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C4ISR OTM E08
Executive Summary

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PM C4ISR OTM

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1 Introduction

Product Manager Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance (C4ISR) On-The-Move (PM C4ISR OTM), is a Research, Development and Engineering Command (RDECOM) Communications-Electronics Research, Development and Engineering Center (CERDEC) organization, chartered in June 2006 to perform integrated C4ISR System of Systems (SoS) Live/Virtual/Constructive (L/V/C) technology demonstrations on a year-round basis. PM C4ISR OTM facilities include a relevant field environment at Fort Dix, NJ and development, integration and simulation laboratories that leverage High Performance Computing (HPC) capabilities at Fort Monmouth, NJ. As an Army capital investment, PM C4ISR OTM supports both Department of Defense and industry technology development efforts by providing a "test/assess-analyze-fix" environment in which systems supporting Future Force initiatives or being considered for acceleration into the Current Force, can be matured and evaluated in a relevant, structured, low-risk manner. Activities conducted at PM C4ISR OTM's lab or field sites are not formal "tests", but are activities constructed as opportunities to expose systems to conditions not ordinarily available within their development environments. The goal of these activities is to evaluate systems against specific performance criteria, and then facilitate maturation by providing early feedback to the developing organization.

From April through August of 2008, RDECOM, CERDEC, and PM C4ISR On-The-Move executed the largest C4ISR and Networking Technology Demonstration to date, referred to as C4ISR On-The-Move Event 08 (E08). Utilizing the combined capabilities of the Joint Megabase (Fort Dix, Lakehurst Naval Air Engineering Station, McGuire Air Force Base), E08 built upon the accomplishments of E07, both in the number of systems and in the complexity of their interconnections. The demonstration enabled a network-centric environment, incorporating more than 100 live communications, sensor and battle command systems. These live systems were complemented by a Brigade-sized element represented in virtual and constructive simulation utilizing organic HPC assets, and instrumented via a robust suite of automated data collection tools.

E08 was designed to assess the technical capability, functionality, maturity, and performance of future, emerging, and Spin Out technologies, and was comprised of Axes of Exploration, Collaborative Efforts, and Technology Excursions.

Key issues relevant to the Army's transformation effort were organized into five diverse, dependent Axes of Exploration termed Brigade and Above, Brigade and Below, FCS/ Future Force, Modeling and Simulation, and Instrumentation, Data Collection and Reduction. Each Axis of Exploration differed in focus, but all utilized a common integrated C4ISR SoS architecture. Each Axis addressed requirements from various customer organizations, but all were aligned to facilitate overall event execution and designed to support broader Army and DoD requirements. For each Axis, individual systems were evaluated in component-level assessments. Communication, sensor and battle command systems were then integrated into a SoS for end-to-end technical evaluations. Finally, force effectiveness was studied by conducting missions designed to assess technology in a relevant environment. Customized automated data collection and reduction tools developed by the PM and leveraged from Army and DoD partners were employed, which allowed comprehensive evaluation and assessment of both individual system and emerging SoS metrics.

In addition to the Axes of Exploration, Army Technology Objectives and Government and Industry partners utilized the E08 SoS architecture and elements of PM C4ISR OTM's physical infrastructure and/or integration services to explore and mature technology readiness in an environment not ordinarily available to individual systems. These activities are characterized as Collaborative Efforts.

Finally, technology providers performed focused, component-level analyses, or Technology Excursions, which utilized the SoS architecture but did not contribute to the integrated SoS analyses.

C4ISR OTM E08 was executed by employing a mix of objective, surrogate, and simulated platforms and systems. Since all elements of the architecture were not available and in place during any given assessment activity, a tight coupling between planning, design, and execution strategies was required. Each E08 Axis of Exploration was as large and complex as any PM C4ISR OTM event prior to 2006. Additionally, E08 was over three times as large as the 2006 Capstone Experiment, and employed significantly more complex data collection and reduction techniques, and M&S capabilities than E07. Over seventy-five Government and industry organizations, and technology providers, as well as soldiers from the 29th Infantry Regiment, Ft. Benning, participated in E08. On peak days, approximately 400 people supported simultaneous activities across Fort Dix, Lakehurst Naval Air Engineering Station, Fort Monmouth, Hanscom Air Force Base, and China Lake. In total, more than one thousand people passed through PM facilities during the E08 timeframe.

C4ISR OTM E08 has provided the Army and sister Services with a venue for quantifying integrated C4ISR, Technology Transition, risk mitigation for future developmental and operational tests, and has also served as a risk reduction/mitigation and systems integration venue for Empire Challenge 08.

This Executive Summary serves as a formal mechanism to highlight the efforts of personnel who contributed to E08; a more comprehensive treatment is documented in the C4ISR OTM E08 Final Report. The report itself is organized into discrete Chapters each focused on a specific topic and each constructed as a standalone document with references to related work or findings in other Chapters of the report. For ease of electronic dissemination, the Executive Summary (E08ExSum. pdf) and the complete C4ISR OTM Event 08 Final Report (E08FinalReport.pdf) will be available in the PM C4ISR OTM file cabinet on Army Knowledge Online, https://www.us.army.mil/suite/folder/13558704.

Please note that the information resulting from C4ISR OTM E08 and the information still to be derived from the raw data sets would be too voluminous to capture in any one document. For a more detailed exploration of any of the topics mentioned in the E08 report, or for further information on PM C4ISR OTM L/V/C initiatives, we invite the reader to visit http://www.cerdec.army.mil/directorates/pmc4isr.asp or contact us at PdMC4ISROTM@conus.army.mil.

2 Relevance

C4ISR OTM E08 is distinguished from previous PM C4ISR OTM events in that multiple coordinated activities (i.e. Axes of Exploration), utilized one single integrated architecture. These activities were executed in parallel, linked as appropriate to meet analysis objectives, and time phased over E08's execution window. The Axes explored an integrated C4ISR SoS, which represented the largest and most complete instantiation of the FCS concept to date. Key design themes included patterning the E08 transport architecture after the objective FCS multi-tiered transport architecture, and patterning the E08 operational and systems architecture after the basic structure of the FCS Spin Out 1/2 organizational structure, as articulated in the Unit Task Organization for the Army Evaluation Task Force (AETF).

As with E07, each Axis of Exploration was specifically designed to support stated or implied programmatic Army and/or DoD requirements. In many cases, engineering personnel from stakeholder organizations participated in the activity designs in integral ways. The technology demonstration and resulting analyses conducted by the PM's core team and its partners included the exploration of:

♦ Eleven FCS Technical Risk Areas, including:

- Network Systems
  - o C40017 – Voice Architecture
  - o C40057 – CT7A: Wideband Waveforms Availability – JTRS
  - o C40113 – CT1A: SW Programmable Radio – JTRS Ground Mobile Radio (GMR) Availability
  - o C40014 – CT1B: SW Programmable Radio – JTRS Handheld, Manpack, Small Form Fit (HMS) Availability
  - o C40015 – CT1C: WINT and HNW Performance/Availability
  - o C40093 – CT7B: Soldier Radio Waveform (SRW) Availability
  - o SSEI0030 – Unmanned Vehicle Network Latency
  - o WFS0330 – Integrate Dismounted Soldier into FCS
- Sensors and Battle Command
  - o C40128 – CT13A1: Sensor Data Fusion – Distributed Fusion Management
  - o C40020 – CT5: End-to-End Quality of Service on Mobile Ad Hoc Networks
  - o C40284 – End-to-End Performance of the FCS Network

- ♦ Questions from the TRADOC Integrated Questions List (IQL):

  - Maneuver

    - o Q1: How can the future Army Modular Force employ joint combined arms capabilities at lower tactical levels?

    - o Q3: What is required to enable Battle Command between BCTs, both current and future, that have dissimilar systems?

    - o Q10: How do future Modular Force tactical units synchronize mounted and dismounted operations within complex terrain, while optimizing fire capabilities and maintaining effective C2?

  - Battle Command

    - o Q1: How do commanders use the network to understand, visualize, describe, direct and assess full spectrum operations?

    - o Q14: Does the network enabled battle command require a flattening of the hierarchical reporting process?

    - o Q25: How can future hybrid forces operate effectively together?

  - See

    - o Q1: What capabilities and functions are required to enable the commander to develop and maintain situational awareness and understanding?

    - o Q2: What higher echelon ISR capabilities' products are best suited to be distributed to lower tactical levels to augment organic capabilities to enable continuous SA?

    - o Q17: What echelon is most appropriate for the tasks required to transform data, information, and knowledge?

C4ISR OTM E08 also provided a rich venue for participants and stakeholders to explore relevant technology issues by serving as a facilitator for tech base evaluations, technology readiness assessments, technology transition events, and PEO/PM assessments. Examples include:

Activity	Stakeholder(s)
JTRS HMS Field Test & LUT	JPEO JTRS
WIN-T Inc 2 & 3 EFT/DT/LUT Risk Mitigation	PM WIN-T
FCS End-to-End Network Performance	PM FCS (BCT) NSI
Spinout 1/2 EPLRS Enhancements	PM Command Post
ABCS/DCGS-A Interoperability	PM Battle Command, PM DCGS-A
IBCT Networked Lethality Field Assessment	TCM IBCT, Infantry Center DCD
Objective Gateway Program/CABLE JCTD	USAF
Empire Challenge 2008	NGA
Paul Revere Joint ISR Comm Relay Assessments	USAF, MIT/LL
BTCR/Killer Bee Assessment	OSD, ONR, USMC
Covert Waveform Radio Assessment	USSOCOM, AFRL
FF Data Collection Tools and Processes	DCRA WG, PEO C3T, ATEC
Architecture Tools and Processes	3CE
Current Force Traffic Loading	PEO C3T
IED Identification	Army Research Institute
Virtual Electronic Battlefield (HALLE) DHPI	HPCMP
Mobile Network Modeling Institute Data	ARL, HPCMP
A160T Hummingbird CL IV UAS Assessment	DARPA, AMRDEC
Family of UGS and Sensor Web Concept	DIA, ARL
DADD Assessment	CERDEC C2D
CPOF/Black Coral Foreign Comparative Test	CERDEC C2D, OSD
IPv6 Assessment	CERDEC S&TCD
Commercial Wireless Assessment	CERDEC S&TCD
FWTI Early Field Test	NSRDEC
PILSNER ATO SW/HW Component Field Test	CERDEC S&TCD, PM WIN-T
NEBC SRL Assessment & Tech Transition Event	CERDEC C2D, PM FCS (BCT) NSI

A comprehensive discussion of stakeholder organizations and their areas of interest can be found in the C4ISR OTM E08 Final Report.

A key product of E08 was the integration of C4ISR itself, in the form of technical insights, lessons learned, raw data, and integrated data sets that were mined and analyzed to support the findings contained in the E08 report. This raw data and integrated data sets are far from being fully exploited for productive information, and should be viewed as a resource to the Army community for additional technical analysis and engineering validation, as well as for the development of more accurate virtual and constructive models and simulations.

C4ISR OTM E08 Architecture Overview

The E08 Technology Demonstration builds upon the accomplishments of C4ISR OTM E07, both in the number of systems and in the complexity of their interconnection. This is reflected in the overall E08 architecture, which included both live and simulated components, and enabled the exploration of key communications, sensor and battle command questions, in order to assess the technical capability, functionality, maturity, and performance of future, emerging, and Spin Out technologies. Key issues relevant to the Army's transformation effort were organized into five diverse, dependent Axes of Exploration termed Brigade and Above, Brigade and Below, FCS/Future Force, Modeling and Simulation, and Instrumentation, Data Collection and Reduction, as illustrated in the figure below:
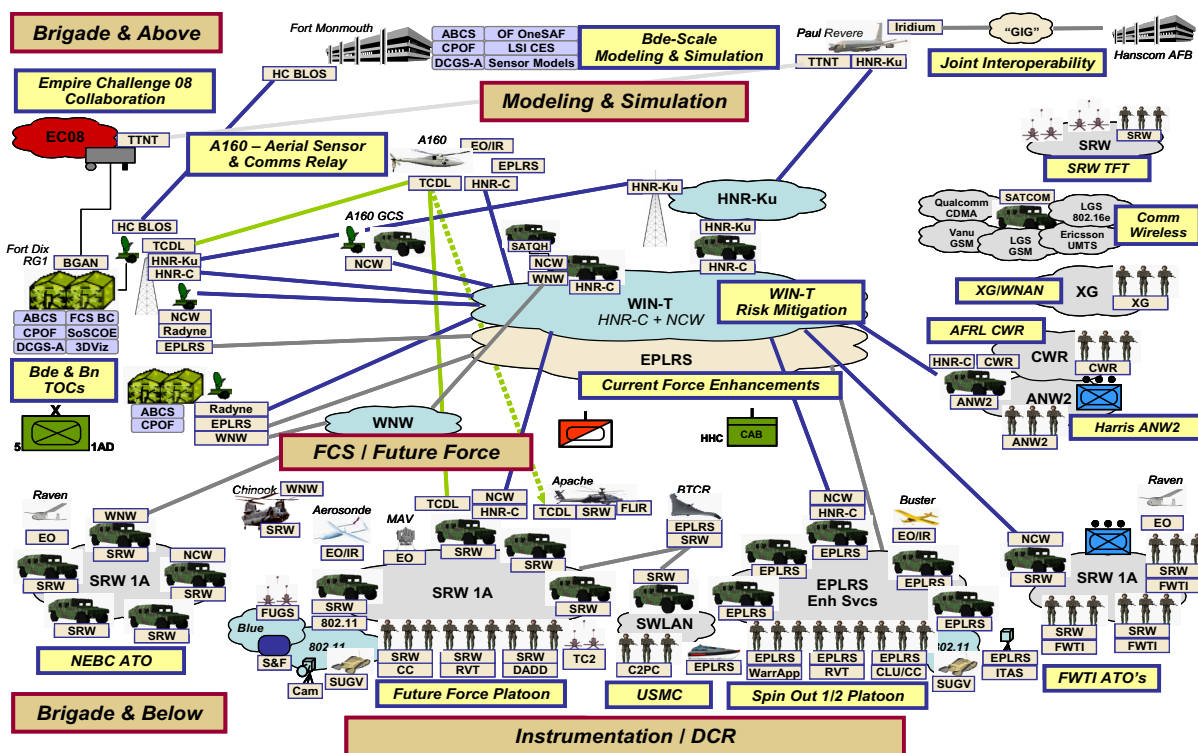
The Brigade & Above Axis focused on issues associated with the upper echelons of Brigade Combat Team structures and their relationship to above-Brigade and Joint warfighting elements. Elements of WIN-T Increment 2 and Increment 3 architectures were juxtaposed with CDL systems in ground and airborne configurations. Assessments were designed that directly tied into programmatic requirements and also explored architectural options. A variety of Joint intelligence and sensor exchanges were demonstrated and several technical evaluations of ISR and Battle Command interoperability were conducted. Key activities included:

♦ Mitigating risk for PM WIN-T Increment 2 & 3 test events;

♦ Exploring the relationship between the WIN-T/JTRS and CDL architectures;

- Assessing the impact of Joint ISR and Sensor Fusion on tactical operations;

- Evaluating the degree of interoperability and collaboration between ISR and Battle Command systems across the Current & Future Forces.

The Brigade & Below Axis focused on issues associated with Company and Platoon-level units, explored through scripted technical evaluations and through the execution of a series of tactical missions conducted with Soldier role players. Both Future Force and Current Force communications systems were employed for voice and data transport, and a variety of air and ground-based sensor systems facilitated the collection of information on Threat forces. The integrated architecture that supported the Soldier-in-the-loop assessments effectively linked a Future Force network (JTRS/SRW) with a Current Force network (EPLRS) via a WIN-T Increment 2 backbone. This network-of-networks enabled the transmission of voice, video and application traffic representative of Future Force data exchanges. Additionally, several communications systems not currently within the formal DoD Acquisition cycle were demonstrated and evaluated. Key activities included:

- Mitigating risk for JTRS HMS/NED test events;

- Investigating methods of augmenting Current & Spin Out 1/2 Force elements in order to increase information dissemination & collaboration;

- Evaluating the utility of lower echelon ISR systems, with emphasis on common control and receive mechanisms;

- Exploring alternative lower echelon communications architectures.

The FCS / Future Force Axis leveraged elements of the Brigade & Below Axis as well as additional systems and assessments conducted by PM FCS (BCT) Network Systems Integration (NSI), which continued after the completion of E08. The goal of these complementary efforts was to begin to understand the scalability of the end-to-end FCS architecture by combining actual FCS software and hardware systems across the Live, Virtual and Constructive space. Key activities included:

- Mitigating technical risk for the FCS program;

- Quantifying the cognitive impact that variations of the FCS SoS have upon warfighters during the execution of tactical tasks;

- Assessing the capability and maturity of emerging FCS hardware and software systems.

The Modeling & Simulation Axis provided support to the first three Axes, as well as conducting focused assessments of emerging software modeling and simulation approaches utilizing both HPC and non-HPC assets. The live component of the C4ISR OTM E08 architecture was stimulated by a Brigade-sized simulation, Objective Force OneSAF running on an HPC platform, and included both maneuver and sensor elements. Traffic profiles derived from tactical network data collected from local, national, and in-theater sources were used to load selected links. Individual studies were also conducted with the goal of comparing the measured performance of live C4ISR systems with software models intended to represent their behavior. Key activities included:

- Providing Virtual / Constructive force & sensor augmentation impacted by realistic effects using HPC and non-HPC systems;

- Stimulating the live environment with traffic profiles extracted from local, national, and in-theater elements;

- Enhancing the process of Cyclic Validation between the live & simulated environments.

The Instrumentation, Data Collection, Reduction (IDCR) Axis focused on a common set of tools and methods supporting Current and Future Force data collection, reduction, and analysis. The IDCR Axis supported the Axes above as well as facilitating comprehensive evaluations and assessments of both individual system and SoS metrics, common test tools, and common processes supporting near-term Army Test and Evaluation efforts. A mix of Current Force and prototype Future Force instrumentation solutions were utilized in order to gather data relevant to E08 goals. Elements of the work performed within this Axis were targeted to directly support PM WIN-T's Increment 2 field test events being conducted in FY09. Additionally, E08 served as a venue in which Army and DoD instrumentation solutions were developed, vetted and matured. Key assessments of varying solutions related to Future Force programs contributed to the Army's Data Collection, Reduction & Analysis (DCRA) Working Group, which seeks to facilitate collaboration between the Research & Development, Acquisition and Test Communities. Key activities included:

- Designing, developing and providing an evaluation venue for instrumentation tools that collect data from Current and Future Force C4ISR systems and SoS;

- Mitigating risk for the PM WIN-T Increment 2 & 3 test instrumentation systems;

- Supporting Army Data Collection, Reduction & Analysis (DCRA) Working Group efforts related to Future Force programs.

4 Document Map

The C4ISR OTM E08 Final Report is an aggregation of the Executive Summary, ten individual chapters and one Appendix designed and created by different members of the C4ISR OTM E08 Team. Additionally, two compendiums have been developed to support this report, the C4ISR OTM E08 Systems Book and a List of Actionable Items. Major contributing authors and editors, as well as their parent organizations are acknowledged at the beginning of each chapter. However, this product is the result of many other people not explicitly identified and PM C4ISR OTM would like to take this opportunity to recognize their direct and indirect contributions.

This document map serves as a guide to help the reader navigate the E08 Report. A brief description of each chapter as well as an example of the content of each chapter is captured below.

Chapter 1: C4ISR OTM E08 Overview describes E08's goals and objectives, scope, design approach, a discussion of each Axis, and concludes with a description of the path forward for C4ISR OTM E09.

Chapter 1 includes a description of 20 Critical Activities each of which mapped to a set of technical objectives and a subset of the C4ISR OTM E08 SoS architecture. These activities assisted the logical management of the execution phase, given the broad scope and large number of participant organizations and systems in E08.

Chapter 2: Systems Engineering & Integration Insights discusses the specific methods employed from an engineering perspective to construct the aggregate SoS, provides a series of insights from E08 C4ISR systems integration experiences, and offers a detailed discussion of the architectures.

Chapter 2 defines an integrated system as one that sends and/or receives messages relevant to other systems in an operational context. It addresses the creation and execution of SoS level message threads through an integration framework which recognizes that systems may enact message exchanges via several established mechanisms. For instances in which an exchange mechanism does not already exist, C4ISR Information Management Service (CIMS), a PM tool developed to facilitate integration and SoS experimentation, is used so that disparate systems integrated into the SoS act synergistically in that environment. Integration during E08 applied not only to Live on Live systems. The integration of Virtual and Constructive assets into the Live environment via distributed connectivity was also implemented.

Chapter 3: Communications System Evaluations describes the communications systems employed within C4ISR OTM's E08 network of networks, which included all Future Force waveforms, and integrated TCDL links serving high throughput sensor data. Additionally, activities supporting WIN-T risk mitigation, SRW technical assessments, EPLRS technical assessments, evaluations of alternative and emerging waveforms, and E08 engineering assets and complementary test cases leveraged by the JTRS HMS Technical Field Test, are discussed.

Chapter 3 addresses PM WIN-T's transmission systems, including a WIN-T Increment 2 backbone that provided reachback for SRW and EPLRS subnets supporting mobile tactical elements. In combination with continuing improvements to the PM C4ISR OTM Instrumentation, Data Collection & Reduction (IDCR) suite, exercise of these WIN-T components within C4ISR OTM E08 provided direct risk mitigation to Increment 2 Developmental Test, Engineering Field

Test and Limited User Test events being conducted through 2009.

Chapter 4: Sensor Fusion & ISR Assessment addresses processes and lessons learned from the employment, execution and analysis of three L/V/C C4ISR SoS threads exploring Video-based Moving Target Indication (VMTI), FCS Level 1 Fusion (L1F), and Sensor Cross Cueing.

Chapter 4 includes a discussion on the ability to re-task a UAS to intercept targets. This was successfully demonstrated for four UASs, which varied from Class I Platoon-level (e.g. Buster, gMAV, Aerosonde) to Class IV Brigade-level (e.g. A160T Hummingbird) systems. Both qualitative and quantitative National Image Interpretability Rating Scale (NIIRS) ratings were successfully leveraged in assessing the effectiveness of the employment of these four UAS platforms. Automated and Human-in-the-Loop (HITL) notations for imagery and/or video were effectively used for all four unmanned aerial systems. Where applicable, ground truth measurements and GPS jitter statistics were used to illustrate that a given UAS demonstrated Threshold FCS requirements for target location error (TLE).

Chapter 5: Joint ISR explores the Paul Revere Airborne Test Bed's employment within C4ISR OTM E08 and the participation of PM C4ISR OTM in NGA's Empire Challenge 2008.

Chapter 5 discusses participation of PM C4ISR OTM and the Paul Revere Airborne Testbed in the National Geospatial Agency's Empire Challenge 2008 exercise at China Lake, after participation of the Paul Revere in the initial segment of E08. Integration work performed at Fort Dix enabled a Beyond Line of Sight (BLOS) connection via the Inmarsat Broadband Global Area Network (BGAN), providing linkage between the two venues, allowing integrated mission threads to be executed across the two activities including the exchange of Common Picture (CP) data, and text chat.

Chapter 6: Cognitive Impact Study addresses the human integration of information into knowledge that can drive purposeful actions against an adaptive enemy threat. The demographics of participants, reports from Soldiers on communication technology, results from decision accuracy and timeliness analyses, and supporting measures of workload, situational awareness, and trust in the network are explored. As a primary goal of E08, the Cognitive Impact study represents the first major field investigation of this problem at the tactical level.

Chapter 6 discusses the formulation, execution, and preliminary results of this study which employed a Company (-) sized element from the 1/29th Infantry Regiment, Fort Benning, Georgia, organized into two reconnaissance platoons and a Company Headquarters element. Each platoon was equipped with mounted and dismounted communications, battle command devices, a complement of dismounted ISR collection devices, and benefitted from higher echelon ISR tools to include Unattended Ground Sensors and several Unmanned and Manned Aerial Sensor platforms. This study was driven by senior Army leaders who noted that networked technology solutions were growing at a faster pace than our ability to understand the impact of those systems on Soldiers. While other components of the C4ISR OTM E08 report provide a detailed exploration of how complex C4ISR networks provide a Warfighting organization with information in a dynamic battlefield environment, the activities captured here explicitly address the use of technology to support-not replace-human decision makers.

Chapter 7: Modeling and Simulation summarizes the use of distributed connectivity, high fidelity terrain, an instrumented OPFOR, the challenges of porting OF OneSAF to the IBM P5 575 Dedicated HPC Project Investment (DHPI), and the migration from and co-existence with non-HPC assets to achieve a Brigade-scale simulation stimulating the Live environment of E08.

Chapter 7 discusses the employment of simulated elements integrated with the live entities under a single force structure that was composed of approximately 4400 virtual and constructive systems, 3000 of which were used at any given time during E08 to stimulate the Live environment. The intentional synergy between the IDCR and the M&S Axes of Exploration allowed data collected during the communications evaluations and integrated C4ISR assessment phases of E08 to be used in emulation and simulation development, as well as positioning live experimentation in E09 by programs such as Army Research Laboratory's Mobile Network Modeling Institute (MNMI). These same data collection techniques enabled Cyclic Validation opportunities for the comparison of models and simulations with the live systems they represent. Additionally, data reduction tools which complemented live data capture tools were ported onto the HPC platform, to accelerate computationally intensive data reduction.

Chapter 8: Instrumentation, Data Collection & Reduction includes the suite of processes, procedures and common test tools that facilitate the collection, harvesting and reduction of data from lab and field based activities. The data, and products derived from this data, support analytical efforts of the PM, its partners, and customer organizations, including the Army's Data Collection, Reduction & Analysis (DCRA) Working Group for which PM C4ISR OTM serves as the CERDEC Future Force systems lead.

Chapter 8 includes a series of practical observations on data collection, reduction, and analysis. As data reduction is not a solely automated process, manual integration may also be required in order to represent criteria such as observer notes or environmental data. These practicalities of execution are contributing to the development and evolution of a Future Force-IDCR tool suite, for use in supporting assessment events that provide quantifiable feedback to technology developers and program managers. In addition to supporting PM C4ISR OTM events, the FF-IDCR tool suite initiative is assisting in the articulation of requirements which can be leveraged by the DoD Test community, as it develops and employs tools to facilitate successful execution of developmental and operational tests of the Future Force network.

Chapter 9: Collaborative Efforts and Technology Excursions discusses the explorations of key technology partners ranging from Science and Technology to Programs of Record. These organizations utilized RDECOM's integrated C4ISR environment including the E08 SoS architecture, elements of PM C4ISR OTM's physical infrastructure, and/or integration services to explore and mature technology readiness, perform foreign comparative tests, or explore Current Force/Future Force interoperability and coexistence.

Chapter 9 includes a description of the individual and collaborative explorations of key technology partners in E08 including RDECOM's FWTI, PILSNER, and NEBC Army Technology Objectives; Collaborative efforts with the A160T Hummingbird CL IV UAS; the ONR OSD BTCR program including the Killerbee UAS; the CH-47 Chinook aviation asset assessments; and the Black Coral Foreign Comparative Test which extended CPOF to the tactical edge.

Chapter 10: FCS End-to-End Performance Tests highlights the technical evaluations performed by PM FCS BCT NSI's NAIL laboratory as it leveraged the integrated E08 architecture to address FCS Battle Command/SoSCOE End-to-End performance and voice interoperability within Live/Virtual/Constructive environments, as well as teleoperating large unmanned vehicles over bandwidth-limited channels.

Chapter 10 provides a preliminary description of PM FCS (BCT) NSI NAIL efforts which were designed to be conducted throughout and following the formal window of C4ISR OTM

E08. Phase III activities continued through November 2008 and focused on a comprehensive network performance evaluation of a Brigade-sized FCS network, utilizing a mix of live, virtual and constructive hardware and software systems.

Appendix A- List of Abbreviations

Compendium: C4ISR OTM E08 Systems Book. This document includes descriptions of the technologies that enabled the execution of E08, grouped by Axis of Exploration.

Compendium: Actionable Items. This list is the result of observations, analyses, and lessons learned derived from E08, offered as input to maturing technologies and Programs of Record as they evolve to interact within the SoS of Network Centric Warfare.

5   Path Forward

PM C4ISR OTM recognizes that the scope, complexity and resources required to design and execute relevant technology demonstrations require leveraging related work across the Army and Joint Services. The activities conducted by PM C4ISR OTM stem from and inform the growth of technological capabilities, and will not only enable FCS and the Future Force, but will support the Current Force by identifying technology acceleration opportunities.

PM C4ISR OTM has begun the planning phase of its Event 09 (E09) that will be conducted from June through September of 2009 at its Fort Dix field site, its Fort Monmouth Center for Live/Virtual/Constructive Environments, and at selected additional distributed locations. The E09 System-of-Systems architecture will leverage and extend the E08 architecture and will feature multiple Axes of Exploration including: (1) Brigade and Above; (2) Brigade and Below; (3) Future Force; (4) Modeling and Simulation; (5) Instrumentation, Data Collection, Reduction; and (6) Coalition Interoperability.

As with C4ISR OTM E08, all E09 design constructs will be oriented toward stated or implied programmatic requirements, risks, and technology gaps, in support of broader Army initiatives. E09 will build upon the integrated architecture of E08, and include:

♦   The exploration and documentation of insights and quantitative data addressing difficult network-of-network challenges, such as active routing across differing network types, end-to-end Quality of Service, and Future Force Network Operations systems;

♦   Addressing relevant challenges with Current and anticipated Future Force intelligence collection, fusion and dissemination across echelons and Services, with emphasis on methods of integrating ISR data into Current Force architectures, and the utility and scalability of automated and human-in-the-loop sensor fusion approaches;

♦   The construction and quantification of the performance of segments of the Unified Battle Command architecture, including the interface between Current and Future Force battle command systems and service layers, and the integration of fixed facility, mounted and dismounted battle command systems.

A list of Actionable Items, derived from observations, initial analyses, and lessons learned will serve as a data point for future analyses and investigations on individual Current Force and Future Force systems, as they integrate into the SoS construct that will enable Network Centric Warfare.

Architectural Working Groups supporting the design and development of C4ISR OTM E09 will be conducted through December 2008, with the Mid Planning Conference scheduled for January of 2009. Organizations interested in participating are invited to contact PM C4ISR OTM at MONM-PdMC4ISROTM@conus.army.mil.

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