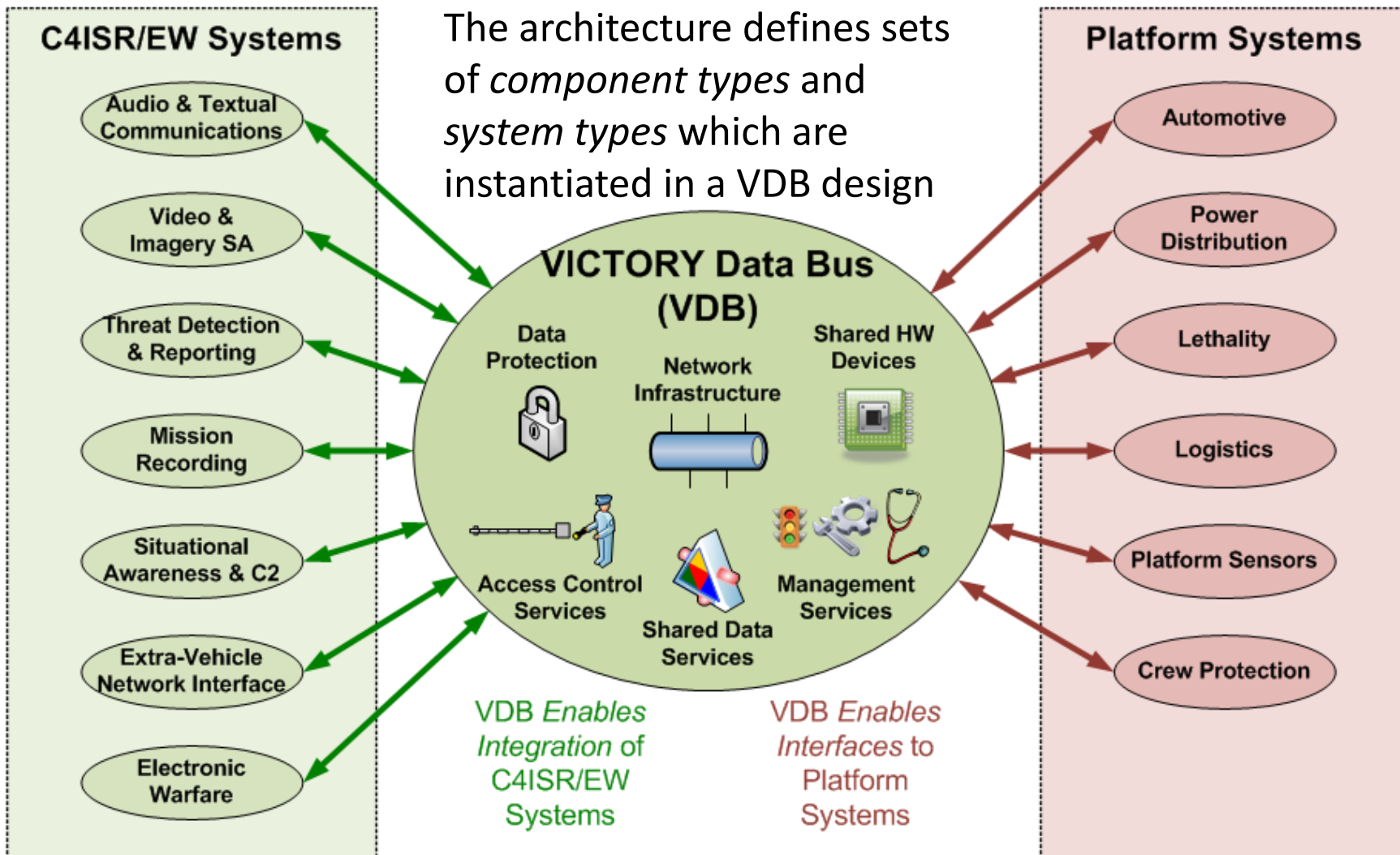


Platform System Interfaces





VICTORY Architecture Composition



System Types, Component Types, Interfaces



- Architecture defines
 - System types
 - Component types
 - Interfaces

- Organization of architecture
 - VDB component types
 - C4ISR/EW systems and component types
 - Platform system types



Component and System Interface Types

- Network (messaging) interfaces
 - Data transport interfaces
 - Physical to transport layer protocols: data delivery, QoS, signaling
 - Data interfaces
 - Higher layer protocols: application data format, encoding, encapsulation
 - Management interfaces
 - Configuration & control, health management (status & faults)
 - Access control interfaces
 - Authentication & authorization, data protection
 - Used in conjunction with all network, data, & management interfaces
- Software (application program) interfaces
 - Processor API (e.g. shared processing unit)
- Non-networked electrical interfaces (a few)
 - Device connections: time reference, GPS RX, display, UI devices, etc



VICTORY Architecture Conclusions

- Architecture document defines sets of
 - System types
 - Component types
- Each system and component type has...
 - Functions
 - Set of interfaces
 - Data transport interfaces
 - Data interfaces
 - Management
 - Access control interfaces
 - Non-networked interfaces
- The architecture identifies the interfaces, not the details
- The working groups develop interface specifications (details)
- VSSO matures the specifications into standards
- For more information contact:
 - Grace Xiang, Deputy Director, VSSO
 - qiping.xiang@us.army.mil
 - www.victory-standards.org

VICTORY

VICTORY Training IPT



- VICTORY Training IPT to be established January 2013
 - Need government and industry representatives
 - Need to develop Embedded Training Interface section to support Fall 2013 release
 - Need to ensure live, virtual, constructive, gaming interfaces are identified
- Bi-weekly VICTORY Working Group telecons (AIWG, DBWG, IAWG)
- Quarterly face-to-face meetings

Pat Sincebaugh
PEO STRI PM TRADE
407-384-5492

patrick.sincebaugh@us.army.mil