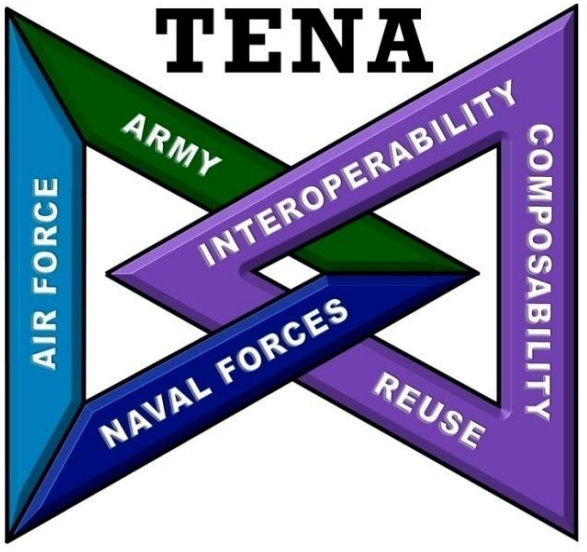
TENA and JMETC Enabling Interoperability Among Ranges, Facilities, and Simulations

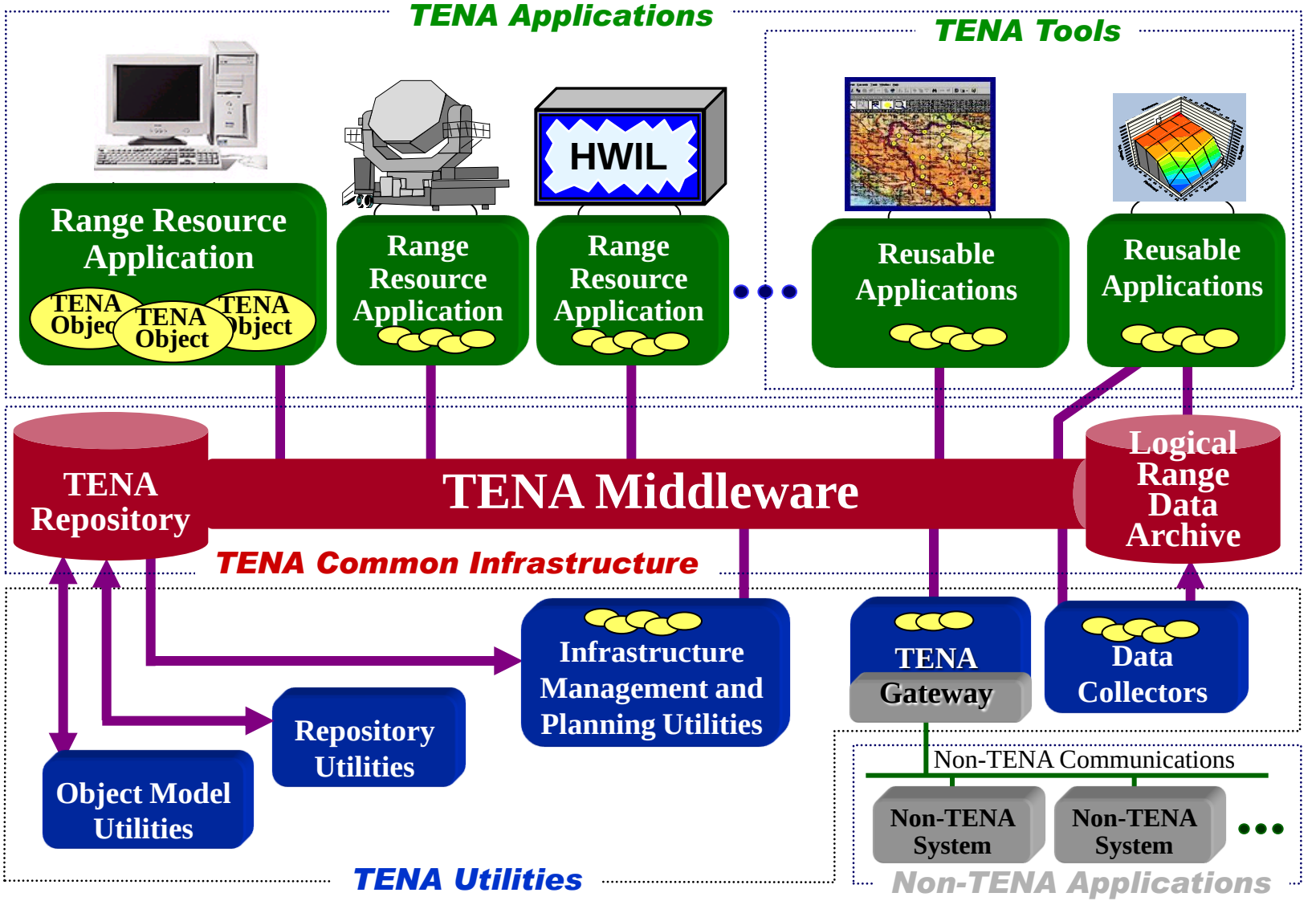


Briefing for:
28th Annual NDIA T&E

March 13, 2012

Gene Hudgins, TENA SDA User Support Lead

TENA Architecture Overview



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

Benefits

A Notional Range

Past Approaches

Challenges

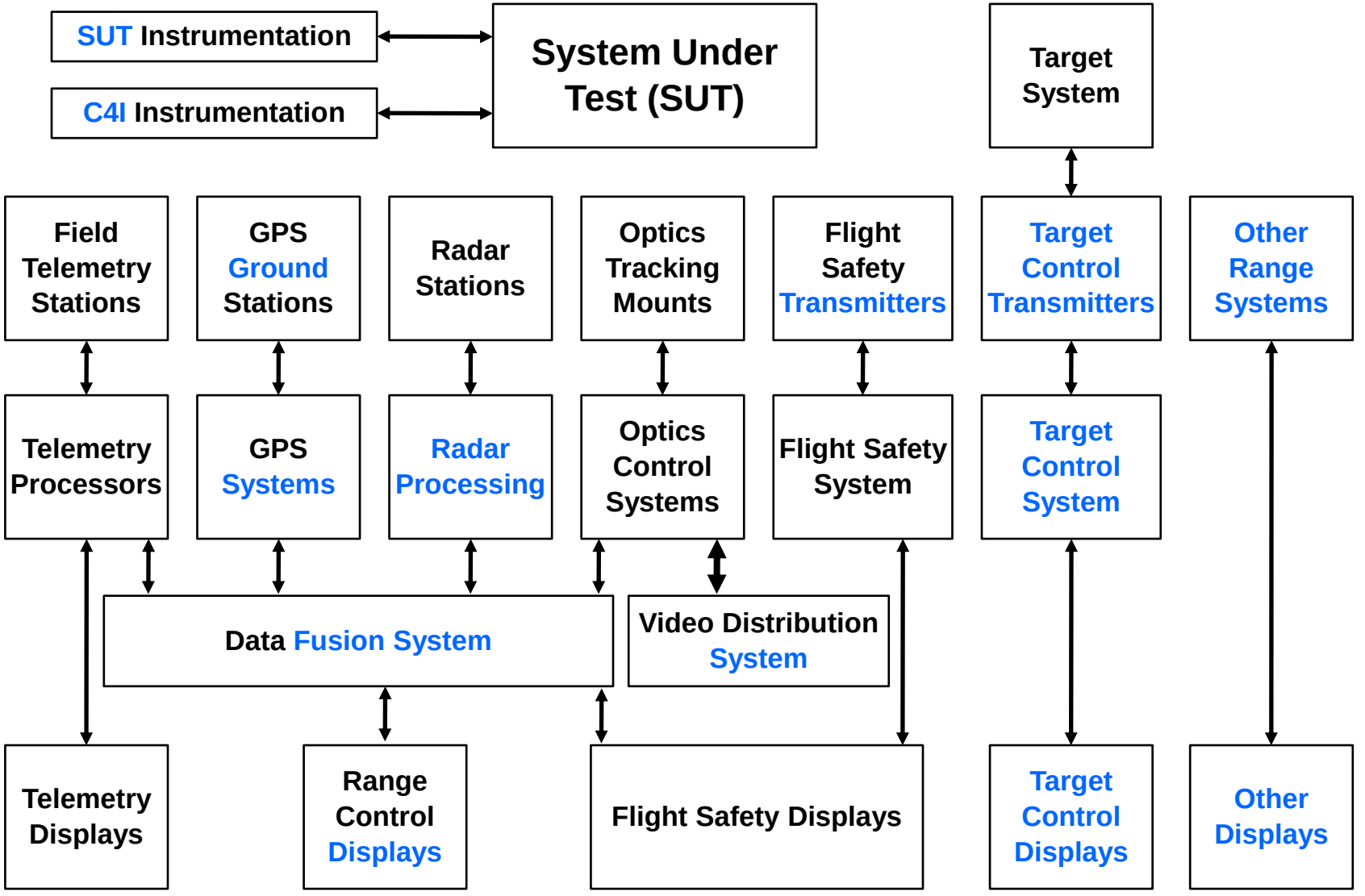
Range Sys Anatomy

TENA Middleware

TENA Obj. Models

TENA Examples

A Notional Test Range



A Notional Range

Past Approaches

Challenges

Range Sys Anatomy

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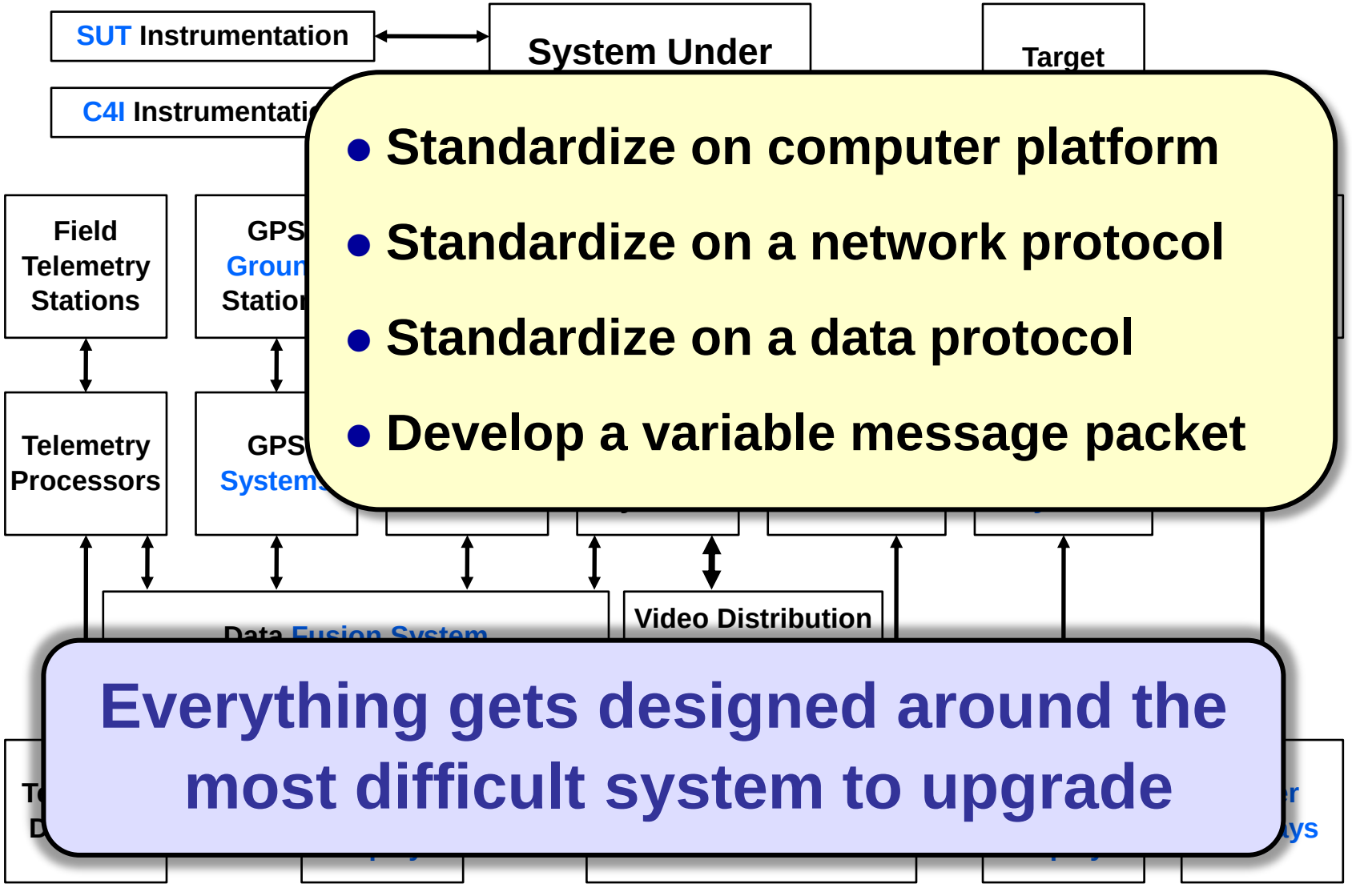
TENA Examples

TENA Testing

Past Approaches

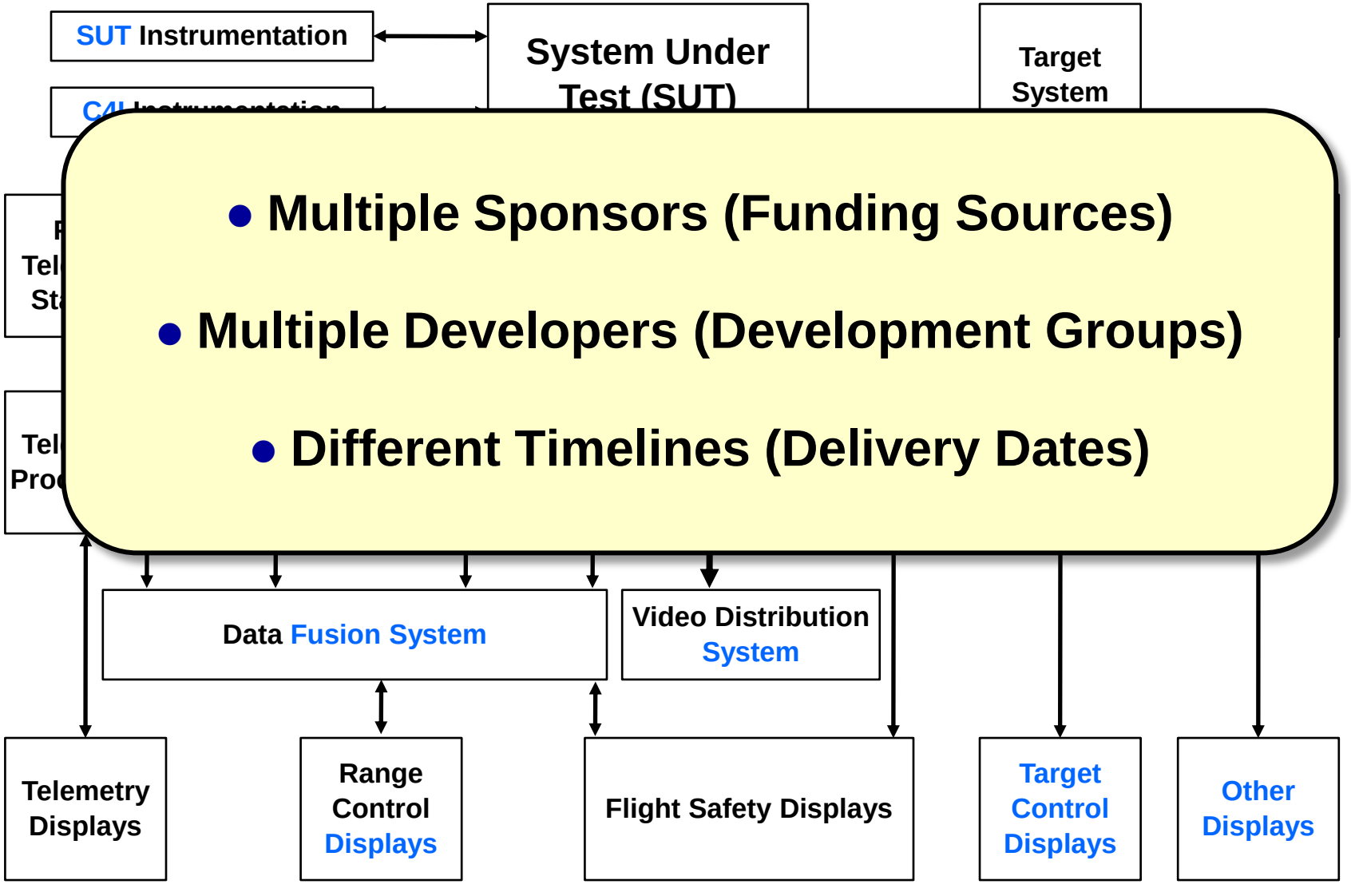


- **Standardize on computer platform**
- **Standardize on a network protocol**
- **Standardize on a data protocol**
- **Develop a variable message packet**

Everything gets designed around the most difficult system to upgrade

Past Approaches
Challenges
Range Sys Anatomy
TENA Middleware
TENA Obj. Models
TENA Examples
TENA Testing
TENA Portal

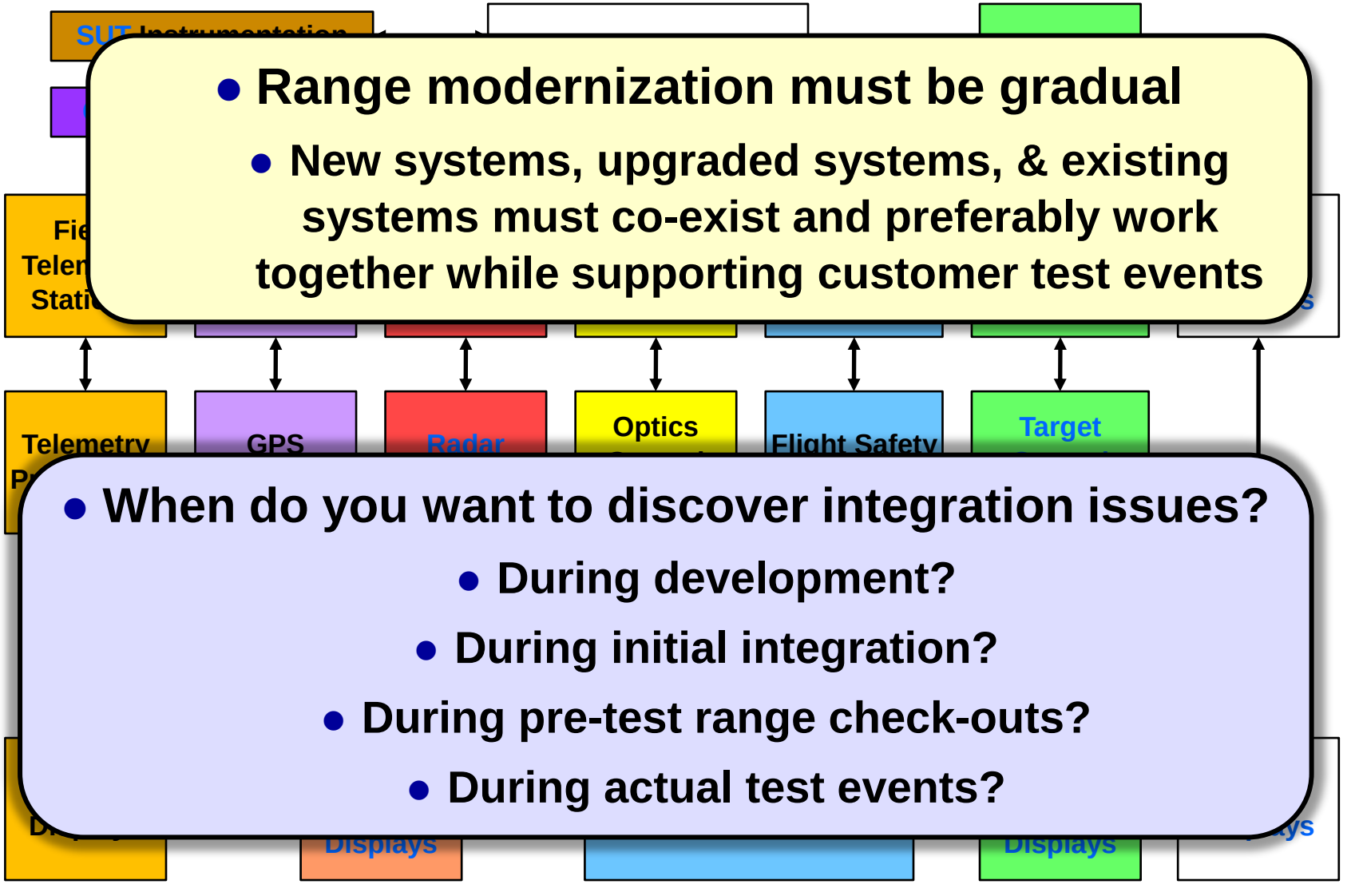
Development Challenges



Challenges

- Range Sys Anatomy
- TENA Middleware
- TENA Obj. Models
- TENA Examples
- TENA Testing
- TENA Portal
- On-line Document.

Development Challenges

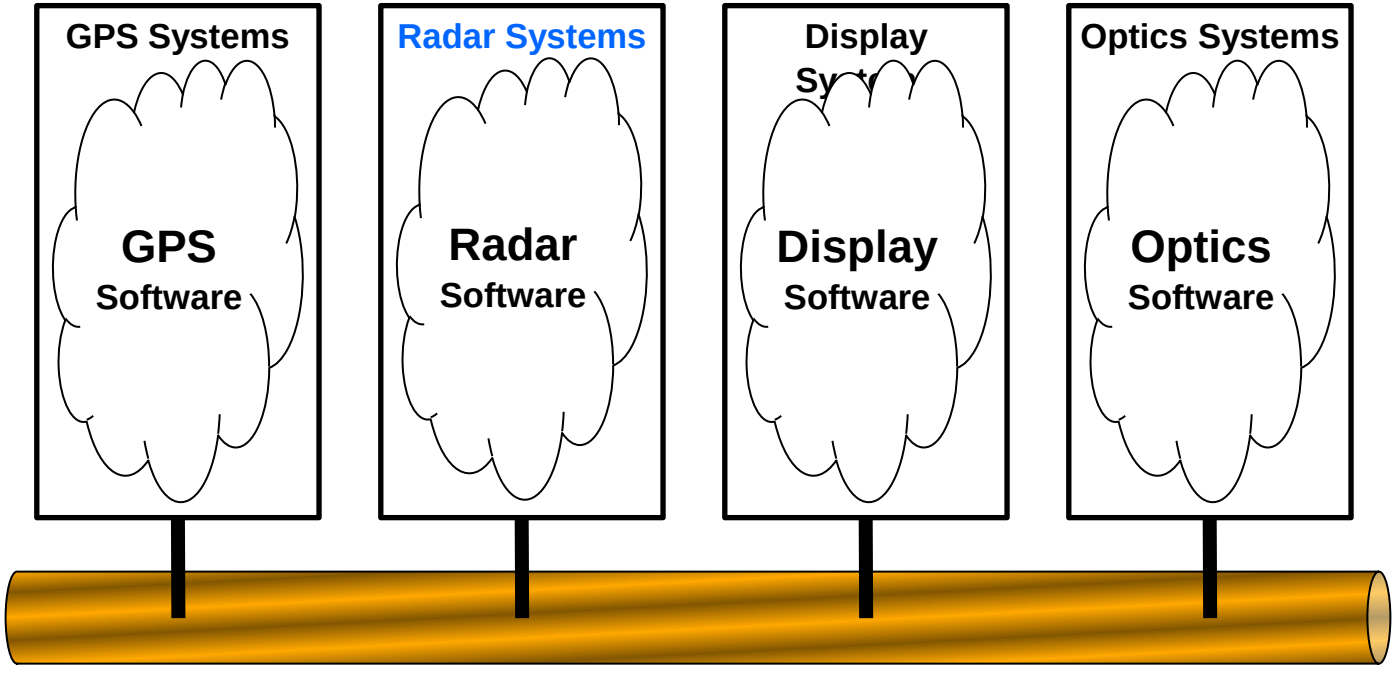


- **Range modernization must be gradual**
  - **New systems, upgraded systems, & existing systems must co-exist and preferably work together while supporting customer test events**

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

Challenges
Range Sys Anatomy
TENA Middleware
TENA Obj. Models
TENA Examples
TENA Testing
TENA Portal
On-line Document.

Anatomy of Range Systems

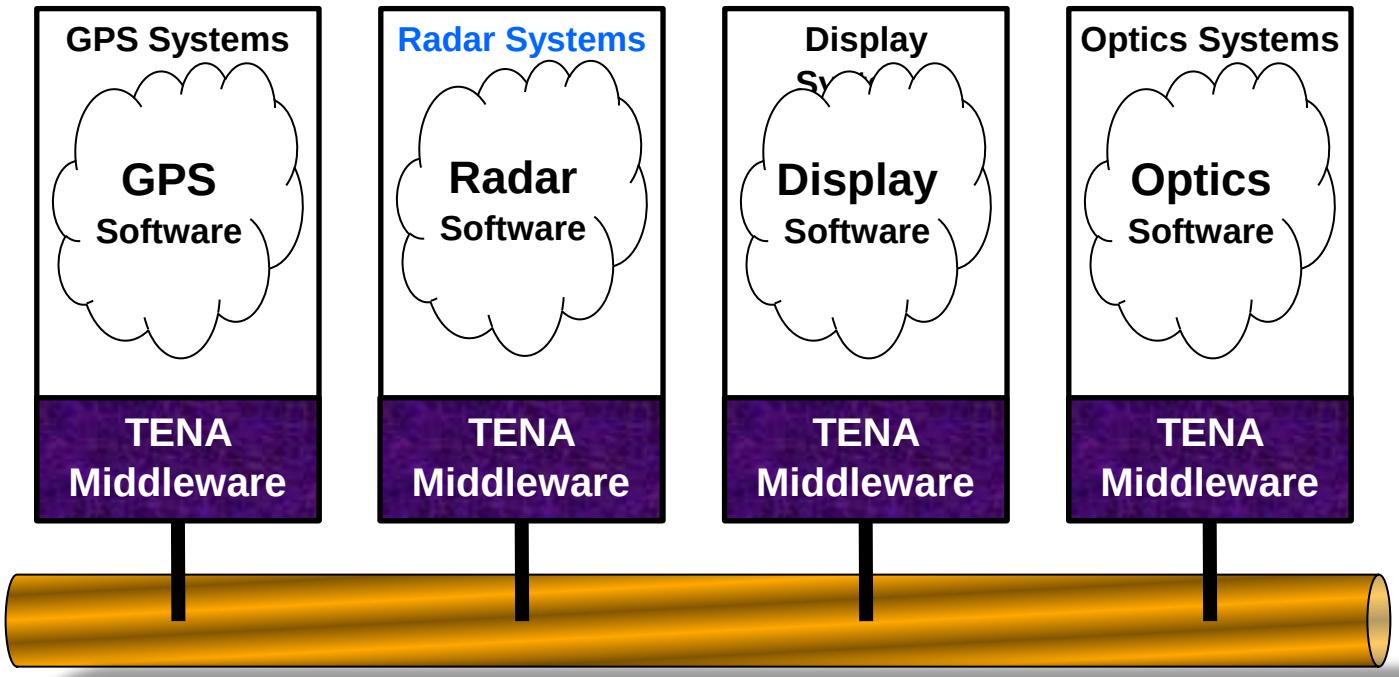


- **Traditionally, all developers must develop code that performs the function of data exchange between systems**
  - **Data packing, message packing, network protocols, packet padding, network flow control, etc.**

Range Sys Anatomy
TENA Middleware
TENA Obj. Models
TENA Examples
TENA Testing
TENA Portal
On-line Document.
TENA Console

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 Middleware

TENA Obj. Models

TENA Examples

TENA Testing

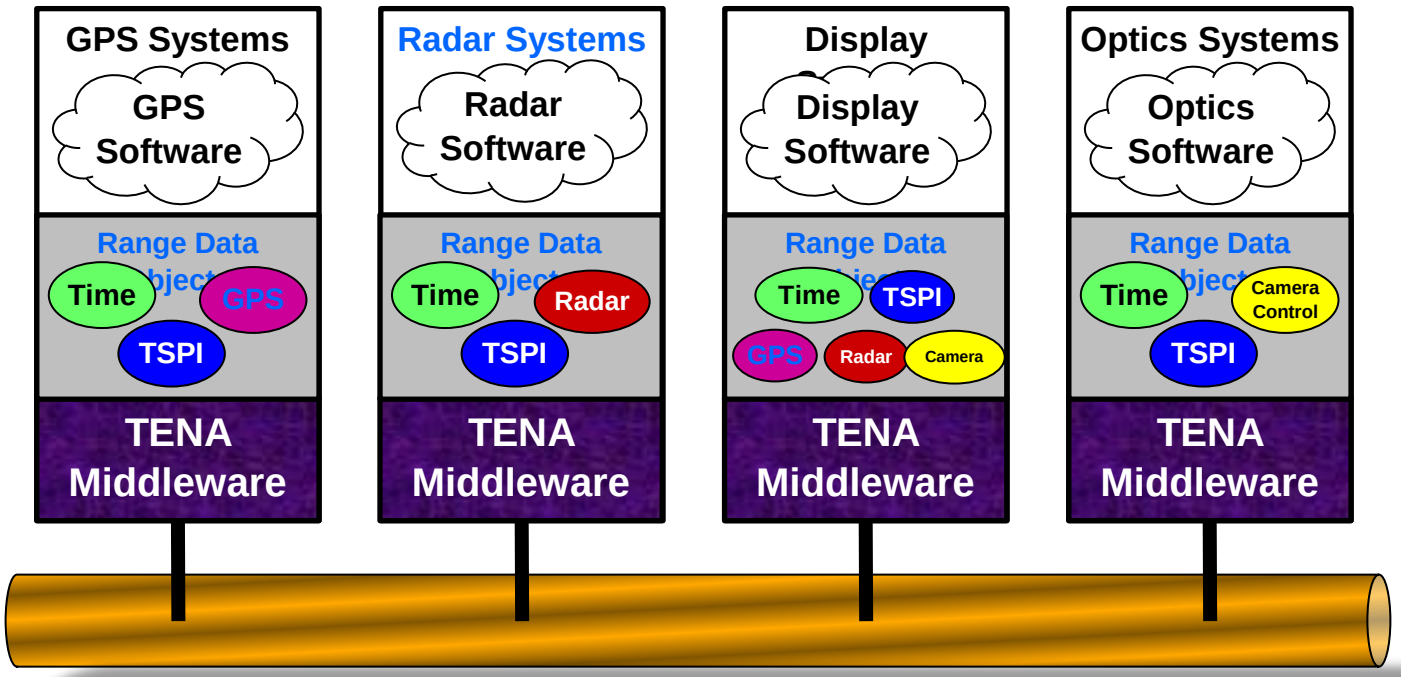
TENA Portal

On-line Document.

TENA Console

TIDE

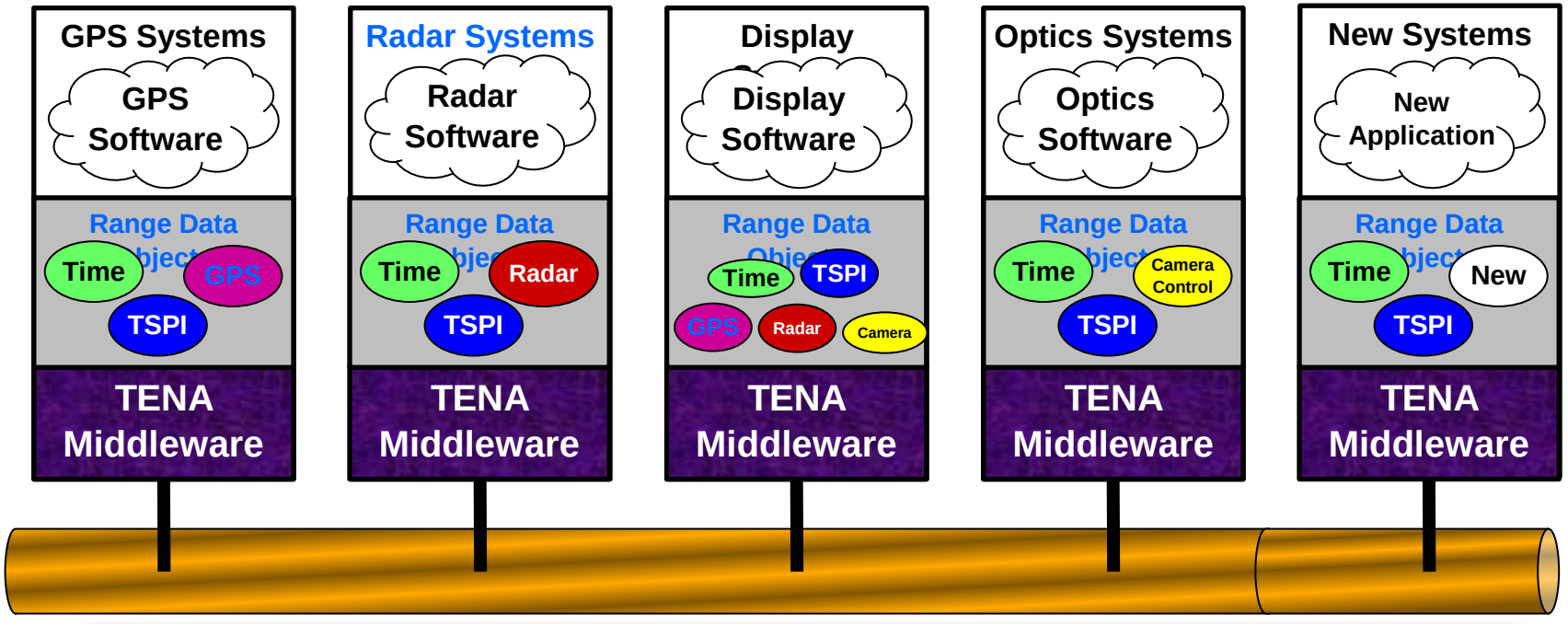
TENA Object Models
(Range Data Formats & Algorithms)



- **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**

TENA Obj. Models
TENA Examples
TENA Testing
TENA Portal
On-line Document.
TENA Console
TIDE

Adding New Range Capabilities



TENA Examples

- TENA Testing
- TENA Portal
- On-line Document.
- TENA Console
- TIDE

- **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

Some Examples of TENA Usage

- InterTEC (C4ISR stim/sim/collection)
- JDAS (data archive)
- TVDS (video distribution)
- JMITS (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 Examples

TENA Testing

TENA Portal

On-line Document.

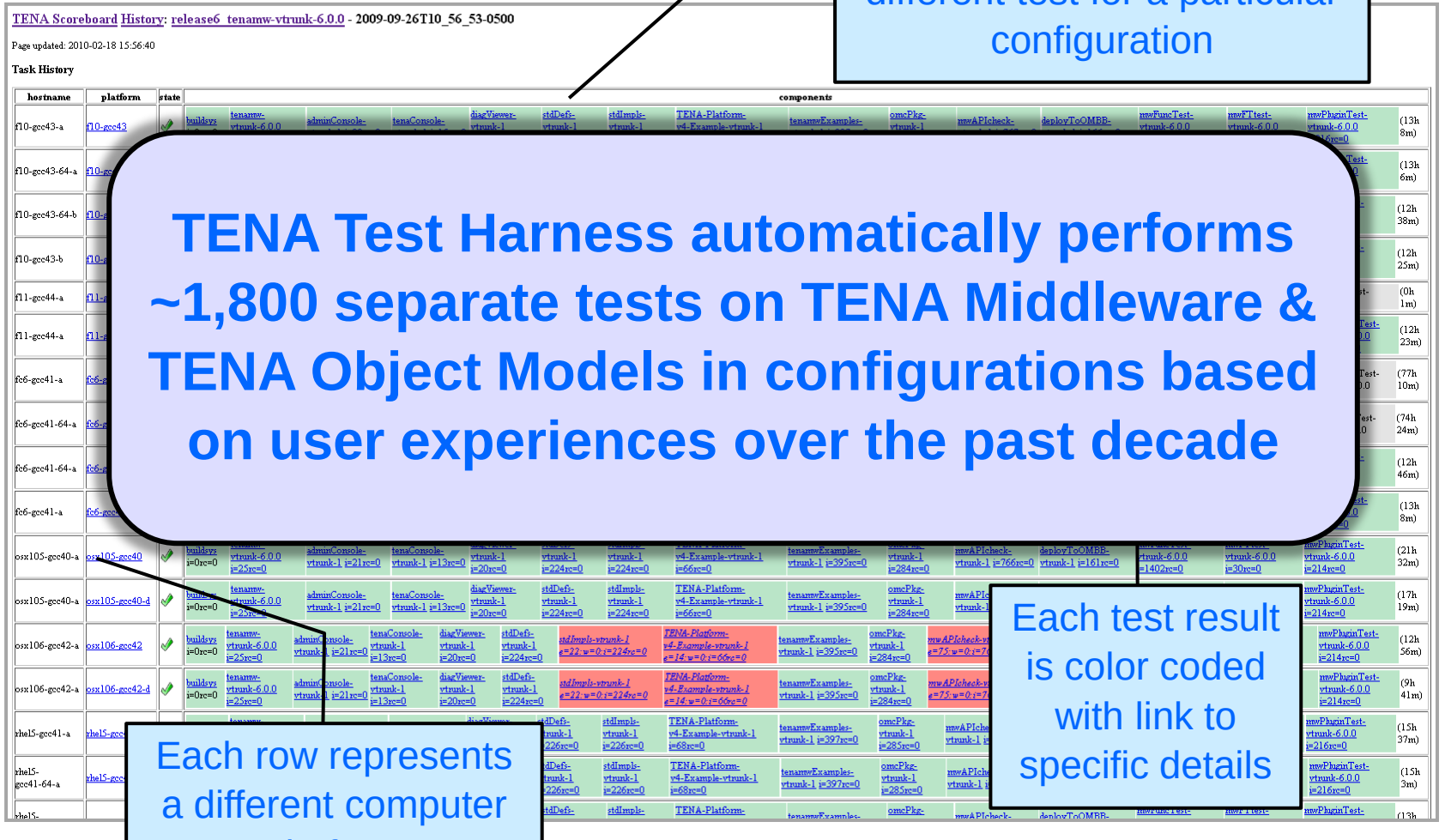
TENA Console

TIDE

TENA Automated Test Harness

("eye chart") Illustration

Each column represents a different test for a particular configuration



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

Each test result is color coded with link to specific details

Each row represents a different computer platform

TENA Testing

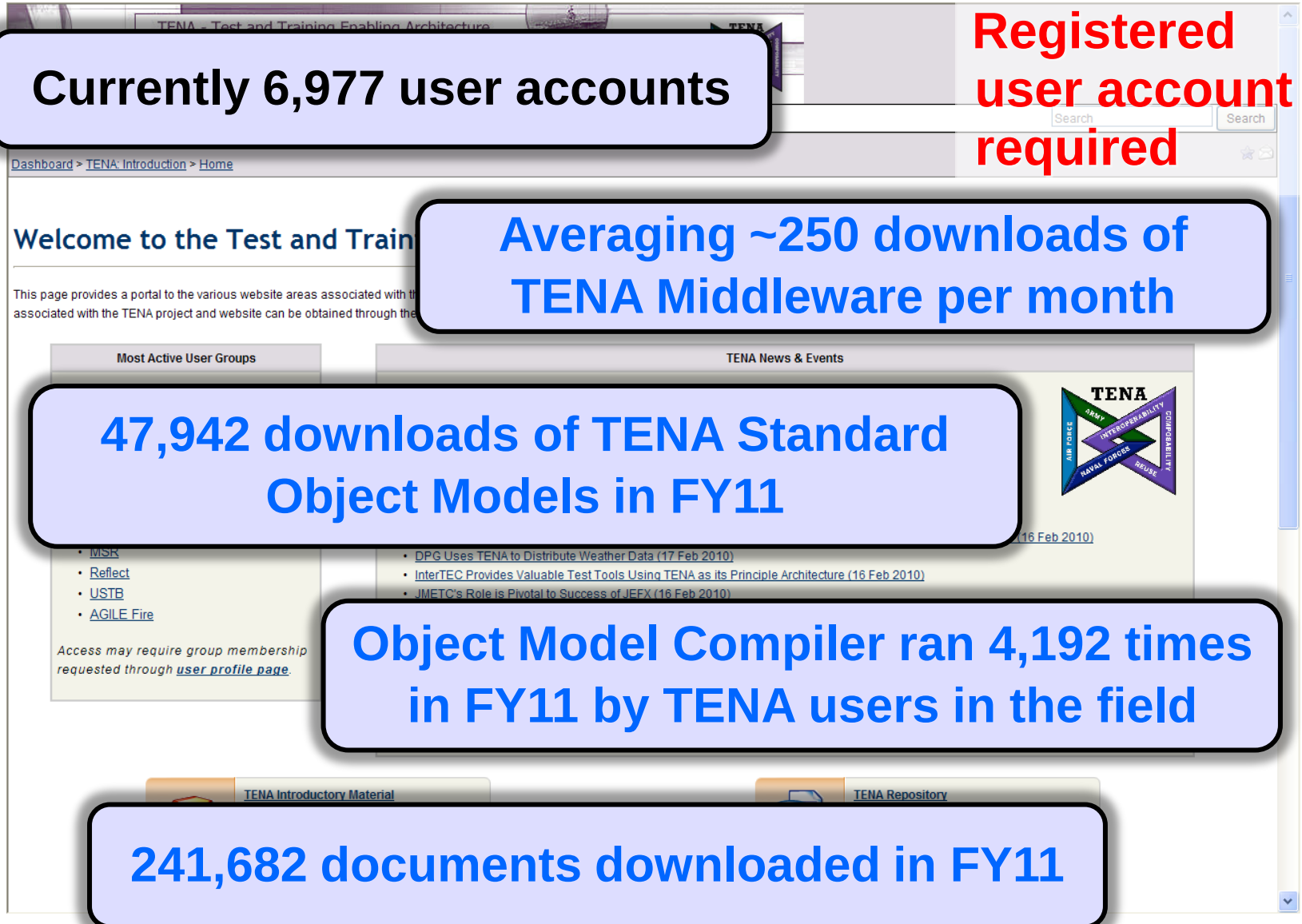
TENA Portal

On-line Document.

TENA Console

TIDE

TENA Web Portal
http://www.tena-sda.org/



- TENA Portal
- On-line Document.
- TENA Console
- TIDE

TENA On-Line Documentation

On-line Document.

TENA Console

TIDE

TENA - Test and Training Enabling Architecture

Home [Documentation] Downloads View Edit Search

Dashboard > TENA: Middleware > Release Documentation > Middleware -v6 > Middleware -v6 User Guide > Middleware Services -v6 > Advanced Filtering -v6

- Middleware -v6 User Guide
- Middleware Introduction -v6
- Object Model -v6
- Application Development -v6
- Middleware Services -v6
  - Configuration Mechanism -v6
  - Execution Management Services -v6
  - Publication Services -v6
  - Subscription Services -v6
    - Observer Mechanism -v6
    - Callback Framework -v6
    - Object Model Subsetting -v6
    - Subscription Slicing -v6
  - Advanced Filtering -v6
    - Filtering Context -v6
      - Computing Filtering Context based on State Update -v6
    - Filter -v6
    - Stateful Distributed Object -v6
  - Middleware Threading Model -v6
  - Middleware IDs -v6
  - Middleware Metadata -v6
- Execution Manager -v6
- Message -v6
  - Message Sender -v6
  - Message Constructor -v6
  - Message Implementation Registration -v6
  - Message Subscription -v6
  - Message Inheritance and Polymorphism -v6
  - Message Unsubscribe -v6
  - Message ID -v6
  - Adding Message Support to Existing Application -v6
- Local Class -v6
- Event Management -v6

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.

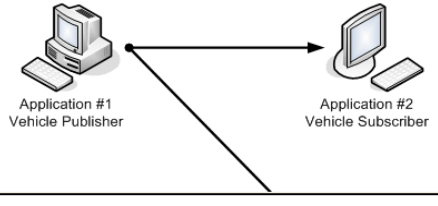
Description

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 Stateful 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 Servant or an SDO Proxy, 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` data published by Application #3. Application #4 subscribes to both type `Vehicle` and type `Person`, so it will receive data from both Application #1 and Application #3.

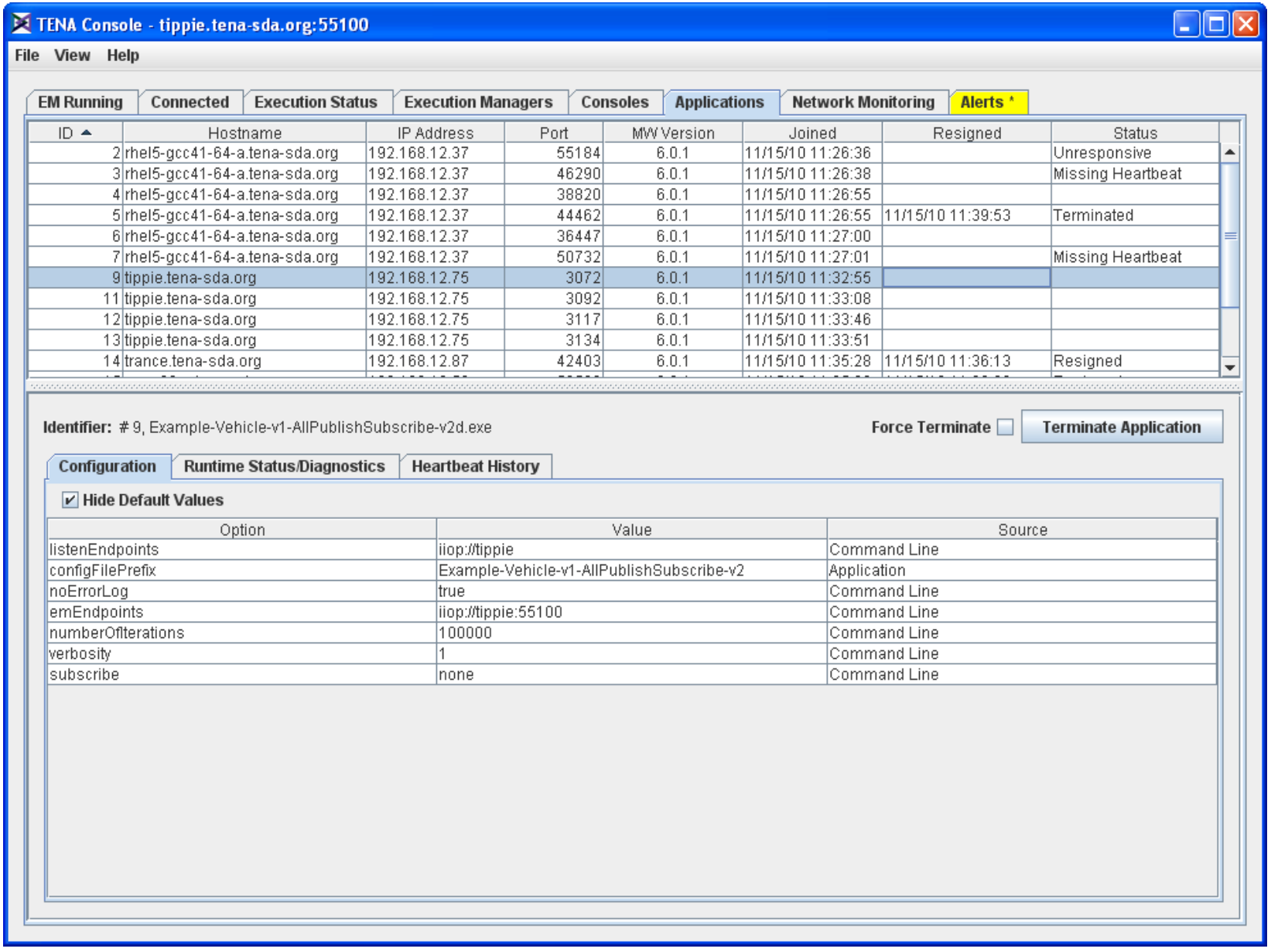


- **Installation Guide and Release Notes**
- **Middleware Guide arranged in individual topic pages**
  - Simplifies user navigation

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

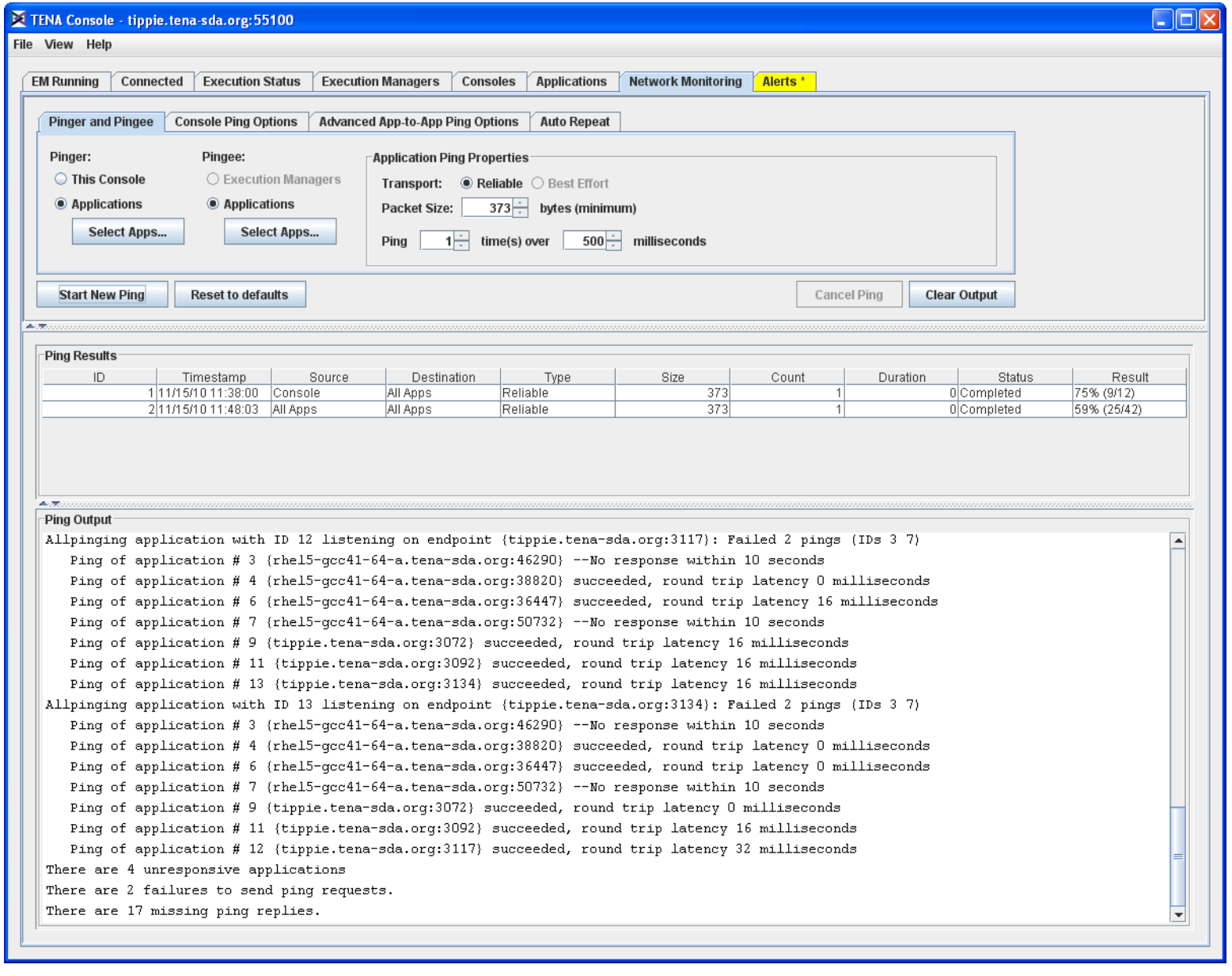
TENA Console



TENA Console

TIDE

TENA Console



TENA Console

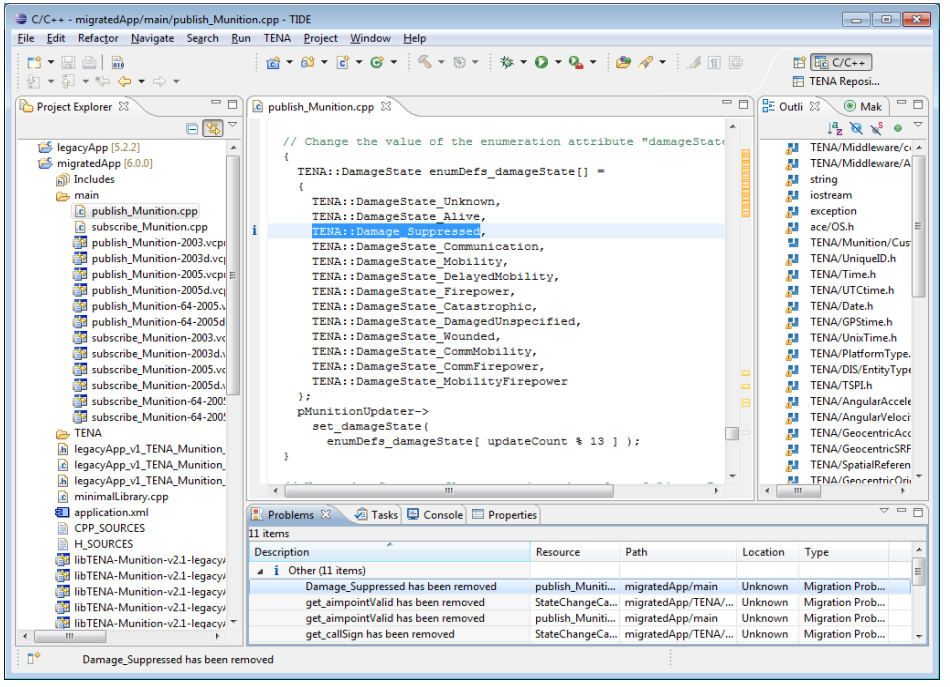
TIDE

Range Developer Support Tools

(TENA Integrated Development Environment, aka "TIDE")

TIDE

- **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

TENA Upgrade Support Offer

- **The 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
  - Hands-on training classes on using “TIDE” (a TENA Development Tool)
    - Eases developing TENA interface
    - Assists incorporating different Object Models
    - Upgrade utility for HLA applications migrating to TENA

Opportunity to Get Assistance in Using TENA

E-mail request to: feedback@tena-sda.org

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

New Middleware Capabilities

- Advanced Filteri
- OM Sub
- S pport
- tion
- ctivation
- parate Inbound/Outbound ORBs

•Enhanced data distribution
•Optimized network usage

Metamodel and Model Improvements

- Fundamental Si
- Const O
- Metadata
- dleware IDs

•Better ways to define data
•Remove ambiguity

New Event Management Capabilities

- Object Model
- Rem
- Tolerance
- gnostics
- onsole

•Improved reliability
•Enhanced troubleshooting

Usability Improvements

- Observer Patt (with C
- tallation Layout

•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 (AMT-49 is May 10 in Phoenix, AZ)**

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**

- **Design Decisions / Trade-offs / Status / Technical Exchanges of Lessons Learned / Use Cases / Testing / Issues & Concerns Identification, Investigation & Resolution**

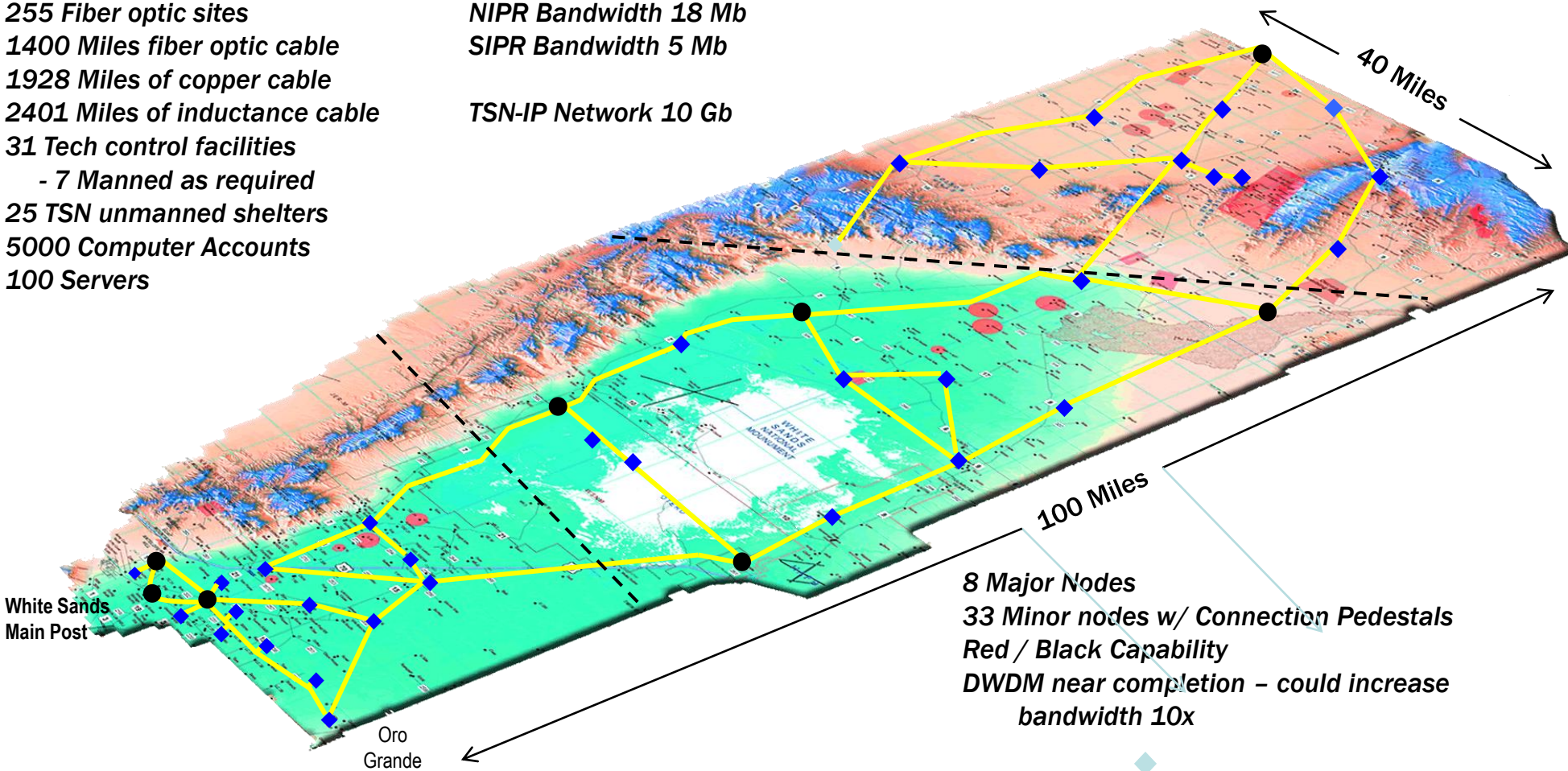
Network Migration At White Sands
The Test Support Network – A Perfect TENA Incubator

3400 Square miles
3000 Instrumented sites
255 Fiber optic sites
1400 Miles fiber optic cable
1928 Miles of copper cable
2401 Miles of inductance cable
31 Tech control facilities
- 7 Manned as required
25 TSN unmanned shelters
5000 Computer Accounts
100 Servers

DREN/S Bandwidth OC 12

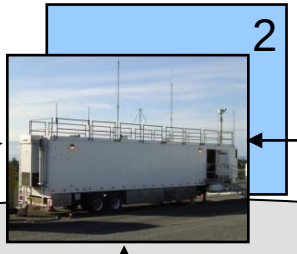
NIPR Bandwidth 18 Mb
SIPR Bandwidth 5 Mb

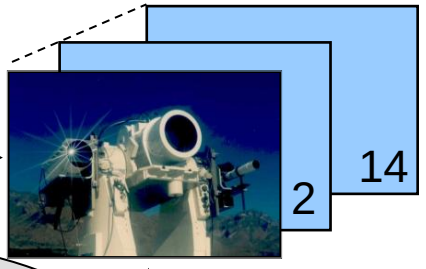
TSN-IP Network 10 Gb



8 Major Nodes
33 Minor nodes w/ Connection Pedestals
Red / Black Capability
DWDM near completion – could increase bandwidth 10x

A Compelling, Comprehensive Range Instrumentation Use Case at White Sands





20 Hz

60 Hz

Optics Multi-cast Group

Test Support Network
TSN / IP

Cox Pointing Data Object
on **TENA V6**

Measureand Object
on **TENA V6**

TM Multicast Group

Radar Multicast Group

Radar Track Object
on **TENA V6**

IRCC

DREN

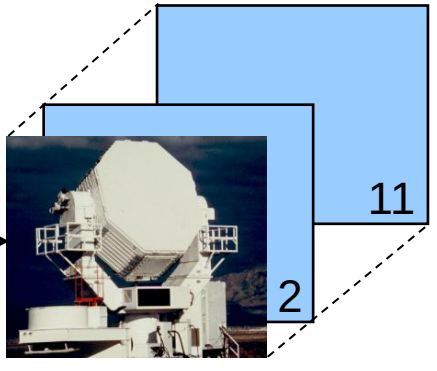
MRTFB 2

MRTFB 3

Telemetry
Pre-Processor

NetAcquire

on TENA V6

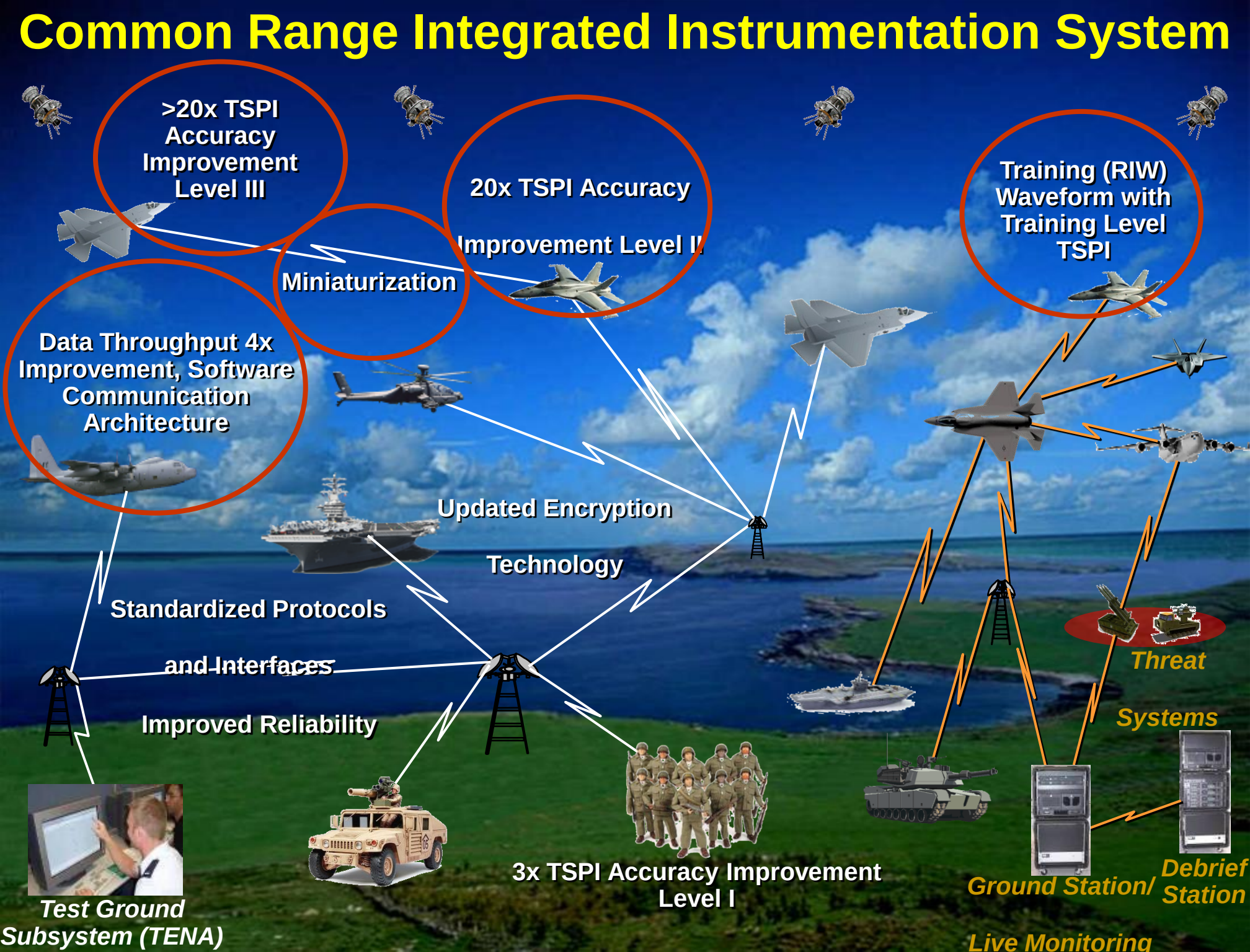


Army Proven
Battle Ready

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



TRMC Investment Programs Overview

T&E/S&T

- Established in FY2002
- Develops technologies required to test future warfighting capabilities
- 6.3 RDT&E funds
- ~$100M / year
- 9 current Tech areas
  - Directed Energy
  - Hypersonics
  - Netcentric Systems
  - Unmanned Systems
  - Multi-Spectral Sensors
  - Non-intrusive Instruments
  - Spectrum Efficiencies
  - Electronic Warfare
  - Cyberspace Test

CTEIP

- Established in FY1991
- Develops or improves test capabilities that have multi-Service utility
- 6.4 RDT&E funds
- ~$140M / year
- 51 current projects
  - 25 projects developing core Joint capabilities
    - 2 projects improving interoperability test cap.
  - 8 projects improving threat representations used in testing
  - 14 projects addressing near-term OT shortfalls

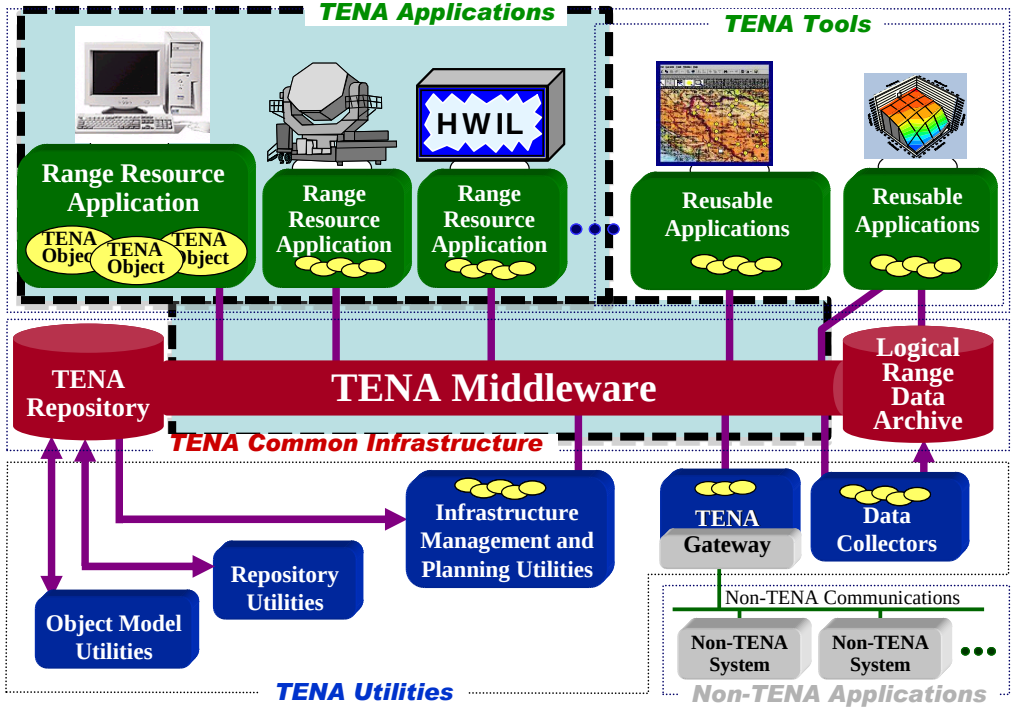
JMETC

- Established in FY2007
- Provides corporate infrastructure for distributed Joint testing
- 6.5 RDT&E funds
- ~$10M / year
- 69 current sites
  - Expanding to 70 sites
- Maintains
  - Network connections
  - Security agreements
  - Integration software
  - Interface definitions
  - Distributed test tools
  - Reuse repository

TENA in Resource Constrained Environments (TRCE) Project Addresses These Issues

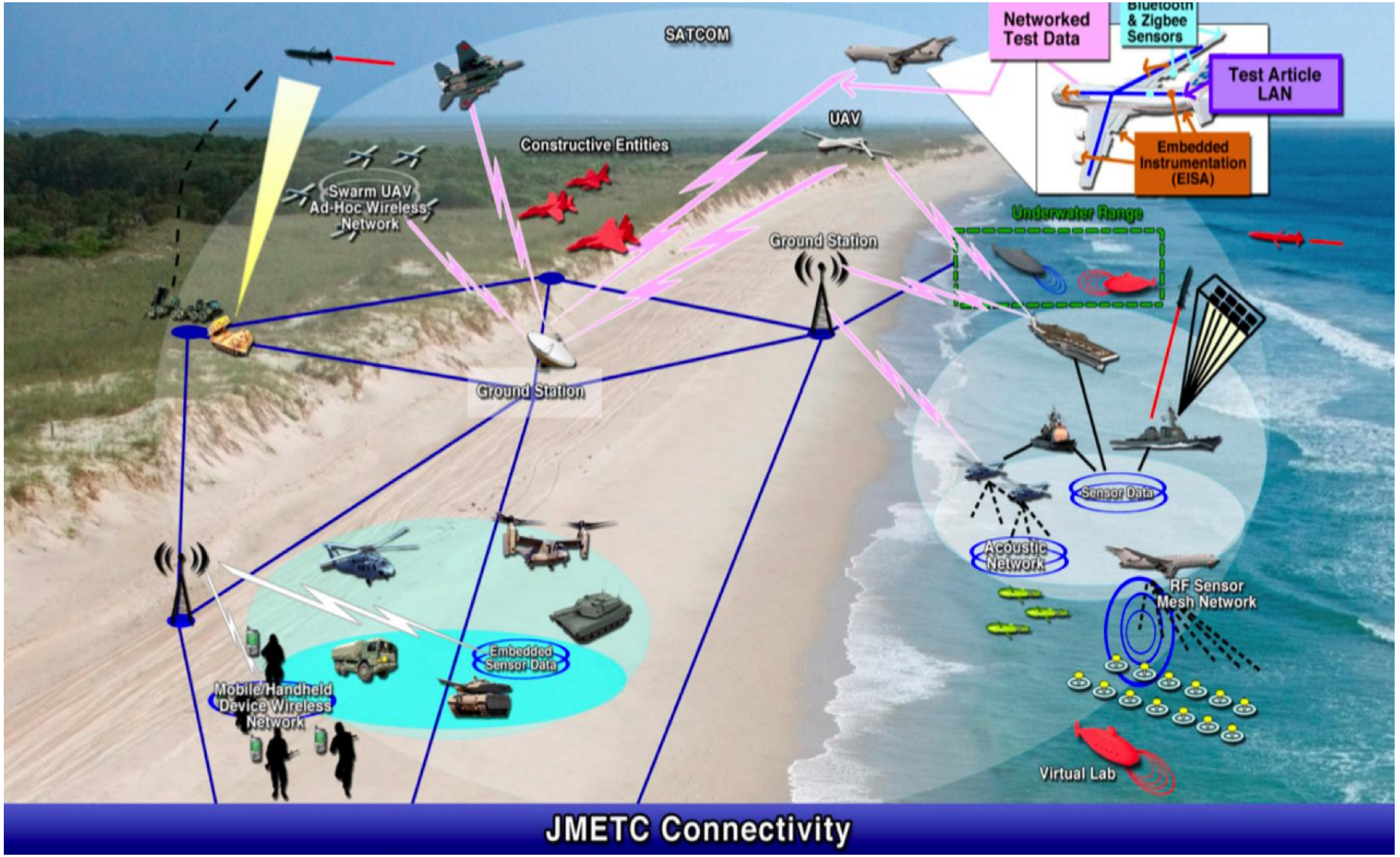
- Improve TENA's support for variable quality and low data rate network links including wireless networks

- Expand TENA's support for handheld and embedded instrumentation computational platforms

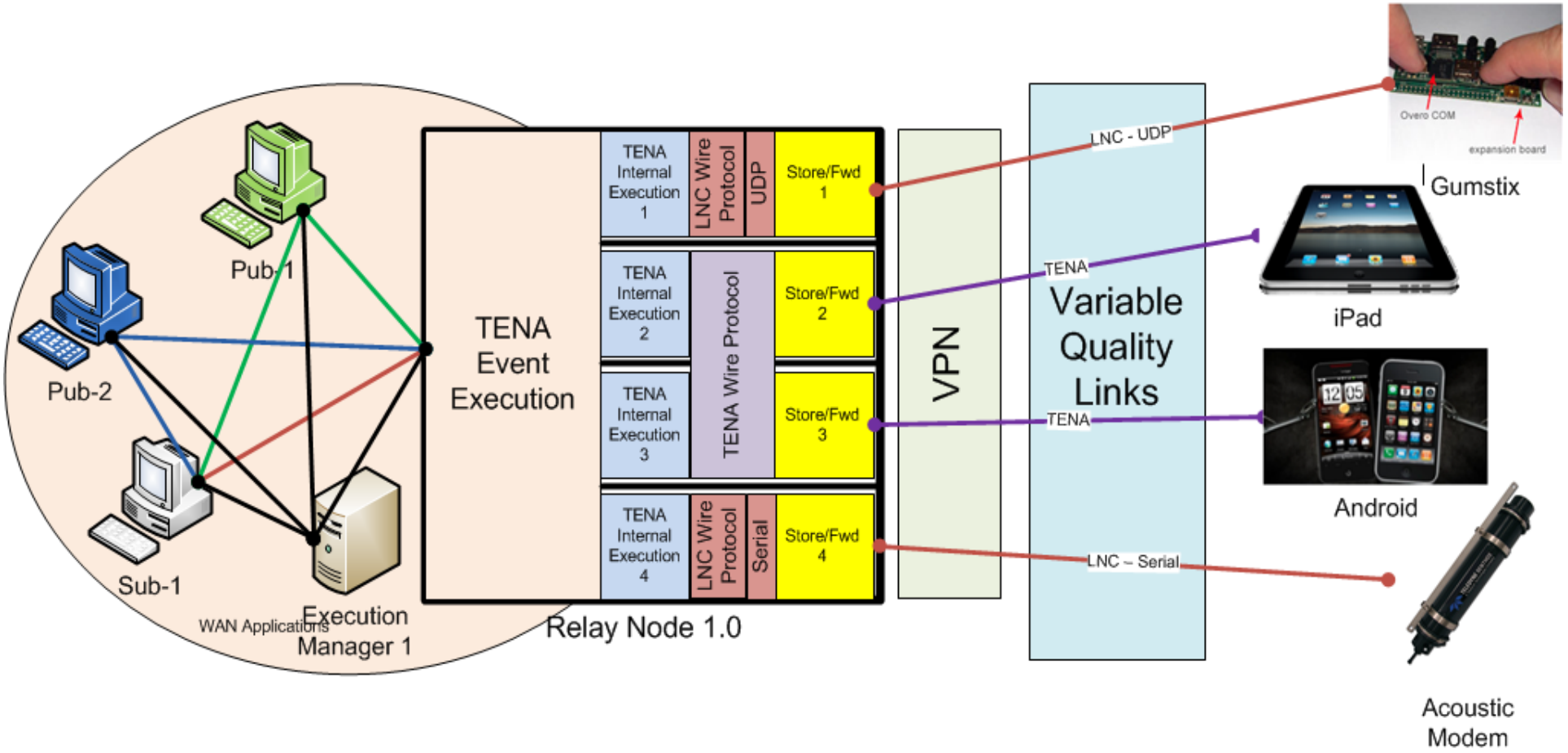


- Low Data Rate Networks
  - TENA must be able to establish and maintain data connections on low data rate networks
  - Need to optimize use of low data rate networks to support relevant operational scenarios
- Wireless Networks
  - Current range environments use wireless links extensively for various systems under test
- Variable Quality Networks
  - T&E systems poorly tolerate high loss, link failure, or heterogeneous links
  - Need to provide data continuity for degraded or heterogeneous networks
- Specification of Interests
  - Subscribers must be able to specify data "interests" to more efficiently use available & limited network resources

TRCE OV-1



RelayNode 1.0



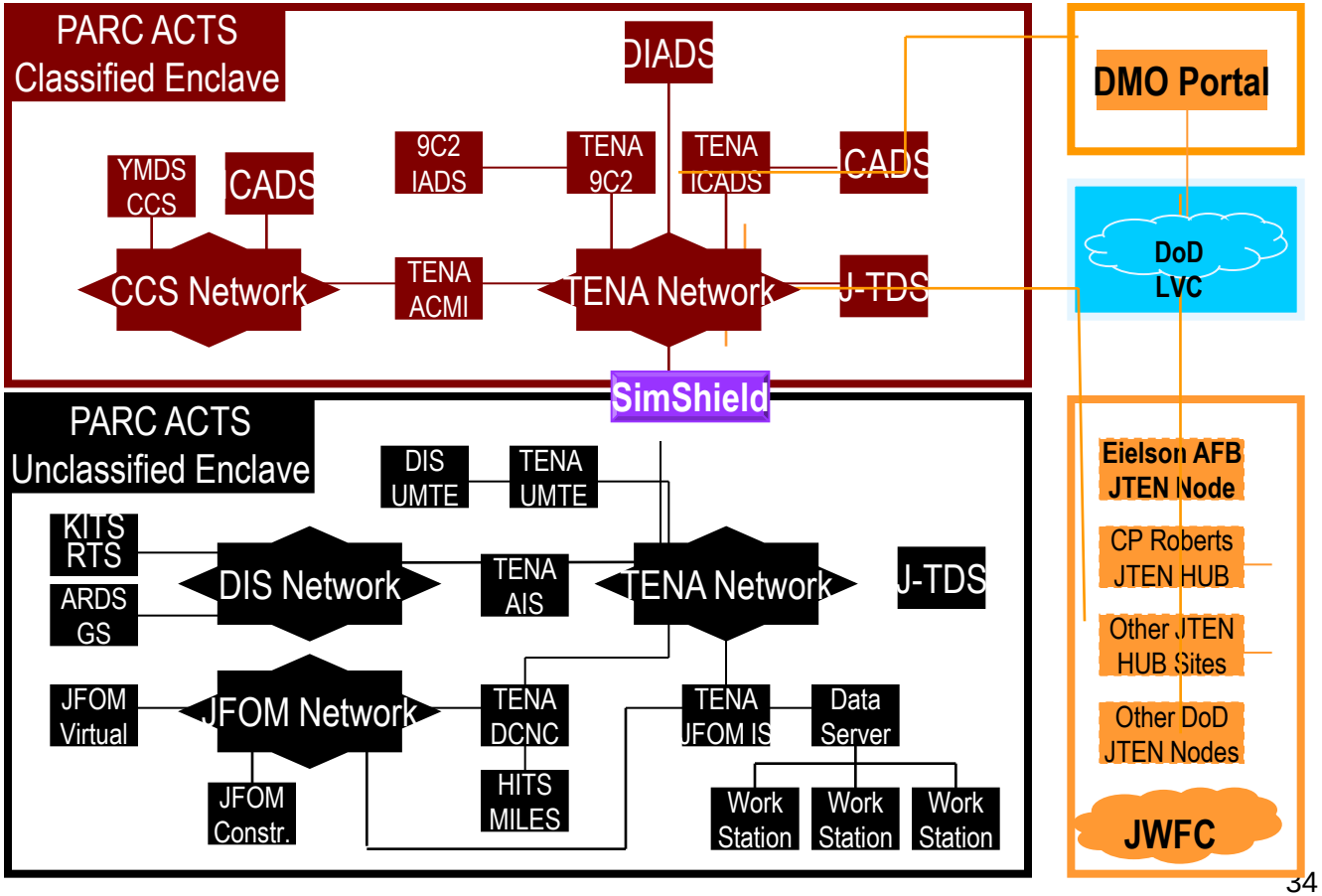
- Auto-generated application that will support a wide range of object models
- Can be deployed at strategic points geographically on the LAN/WAN
- Supports each device connection in separate thread
- Will eventually support Bluetooth and Zigbee devices

Alaska Training Range Evolution Program (ATREP) use of TENA

ATREP'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



PMRF TENA Roadmap

Range Department/Division Heads:

PMRF's high-level direction for future information technology is to move to the TENA Object Model standard for information exchange between PMRF systems and between PMRF and other ranges.

The PRITEC program produced a TENA-Enabled Range Roadmap (attached). The roadmap explains the way PMRF will transition from the IT infrastructure today to a TENA-enabled range of the future. All PMRF personnel are directed to ensure that resources expended to modernize, improve, upgrade or replace existing or new capabilities at PMRF will be in compliance with the roadmap. Deviations from, or changes to, the roadmap must be approved by the CIO or above.

All new initiatives must be briefed to the CIO to demonstrate their TENA compatibility, and to receive CIO approval before they can proceed. This briefing shall also include; who the government system owner will be, what the source of funding is, what the support/sustainability plan is throughout the system lifecycle, what the IA plan is, etc. The CIO will create a guidance memorandum identifying the standard content for the briefing.

Bottom line: Any new IT initiatives, including servers, sensors, radars, telemetry, data processing, and software initiatives need to actually implement TENA whenever possible or be capable of implementing TENA immediately when called upon to do so.

Aloha

Jack

Technical Director

Pacific Missile Range Facility

Pacific Region Interoperability T&E Capability (PRITEC)

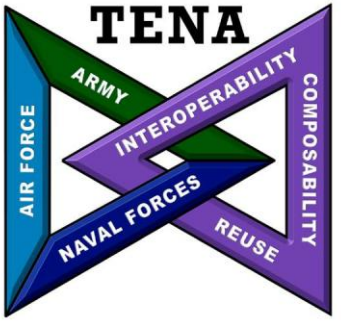
- **Enhance interoperability through use of DoD standard interfaces and middleware**
- **Take advantage of features of TENA Middleware for intra-range data processing (e.g., publish-subscribe mechanism for control of data flow)**
- **Create opportunity to reuse and leverage TENA applications and tools developed for other ranges**
- **Make PMRF developed TENA applications available to other ranges**
- **Leverage DoD joint test infrastructure provided by JMETC**

PRITEC Migrates PMRF to TENA

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

JMETC Virtual Private Network using SDREN



TENA Software, Object Models, Tools, Repository

- Provides customer support team for JMETC products and distributed testing

Summary

- TENA offers significant benefit to the Ranges and fosters the mission of the RCC with common data standards, common instrumentation interface, common data exchange, common tools, engineering support, and a plan for long term sustainability for reduced O&M
- 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 JNTC 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 May 7-10 in Phoenix, AZ

Important Contact Information

- **TENA Website: www.tena-sda.org**
  - Download TENA Middleware
- **JMETC Website: www.jmetc.org**

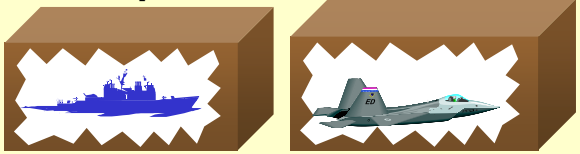
- **TENA Feedback: feedback@tena-sda.org**
  - Provide technical feedback on TENA Architecture or Middleware
- **JMETC Feedback: jmetc-feedback@jmetc.org**

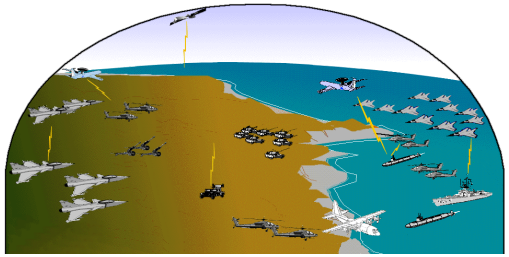
- **TENA SDA Contact**
  - Telephone: (571) 372-2714
- **JMETC Program Office Contact**
  - Telephone: (571) 372-2699

JMETC Enables Distributed Testing

Systems Under Test

Joint Operational Scenarios

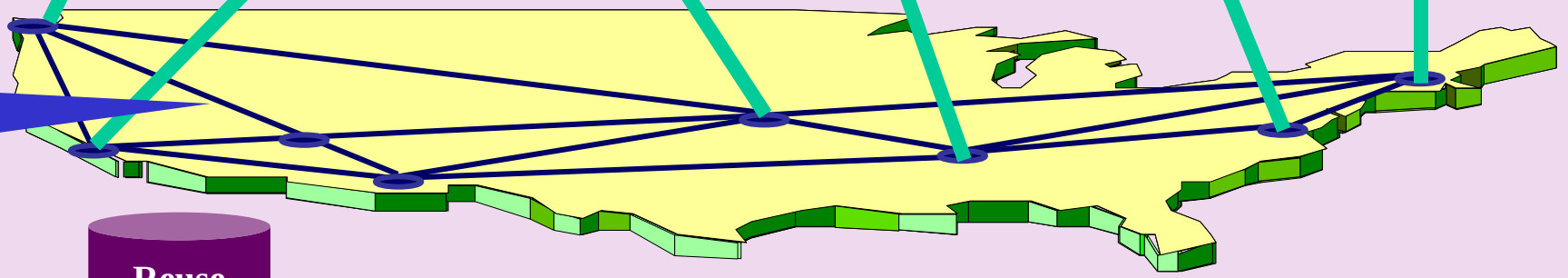




Integrated Test Resources

Virtual Prototype	Hardware in the Loop	Installed Systems Test Facility	Range	Environment Generator	Threat Systems
TENA Standard Interface Definitions	TENA Standard Interface Definitions	TENA Standard Interface Definitions	TENA Standard Interface Definitions	TENA Standard Interface Definitions	TENA Standard Interface Definitions
TENA Common Middleware	TENA Common Middleware	TENA Common Middleware	TENA Common Middleware	TENA Common Middleware	TENA Common Middleware

JMETC Connectivity on SDREN



Reuse Repository

JMETC Infrastructure

Distributed Test Support Tools

Data Management Solutions

Customer Support

* 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: 69
- New Sites Planned: 11
- Connection Points to Other Networks: 6

- 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

Boeing LabNet: Tukwila
Keyport: NUWC
Ft Lewis: EPG

Site in Alaska
Ft. Greely: CRTC

Sites in So Cal
Edwards (2): Ridley
412th EWG IFAST
China Lake (3): AV-8B, F/A-18, IBAR
TSPIL
Point Mugu (2): ITEC, EA-6B
El Segundo: NGC B-2
Camp Pendleton: MCTSSA
Corona: NSWC
Palmdale, NGC BAMS
Point Loma :
SSC-PAC 59140
SSC-PAC HAIPE
West Agg Rtr.
Rancho Bernardo, NGC BAMS

Sites in Hawaii
PMRF: Bldg 105
MHPCC

Dugway Proving Ground
Schriever AFB: JEWL
Nellis AFB: CAOC-N
Tinker AFB: AWACS
Ft. Sill: FSED
Yuma PG
WSMR: IRCC
Greenville: Rivet Joint
Ft Huachuca: (4) JITC, JTDL, CMIS, JTRS
Ft Hood (2): CTSF, TTEC

WPAFB: SIMAF
NSWC-Crane: RDT&E
Boeing LabNet: Berkeley

Redstone (10): SMDC
RTC: DTCC, GMAN
SED: Patriot, THAAD, FAAD, GSIL, JLENS, MUSE, SIV
SED-PSEM

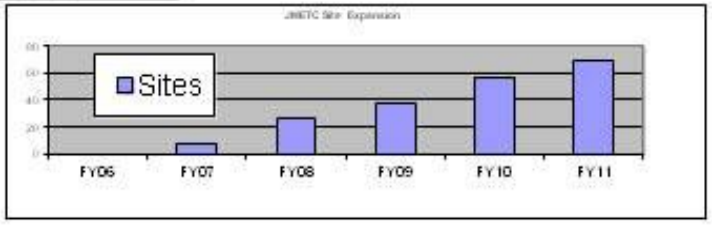
Charleston (2): IPC, MEF-MEU

Sites in Gulf Range
Hurlburt Field: C2DAC
Eglin AFB (5): AOC, DTF, GWEF, KHILS, JDAT

Melbourne: NGC JSTARS

Hanscom AFB: CEIF
Bethpage: NGC BAMS
Bethpage: NGC BCN
Moorestown: CSEDS

Sites in MD, DC, VA
Aberdeen: ACCN
Pax River:
(8)ESTEL E2C/D, MCL, ACETEF, SAIL, ATR, E-2C SIL, UASIL, MFS
JMETC SYSCON
East Agg Rtr.
DISA: Sky 7
Dahlgren (2): CEDL,IWSL
JS J8 DDC4: C4AD
Langley (2): C-GIIF, TDLITC
Norfolk: COMOPTEVFOR
Dam Neck: CDSA
Wallops Island: (2) SCSC, SSDS
Newport News: NGC VASCIC
McLean: MITRE NCEL
Lockheed Martin Peering Arlington, VA

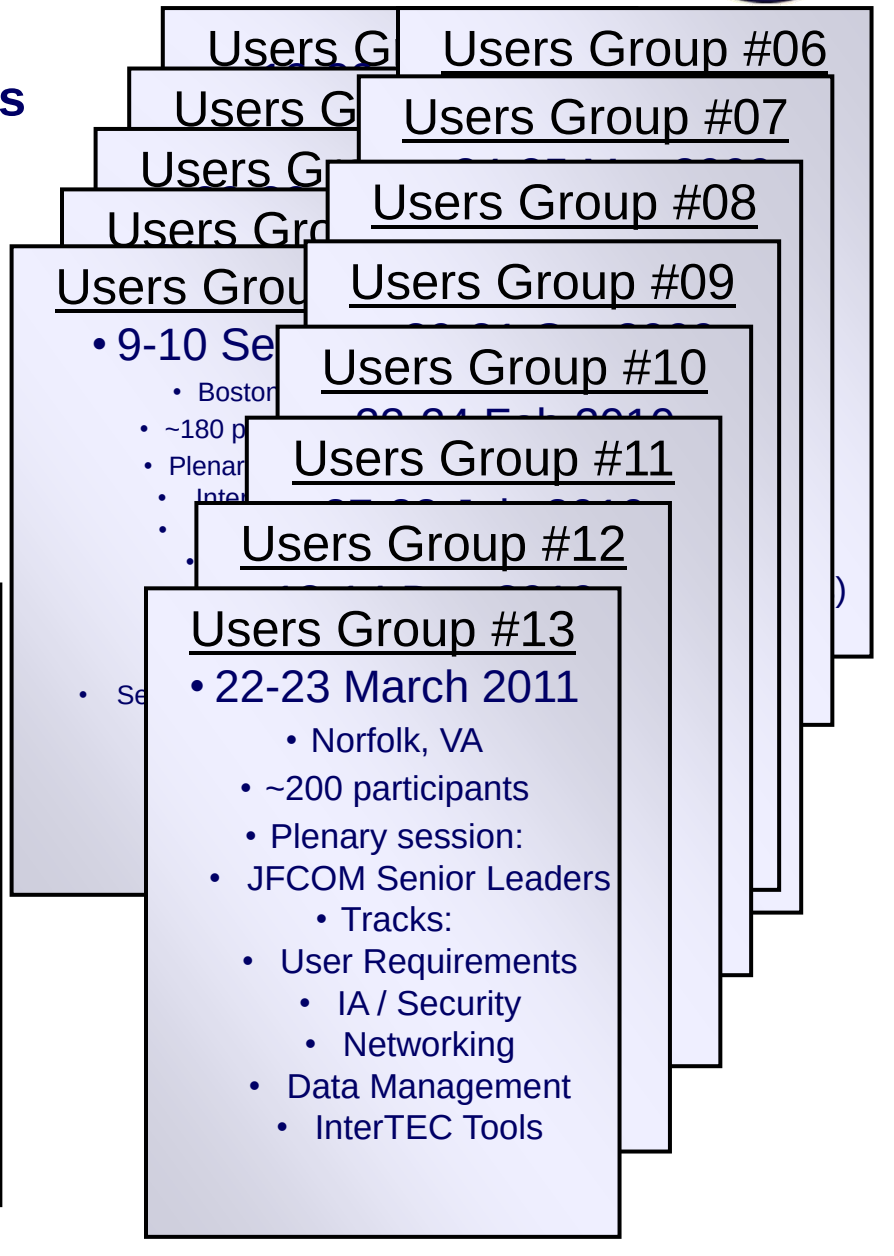


As of 09 Jan 2012

- Army
- Air Force
- Navy
- Marines
- Joint
- Industry

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**



Last JMETC Users Group Meeting:

- November 15-16, 2011
- Location: Baltimore, MD
- Tracks:
  - User Requirements
  - Information Assurance / Security
  - Data Management
  - Distributed Test Tools
  - Cyberspace T&E (FOUO)