



Test Resource Management Center (TRMC) State of Cyber Test and Evaluation



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TRMC Overview



TRMC Mission



TRMC Mission: Readiness of the DoD T&E Infrastructure

TRMC Mission Areas

– Test Resource – Governance

- Sustain current DoD test capability & capacity
- Certify Service T&E budgets
- Approve changes to the Major Range and Test Facility Base (MRTFB)

– Test Resource – Modernization

- Forecast future test needs
- Develop strategic plan (30-year outlook, updated annually)
- Deconflict DoD modernization efforts with common test resource needs

– Test Resource – Investments

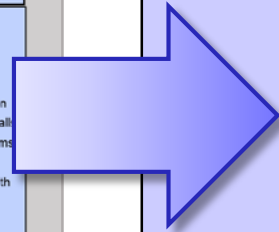
- Develop new test technologies
- Improve T&E capabilities
- Support Joint mission interoperability & cyber testing



TRMC Investment Portfolios

Legacy Investment Structure

> Long-Term multi-Service Investments			> Near-Term Investments	
Joint Improvement & Modernization (JIM)			Resource Enhancement Project (REP)	Threat Systems Project (TSP)
JIM-Core <ul style="list-style-type: none"> 3-5 year requirement horizon EMD of major multi-Service test capabilities Development, not procurement Services & Agencies budget for O&M \$110-140M/year, \$600-\$700M over 5 years 	JIM-EW <ul style="list-style-type: none"> Special DoD area of emphasis EMD of electronic warfare (EW) test capabilities Assess aircraft performance against complex new threats. Service budget for O&M Total cost ~\$465 over ~7 years 	JIM-Hypersonics <ul style="list-style-type: none"> Special DoD area of emphasis EMD of hypersonic ground test capabilities Focus on hypersonic cruise & boost glide missiles Service budget for O&M Total cost ~\$350 over ~5 years 	<ul style="list-style-type: none"> 1-2 year horizon EMD of instrumentation to address near term OT shortfalls Coordinated with DOT&E \$18-20M/year 	<ul style="list-style-type: none"> 1-2 year horizon Address shortfall in threat systems representation Coordinated with DOT&E \$3-5M/year



Portfolio Investment Structure

• Strategic Portfolios

- Hypersonics
- Directed Energy
- **Cyber**
- Nuclear
- Electronic Warfare
- Space
- Autonomous Systems (and Artificial Intelligence)
- Multi-Domain Integration

• Foundational Portfolios

- Common Range Instrumentation
- Target/Threat Systems
- Knowledge Management (and Big Data Analytics)

• Major Projects

- Joint Improvement Modernization Projects
- Quick Reaction Test Capability Projects

Strategic Portfolios cover both Offensive & Defensive

Portfolios support testing across all paths of the acquisition framework (Major Capability, MTA, Software, etc.)

Portfolios support all types of testing (Demos, Experiments, DT, OT, etc.)

Portfolios consist of investments across all test resource categories (M&S, Test Facilities, HWIL, SIL, Test Ranges, Workforce, etc.)



Cyber T&E Investments



Evolution of Cyber T&E Event Complexity

- Boundary Defense
- Subsystems Testing
- Small Scale Mission System Testing
- Individual Classroom Training
- Small to Mid-Size Exercises
- Increased Environment Scalability and Stability
- Tailored Instrumentation and Traffic Generation
- Co-developed CTT Methodology

- Hi-Fidelity, Complex Emulations
- Broader Complex Mission Systems
- Increased Attack Surface
- Industrial Controls
- Hardware-in-the-Loop
- Cross-Domain Solutions
- Limited SoS Testing
- Persistent Training Environments
- Flexible Patch Dates
- Advanced TG Tools
- CTTs on Acquisition Programs and Test Ranges

- From Hi-Fidelity Emulations to Actual Replications of Operational Environments
- Mission-based SoS and FoS testing
- Competitive Training Events
- Actual Wireless/RF Signals vs. Simulations
- Standardized Bus Architectures
- Increased CSET Skillsets
- Increased Base of SMEs in Diverse Technology Areas

2013-2014

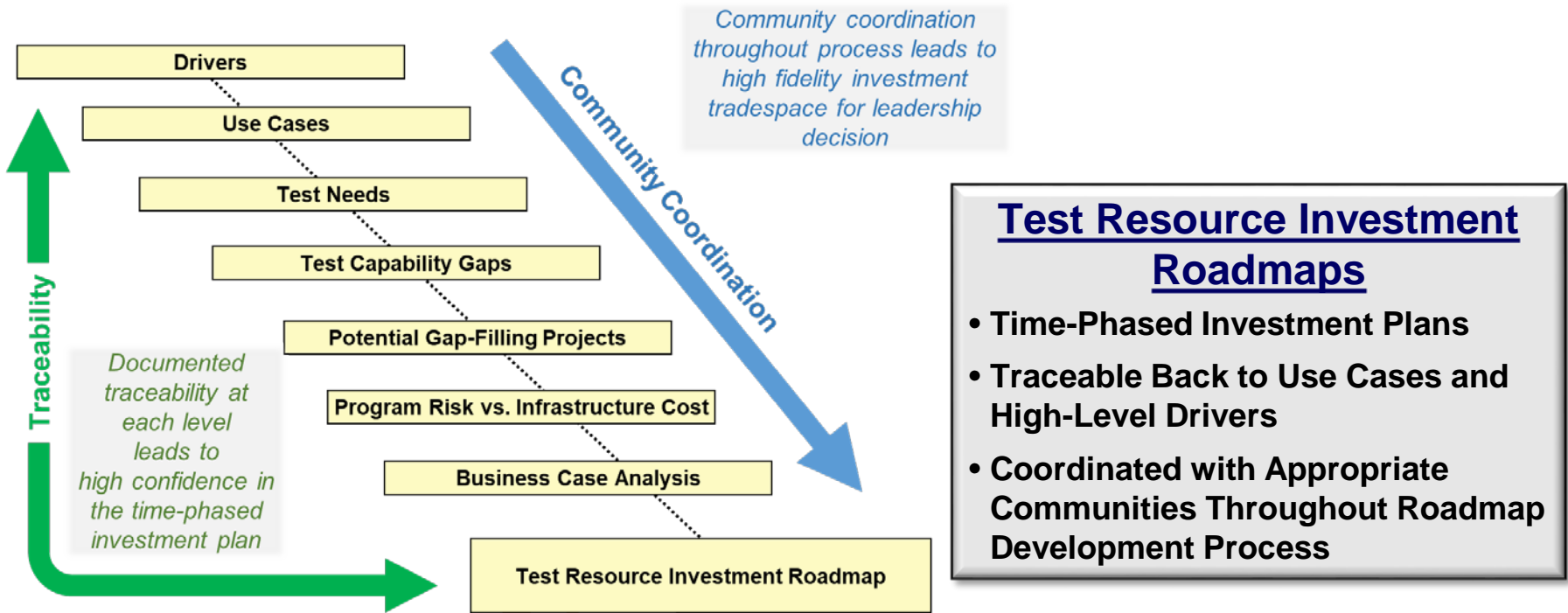
2015-2016

2017-2020

Improving Cyber Lethality and Mission Resilience



Cyber Test Resource Investment Roadmap



• Cyber Test Resource Roadmap

- FY 2021 new start research projects will likely focus on testing cyber operational technologies rather than information technologies



Cyber T&E Investments – Infrastructure National Cyber Range Complex Expansion

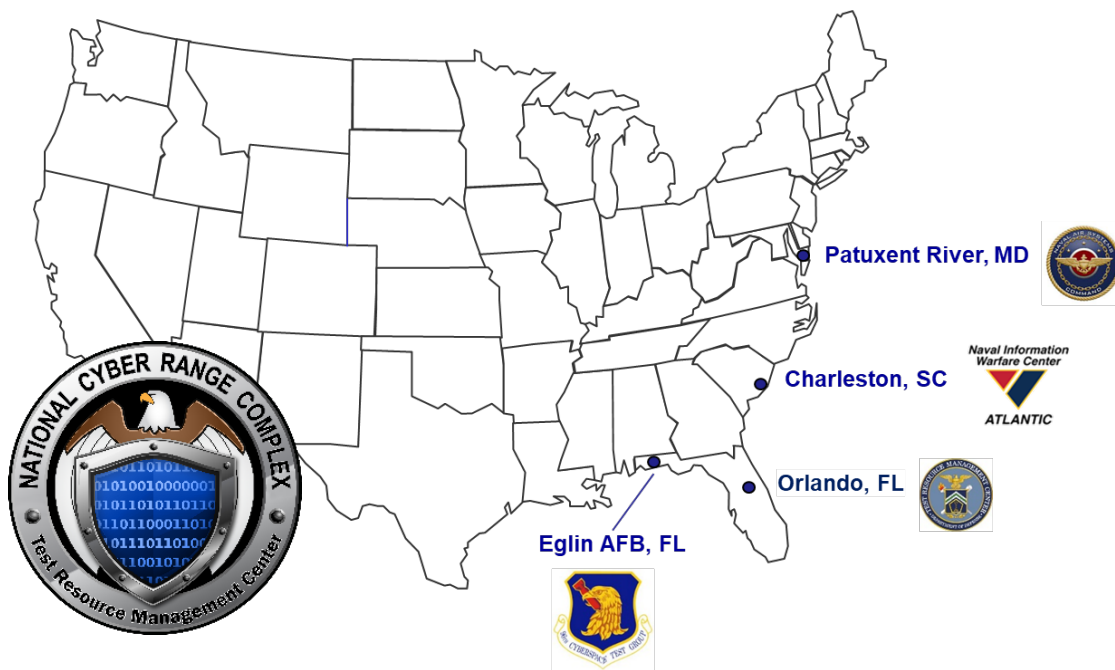
NCRC Vision An integrated and interoperable constellation of facilities designed to enable the planning and execution of large-scale, complex, distributed cybersecurity events to satisfy multi-service/multi-domain requirements to conduct R&D, S&T, DT&E, OT&E, team certification, training exercises, and mission rehearsal.

TRMC Working with the Services to Establish New NCRC Facilities

- Charleston, SC (NIWC Atlantic)
- Eglin AFB, FL (96th Cyberspace Test Group)
- Orlando, FL (Army PEO STRI, PM CT2)
- Patuxent River, MD (NAVAIR)

NCRC Enterprise Elements

- Realistic Mission Environments
- Event Content Repository
- Common Architecture
- Instrumentation
- Analysis Tools
- Security Accreditation
- Workforce Training



The NCRC is Expanding to Meet Growing Demand for Cyber T&E and Training



Cyber T&E Investments – Tools TRMC Development Efforts



- ***Cyber Threat Automation and Monitoring***

Enabling the use of modern artificial intelligence / machine learning to analyze the effects of cyberattacks on virtualized targets

- ***Red Team Automation***

Tools to automate some NSA-certified Red Team functions to free humans to take on more complex testing

- ***Next Generation Traffic Generation***

Using modern artificial intelligence techniques and detailed network, human social, and work flow models to (1) generate traffic that cannot be easily distinguished from human-generated traffic, and (2) generate a synthetic internet with content much more representative of the current real-world internet

- ***Fuzzing From Above and Below***

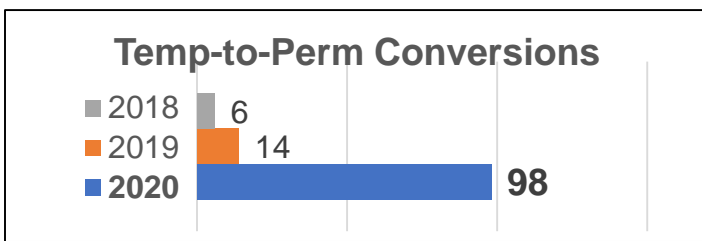
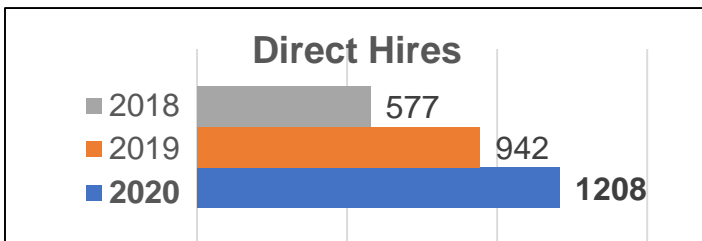
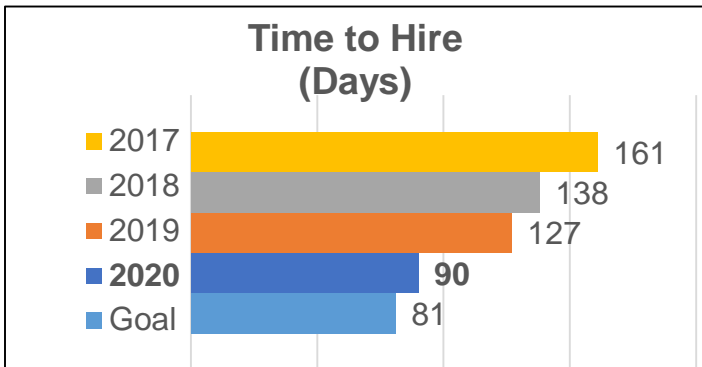
Fuzzing the machine state to see the effect of machine state changes on the software running on the machine



Cyber T&E Investments – Workforce TRMC STEM Initiative

Vision: A combined civilian, contractor, and military T&E workforce that fully supports the National Defense Strategy

Key Metrics:



Key Cyber Workforce Initiatives:

- **DISA/JITC converting to Cyber Excepted Service**
 - Competitive hiring flexibilities
 - Reduced time to hire
 - Salary flexibility for Government employees

- **TRMC National Defense Strategy STEM Intern Program**
 - Objective: Pipeline of new talent at T&E ranges
 - Up to 40 interns beginning Summer 2021
 - Aligned to OUSD(R&E) portfolios and NDS interest areas
 - Keys to Success
 - Mentor Program
 - T&E-specific research and engagement
 - Positive experience
 - Lessons learned from prior years
 - Eligible Facilities
 - MRTFB Activities
 - NCRC (Orlando, Charleston, Patuxent River)
 - NCRC – Unclassified (Georgia Cyber Center)



Cyber T&E Investments – Workforce NCRC Unclassified (NCRC-U)

NCRC-U Objectives

- **Provide cyber operator training** in support of developing the future Warfighter
- **Encourage non-traditional defense contractor participation** by reducing the barrier to entry to an UNCLASSIFIED instance and workspace
- **Spur dual-use R&D from industry and academia** to create gains in commercial and government cybersecurity and testing

High-Level FY21 Milestones

- **Workforce Training and Development Course**
- **Virtual Environment**
- **Innovation Challenges**



Current Innovation Challenges

- **802.11 DSRC WAVE Environment Remote Kit**
 - Auburn University
 - Supports DoT testing of autonomous vehicles
 - Provides wireless environment and remote connectivity to range core environments
- **Electrical Smart Grid Model**
 - Clemson University
 - Physical model of a city area with a working electrical grid
 - Smart grid capable infrastructure for testing/training
 - L/V/C model enhances workforce capability in SCADA environments
- **Project GHOST**
 - Augusta University
 - Virtual infrastructure for non-attributable research/intelligence
 - Sandbox environment for malware analysis and segregation



Additional TRMC Touchpoints

- **Monday, Nov. 16 – Pre-Workshop Tutorial**
“TENA and JMETC Solutions for Cyber Test and Training”
Gene Hudgins (TRMC/JMETC)
- **Wednesday, Nov. 18 – Main Stage**
Deputy Executive Agent for Cyber Test Ranges
Chip Ferguson (Chief Information Officer // Deputy Executive Agent for Cyber Test Ranges, TRMC)
- **Thursday, Nov. 19 – Technical Track Sessions**
 - ***“Artificial Intelligence Platform of Cyber Threat Automation and Monitoring (CTAM) System”***
 - ***“TRMC Cybersecurity Services Update”***
Robin Deiulio (TRMC/NCRC)



Questions?