Air Virtual At Sea (VAST) Platform Stimulation Analysis

Final Report
Concept for Support of ONR/JFCOM

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CUBIC DEFENSE APPLICATIONS, INC.
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Report Documentation Page

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Outline

- VAST / LVC Integration Concept
- VAST / LVC Integration Architecture
  - Notional
  - Component
- Demonstration Concept
  - Phase 1
  - Phase 2
  - Phase 3 (’06 opportunity)
- Schedule and Cost
- Engineering Management Topics

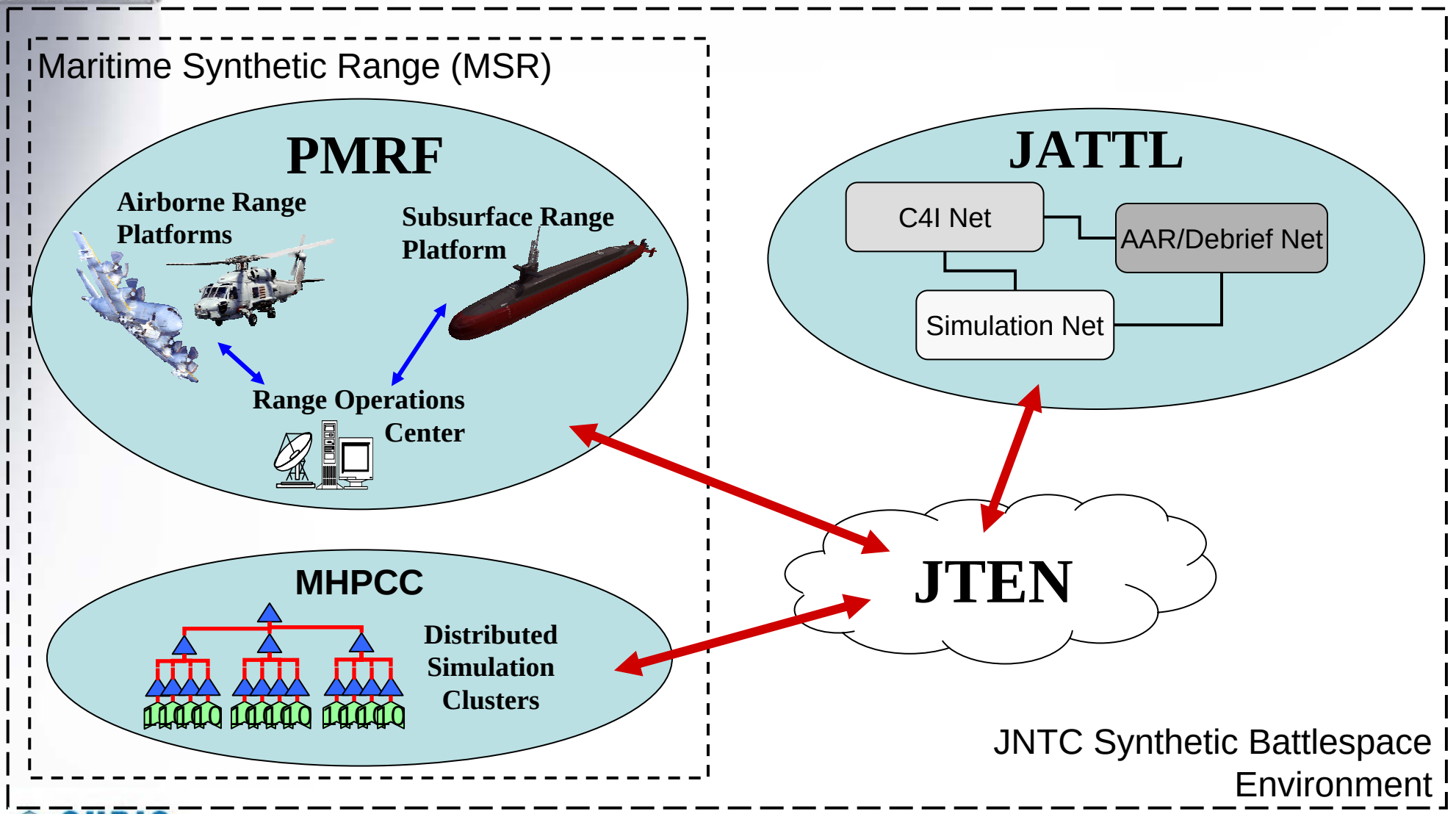
VAST / LVC Integration Concept

- Goal: Concept exploration of bi-directional stimulation of live, airborne platforms and a synthetic battlespace environment.
- Objective: Enhance LVC infrastructure in the Hawaiian Islands
  - Maui High Performance Computing Center (MHPCC)
  - Kauai Pacific Missile Range Facility (PMRF)
- Extend MSR infrastructure to include stimulation of a generic live node sensor system with virtual and constructive state information
- Integrate newly developed MSR infrastructure into the JTEN

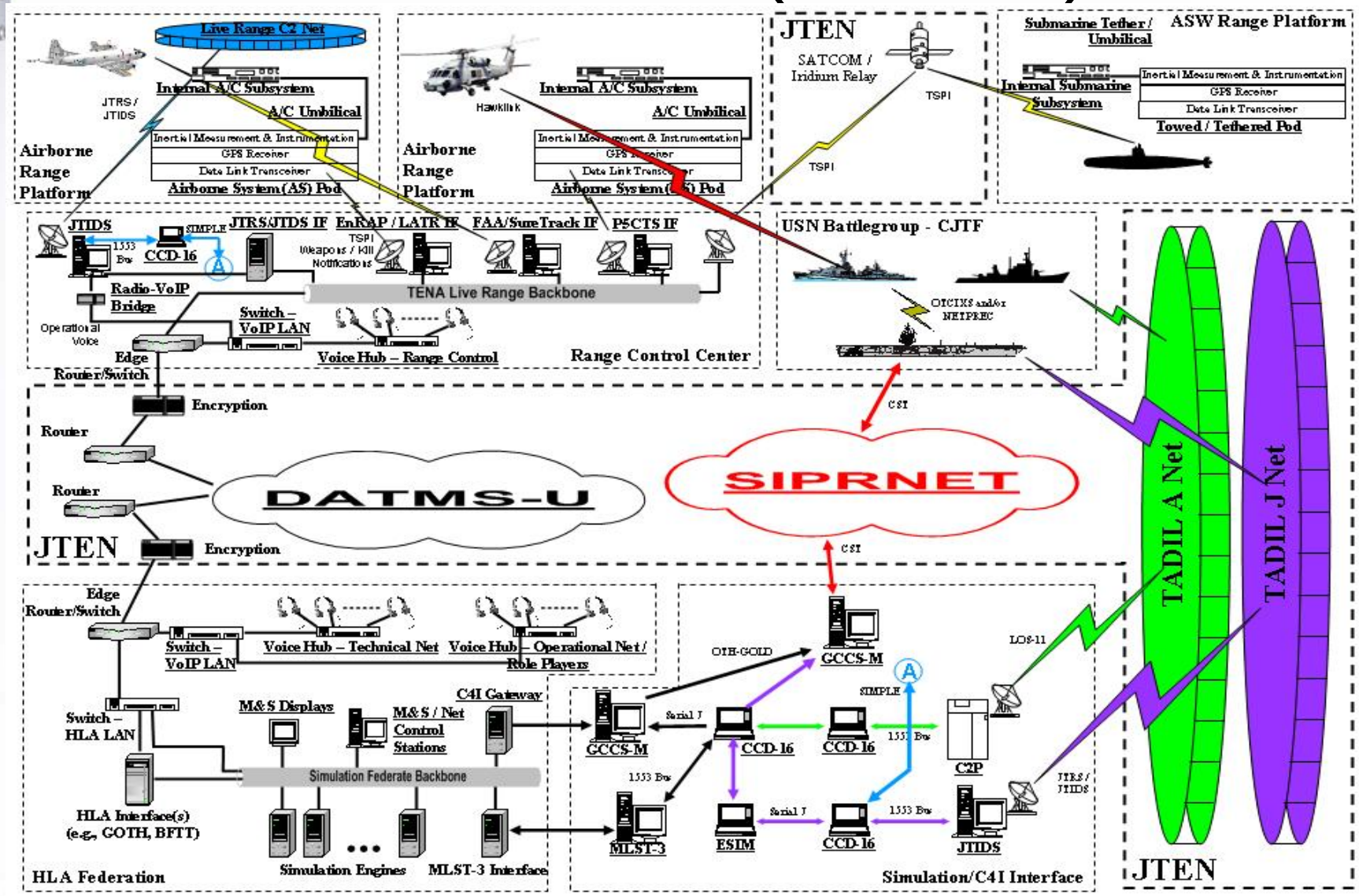
VAST / LVC Integration Approach

- Develop a demonstration concept based on leveraging emergent technologies and existing core LVC technologies.
- Leverage P5CTS development to support platform integration; Use of P5CTS will complement the P5CTS program goals on a non-interference basis
  - Performs early risk reduction for P5CTS in the simulation/stimulation area
  - Uses contractor assets as P5 surrogate hardware for demos
  - Takes advantage of Cubic advanced systems engineering group domain knowledge in TACTS/ACMI especially P5
- As required, reuse/leverage surrogate platform integration technologies (e.g., ASW VAST MRT3, ONR LCASS)
- Leverage standardized JNTC / NCTE simulation/stimulation technologies (to include network infrastructure).

VAST/LVC Integration Conceptual Architecture



VAST/LVC Component Architecture (Notional)



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Component Technologies

- ASW Platforms – SH-60B (’05), P-3C (’06), SSN (’06)
- Platform Stimulation - P5CTS, LCASS (like technologies), TATS, range voice communications and circuits
- Platform Interface – P5CTS, LCASS, Towed Array Antenna, Organic sensors and transceivers, P5CTS⇔TENA interface
- Networking - JTEN, SDREN/DREN, TENA⇔HLA interfaces, LVC Bridge
- Simulation – JNTC Toolkit (e.g., JSAF, FAARS, MARCI)
- C4I – Alternative C4I GW, GCCS, TADIL (MLST3)

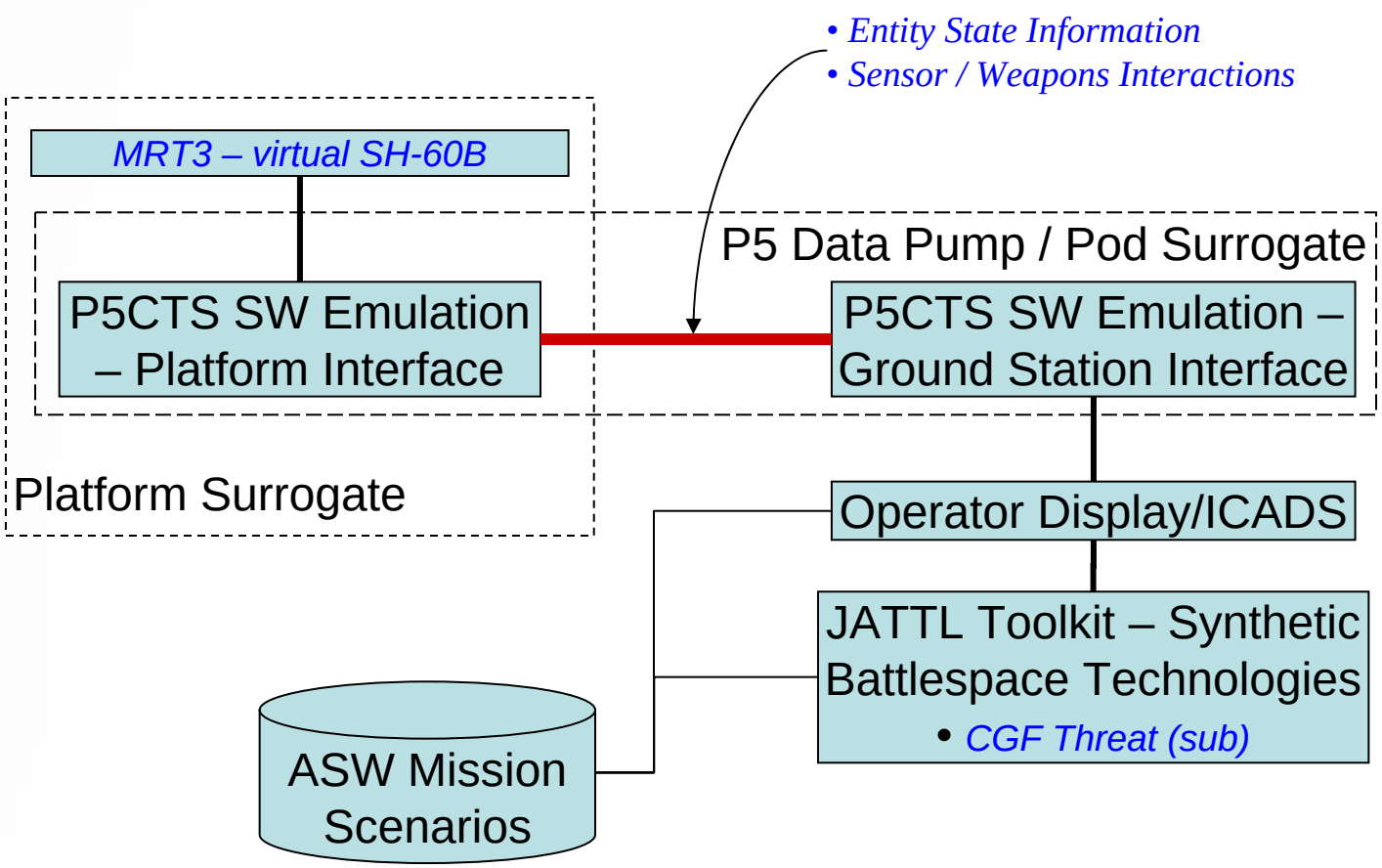
Demonstration Concept

- ASW mission
  - Technology demonstration
  - ASW training in context of Joint Operations
- Incremental capabilities; spiraling integration
  - Range Integration
    - Airborne platforms
    - Subsurface
  - JATTL/MHPCC Integration
- On- and Off-platform stimulation using distributed computing technologies
- Two Phase Demonstration Approach

Phase 1 Demo Concept

- Evolve and develop Use Cases/Scenarios
- Develop Demo System Architecture/SRD
- Develop ASW constructive simulation/stimulation models for SH-60/P-3C and submarine target
- Develop / enhance operator displays to include RWR and ASW views
- Create P5 data pump and integrate with constructive simulator
- Perform Lab Demo of ASW training concept using constructive simulator/stimulator and P5 data pump

Phase 1 Demo Architecture



Phase 1 Demo Technical Approach

- Reuse of ASW VAST / MRT3 (SH-60B)
- Design reusable data model for platform stimulation
- Develop prototype P5CTS SW components required for demonstration of concept
- Modify operator displays and constructive simulation components to manage data flow and component interfaces
- Restrict effort and development activities to SW components and component interfaces

Phase 2 Demo Concept

- Replace ASW VAST MRT3 (virtual simulator) w/ instrumented SH-60/P3C for ASW platform
  - Uses existing Cubic pod inventory
  - Enhance Cubic pods to perform as P5 surrogate
- Integrate PMRF into larger Joint synthetic battlespace using JTEN
  - Develop PMRF⇔TENA⇔HLA Interface
  - Stimulate PMRF airborne platform environment using JATTL Toolkit
  - Utilize MHPCC for large-scale, high-density battlespace; environmental/clutter modeling
- Retain constructive (CGF) threat environment (i.e., submarine target)

Phase 2 Demo Architecture

Internal A/C Subsystem

A/C Umbilical

Inertial Measurement & Instrumentation

GPS Receiver

Data Link Transceiver

Airborne System (AS) Pod

Airborne Range Platform

- *Entity State Information*
- *Sensor / Weapons Interactions*

PMRF Range Operations Center

Cubic Pod Surrogate

Ground Station Interface

Operator Display/ICADS

Range Control Interface

JTEN

JATTL

Joint Operating Concepts

ASW Mission Scenarios

- *CGF Threat (sub)*
- *Environmental*
- *Clutter*

MHPCC

Joint Synthetic Battlespace

Demo Phase 2 Technical Approach

- Utilize Cubic Pod surrogate technologies to integrate PMRF airborne range platform
- Demonstrate stimulation of aircraft subsystems
- Integrate platform stimulation at Mayport NS, NAS Jax, or NAS North Island
- Develop key PMRF network/data interfaces based on JATTL interoperability requirements
- Demonstration scenario to incorporate JNTC-based Joint Operating Concepts that include ASW operations

Demo Phase 2 Risks

- Risk: Availability of airborne platforms
  - Mitigation: Use of virtual surrogates; modify end-to-end architecture to include reusable components
- Risk: Availability of P5 hardware
  - Mitigation: Use of LCASS technologies as HW surrogate
- Risk: Aggressive development schedule
  - Mitigation: Technology leveraging/reuse
  - restrict system capabilities to only show simple dataflow

Demo Phase 3 Concept

- Phase 3 Evolutionary Step (’06 opportunity)
  - Replaces constructive simulated submarine target with live submarine target; integrated in-range and open ocean communications (i.e., acoustic modem and tow array antenna technologies)
  - Field updated system at PMRF and JATTL facilities
  - Adds a AF asset such as E3
  - Generate report on lessons learned and risk mitigation recommendations for sustaining Joint / ASW mission training capabilities
- Phase 3 Baseline
  - Retains instrumented SH-60 or P3C for ASW platform with surrogate P5 hardware
  - Uses TENA and JTEN for link between JATTL and PMRF

POA&M

- Plan of Action and Milestones + 45 Days
  - Outlines major MSR/JTEN engineering milestones
- Systems Requirements Document (SRD) + 60 Days
- Architecture (DODAF Views) + 9 Months
- System Integration and Test Plan + 10 Months
- Demonstration + 12 Months

ROM Cost

- Labor - $400,000
- Travel - $ 20,000
- ODC - $ 5,000
- Hardware - $ 60,000
- Contract Service - $ 15,000
- Total - $500,000

Critical Engineering Management Activities

- Project Management Planning
  - Schedule management
  - Recurring technical risk assessment and mitigation
- Requirements analysis / Architecture development
  - Focus on functional vs. non-functional requirements
  - Emphasis on technical requirements for key interface components
  - Identify high-value (meaningful and useful) data exchanges to effectively demonstrate stimulation of platform subsystems.
- Incremental integration and test processes
  - Required to effectively manage complex scope of component interfaces
  - Tight feedback loop with management planning (i.e., risk management)
- Control of HW/SW releases and system documentation (CM)
  - Coordination with other programs developing dependent technologies
  - To provide sustainment of demonstration capabilities and support transition/evolution of integrated VAST and LVC technologies

Sustaining Infrastructure

- Architecture and concept
  - Develop conformant w/JNTC std. (DoDAF)
  - Develop CONOPS for service specific mission training w/JTT
- Pod interfaces
  - Establish technical migration path to utilization of P5CTS technologies
  - Develop prototype operational configuration and control components
- JATTL interfaces
  - Develop baseline networking / data translation technologies
  - Maintain within the existing JATTL CM framework / infrastructure
- Integration methodology
  - Documented procedures and technical integration plans
  - Appropriate methodology to manage classified and secure integration w/JATTL

Summary

- A feasible approach exists to integrate operations of PMRF range platforms with JATTL to support Joint training
- Engineering solution relies on the reuse and leveraging of existing/emergent technologies
- An achievable plan exists to demonstrate the concept of VAST / LVC Integration
- The proposed VAST / LVC Integration can be achieved
  - Low-to-moderate technical risks
  - Moderate-to-high schedule risks
  - Low-to-moderate risk within proposed funding