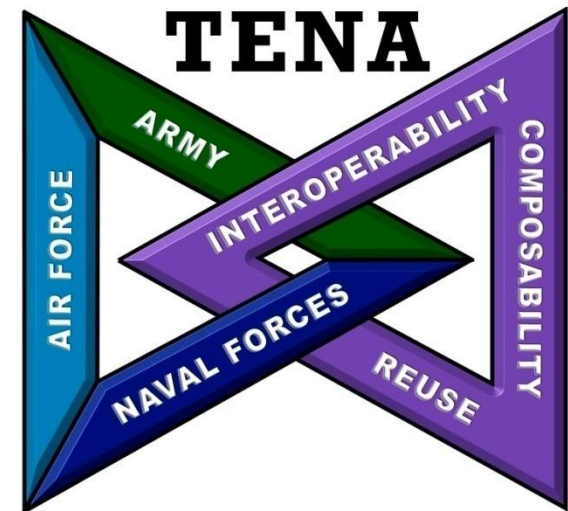


Improving Distributed Test & Evaluation with JMETC & TENA



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TRMC Missions

DoD (Charter) Directive 5105.71



MRTFB OVERSIGHT / T&E INFRASTRUCTURE

- *Plan for and assess the adequacy of the MRTFB to provide adequate testing in support of the development, acquisition, fielding, and sustainment of defense systems*
- Support the Department's objective of ensuring **compliance with DoDD 7000.14-R**
- *Review proposed significant changes to T&E facilities and resources of the MRTFB before they are implemented by the DoD Components*
- **Issue guidance** to the DoD Components, through the USD(AT&L), with respect to MRTFB planning
- Maintain an **awareness of other T&E facilities and resources**, within and outside the DoD, and their impacts on DoD requirements
- Serve as **Executive Agent for Cyber Test Ranges**

STRATEGIC PLAN

- *Complete a strategic plan for T&E not less often than once every 2 fiscal years*

BUDGET CERTIFICATION

- *Submit report to the SECDEF containing the comments of the Director concerning all such proposed budgets, together with the Director's certification as to whether such proposed budgets are **adequate***

PROGRAMS

- *Administer the **CTEIP** (Central Test and Evaluation Investment Program) and **T&E/S&T Program***

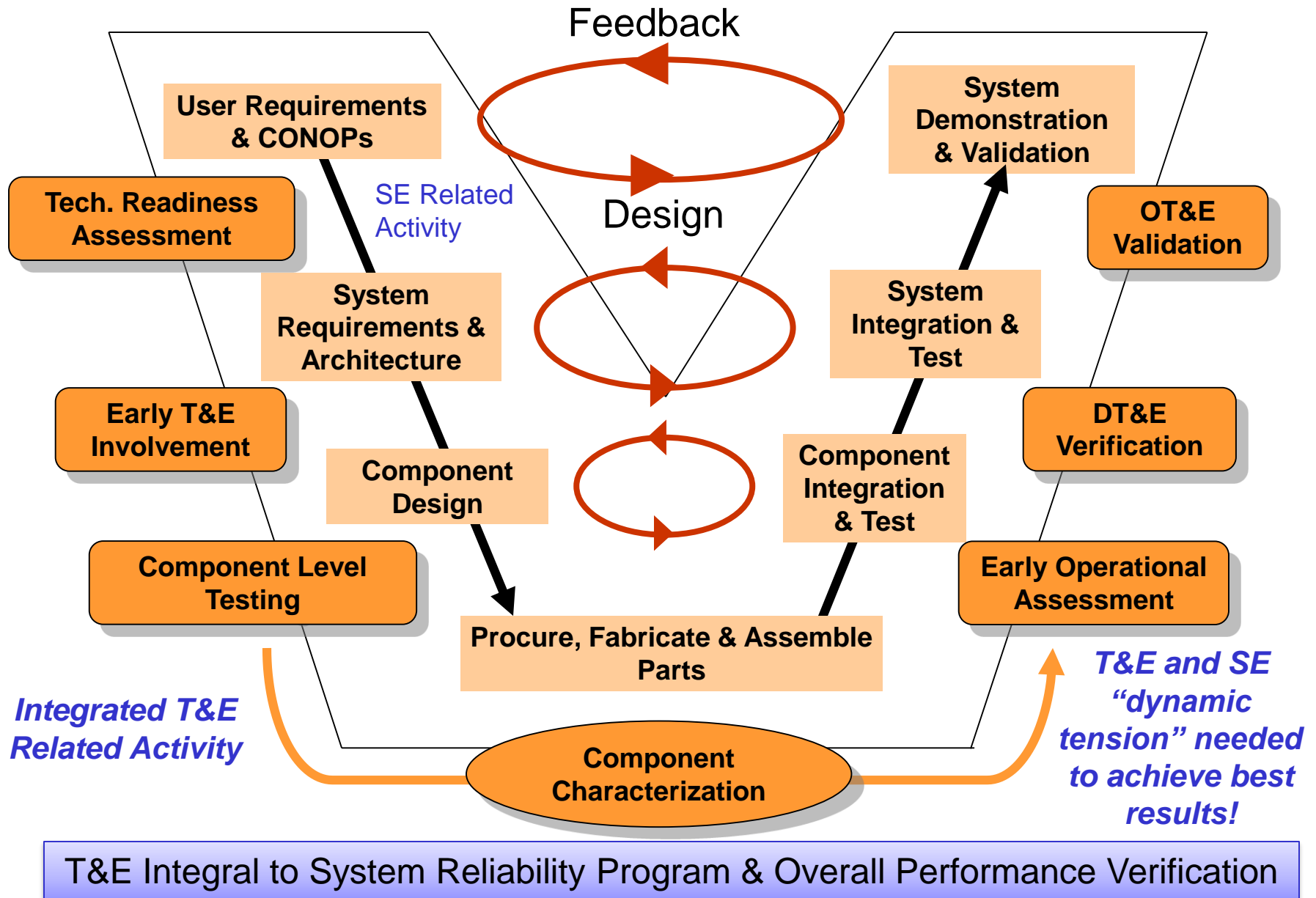
CAPABILITIES

- Manage and operate the **JMETC** (Joint Mission Environment Test Capability) Multiple Independent Levels of Security (MILS) Network and the Regional Service Delivery Points (RSDP) cloud computing environments
- Manage and operate the **NCR** (National Cyber Range) (IAW RMD 407A1, Issue #1, Title: Cyber, Jan 12, 2015) to provide cyber test capability and capacity for the T&E Community

Statutory **Regulatory**

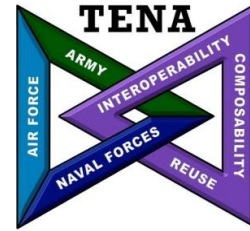
Why Are We Here?

Distributed T&E Supports Systems Engineering (SE)





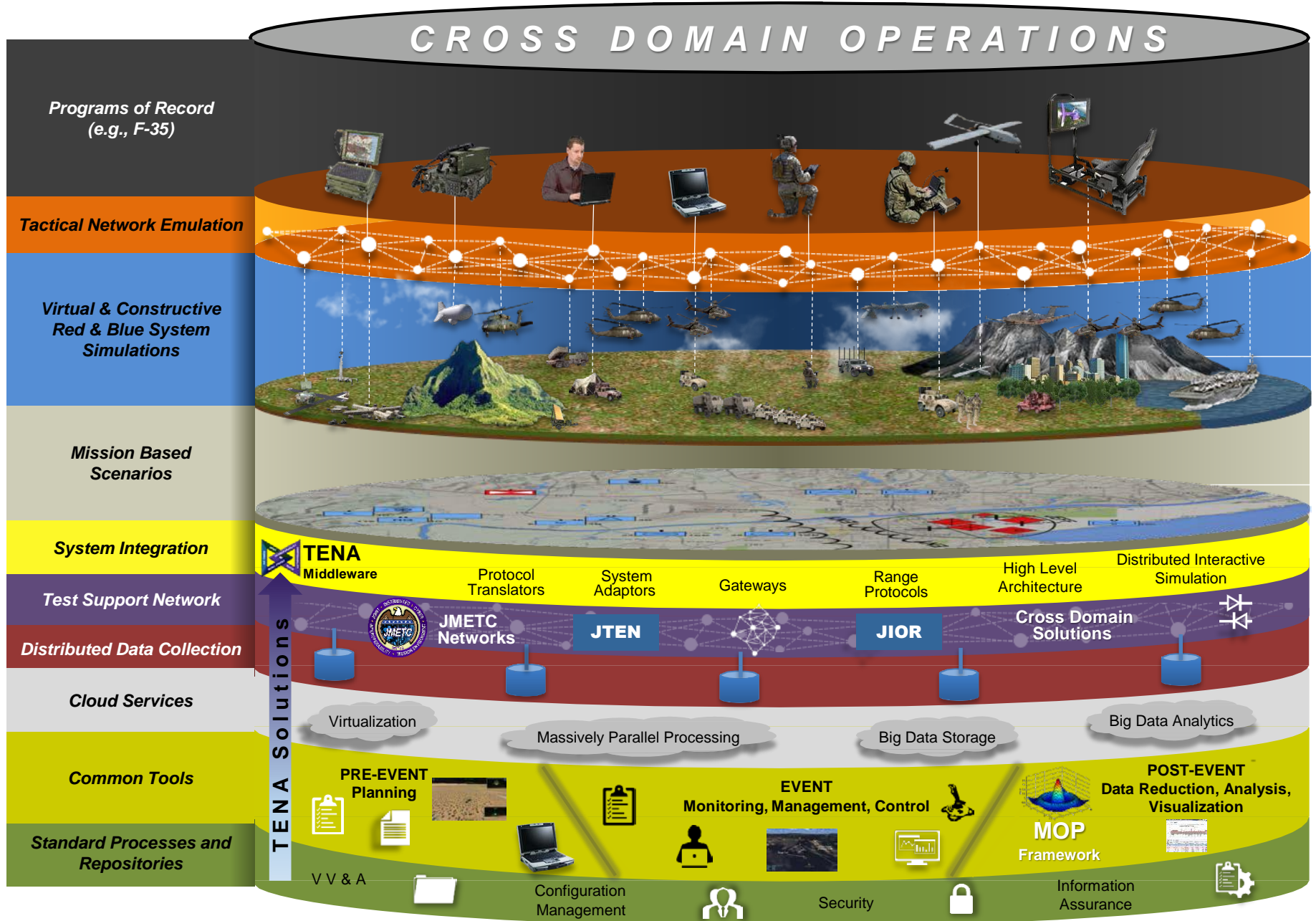
T&E at a Crossroads



- **Live-Virtual-Constructive distributed T&E mitigates today's biggest testing limitations:**
 - We aren't challenging current generation acquisition systems with complex enough test environments
 - We have limited high priority / low availability assets to go around
 - Testing with multiple security levels / boundaries is too resource-intensive to be viable
 - Information Assurance & Cybersecurity is equal parts necessary and frustrating
 - "Traditional" T&E model not relevant in an agile acquisition world
- **The Problem: Distributed T&E is still "hard" so it isn't a critical part of every program's day-to-day test activities**
 - Connecting disparate lab & range networks needs to be easier & faster
 - Effort needs to shift from environment construction and test execution to improving data analysis capabilities
 - Cooperation & collaboration between facilities needs to be the norm rather than the exception
- **Vision: We must make distributed T&E routine**
 - **Before JMETC:** Months / Years to plan, execute, & analyze
 - **With JMETC Now:** Weeks / Months to plan, execute, & analyze
 - **Our Need:** Hours / Days to plan, execute, & analyze

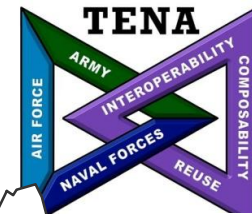
T&E risks irrelevance if we don't address these limitations

Vision: Agile T&E Infrastructure that supports acquisition

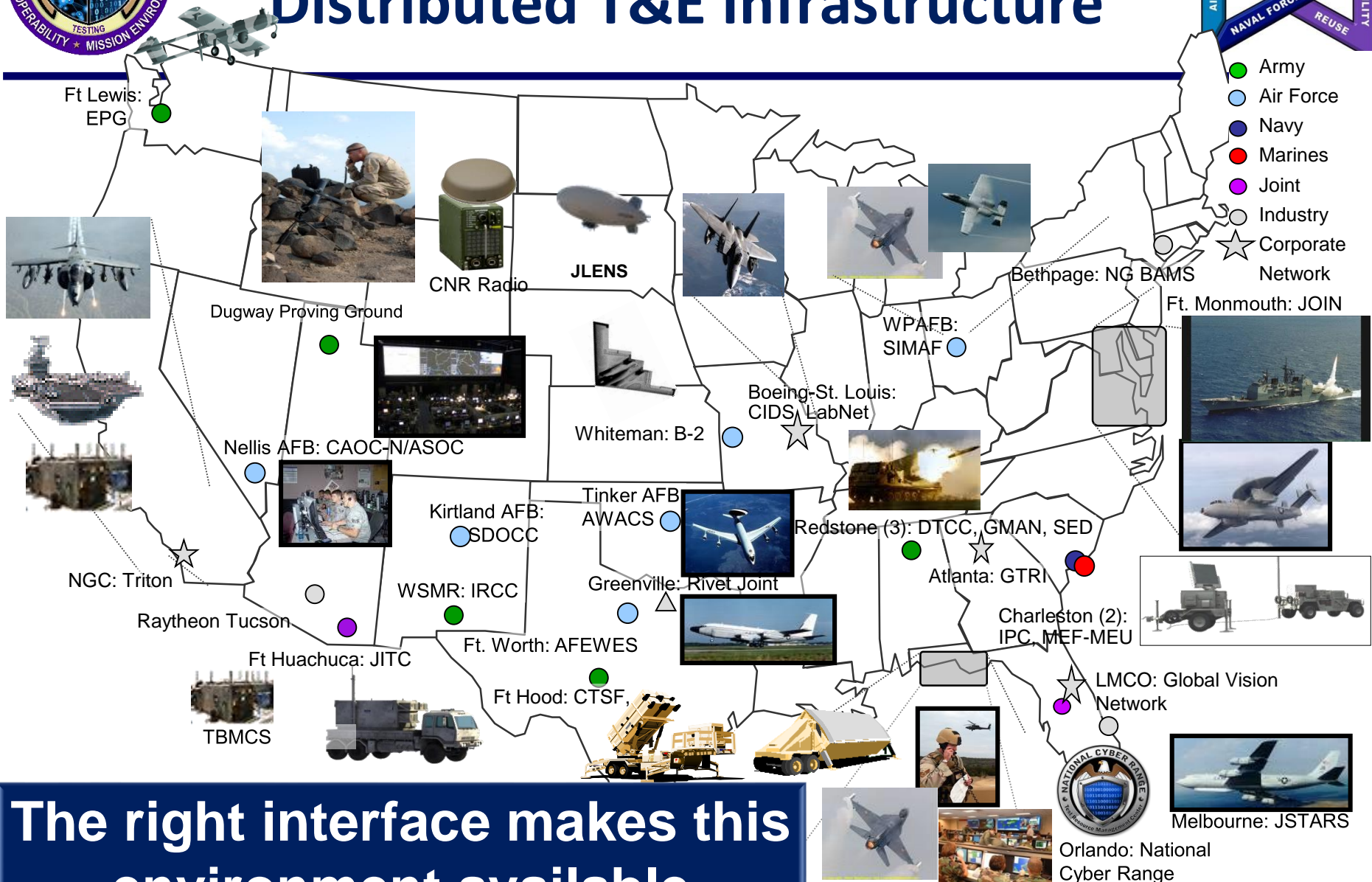




Example Assets Available Through Distributed T&E Infrastructure



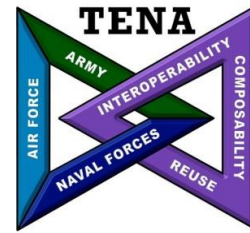
- Army
- Air Force
- Navy
- Marines
- Joint
- Industry
- ★ Corporate Network



The right interface makes this environment available



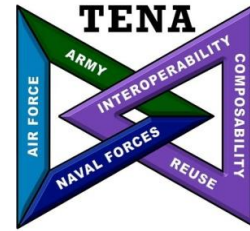
Joint Mission Environment Test Capability (JMETC) Program



- **Distributed Testing (Events, Tools, etc.)**
- **JMETC Secret Network (JSN)**
- **Test & Training Enabling Architecture (TENA)**
 - TENA Object Models
 - TENA Web Services
 - TENA Software Repository
 - TENA Tools
- **Big Data / Knowledge Management Initiative**
- **National Cyber Range Complex (NCRC)**
 - National Cyber Range (NCR)
 - Regional Service Delivery Points (RSDPs)
 - NCR Expansion (Service Sites)
- **JMETC MILS Network (JMN)**
- **Executive Agent (EA) for Cyber Test Ranges**



Distributed T&E Ingredients Supporting the Vision



- **Connectivity: “Persistent MILS Network”**

- Common network practices & procedures that reduce test execution risk
- Shared Cross Domain Solutions (CDS) that reduce cost to use & maintain
- Proactive monitoring & troubleshooting when things gone wrong

- **Analysis Capabilities: “Bring Big Data Analytics to T&E”**

- Connections to physically disparate data sources
- Automated analysis and reporting capabilities
- Empower analysts to ask questions they never thought possible to ask

- **Information Assurance / Cybersecurity: “Balancing security & mission”**

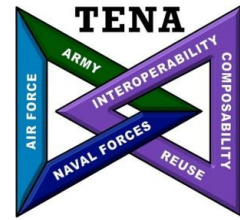
- Pre-negotiated security agreements with reciprocity across disparate domains
- Common Risk Management Framework (RMF) Overlay for RDT&E Networks
- Shared software certifications for common tools

- **Subject Matter Expertise: “JMETC is its people”**

- Seasoned team with decades of hands-on distributed T&E experience
- “Walking Encyclopedias” of available test assets & best practices



JMETC Benefits Acquisition Programs, Testers, & Evaluators

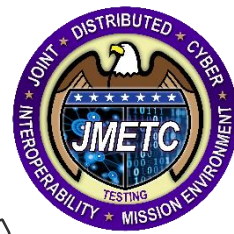


- Enables early verification that systems work in a Joint Environment
 - Test whether systems work well together
- Supports all aspects of testing
 - Rapid acquisition, Developmental Test, Operational Test, Interoperability Certification, Net-Ready Key Performance Parameters testing, Joint Mission Capability Portfolio testing
- Helps find problems early in acquisition – when they are less costly to fix
 - Customers have run as many as 20 independent test runs in a day and fixed interoperability issues overnight
- Reduces acquisition time and cost
 - Readily-available, persistent connectivity with standing network security agreements
 - Common integration software for linking sites
 - Accredited test tools for distributed testing
- Support to Acquisition Programs
 - Expertise to integrate distributed test facilities

JMETC is identified in T&E Master Plans (TEMPs) as the distributed infrastructure to be used to conduct Joint testing

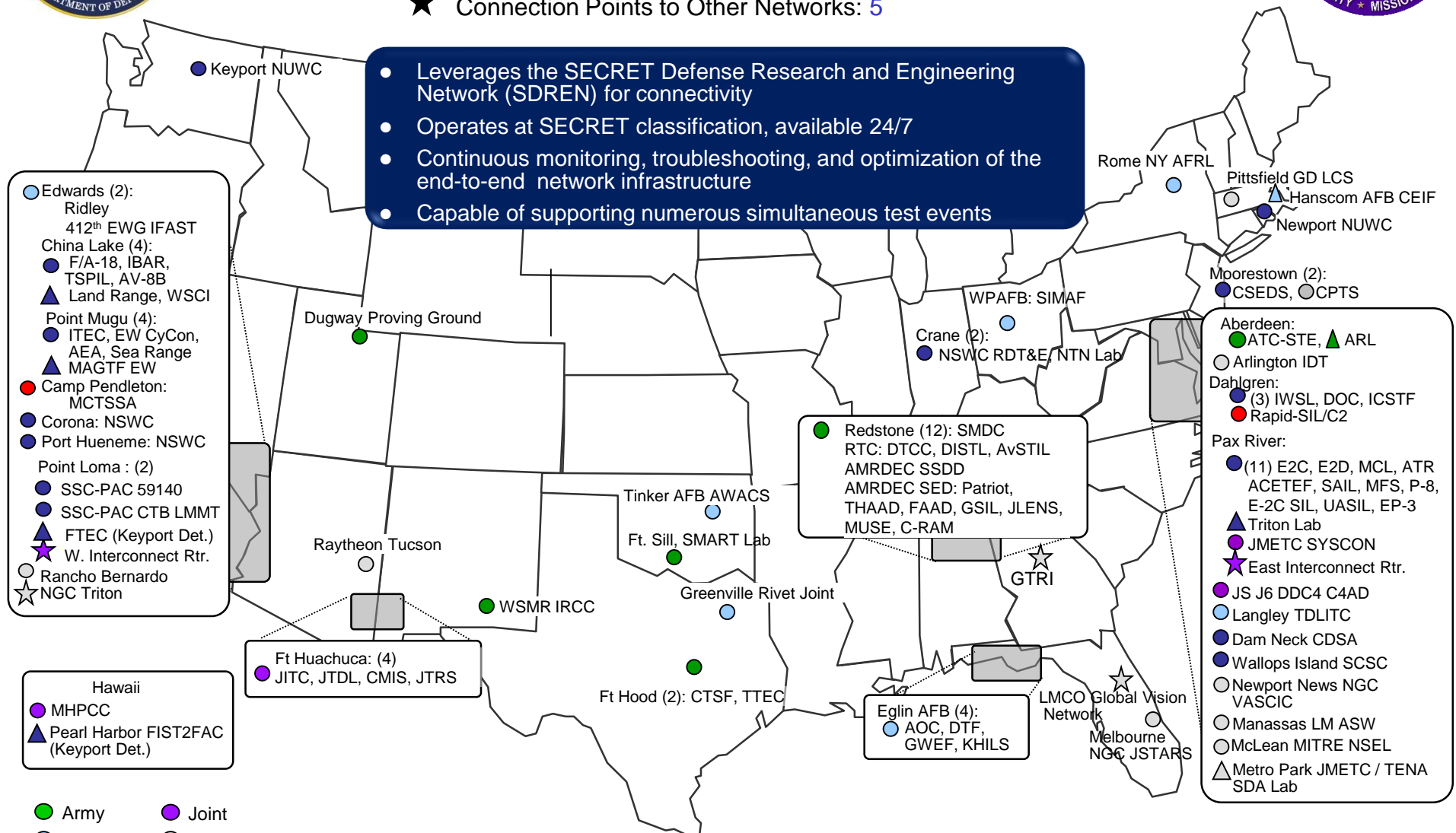


JMETC SECRET Network (JSN) Site Map



- Functional JSN Locations: 46 (access to 79 labs/facilities)
- ▲ Planned JSN Locations: 9
- ★ Connection Points to Other Networks: 5

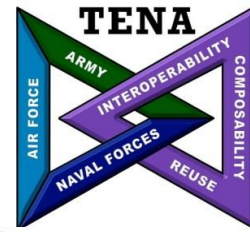
- Leverages the SECRET Defense Research and Engineering Network (SDREN) for connectivity
- Operates at SECRET classification, available 24/7
- Continuous monitoring, troubleshooting, and optimization of the end-to-end network infrastructure
- Capable of supporting numerous simultaneous test events



As of 21 Aug 2017

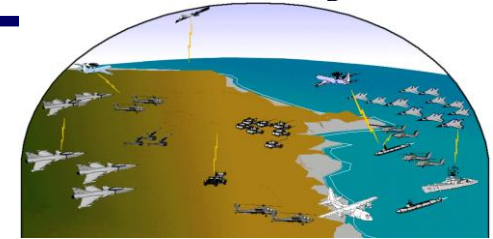
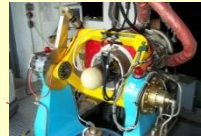


JMETC Uses TENA as its Distributed Test Architecture



Joint Operational Scenarios

Systems Under Test



Integrated Test Resources

Virtual Prototype

Hardware in the Loop

Installed Systems Test Facility

Range

Environment Generator

Threat Systems

TENA Standard Interface Definitions

TENA Standard Interface Definitions

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TENA Common Middleware

TENA Common Middleware

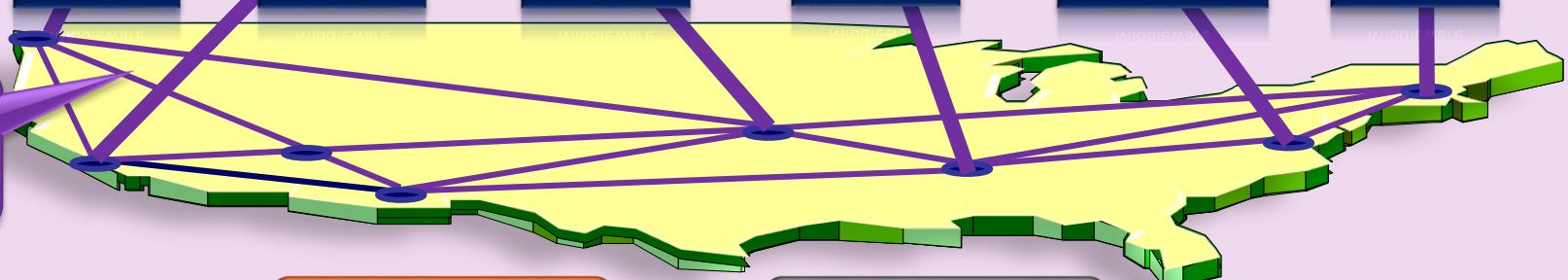
TENA Common Middleware

TENA Common Middleware

TENA Common Middleware

TENA Common Middleware

JMETC Infrastructure on DREN



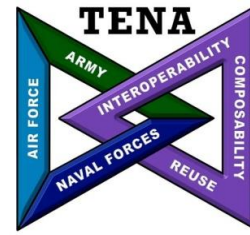
Reuse Repository

Distributed Test Support Tools

* TENA: Test and Training Enabling Architecture



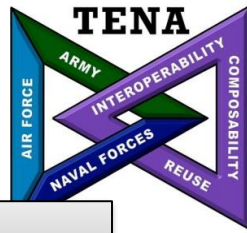
Enterprise Software Ingredients Supporting the Vision



- **System Integration Tools: “LVC Interoperability is our mission”**
 - Software that reduces test setup & design costs in a mixed architecture environment
 - Cross Domain Solutions that bridge classification levels and/or security boundaries
 - Adapters that enable communication without changing existing systems’ behaviors
- **Common Tools: “Build once, use everywhere”**
 - Community tools readily available for download and use
 - Event Planning tools that simplify event integration and setup
 - Event Management tools that enable total awareness
 - Post-Test Event Analysis tools that embrace big data analytics techniques
- **Collaboration Tools: “The sum is better than the parts”**
 - Community-wide and DoD-only event collaboration
 - Community-wide and DoD-only source code collaboration
- **Cloud Services: “Embrace Testing as a Service (TaaS)”**
 - Immersive constructive environments available “on demand”
 - Re-hosted acquisition system software readily available for use (e.g. JSF system software)
 - Reduce local software footprint to mitigate Information Assurance headaches



Test and Training Enabling Architecture (TENA) at a Glance



TENA is DoD's GOTS range integration architecture

● What does TENA enable?

- Interoperability between inter- and intra-range assets
- Elimination of proprietary interfaces to range instrumentation
- Efficient incremental upgrades to test and training capabilities
- Integration of Live, Virtual, and Constructive assets (locally or distributed)
- Sharing and reuse of common capabilities across existing and new investments

● What is included in the TENA architecture?

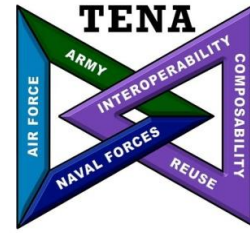
- Customizable “data contracts” that standardize repeatable information exchange
- Interoperability-enabling, auto-code generated software libraries
- A core set of tools that address common test and training requirements
- Collaboration mechanisms that facilitate sharing and reuse

● TENA has a plan for continued evolution and funding to execute this plan

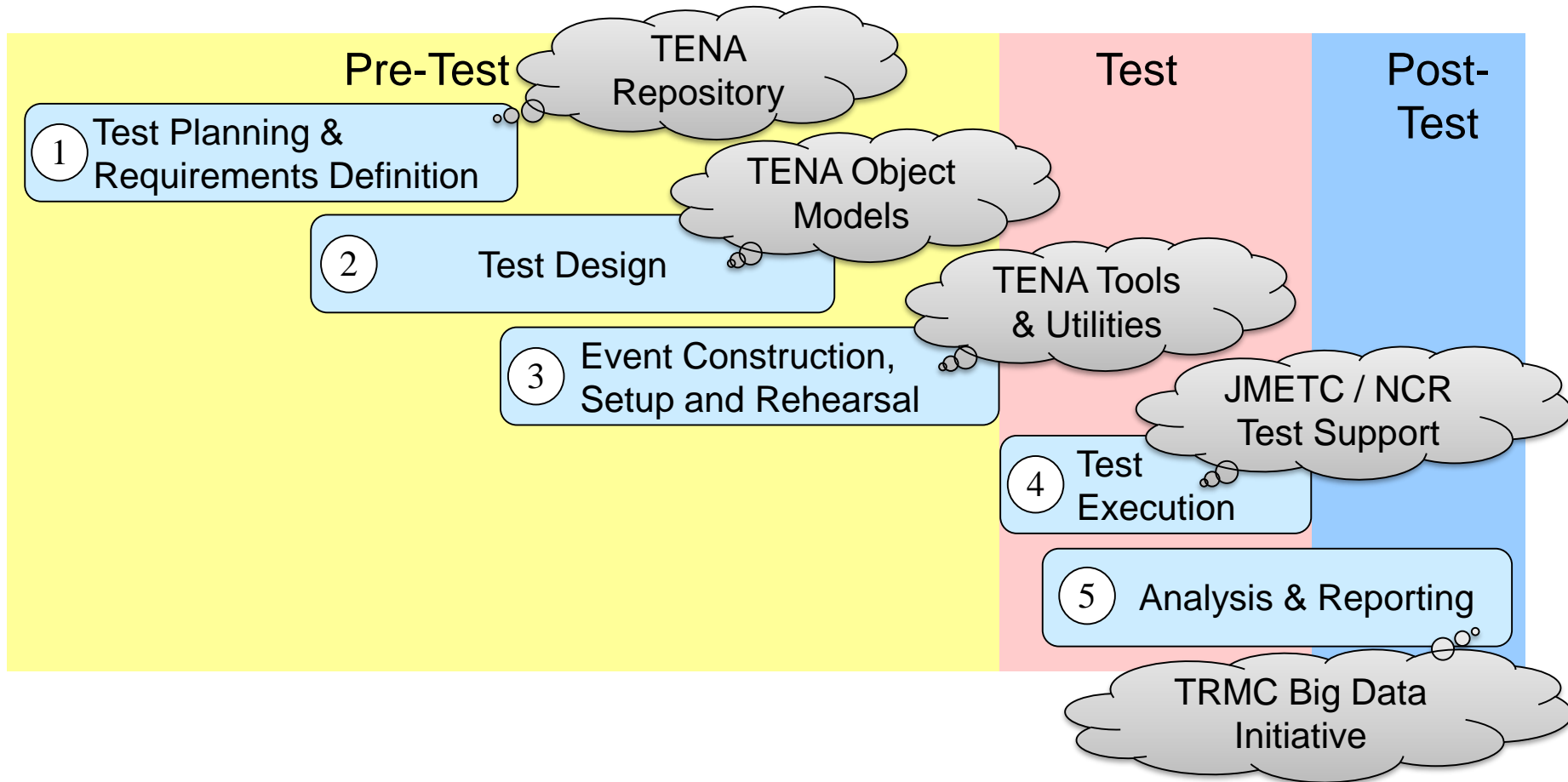




How TRMC Supports T&E: Notional Test Walkthrough

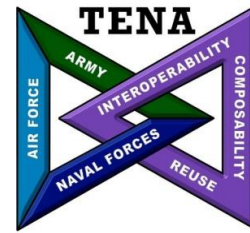


TRMC Subject Matter Expertise (SME) supports entire process





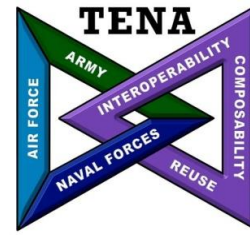
JMETC Current Focus Areas



- **Investigating Information Assurance / Cybersecurity Services that would be value-added to the community**
 - Examples: TRMC software certifications, TRMC AO support, ATO / ISA assistance
- **Transitioning MLS-JCNE Cross Domain Solutions into JMETC SYSCON capabilities**
- **Considering how to bring distributed T&E into areas with limited network infrastructure and/or a single event need**
- **Researching where automation can lead to efficiencies**
 - Example: Ports-Protocol Verification Test Application
- **Reinstituting formal Post-Event User Feedback**
 - Examples: Post-Event Survey; Infrastructure After Action Review as-needed
- **Continually identifying areas where we can do things faster and/or cheaper**



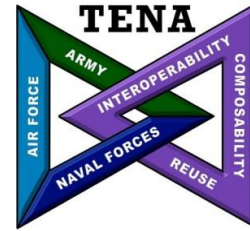
TENA SDA Current Focus Areas



- Supporting capabilities development at ranges & labs
- Enabling TENA use in TRMC CTEIP and T&E S&T projects
- Expanding a GOTS library of range systems adapters
- Standardizing instrumentation remote monitoring and control
- Updating Object Models to better mix Virtual-Constructive with Live
- Improving enterprise tools & utilities
- Enhancing TENA Website Services
- Prototyping Enterprise Software Sharing Repository
- Exploring Software as a Service (SaaS) in the cloud
- Preparing for an enterprise Knowledge Management / Big Data Analytics capability
- Developing a “common language” for cyber T&E and training



JMETC / TENA Support Offer



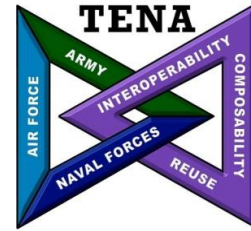
- **The JMETC / TENA team is available to offer advice and assist any organization looking to use TENA**
 - Advice on overall design approach and trade-offs to consider
 - Recommended Object Models to reuse
 - Recommendations on how to design new Object Models
 - Implementation / Code Designs Reviews
 - Awareness of similar systems and lessons learned
 - Hands-on Training classes on TENA capabilities
 - Contract language to help ensure TENA-enabled solutions
 - Network connectivity to CONUS & OCONUS labs / ranges / facilities
 - Distributed event subject matter expertise

Need Assistance?

E-mail request to: feedback@trmc.osd.mil



Summary



- **Vision: An agile Test & Evaluation Infrastructure that support acquisition requirements**
 - Robust, Immersive, Easy-to-Construct Live-Virtual-Constructive Test Environments
 - Agility that supports rapid acquisition & experimentation along with traditional DT / OT
- **TENA provides the architecture and enterprise software foundation to achieve the vision**
- **JMETC provides the network and LVC expertise to achieve the vision**
- **The JMETC / TENA SDA Team is here to help**
 - TENA Upgrade support offer
 - Distributed Test Event Subject Matter Experts (SMEs)
 - Knowledge Management and Big Data Analytics support
 - Information Assurance / Cybersecurity assistance



JMETC Points of Contact



TENA Software Development Activity (SDA) Director

Ryan Norman
(571) 372-2725

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Event Scheduling / Event Questions

Interoperability Events

Keith Poch
(850) 389-6044

keith.poch@tena-sda.org

Distributed Tests

Linking Sites

Cyber Events

Lizann Messerschmidt
(571) 451-4295

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NCR Events

RSDP Events

JMETC Program Manager

George Rumford
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NCRC Expansion / Site Questions

NCRC, Deputy Director

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TENA Products / Software Repository

TENA Software Development Manager

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National Cyber Range Complex (NCRC) Director

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Connectivity / Network Questions

JMETC Secret Network (JSN)

Jeff Braget
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jeff.braget@tena-sda.org

Secret Only

Always Connected

JMETC MILS Network (JMN)

Ben Wilson
(757) 492-7621

bennett.wilson@navy.mil

Above Secret (TS/SCI/SAP)

Connected Only During Event

Miscellaneous Questions

For JMETC questions: feedback@jmetc.org

For TENA questions: feedback@tena-sda.org

Websites

Unclassified, FOUO, DoD-Restricted (CAC required): <https://www.trmc.osd.mil>

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Help Desk

Action Items, Questions, Tasks, Software Needs, Bug Reports: <https://www.tena-sda.org/helpdesk>