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VEHICLE ELECTRONICS AND ARCHITECTURE

Michigan Chapter
NDIA
National Defense Industrial Association

**TARDEC'S VICTORY SIL is a Key Tool for Advancing
Standardized Ground Vehicle Electronic Architecture**

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Agenda

- VICTORY SIL Background
- Timing Plan
- Development Process
- Testing Scheme and Process
- Test Results
- Interoperability
- Small SWaP
- Summary

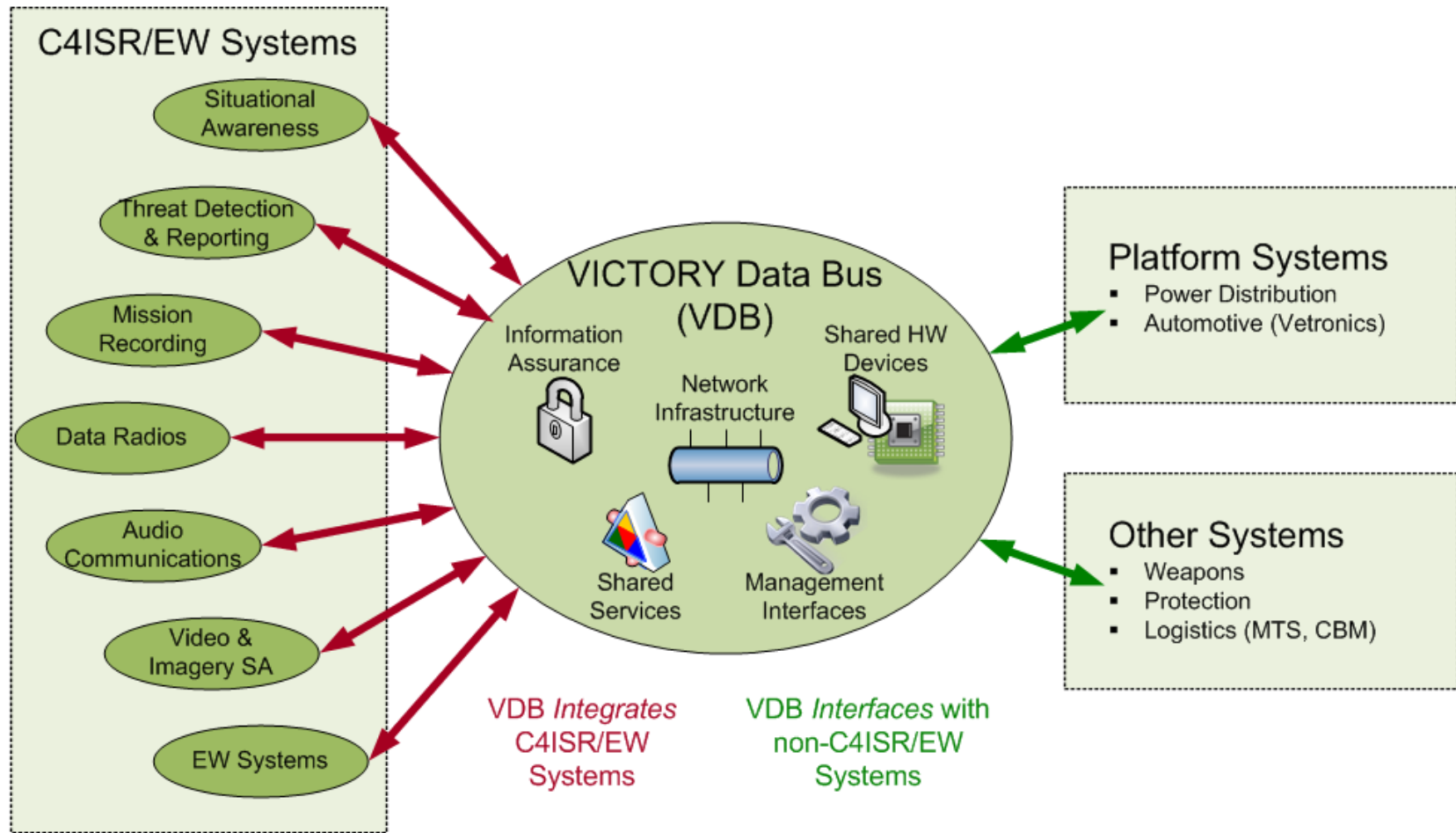
VICTORY SIL is a Tool for Advancing Standardized Ground Vehicle Electronic Architecture

- Build In-house Environment and Knowledge Base to Support Future R&D Capability Regarding Vehicle Electronics and Architecture
- Capability to Test and Verify Vendor Components and Subsystems
- Advance SWaP-C with Porting and Testing VICTORY Implementations to Small, Open and Powerful Process Modules

VICTORY Architecture Concept

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TARDEC VICTORY SIL

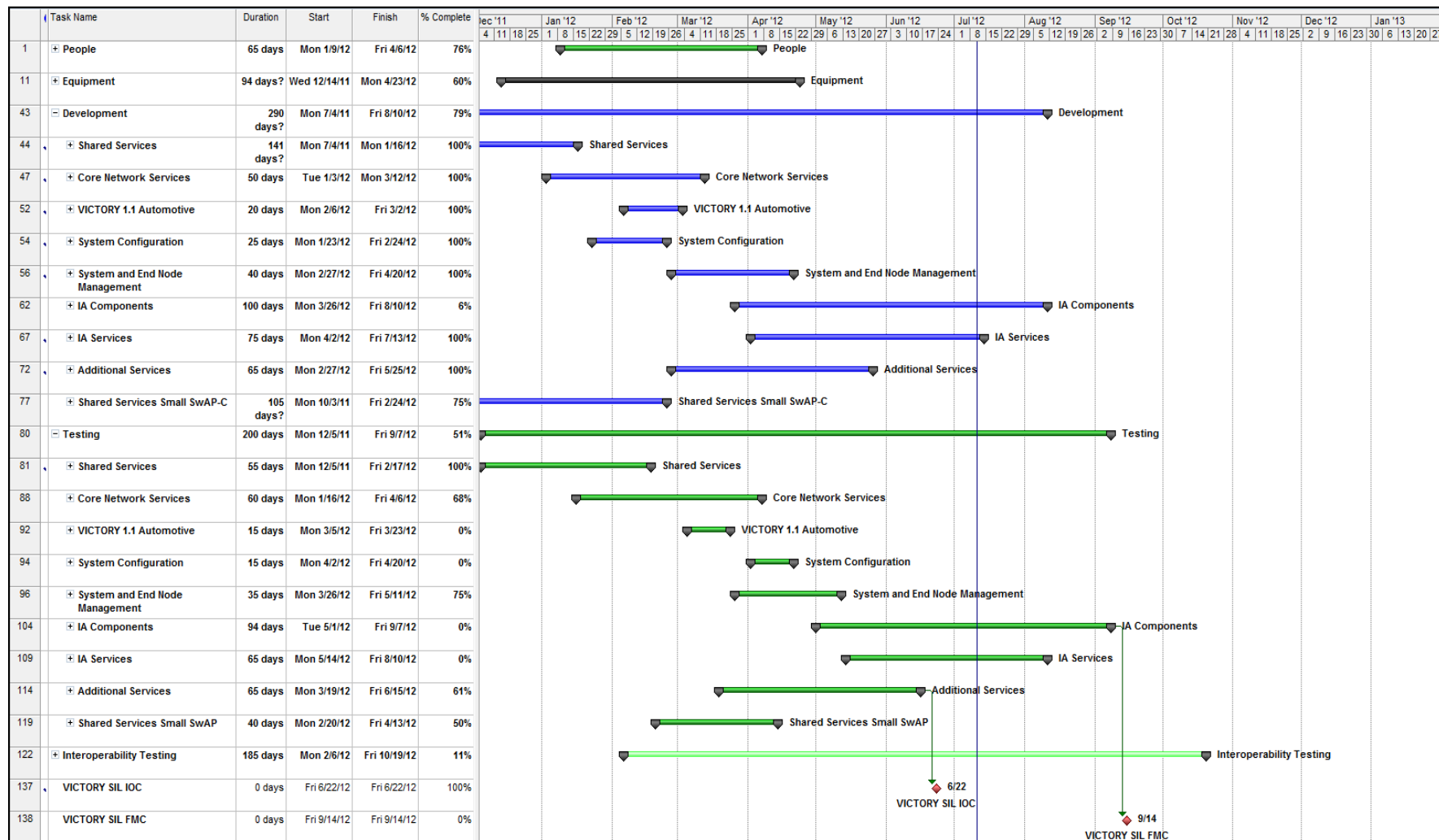


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- Provide an independent implementation of the VICTORY 1.0 Proposed Standards
- Provide Validation and Verification of the VICTORY 1.0 Proposed Standards
- Advance VICTORY Standards from “Proposed” to “Draft”
- Identify and clarify issues with the VICTORY 1.0 Proposed Standards
- The SIL will continue to evolve and change over time as new VICTORY Standards are released (1.1, 1.2, 1.3, 1.4, 2.0, ...)
- Utilize a representative vehicle cabin to demonstrate the VICTORY 1.0 Standards in a system level vehicle environment

Provide Independent Verification of vendors components to VICTORY Standard via Test Service Agreements

Detailed Milestone Schedule



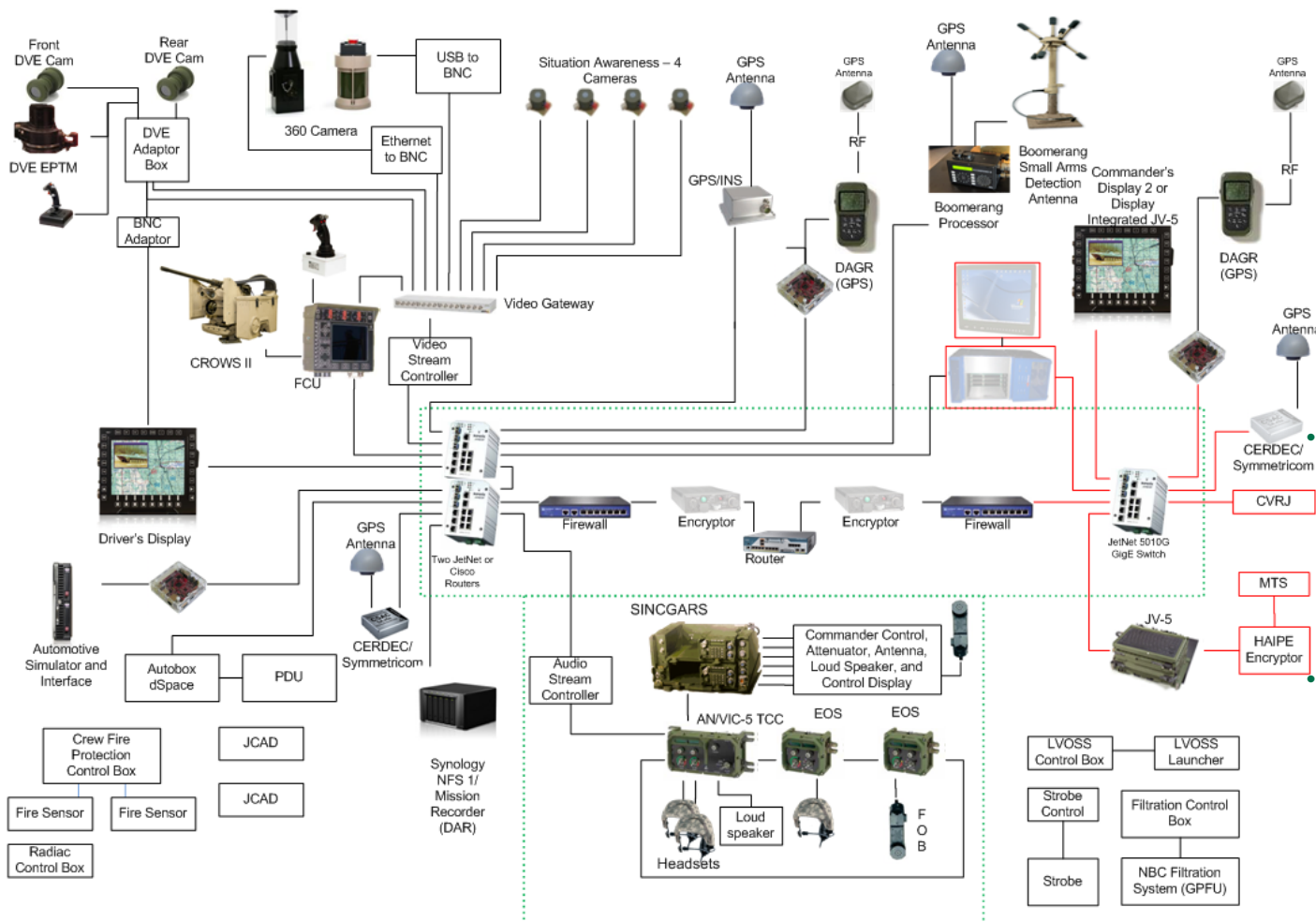
Phased Development Based on VICTORY 1.0 Standard Specification

- Phase 1: Core Services (Time Synchronization, Position, Direction of Travel, Orientation), Threat Detection and Reporting, Remote Weapons Station
- Phase 2: VICTORY Data Bus (VDB) Data Transport Interfaces, Management Interfaces, Component Interfaces, C4ISR System Interfaces, VICTORY Configuration Language, and Automotive Services
- Phase 3: Security and Information Awareness Build Up and Validation

VICTORY 1.0 SIL: End State Architecture

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• Shared Services

- ✓ Time
- ✓ Orientation
- ✓ Direction of Travel
- ✓ Position
- ✓ Threat
- ✓ RWS

• Networking

- ✓ IPv4 and IPv6
- ✓ Multicast
- ✓ SOAP
- ✓ Auto-Discovery
- ✓ SNMP

Information Assurance

- ✓ Access Control CDS
- Inline Network Encryptors
- Firewalls
- Intrusion Detection Systems

Voice and Video

- ✓ Voice Communication Interfaces
- ✓ Radio Management
- ✓ Video Enhanced Situational Awareness (VESA)
- ✓ Streaming Video
- ✓ Camera Management

• Automotive Services

GVSETS

Elements of testing at the SIL

- Specification 1.0 Verification - Message content & Format
- Functional Testing - VICTORY Service Functional Performance
- Management Interface Testing
- VICTORY Service(s) Resource Usage Testing

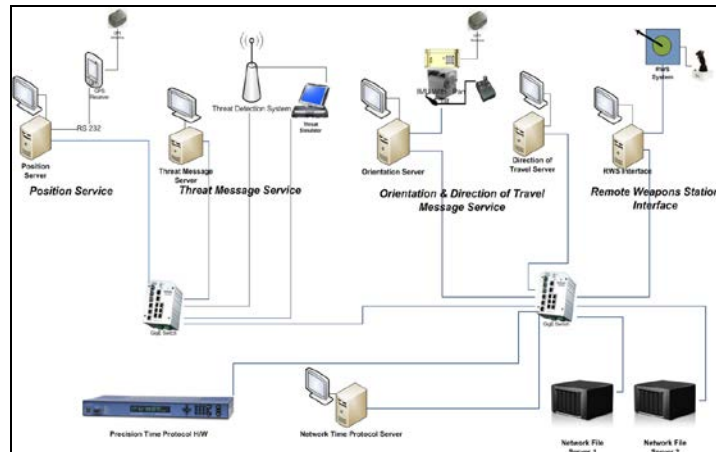
Test Plan Development

- Review of the documentation provided for the VICTORY standard specifications.
- Develop experimental procedures for validating the documented specifications. The procedures target each specification being evaluated.
- Create a logical and physical design for executing the experiment. Design the hardware and software configurations necessary to perform the experiment.

Test Results in VICTORY SIL

Elements of testing at the SIL

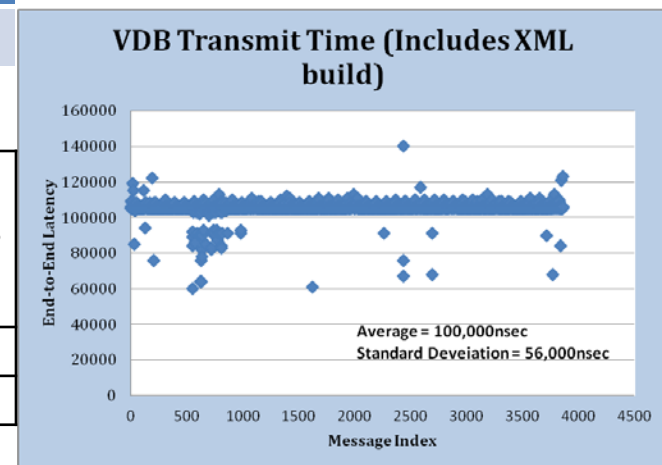
- SIL network built for testing
- Tools Developed to execute the test plan
- Management Interface Testing showed predictable results
- VICTORY Service(s) Resource Usage Testing was well within the limits of network capability.



Static parameters	Values received by client	Values stored in the 'Static Configuration Settings' file
Interface ID	N/A	N/A
Source ID list	N/A	N/A
Interface type	Position	Position
Interface standard version	1.0	1.0
Configuration Version	TARDEC_VEA_VIDS_1.0	TARDEC_VEA_VIDS_1.0
Geodetic datum	N/A	N/A
Timestamp uncertainty	0	0
Minimum update period	0	0
Nominal data available	0, 0, 0	0, 0, 0

Update Period Setting	Average value update for VDM message from Wireshark
1 sec	1.000837923 sec

Specification Version	Number of Proposed Specifications Tested and Verified	Number of Proposed Specifications
1.0	45	96
TOTAL	45	96

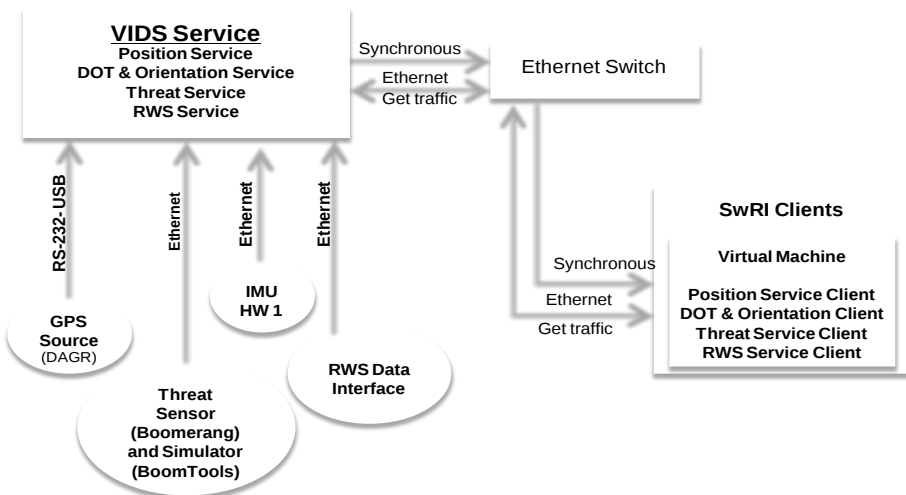
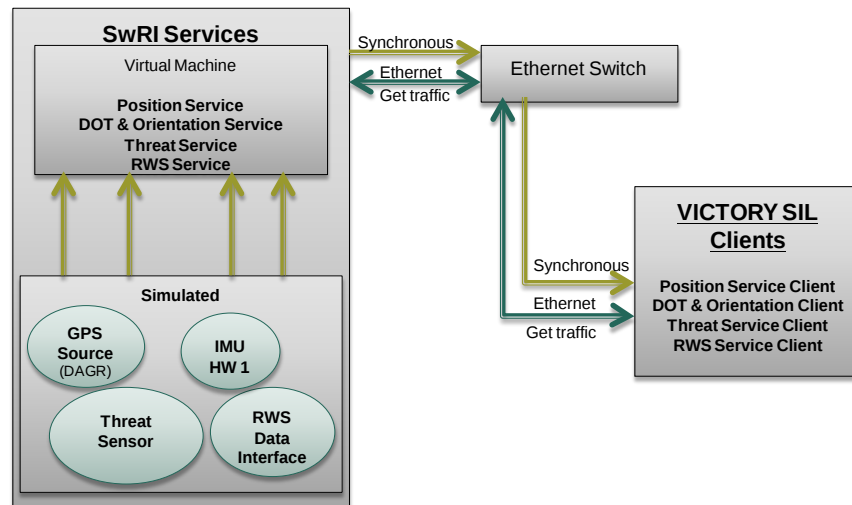


Interoperability with Independent VICTORY Implementations

Interoperability Testing

➤ TARDEC's Implementation of VICTORY services and clients executed interoperated successfully with the SwRI's implementation.

➤ Future testing will include testing of this service with the network fully implemented and with many end user application implemented on the network.



VICTORY Services Implemented on Small-SWAP Board

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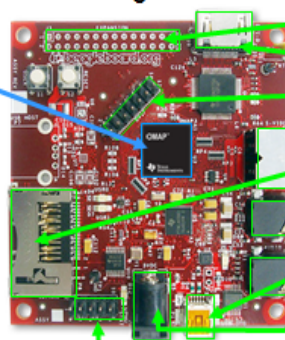
Small-SWAP Testing

- The Small-SWAP Board inserted into the network that included sensors that provided raw data for Position, Orientation, Timing, Threat and Remote Weapons Station.
- The results were very encouraging with very low power consumption (3.15 Watts), less than 1% system memory and CPU utilization and very low heat dissipation.
- Overall, developing and executing services on a Small-SWAP Board type computer on a vehicle platform with tight SWAP requirements is achievable with hardening the system to MIL standards.

Laptop-like performance

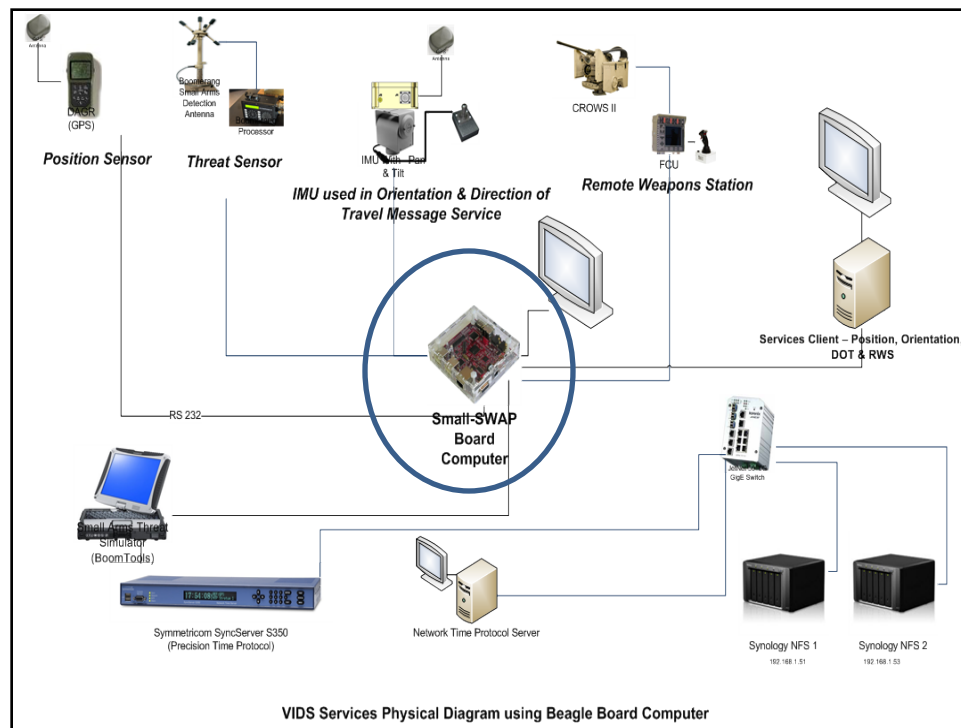
- TI OMAP3530**
- 600 MHz superscaler ARM® Cortex™-A8
 - More than 1200 Dhrystone MIPS
 - Up to 10 Million polygons per sec graphics
 - HD video capable C64x+™ DSP core
- Memory**
- 128MB LPDDR RAM
 - 256MB NAND flash

3"



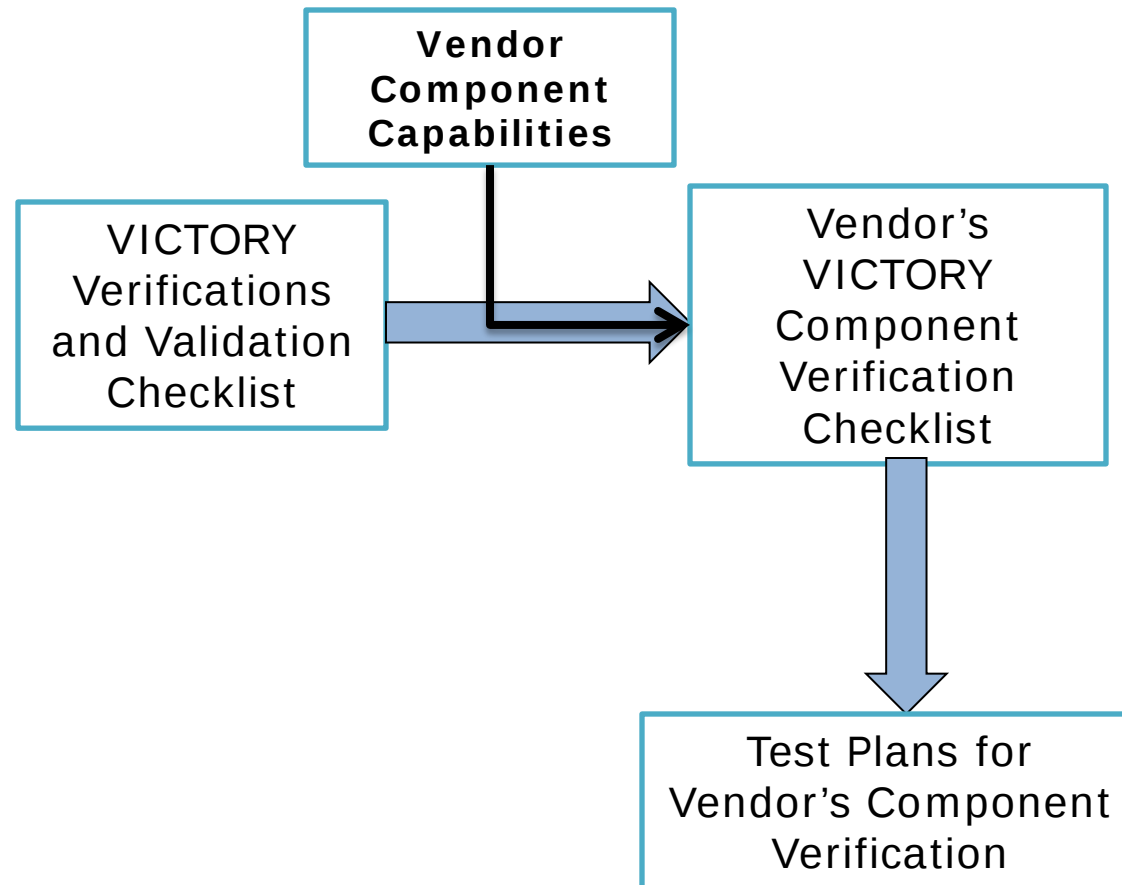
Flexible expansion

- I²C, IFS, SPI, MMC/SD
- DVI-D
- JTAG
- S-Video
- SD/MMC+
- Stereo Out
- Stereo In
- USB 2.0 HS OTG
- Alternate Power
- RS-232 Serial



VIDS Services Physical Diagram using Beagle Board Computer

Verification of Vendor Components





Summary

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- Built Capability for Open and Standardized Vehicle/EW Architecture.
- VICTORY 1.0 implementation is FMC by September, 2012
- Capability to test and verify vendor provided VICTORY capable components & subsystems
- Advancing SWAP-C with porting and testing 1.0 implementation to small, open and powerful process modules