TENA and JMETC Enabling Interoperability Among Ranges, Facilities, and Simulations

Briefing for:
ITEA Instrumentation Workshop
May 10, 2011
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TENA Architecture Overview

TENA Applications

- Range Resource Application
- Range Resource Application
- Range Resource Application
- Reusable Applications
- Reusable Applications

TENA Tools

- TENA Middleware
- Logical Range Data Archive

TENA Common Infrastructure

- TENA Repository
- TENA Utilities

- Repository Utilities
- TENA Object
- TENA Object
- TENA Object
- TENA Utility

Non-TENA Applications

- Non-TENA System
- Non-TENA System

ISF Force Mix Study

Shading is: Phase
Benefits of Using TENA

- Saves Money
- Saves Time
- Optimized for Real-time Performance
- Reliability
- Security / Information Assurance
- Designed for Future Technology Insertion
- Eases Incorporation of New Range Capabilities
- On-line Documentation & Help Desk
- Aligns to Policy
A Notional Test Range

- SUT Instrumentation
- C4I Instrumentation
- Field Telemetry Stations
- GPS Ground Stations
- Radar Stations
- Optics Tracking Mounts
- Flight Safety Transmitters
- Target Control Transmitters
- Other Range Systems
- Telemetry Processors
- GPS Systems
- Radar Processing
- Optics Control Systems
- Flight Safety System
- Target Control System
- Data Fusion System
- Video Distribution System
- Flight Safety Displays
- Target Control Displays
- Other Displays

Past Approaches

Challenges

Range Sys Anatomy

TENA Middleware

TENA Obj. Models

TENA Examples

TENA Testing
Past Approaches

- Standardize on computer platform
- Standardize on a network protocol
- Standardize on a data protocol
- Develop a variable message packet

Everything gets designed around the most difficult system to upgrade
Development Challenges

- Multiple Sponsors (Funding Sources)
- Multiple Developers (Development Groups)
- Different Timelines (Delivery Dates)
Development Challenges

- Range modernization must be gradual
  - New systems, upgraded systems, & existing systems must co-exist and preferably work together while supporting customer test events

- When do you want to discover integration issues?
  - During development?
  - During initial integration?
  - During pre-test range check-outs?
  - During actual test events?

Range Sys Anatomy
TENA Middleware
TENA Obj. Models
TENA Examples
TENA Testing
TENA Portal
On-line Document.
Traditionally, all developers must develop code that performs the function of data exchange between systems.

- Data packing, message packing, network protocols, packet padding, network flow control, etc.
TENA Middleware
(Software Library of Data Exchange Functions)

- TENA Middleware is a set of software that performs real-time data exchange between systems
- TENA Middleware available for ~40 platforms, including:
  - Windows (XP, Server 2003, Vista, 64-bit)
  - Linux (Fedora 6/8/9/12, RedHat 4/5, SUSE, Overo)
  - Mac OS X 10.6 (Intel 64-bit)
  - Solaris 8/10
TENA Object Models
(Range Data Formats & Algorithms)

- TENA Object Models are auto-code generated software interfaces that include data formats, data definitions, and common software algorithms.
- Auto-coded interface software can be standard TENA Objects that the community has designed and agreed on – or – they can be designed for unique user requirements.
- Standard TENA Object Models already developed include:
  - Time, TSPI, Coordinate Systems (including conversions), GPS, Radar, Telemetry, SUT Description, Event Control, Video Distribution, Weather data.
Adding New Range Capabilities

- Easy, reliable incorporation of new range capabilities
  - Known data exchange software (TENA Middleware)
  - Reused standard range data objects (Standard TENA Object Models)
    - Auto-code generate any new data objects
  - Range interface on new application verified while the application is being developed (verification performed during software compile)
  - TENA Middleware verifies new application is using same formats & algorithms when the application is started on the network

TENA Examples
- TENA Testing
- TENA Portal
- On-line Document
- TENA Console
- TIDE
Some Examples of TENA Usage

- InterTEC (C4ISR stim/sim/collection)
- JDAS (data archive)
- TVDS (video distribution)
- JMITIS (live range IR threat emulator)
- SIMDIS (range display)
- Starship (event control)
- Gateways (translators to DIS & HLA)
- CTIA (training instrumentation)
- ARDS (precision TSPI)
- CRIIS (next generation precision TSPI)
- P5 (precision TSPI / ACMI)
- NACTS (precision TSPI / ACMI)
- SimShield (trusted data guard)
- Reflect (data playback)
- MatLab (data analysis)
- Execution Manager GUI (event control)
- IVT (interface/network verification tools)
- JAAR (after action review)
- JIMM (constructive simulation)
- JSAF (constructive simulation)
- DCIT (distributed monitoring)
- Link-16 translator (Link-16 over WAN)
- PET (air picture data analysis system)
- JWinWAM (test assessment tool)
- Real-time Casualty Assessment System
- ICADS (individual combat aircrew dis. sys.)
- ATREP (training instrumentation)
- iNET (wireless networking)
- CRS-P (constructive simulation)
- AEA HWIL (airborne electr. attack lab)
- OT-TES (tactical engagement sys for OT)
- ADMAS (embedded vehicle instruments)
- HWIL RF threat injection system
- Radars (tracking, surveillance, miss-distance)
- Range optics (high fidelity remote control)
- Threat systems
- UAV remote control of sensors
- Range safety systems
- Embedded instrumentation
- Weather server (distribution of weather data)
- Player ID server (Unique ID for entities)
- Open air range acoustic sensors
- Undersea hydrophone instrumentation
- Live video – synthetic scene integration
TENA Automated Test Harness
("eye chart") Illustration

| Each column represents a different test for a particular configuration |
| Each test result is color coded with link to specific details |
| Each row represents a different computer platform |

TENA Test Harness automatically performs ~1,800 separate tests on TENA Middleware & TENA Object Models in configurations based on user experiences over the past decade.
TENA Web Portal
http://www.tena-sda.org/

Currently 6,076 user accounts

Registered user account required

Averaging ~250 downloads of TENA Middleware per month

48,768 downloads of TENA Standard Object Models in FY10

Object Model Compiler ran 4,192 times in FY10 by TENA users in the field

214,088 documents downloaded in FY10
Advanced Filtering

Nominally, the publish-subscribe behavior of the middleware operates on matching the object model type being published with the type of interest for the subscriber. Advanced filtering extends this type-based filtering to allow publishers and subscribers to provide additional criteria to provide finer control of subscription interests to minimize the amount of unwanted information that would occur with a pure type-based filtering system.

Description

The TENA Middleware provides a peer-to-peer publish and subscribe capability in which the underlying software connects publishers with interested subscribers. Once connected, a publisher will attempt to provide the data of interest to the subscriber. The TENA metamodel supports Static Distributed Objects (SDOs) and Messages that can be exchanged between publishers and subscribers. A key objective in many distributed publisher-subscriber systems is to minimize the unwanted data that is sent to the subscribers. For the purpose of improving network utilization and minimizing unnecessary computer processing, if the subscribing application has to perform ‘receive-side’ filtering to throw away a large percentage of received network messages, there is wasted computer resources in sending and processing the unwanted network messages.

Note that the term ‘object’ will be used in the following discussion to represent either an SDO Server or an SDO Peer, depending on whether the object exists in the publishing or subscribing application, respectively.

A primary technique that is used to support publisher-subscriber filtering is based on the particular data types defined in the object model. Type-based filtering ensures that a subscriber will only receive data associated with either an SDO or Message type that matches a subscription request made by the subscribing application. For example, if an object model includes an SDO type named vehicle, and if a subscribing application only subscribes to the Vehicle SDO type, then any other data that is published in the execution will not be delivered to the subscribing application.

A simple illustration of type-based filtering is shown in the figure below. In this hypothetical scenario, Application #2 only subscribes to type Vehicle and will not receive any of the Person or Equipment data published by Application #1. Application #4 subscribes to both type Vehicle and type Person, so it will receive data from both Application #1 and Application #3.

- Installation Guide and Release Notes
- Middleware Guide arranged in individual topic pages
  - Simplifies user navigation
TENA Console

- TENA Console is a GUI-based event management tool used to evaluate and monitor applications and network
  - Utilizes capabilities automatically built into the middleware
  - Multiple TENA Consoles can be run anywhere on the network

- Application Diagnostics
  - Evaluate middleware and application configuration parameters to detect incorrect settings
  - Obtain runtime diagnostic values related to the state and performance of the application

- Network Monitoring
  - Perform TCP and (unobtrusive) UDP Multicast “ping” operations between applications to test communication
  - Establish continuous ping operations to notify operators of transient network problems

- Application Alerts
  - Notify operators of application warnings that require investigation
TENA Console
The TENA Integrated Development Environment (TIDE) is a tool designed to assist range system developers in the creation, development, testing and deployment of TENA-enabled range systems.

- Designed to make upgrades fast & efficient
- Assists in developing a new TENA application
- Easy migration of new Middleware versions
- Easy incorporation of Object Model updates
- Can compare & contrast Object model differences

**TIDE 2.0**
- Available at: http://www.tena-sda.org/tide
Benefits of TENA

- All TENA software and support is **free** to users
- TENA is the most **capable** and **sophisticated** interoperability solution
- TENA software is **thoroughly tested** and very reliable
- TENA Auto-Code Generation makes creating a TENA application as **simple** as possible
  - TIDE Tool manages installation and configuration, upgrading and maintenance
  - Auto-generated starting points mean you never start with a blank page
  - **Rapid development** of real-time, distributed, LVC applications
  - Auto-generated test programs make integration a snap
- TENA’s technical approach emphasizes **cost savings and reliability**
  - The TENA software is hard to use wrong
  - TENA catches many user errors at compile time rather than run time
  - TENA Tools provide unprecedented understanding of an event
- TENA has a **standard object model** enhancing interoperability
- The TENA web site/repository has **extensive documentation**, training, and collaboration capabilities
- TENA has a plan for **evolution** and **funding** to execute this plan!
### Key Release 6 Improvements and New Capabilities

#### New Middleware Capabilities
- Advanced Filtering
- OM Subsetting Support
- SDO State Processing Support
- Self-Reflection Option
- Object Reactivation
- Separate Inbound/Outbound ORBs

#### Metamodel and Model Improvements
- Fundamental Sized Type Aliases
- Const Qualifier
- Optional Attributes
- SDO Initializers
- Middleware Metadata
- Middleware IDs

#### New Event Management Capabilities
- Object Model Consistency Checking
- Remote Object Termination
- Execution Manager Fault Tolerance
- Embedded Diagnostics
- TENA Console

#### Usability Improvements
- Observer Pattern (with Callback Aggregation)
- Local Methods Factory Registration
- Code Installation Layout
Key Release 6 Improvements and New Capabilities

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**Usability Improvements**
- Observer Pattern (with Callback Aggregation)
- Local Methods Factory Registration
- Code Installation Layout

- Enhanced data distribution
- Optimized network usage

- Better ways to define data
- Remove ambiguity

- Improved reliability
- Enhanced troubleshooting

- Easy to use
- Harder to use wrong
TENA Architecture Management Team (AMT)

- AMT: A technical forum providing an open dialogue between users and TENA developers to understand current issues and agree on solutions
  - Provide more insight to current capabilities and on emerging technical challenges to discuss a common approach to satisfying requirements

- AMT Process: Identify issues, vet concerns, debate potential solutions, and agree on a way forward with active participation from all stakeholders
  - TENA maintained according to consensus of its users assembled as the AMT
  - TENA design and improvements driven from the AMT exchange
  - Current improvements to the next release of TENA are a direct result from vote by AMT members at previous meeting
  - Industry heavily participates at AMT meetings

- AMT Schedule: Quarterly (Next is AMT 48 on 30 June 2011 in Baltimore, MD)

Registration Open on https://www.tena-sda.org
Architecture Management Team (TENA AMT)

- AMT Members:
  - 329 Armament Systems Group (329 ARSG)
  - Aberdeen Test Center (ATC), Aberdeen Proving Ground, MD
  - Air Armament Center (AAC), Eglin AFB, FL
  - Air Force Flight Test Center (AFFTC), Edwards AFB, CA
  - Army Operational Test Command (OTC), Fort Hood, TX
  - Common Training Instrumentation Architecture (CTIA)
  - Dugway Proving Ground (DPG)
  - Electronic Proving Ground (EPG)
  - integrated Network Enhanced Telemetry (iNET)
  - Interoperability Test and Evaluation Capability (InterTEC)
  - Joint Fires Integration & Interoperability Team (JFIIT)
  - Joint National Training Capability (JNTC)
  - Naval Air Warfare Center – Aircraft Division
  - NAWC – Weapons Division
  - Naval Aviation Training Systems Program Office (PMA-205)
  - Naval Undersea Warfare Center (NUWC)
  - NAVSEA Warfare Center - Keyport
  - P5 Combat Training System (P5CTS)
  - Pacific Missile Range Facility (PMRF)
  - Redstone Technical Test Center (RTTC)
  - T&E/S&T Non-Intrusive Instrumentation
  - White Sands Missile Range (WSMR)

- Meetings every 3 months
- US Advising Members:
  - BMH Associates, Inc.
  - Boeing
  - Cubic Defense
  - DRS
  - Embedded Planet
  - EMC
  - Kenetics
  - MAK Technologies
  - NetAcquire
  - Science Applications International Corporation (SAIC)
  - Scientific Research Corporation (SRC)
  - Scientific Solutions, Inc. (SSI)

- International Participation
  - Australia
  - Denmark
  - France
  - Singapore
  - Sweden
  - United Kingdom

Alaska Training Range Evolution Program (ATRELP) use of TENA

ATRELP’s intent is to enhance the existing Pacific Alaska Range Complex air and ground capabilities by providing a force-on-force (FOF) training capability that fully integrates and supports joint and coalition components for both air and ground training in live, virtual, and constructive (LVC) domains.

**High Side**
- TENA ICADS
- TENA ACMI
- TENA 9C2
- TENA DIADS
- TENA SimShield

**Low Side**
- TENA MOKKITS
- TENA MILES 2000
- TENA I-HITS
- TENA UMTE
TENA and RRRP

- Use of TENA will facilitate Remote Operations and Interoperability of the Ranges’ Radar Systems

- TENA Instrumentation Radar Object Models will be used for all communications external to the individual Radar Systems
  - Pointing data for optics, telemetry, or other radars
  - Remote Single Integrated Air Picture (SIAP)

- Development of TENA Instrumentation Radar Object Models
  - Developed initial Instrumentation Radar TSPI Object Model
    - Received input from Test Center SMEs
    - For CW Doppler and Pulse radar systems
  - Instrumentation Radar Object Models will be finalized after contract award
Common Range Integrated Instrumentation System

- >20x TSPI Accuracy Improvement Level III
- 20x TSPI Accuracy Improvement Level II
- Miniaturization
- Data Throughput 4x Improvement, Software Communication Architecture
- Updated Encryption Technology
- Training (RIW) Waveform with Training Level TSPI
- Standardized Protocols and Interfaces
- Improved Reliability
- 3x TSPI Accuracy Improvement Level I
What is JMETC?

• A corporate approach for linking distributed facilities
  • Enables customers to efficiently evaluate their warfighting capabilities in a Joint context
  • Provides compatibility between test and training
• A core, reusable, and easily reconfigurable infrastructure
  • Consists of the following products:
    • Persistent connectivity
    • Middleware
    • Standard interface definitions and software algorithms
    • Distributed test support tools
    • Data management solutions
    • Reuse repository
• Provides customer support team for JMETC products and distributed testing
JMETC Enables Distributed Testing

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: Test and Training Enabling Architecture

JMETC Connectivity on SDREN

Reuse Repository

Distributed Test Support Tools

Data Management Solutions

Customer Support

JMETC Infrastructure

* TENA: Test and Training Enabling Architecture
JMETC Benefits

• **Provides Department-wide capability for:**
  • Evaluation of a weapon system in a joint context
  • DT, OT, Interoperability Certification, Net-Ready KPP compliance testing, Joint Mission Capability Portfolio testing, etc.

• **Provides test capability aligned with JNTC**
  • Both use TENA architecture
  • Both use Network Aggregator

• **Reduces time and cost by providing**
  • Readily available, persistent connectivity with standing network security agreements
  • Common integration software for linking sites
  • Distributed test planning support tools

• **Provides distributed test expertise**
JMETC Connectivity

- Functional Sites: 61
- New Sites Planned: 8
- Connection Points to Other Networks: 5

- Dedicated, trusted connectivity on SDREN (part of the GIG)
- Encrypted for Secret – System High
- DISA-registered IP address space
- Active monitoring of network performance
- Capable of supporting multiple simultaneous test events

As of 09 Dec 2010

Sites in SoCal
- Edwards: Ridley
- China Lake (3): AV-8B, F/A-18, IBAR
- Point Mugu (2): ITEC, AEA
- El Segundo: NGC B-2
- Camp Pendleton: MCTSSA
- Corona: NSWNC
- Point Loma (2): RLBTS, SSC-PAC
- Rancho Bernardo, NGC BAMs

Sites in Hawaii
- PMRF: Bldg 105
- MHPC
- Site in Alaska
- Ft. Greely: CRTC

Sites in Gulf Range
- Hurlburt Field: C2DAC
- Eglin AFB (4): AOC, DTF, GWEF, KHILS

Sites in MD, DC, VA
- Aberdeen: ACCN
- Pax River (5): ESTEL E2C/D, MCL, ACETEF, SAIL, ATR
- JMETC SYSCON
- East Agg Rtr.
- Pentagon: WARCAP
- DISA: Sky 7
- Dahlgren (2): CEDL, IWSL
- JFCOM: JSIC
- Langley (2): C-GIF, TDLITC
- Norfolk: COMOPETFOR
- Norfolk:C2F Mitscher Ctr
- Dam Neck: CDSA
- Wallops Island: (2) SCSC, SSDS
- Newport News: NGC VASCIC

As of 09 Dec 2010
Joint Mission Environment Test Capability (JMETC)
FY 10 Accomplishments

**FY10 Example JMETC Customers**
- Joint Integrated Air & Missile Defense Organization (JIAMDO)
- Broad Area Communications Node (BACN) JUON
- B1-B
- Broad Area Maritime Surveillance System (BAMS)
- Air-Ground Integrated Layer Exploration (AGILE)
- Joint Interoperability Test Command (JITC)

**JMETC Accomplishments**
- Supported 88 distinct customer test activities
- Expanded network from 38 to 57 sites
- ATIN and JTDL Networks transitioned to JMETC
- Upgraded JMETC support applications and utilities to TENA R6
- DIACAP Tiger Team report completed and recommendations being executed
- Enhanced JMETC services and capabilities provided by leveraging InterTEC, Services, and Industry
- Reuse Repository usability improvements

**Selected Benefits to the DoD**
- Integrated DT & OT on a Joint Urgent Operational Need for the warfighter
- Maximized usage of theater assets during limited maintenance windows
- Improved Joint track information sharing to ensure interoperability of systems in theater operations
- Coalition exchange and examination of real-time air picture data
- Identification of Air Force Initiatives ready for warfighter transition
- Tactical UAS deployment in the National Airspace
- Employment of Net-Enabled Weapons
- JCAS immediate request & end-to-end processes “as-is” characterization
- Determined distributed system components were not ready for full live integration testing
- Executed testing to support system-of-system interoperability certification
Partial Listing of Recent Testing, Training, and Experiments Using TENA-Compliant Capabilities

- **Test Events**
  - SIAP JDEP Combined Hardware-in-the-Loop Phase 5, Jan-May 09
  - Digital Close Air Support – Integrated Model Test Event, Jan-Mar 09
  - Multi-Service System-of-Systems Test-bed, Jul 09
  - Strategic Integrated M&S Capability, May-Aug 09
  - Joint Electronic Warfare Assessment for Test and Evaluation, Sep 09
  - Tactical End-to-End Closed Loop Sim, Nov 09
  - Joint Distributed IRCM System Test Event, Mar 10
  - Joint Close Air Support Distributed Test, Jun 10
  - Battlefield Airborne Communications Node (BACN) Joint Urgent Operational Need (JUON), Aug 10
  - JIAMDO Air & Missile Defense Correlation / Decorrelation Interoperability Test (CDIT) CONUS, Sept 10
  - Unmanned Aircraft System (UAS) in National Air Space (NAS) Oct 09 and Oct 10
  - JITC Joint Interoperability Test (JIT) Sep-Nov 10
  - JIAMDO CDIT UK, Oct 10
  - Air-to-Ground Integrated Layer Exploration AGILE Fire III, Feb 11

- **Training Exercises**
  - Daily Training, Eielson AFB
  - Daily Training, Fallon AFB
  - Red Flag Alaska (RFA) 09-1, October 08, Pacific Alaska Range (PARC)
  - JDEWR Cope Tiger 09, Mar 09, PARC
  - RFA 09-2, April-May 09, PARC
  - Distant Frontier, May-June 09, PARC
  - Northern Edge 09, June 09, PARC
  - Talisman Sabre 09 - Australian Army and US Army, July 09, Shoalwater Bay, Queensland Australia
  - RFA 09-3, July-Aug 09, PARC
  - JDEWR Talisman Sabre 09, July 09, PARC
  - RFA 10-1, October 09
  - RFA 10-2, April 10
  - Northern Edge, June 10
  - RFA 10-3, Aug 10

- **Experiments**
  - Joint Surface Warfare JCTD, Feb 09 and Oct 10
  - Joint Expeditionary Force Experiment (JEFX) 09-1, 09-2, 09-3, Feb-Apr 09
  - JEFX 09-4 B-2 Test (Spirit ICE), Aug 09
  - JEFX 10-1, 10-2, 10-3, Jan-Apr 10

Distributed Events operated over the JMETC and JTEN Connectivity
JMETC Users Group Meetings

- Identify core infrastructure requirements and use cases
- Identify, investigate, & resolve issues
- Identify opportunities to collaborate
- Discuss available solutions, tools, and techniques
- Share lessons learned

Next JMETC Users Group Meeting #14:
- Scheduled for 28-29 June
- Location: Baltimore, MD
- Potential Tracks:
  - User Requirements
  - Information Assurance / Security
  - Data Management
  - Networking

Users Group #01
- 19-20 Jun 2007
- Dulles, VA
- ~140 participants
- Plenary session: SIAP, JSF, FCS CTO

Users Group #02
- 14-15 Aug 2007
- San Diego, CA
- ~150 participants
- Plenary session: Navy DEP

Users Group #03
- 29-30 Jan 2008
- Portsmouth, VA
- ~200 participants
- Plenary briefs: InterTEC Spiral 2, AF-ICE, JFCOM J84

Users Group #04
- 20-21 May 2008
- Charleston, SC
- ~135 participants
- Plenary session: InterTEC Spiral 2, SPAWAR Systems Center Charleston

Users Group #05
- 9-10 Sep 2008
- Boston, MA
- ~180 participants
- Plenary session: InterTEC Spiral 2, Air Force Testing, FCS Testing
- Tracks: User Requirements, Distrib. Test Tools, Service-Oriented Architectures (SOAs), Networking

Users Group #06
- 16-17 Dec 2008
- Austin, TX
- ~180 participants
- Plenary session: GCIC, CTSF, ATEC
- Tracks: User Requirements, Security, Service-Oriented Architectures (SOAs), Networking

Users Group #07
- 24-25 Mar 2009
- Ft. Walton Beach, FL
- ~210 participants
- Plenary session: 46 TS, 505 CCW
- Tracks: User Requirements, Security, GIG-Enabled T&E, Networking

Users Group #08
- 30 Jun – 1 Jul 2009
- Portsmouth, VA
- ~280 participants
- Plenary session: TRMC, JFCOM J7, JFCOM J8, JEFX 09-02/03

Users Group #09
- 20-21 Oct 2009
- Ventura, CA
- ~240 participants
- Plenary session: NAVAIR
- Tracks: User Requirements, Security, GIG-Enabled T&E, Networking, SOA, CMIS Demonstration

Users Group #10
- 23-24 Feb 2010
- Orlando, FL
- ~300 participants
- Plenary session: TRMC, Navy T&E
- Tracks: User Requirements, IA / Security, Object Models, Networking, SOA
Summary

- **JMETC** supports the full spectrum of Joint testing, supporting many customers in many different Joint mission threads
  - CVN-21, JSF, MMA, NECC, DD1000, WWF, BAMS, JIAMDO
- **TENA** is the CTEIP architecture for future instrumentation, the JNTC architecture for Live integration and an enabling technology for JMETC
- **TENA and JMETC:**
  - Being built based on customer requirements
  - Partnering with Service activities and leveraging existing capabilities
  - Coordinating with JFCOM to bridge test and training capabilities
  - Provide a forum for users to develop and expand the architecture
    - JMETC User Groups, TENA AMT Meetings
    - Next Meeting is week of June 28-30 in Baltimore, MD
Important Contact Information

- **TENA Website:** [www.tena-sda.org](http://www.tena-sda.org)
  - Download TENA Middleware
- **JMETC Website:** [www.jmetc.org](http://www.jmetc.org)
- **TENA Feedback:** feedback@tena-sda.org
  - Provide technical feedback on TENA Architecture or Middleware
- **JMETC Feedback:** jmetc-feedback@jmetc.org
- **TENA SDA Contact**
  - Telephone: (703) 601-5202
- **JMETC Program Office Contact**
  - Telephone: (703) 601-5280