ANNEX A – JOINT OPERATIONAL CONTEXT FOR TEST (JOC-T) EXAMPLE

A.1. Operational Mission Overview

Describes mission objectives (textual descriptions of mission statements, mission-desired effects, and mission end state) and depicts high-level mission concept processes.

A.1.1. Joint Mission Statement

Include the who, what, when, where, and why of the mission.

A.1.2. Joint Mission Desired Effects

List desired effects and relationships to end state.

A.1.3. Joint Mission End States

Describe the set of required conditions that defines achievement of the commander's objectives.

A.1.4. OV-1 High-Level Mission Graphic

JOC-T High Level Operational Concept (OV-1) (Figure A-1) portrays key joint capability effects relevant to the client system, key blue and threat entities, key interactions between the client system and its environment key interactions between the client system and external threat/blue systems.

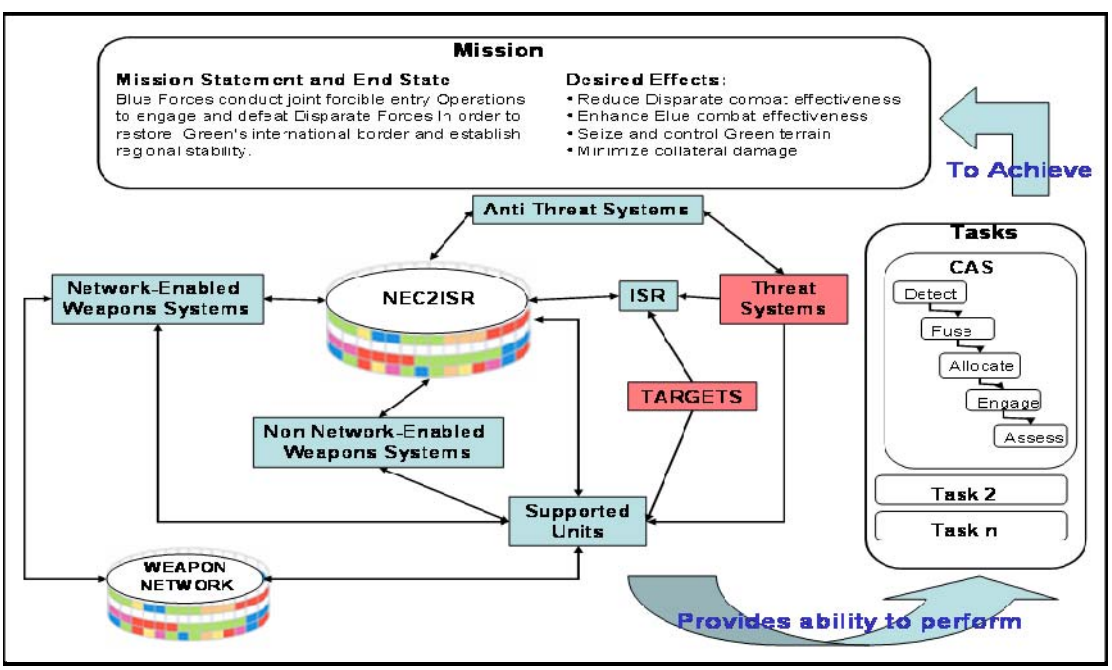

Figure A-1. Notional High-Level Graphic (JOC-T OV-1)

A.2. Blue Forces

A.2.1. Blue Forces Description

Description of mission level blue forces, actions, and interactions. Blue forces include system of systems (SoS), system capability requirements, and systems means to implement those requirements.

Systems' means to implement requirements include: system types, numbers, behaviors, operating parameters, and limitations, task organizations, command and control (C2) structures, and blue operational force lay down (with primary nodes and systems)

A.2.1.1. Blue SoS Context

A.2.1.2. Blue High-Level Graphic (JOC-T BOV-1)

The Blue Force High-Level Graphic (BOV-1) (Figure A-2) describes a mission and the main operational nodes. It should depict any unique aspects of blue force operations as well as the interactions between blue forces, their architecture, and the environment. The purpose of the OV-1 is to give a high-level description of what the blue forces are supposed to do and explain how they will achieve this. The textual portion of the OV-1 should explain the top-level operational role of the threat forces shown in the graphic and the context within which they are performing their mission.

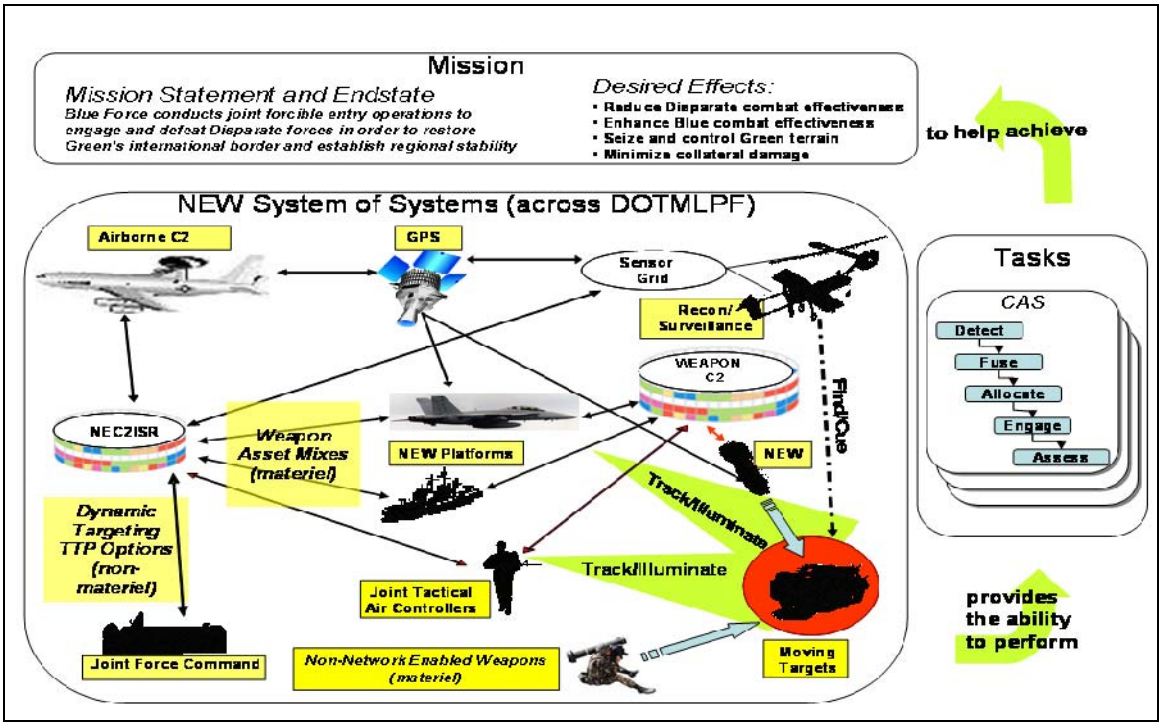

Figure A-2. Notional BOV-1 Blue High Level Graphic

A.2.1.3. Blue C2 Structure/Operational Node Connectivity Description (JOC-T BOV-5, BOV-2)

A.2.1.3.1. Operational Activity Model (OV-5)

Describes the activities through which each military mission is accomplished. Use activities from accepted standard tasks lists such as the Universal Joint Task List (UJTL), joint mission essential task lists (JMETL) developed by one or more of the commands, and Service task lists. Determine the information flow associated with the activity set. Identify inputs, controls, outputs, and mechanisms (ICOM) associated with the activities. These activities, along with the input and output of information between them, form the activity model. However, the activity model does not establish order of execution or timing relations among the activities. Note that to a large extent, OV-5 provides the foundation for the remaining OV products.

A.2.1.3.2. Operational Node Connectivity Description (BOV-2) (Figure A-3)

Identifies the operational nodes (groupings of like activities that are performed together to carry out the operational concept) and information flow need lines between nodes. The nodes can be thought of as task-oriented cells where work is accomplished. Because the activities of OV-5 carry input and output relations, the nodes of OV-2 inherit these relations, which are referred to as needlines. A needline represents an aggregation of information flows between two operational nodes, where the aggregated information exchanges are of a similar information type or share some characteristic.

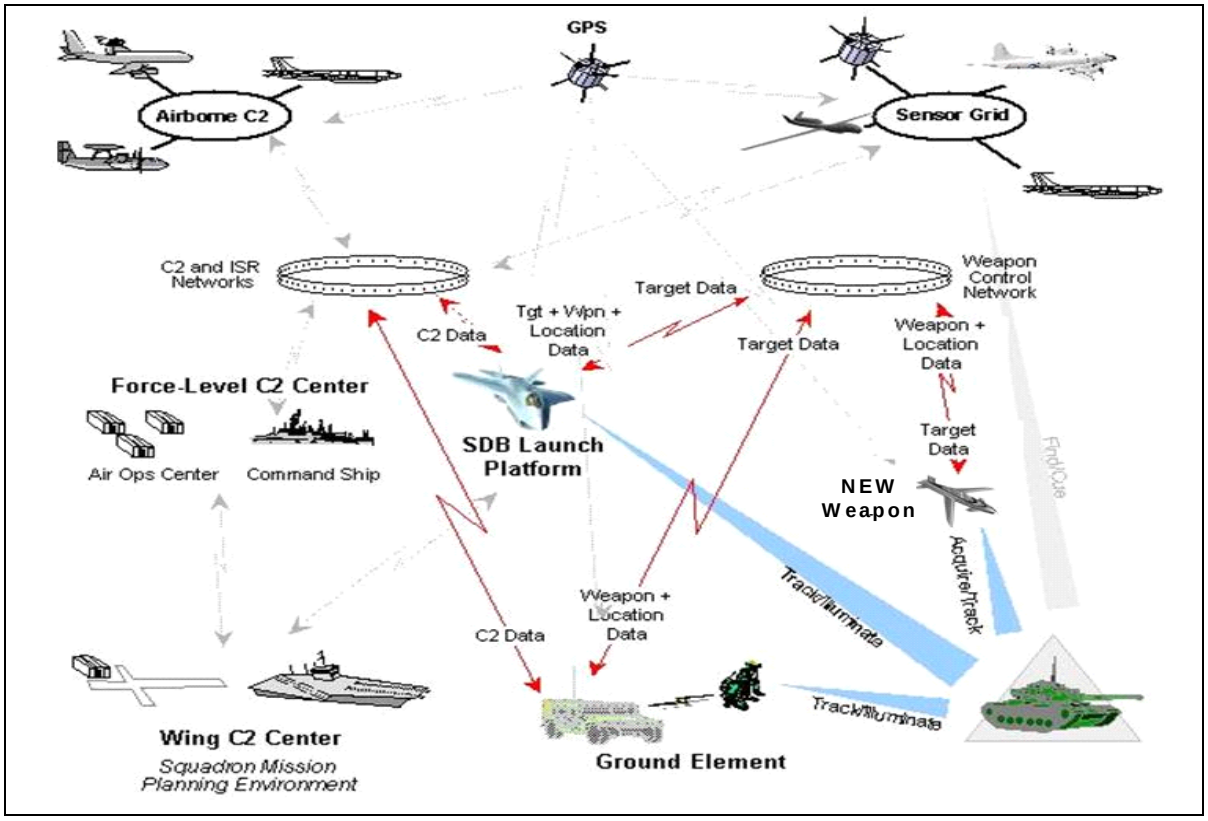

Figure A-3. Notional BOV-2 Operational Node Connectivity Description

A.2.1.4. Task Organization (JOC-T BOV-4)

Organizations identified for the given operational concept and scenarios are assembled into a force structure for conducting the designated operation. A key element of this structure is the relationship that must exist among the organizations that it comprises. This captures the data required to produce the Organizational Relationships Chart (OV-4) (Figure A-4). This organizational laydown helps to capture the scenario-dependent long-haul communications requirements for the Systems View.

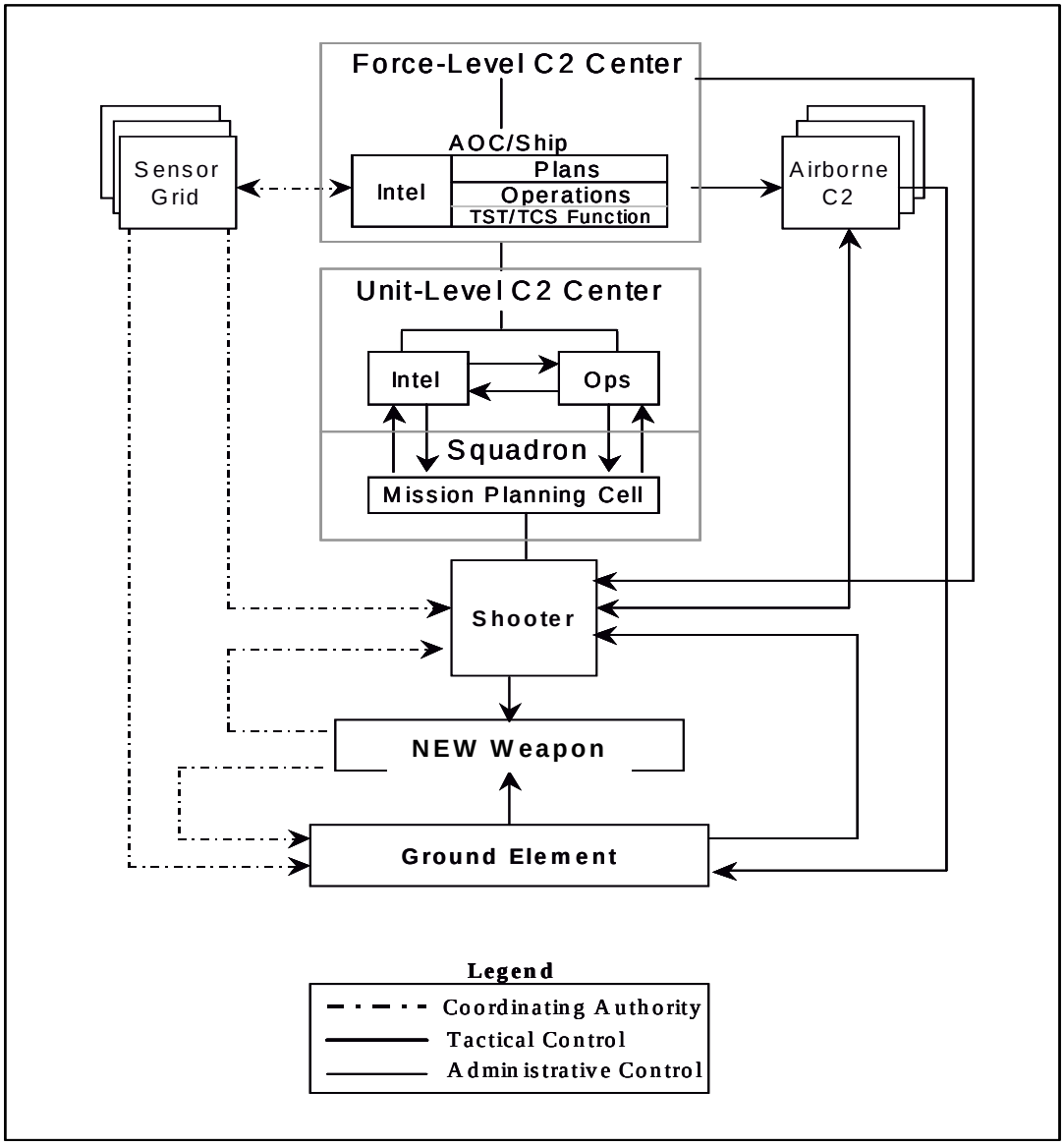

Figure A-4. Notional BOV-4 Relationships Chart

A.2.1.5. Blue Systems (JOC-T BSV)

A.2.1.5.1. Blue SoS Interface Description (BSV-1)

The Systems Interface Description (SV-1) product graphically illustrates "network" (systems nodes) data elements and "data" characteristics and the relationships among them. Systems and/or subsystems resident at the systems nodes, or the system functions required to automate some of the operational activities (from OV-5), or how to implement certain capabilities, may be specified (Figure A-5). SV-1 relates the network, data, and function data elements. It is more relevant to specify system functions at this level than it is to assign functionality to existing or future systems.

For architectures that involve legacy systems, SV-1 may be used to specify the functions that are already supported by these legacy systems and that play a part (that is, restrict, constrain, or influence decisions) in the architecture development at hand.

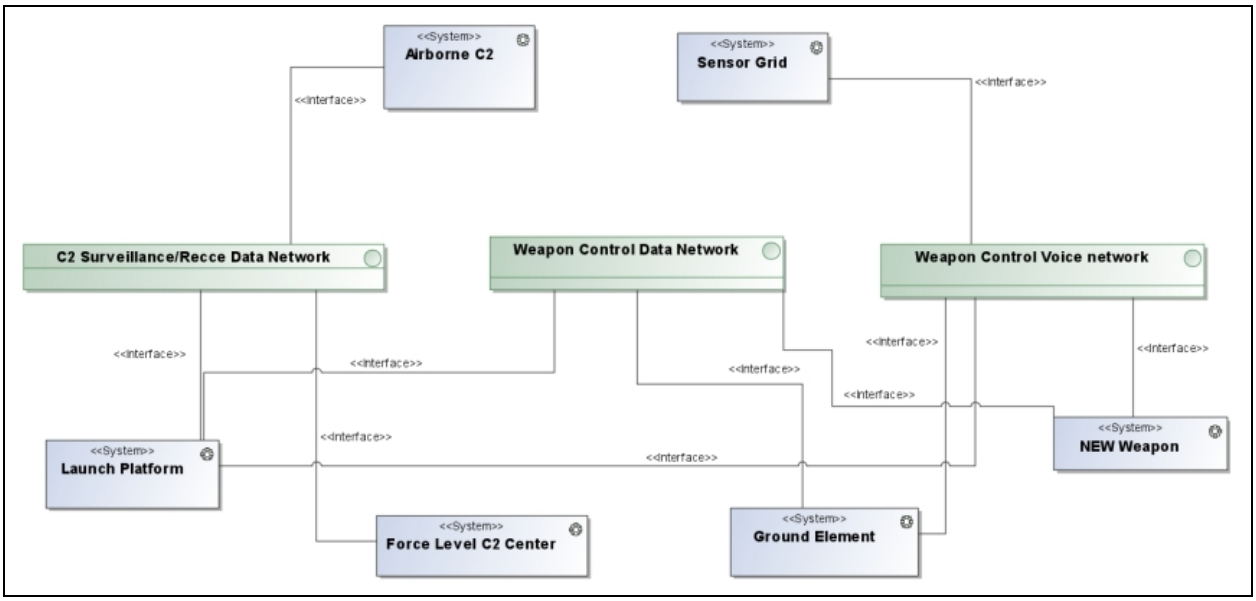

Figure A-5. Notional BSV-1 SoS Interface Description

A.2.1.5.2. Operational Activity to Function Traceability Matrix Description (BSV-5)

The operational activity to systems function traceability matrix (SV-5) (Table A-1) depicts the mapping between the capabilities and systems, and thus identifies the transition of a capability into a planned or fielded system. The matrix depicts the mapping of operational activities (from OV-5) to system functions (from SV-1, showing the assignment of system functions to systems nodes) and essentially identifies the transformation of an operational need into a purposeful action performed by a system.

The SV-5 can also be used to identify system functions that would not be satisfied if a specific system is not fielded to a specific unit in the architecture. An operational activity to systems function traceability matrix (SV-5) correlates capability requirements that would not be satisfied if a specific system is not fielded to a specific unit in the architecture.

Table A-1. Notional BSV-5 Operational Activity to SUT Functional Traceability Matrix

Weapon		
Operational Activity	**Component**	**Component Functions**
Weapon Separation	- Real-Time Operating System (OS) - Guidance & Control	- Weapon Control
Initialize Fly-Out to Target	- Real-Time OS - Data Storage	- Store and Process Target Data
Accurately Fly to Target	- Guidance & Control - Navigation	- Weapon Control - Accurate Weapon Location
Acquire Moving Target	- Sensor - Communications - Navigation	- Find Target - Receive Cues from Other Sensor/C2 Node - Accurately Point Sensor
Engage Moving Target	- Real-Time OS - Data Storage - Guidance & Control - Communications - Sensor	- Store and Process Target Data - Receive Cues from Other Sensor/C2 Node - Maintain Track on Target
Track Moving Target	- Real-Time OS - Data Storage - Sensor - Communications	- Look at Target - Receive Target Location Data from Other Sensor/C2 Node
Accurately Update Location of Moving Target	- Communications - Sensor	- Receive Target Location Data From Other Sensor/C2 Node - Maintain Track on Target
Transmit Weapon Location Data	- Communications	- Report Weapon Location
Transmit Weapon Data	- Communications	- Report Weapon Status Prior to Impact

A.2.1.5.3. Blue SoS Functionality Description (BSV-4)

The systems functionality description (SV-4) describes system functions (how) as well as the data (what) produced and consumed (relationships) by the functions. SV-4 is the list of the system functions used to enable or execute the operational activities (Figure A-6). The SV-4 depicts the system (application) functions using hierarchical decomposition. The decomposition should allow description of the application's functions at whatever level of detail is required. The level of detail will emerge in the course of the analysis, so that initial characterizations can be fairly high-level. As the analysis proceeds, details can be added in specific areas of interest.

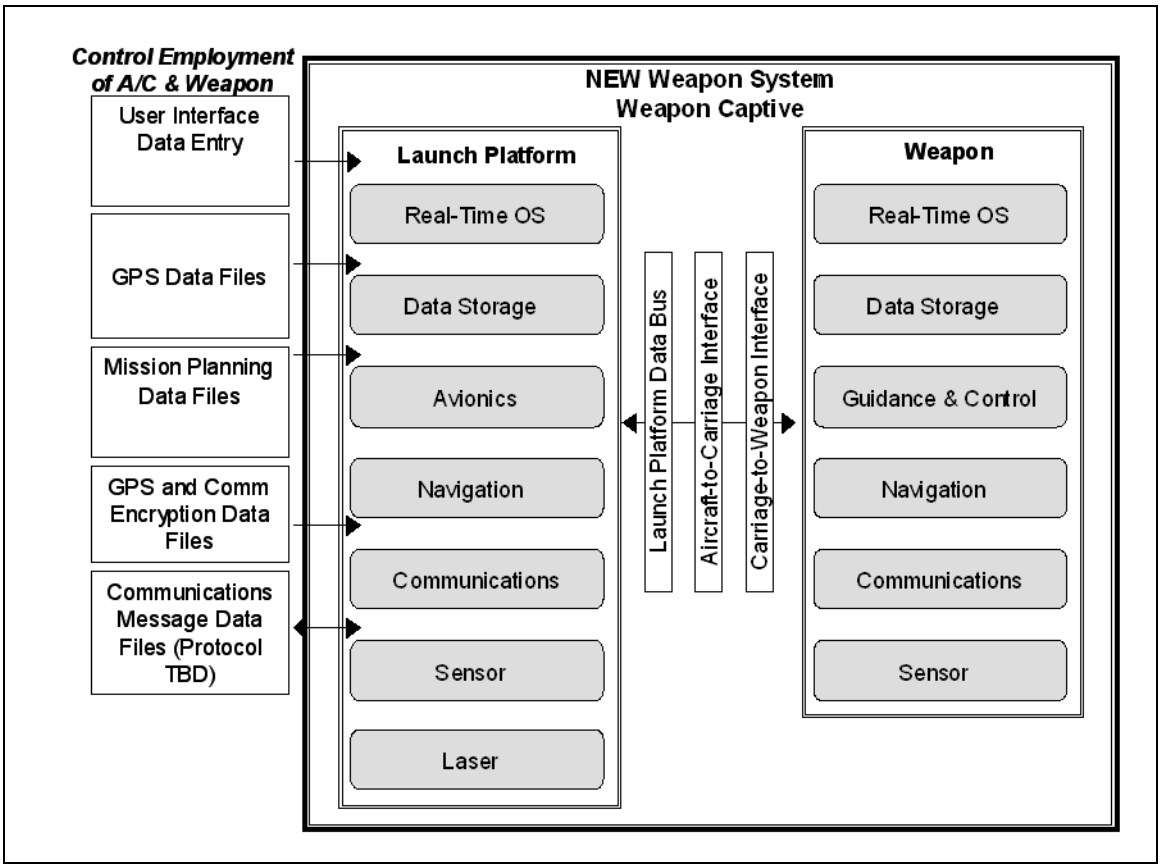

Figure A-6. Notional BSV-4 SoS Functionality Description

A.2.1.5.4. Information Exchange Matrix (BSV-6)

The systems data exchange matrix (SV-6) is an architecture composite that contains details on the architecture's systems data elements and their attributes grouped under the title "Data Exchanges." This matrix (Table A-2) provides the systems details that implement the operational information exchange requirements and relates these data elements to systems nodes, system functions of SV-4, and time.

Table A-2. Notional BSV-6 Systems Data Exchange Matrix

		IER			
		1	2	3	4
Interface Identifier	System Interface Name and Identifier	GPS Satellite to Weapon GPS Receiver	Aircraft to Weapon	Ground Element to Weapon	Weapon to Aircraft/ Ground Element
Data Exchange Identifier	System Data Exchange Name and Identifier	Navigation Data Broadcast	In-Flight Target Update	In-Flight Target Update	Bomb Impact Assessment (BIA)
Data Description	Data Element Name and Identifier	Navigation Data	Target Data	Target Data	Weapon and Target Data
	Content	GPS Ephemeris, GPS Time, Nav Message	Track Data, Control Data, Target Location Data	Track Data, Target, Control Data, Location Data	Weapon Status, Weapon Location
	Format Type	Data	Data	Data	Data
	Media Type	N/A	Weapon Data Link Network Message	Weapon Data Link Network Message	Weapon Data Message File(s)
	Accuracy	Inherent GPS Error	Lat/Lon: 4 Decimal Minutes Elev: Nearest Foot/Meter	Lat/Lon: 4 Decimal Minutes Elev: Nearest Foot/Meter	TBD
	Units of Measurement	As Required in GPS Specifications	Lat: ddmm.mmmm Long: dddmm.mmmm Elev: Feet/Meters	Lat: ddmm.mmmm Long: dddmm.mmmm Elev: Feet/Meters	Various

		IER			
		1	2	3	4
	Data Standard	NMEA/RTCM	As Required	As Required	As Required
Producer	Sending System Name and Identifier	NAVSTAR GPS Satellite	Aircraft Data Terminal	Ground Element Data Terminal	Weapon Data Terminal
	Sending System Function Name and Identifier	Transmit Navigation Data	Transmit Control and Target Data	Transmit Control and Target Data	Transmit Weapon and Target Data
Consumer	Receiving System Name and Identifier	SDB GPS Receiver	Weapon Data Terminal	Weapon Data Terminal	Aircraft/ Ground Element Data Terminal
	Receiving System Function Name and Identifier	Receive and Process Navigation Data	Receive and Process Control and Target Data	Receive and Process Control and Target Data	Receive and Process Weapon and Target Data
Nature of Transaction	Transaction Type	Broadcast	Point-to-Point	Point-to-Point	Point-to-Point
	Triggering Event	None	Target Coordinate Data is Refreshed	Target Coordinate Data is Refreshed	Terminal Phase of Flight
	Interoperability Level Achieved	N/A	N/A	N/A	N/A
	Criticality	Critical	Critical	Critical	Critical
Performance Attributes	Periodicity	Continuous	Weapon Data Link Network Periodicity	Weapon Data Link Network Periodicity	Weapon Data Link Network Periodicity
	Timeliness	Network Latency	Network Latency	Network Latency	Network Latency

		IER			
		1	2	3	4
	Throughput	C/A: 1.023 Mchips/s Nav Data: 50 bps P(Y): 10.23 Mchips/s	1.137 Mbps 9.6 Kbps - 64 Kbps	1.137 Mbps 9.6 Kbps - 64 Kbps	1.137 Mbps 9.6 Kbps - 64 Kbps
	Size	PGM-GRAM Standard Interface Message Set	< 100 Kilobytes	< 100 Kilobytes	< 100 Kilobytes
Information Assurance	Access Control	7	7	7	7
	Availability	GPS Data Network	Weapon Data Network	Weapon Data Network	Weapon Data Network
	Confidentiality	GPS Encryption	Encryption	Encryption	Encryption
	Dissemination Control	Worldwide Commodity	As Required	As Required	As Required
	Integrity	Message or Data Validation	Message or Data Validation	Message or Data Validation	Message or Data Validation
	Non-Repudiation Producer	N/A	N/A	N/A	N/A
	Non-Repudiation Consumer	N/A	N/A	N/A	N/A

		IER			
		1	2	3	4
Security	Protection (Type Name, Duration, Date)	Encryption	Encryption	Encryption	Encryption
	Classification	Unclassified	TBD	TBD	TBD
	Classification Caveat	By Agreement between US and Allied Forces	TBD	TBD	TBD
	Releasability	By Agreement between US and Allied Forces	TBD	TBD	TBD
	Security Standard	SAASM	TBD	TBD	TBD

A.2.2. Blue Actions

Blue action descriptions include joint/Service task decompositions, mission threads, or operational activity flows, and general schemes of maneuver with phasing.

A.2.2.1. Blue Activity Models (JOC-T BOV 5/6c)

Operational event-trace description (OV-6c), sometimes called a sequence diagram, is a basic product for addressing the executability (or dynamic validity) of the operational view of the architecture. It enables the traceability of actions in a scenario or critical sequence of events. OV-6c organizes OV-5 activities around OV-2, using OV-4 for C2 of architecture responses to scenario events. It introduces timing and sequencing into the activity model (OV-5).

A.2.2.2. Blue Maneuver Scheme / Phasing

A.2.3. Interactions

Descriptions include key blue-to-threat, blue-to-blue, and blue-to-environment interactions with potential testing implications.

A.2.3.1. Blue-Threat Interactions

A.2.3.2. Blue-Blue Interactions

A.2.3.3. Environmental Interactions

A.3. Environment

Adequately describe the nature and fidelity of blue environment and threat environment required interactions.

A.3.1. Physical Environment

Physical conditions include geospatial, meteorological, oceanographic, and space.

A.3.2. Civil Environment

Civil conditions include local indigenous customs; ethnic, political and religious factions or groups; group history and inter-relationships; general population views toward blue and threat forces; and so forth.

A.4. Threat Forces

A.4.1. Threat Forces Description (SoS Threat Assessment)

Threat force descriptions include: threat order of battle; threat C2 structure; threat system types, number, and key behaviors; and threat force laydowns.

A.4.1.1. Threat SoS Context

A.4.1.2. Threat High-Level Graphic (JOCT TOV-1) (Figure A-7)

See A.2.1.2. for description of OV-1

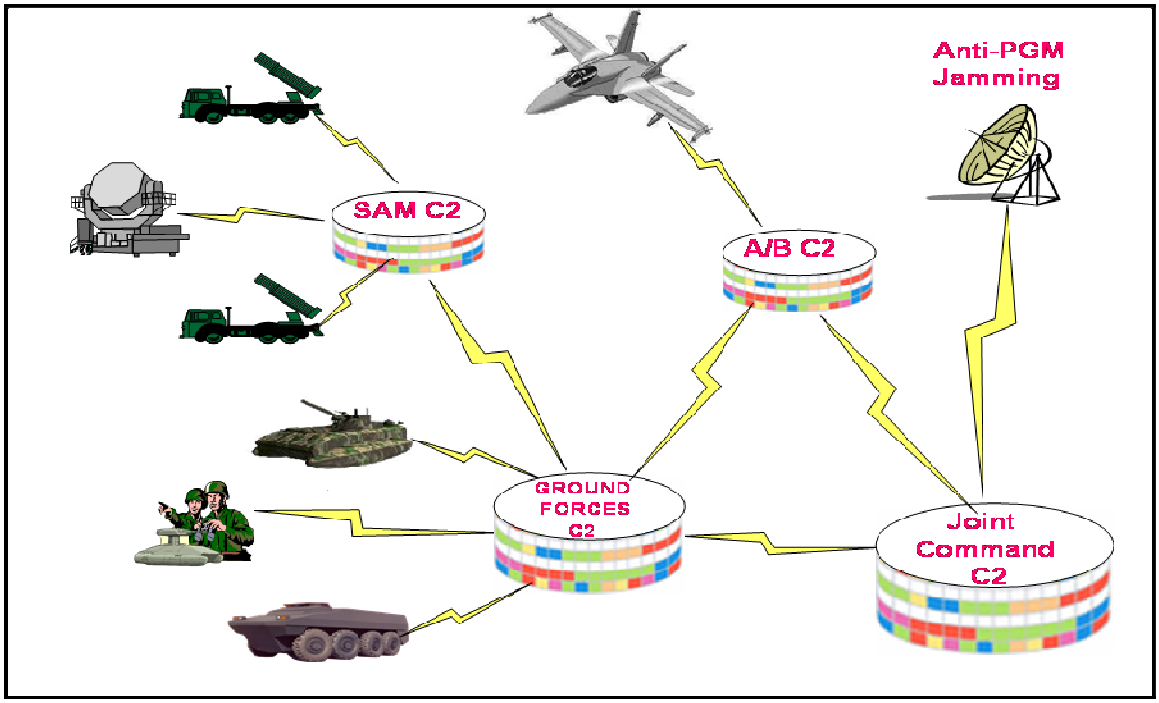

Figure A-7. Notional TOV-1 Threat High-Level Graphic

A.4.1.3. Threat C2 Structure/Operational Node Connectivity (JOCT TOV-5, TOV-2)

See A.2.1.3. for description of OV-5 and OV-2

A.4.1.4. Threat Organizational Relationship Chart (JOCT TOV-4)

See A.2.1.4. for description of OV-4

Charts should include:

- Threat Order of Battle
- Threat Task Organization

A.4.1.5. Threat Systems (JOCT TSV)

A.4.1.5.1. Threat SoS Interface Description (TSV-1)

See A.2.1.5.1. for description of SV-1

A.4.1.5.2. Threat SoS Functionality Description (TSV-4)

See A.2.1.5.3. for description of SV-4

A.4.2. Threat Actions (SoS Threat Assessment)

Threat actions include joint/Service task decompositions, mission threads, and threat operational activity flows. Descriptions include key blue-to-threat, threat-to-threat, and threat-to-environment interactions with potential testing implications.

A.4.2.1. Threat Activity Models (JOCT TOV 5/6c)

See A.2.2.1. for description of OV-6c

A.4.2.2. Threat Maneuver Scheme/Phasing

A.4.3. Threat Interactions (SoS Threat Assessment)

Threat interactions include key threat-to-blue, threat-to-threat, and threat-to-environment interactions with potential testing implications.

A.4.3.1. Threat -Blue Interactions

A.4.3.2. Threat -Neutral Interactions

A.4.3.3. Threat-Environment Interactions

ANNEX B – SYSTEM DESIGN DOCUMENT (SDD) EXAMPLE

The following example provides a notional composition for an SDD.

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JOINT TEST AND EVALUATION
METHODOLOGY (JTEM)
JOINT TEST AND EVALUATION (JT&E)

Joint Mission Environment (JME) System Design Document (SDD)

Date (Month XX, XXXX)

Approved By:

_____

xxxxxxxxxxxxxxxxx
Joint Test Director, XXXXX

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1. Overview (AV-1)

The system design document (SDD) describes the live, virtual, constructive distributed environment (LVC-DE) configuration for the joint mission environment (JME) to test and evaluate the capability contribution of a specified system of systems (SoS) to a specified joint mission, such as Joint Close Air Support (JCAS). The instantiated JME will be one unique configuration of the LVC-DE baseline system that supports a particular test event. This document supports the JME development and integration by providing logical and physical design specifications.

This document describes two supporting design products. The first is the *logical design* that provides a logical description of the instantiated JME framework independent of system instantiations. The second is the *physical design* that will describe the physical instance of the logical design.

1.1. Project Identification

1.1.1. Project Name

EXAMPLE: Joint Close Air Support (JCAS) Test and Evaluation

1.1.2. Systems Engineers and System Architects

EXAMPLE: Service subject matter experts and team

1.1.3. Developing Organization

1.1.4. Purpose

The system design document (SDD) describes the logical and physical design of the JME in accordance with the LVC-DE functional description. The focus of this SDD is to identify the relevant stakeholder concerns and to address these concerns in the logical design and physical design views.

1.1.5. Assumptions and Constraints

LVC-DE baseline asset descriptions are stored in a database, along with other associated data, including validation & verification (V&V) information, conceptual models, authoritative system descriptions (DoDAF/UML/IDEF), and requirements. In theory, existing LVC applications should not drive design of the JME. In practice, legacy systems will have to be integrated in the JME. This design constraint will be addressed in the logical and physical design.

1.2. Scope: Views and Products

The logical and physical design descriptions are achieved through the development of operational, systems, and technical perspectives and their associated products as defined in the DoDAF. The SDD references the JME Foundation Model (JFM) to support the development of the logical and physical design. The SDD will be updated at defined

points and test phases (that is, DT/OT) throughout the program life cycle. The detailed view taxonomy is listed in each corresponding logical design and physical design section.

1.3. Organizations Involved

1.4. System Design Tasks, Level of Effort, and Schedule

1.5. Linkages to Other Architectures

1.6. Context and Purpose

1.6.1. Evaluator Questions to Be Answered

1.6.2. Anticipated Users

1.7. Tools and Formats Used

1.8. Summary of Findings

1.9. Schedules

1.9.1. Test Schedule

1.9.2. System Design Schedule

1.9.3. Design, Development, and Integration Schedule

1.9.4. Requirements Verification and Validation

1.9.5. Design

1.9.6. Build

1.9.7. Integration

1.9.8. Deployment

1.9.9. Reviews

2. References

- Test Plan
- Data Analysis Plan (DAP), Data Management Plan (DMP) and Integrated Data Requirements List (IDRL)
- JME Foundation Model (JFM)
- Etc.

3. General Design Approach

This section contains the description of the conceptual design.

3.1. Overview

This section will define the logical and physical design for the sets of components and component types included in the JME configuration design for the relevant test event(s), identify component relationships, identify component interfaces, and define the interfaces to potential external systems that may need to be added later. Additionally, the SDD will identify the required operational modes and the patterns of component platform behaviors, mission functions, and interactions required for all operational modes of the LVC-DE.

3.2. Functional Description

3.3. Joint Mission Environment Foundation Model (JFM) Approach

This section describes the application of the JFM to the design and should reference the JFM.

3.4. Logical Design Approach

The logical design provides a system-level viewpoint of the LVC system component types, descriptions of the roles these components serve, and how they are intended to work together. The purpose of this section is to describe the abstract LVC component and component relationships that embody the critical operational and functional requirements described in previous sections.

3.5. Physical Design Approach

3.6. Scenario Design/Implementation Approach

The scenario design and implementation includes the lay-down of units on the LVC range, order of battle, unit roles, terrain databases, weather and other environmental parameters, and how these are implemented.

3.7. Service-Based Design Approach

This section describes the approach to take advantage of a service-based design and where that design is or is not applied. This includes the defined common interfaces/services used cooperatively by other system components. This section also describes the embedded implementations of particular capabilities within legacy components. Typically these embedded functions are exposed and implemented as stand-alone servers implemented with well-defined interfaces and data interchanges.

3.8. Decomposition Philosophy and Approach

This section describes the approach to decompose the LVC-DE design via the JFM into a set of building block components that will provide common functions for reuse across various mission threads required by the test.

This approach should take into account the following considerations:

- The functional needs of LVC-DE to support multiple mission threads
- Functions that are crucial and should be consistently implemented for valid execution
- Functionality where different levels of resolution or fidelity are required depending on the questions to be answered and design trade-off considerations
- Functionality that is compute intensive where parallelization is required to increase scalability
- Functionality that requires significant subject matter expertise

3.9. Design Trade-Off Approach

Define how to capture competing requirements and define metrics to measure tradeoffs.

4. JME LVC-DE Capability Requirements

4.1. General Capabilities and Uses

4.2. Test Plan Functional Description

4.2.1. Desired Force Level Representation and Application

4.2.2. SME Component Capability Requirements

4.2.3. Resolution

4.2.4. Fidelity

4.2.5. Precision

4.3. Verification, Validation, and Accreditation (VV&A)

Verification, validation, and accreditation (VV&A) of the LVC environment is essential to gain the confidence of the user community that LVC environment outcomes represent the “real world”. This section describes the VV&A approach and should also reference detailed VV&A plans.

4.4. Authoritative Data

This section describes the authoritative data requirements (for example, threat representation, platform representations, environment representations, and so forth).

4.5. Operation over Wide Area Networks (WAN)

This section will describe the requirement for dedicated computing assets, WAN access points, hosts, gateways, routers and switches at each range. This section will also describe network security issues.

4.6. Operation over Local Area Networks (LAN)

4.7. JME LVC-DE Operational Capability Requirements

4.7.1. Pre-Execution Operational Requirements

4.7.2. Test Exercise Operational Requirements

4.7.3. Exercise Design Requirements

4.7.4. Test Plan DAP and IDRL Support Requirements

4.7.4.1. Measures of Effectiveness (MOE)

Numeric data that is summarized or calculated/correlated that support predefined MOEs.

4.7.4.2. Measures of Performance (MOP)

Numeric data that is summarized or calculated/correlated that support predefined MOPs.

4.7.4.3. Data Collection

Define the discrete exchanges between components and the implicit required data for LVC component exchange supporting MOE and MOP data elements.

4.7.5. Data Design/Collection Requirements

4.7.6. Execution Operational Requirements

During exercise execution, LVC platforms maneuver around the battlespace and activities and processes may be represented via virtual/constructive, as well as human participation. Attributes of the platforms, processes, and human activities are defined here. Example execution attributes are:

- *Speed of operation*: Slower than real-time, real-time, or faster than real-time.
- *Human participation*: Operation with or without human participation (human-in-the-loop [HITL]).
- *Hardware participation*: Actual hardware systems can be integrated and executed in concert with the simulated portions of the experiment (hardware–in-the-loop [HWIL]).

- *Level of representation*: Platforms can be modeled individually or platform components can be separated and modeled separately as the test dictates.

4.7.6.1. Test Control

4.7.6.2. Time Synchronization

4.7.7. Post-Execution Operations

For post-exercise operations, define data reduction, visualization, and analysis capability requirements for post exercise data reduction and analysis.

4.8. Distributed Development and Execution

Define the modes of distributed operation—the following are example modes that can be defined. The JME can consist of multiple mode configurations:

- Run Component and Access Data Locally. In this mode, a single range maintains and operates the LVC components that it needs to perform a runtime execution. No interaction with remote sites is required.
- Download Simulation Data Remotely, Run Locally. In this mode, the local range accesses one or more remote sites to download one or more simulation database(s) maintained by those remote sites. This is the lowest level of remote interaction. Familiar examples of such data downloads would include common terrain and environmental databases, scenario files, enumerations and parameter files used by various simulation components.
- Download Component Remotely, Run Locally. In this mode, the local range downloads one or more simulation components from remote sites. These components are composed and executed in a local runtime environment.
- Access Data Remotely. This mode involves remote access to databases in a distributed runtime environment.
- Run Component Remotely. This mode involves remote access to LVC components in a distributed runtime environment (for example, SDO).
- Multiple Sites Interact Remotely. This mode includes peer-to-peer as well as client-server interactions among remote sites.

ANNEX B, APPENDIX 1

JOINT MISSION ENVIRONMENT (JME)
SYSTEM DESIGN DOCUMENT (SDD)

APPENDIX 1
JME/JOINT OPERATIONAL CONTEXT FOR TEST (JOC-T)

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3. Joint Operational Context For Test Use-Case B-1-4

1. Overview

This section outlines the size and scope of the joint mission environment (JME) and describes the system of systems (SoS) environment to be tested in operational terms for the system under test.

2. Purpose

This section would describe why the Joint Operational Context for Test (JOC-T) use-case was selected. This section should describe the most relevant operational environment for the system under test as it will be fielded, and then align the warfighter's needs with the JOC-T to ensure a joint environment reflective of warfighter expectations. Although we include the operational context as the first appendix in the system design document (SDD), this use-case will have already been developed and validated earlier in the CTM process and will outline the initial requirements of the size, scope, and interactions to be emulated in the live, virtual, constructive distributed environment (LVC-DE) and forms the basis of the JME logical design (appendix 2 to this annex).

3. Joint Operational Context For Test (JOC-T) Use-Case

This is a description of the tactical operational use case. Should be able to leverage the Test Plan Functional Description.

The logical design provides a system-level viewpoint of the LVC system component types, descriptions of the roles these components serve, and how they are intended to work together. The purpose of this section is to describe the abstract LVC component and component relationships that embody the critical operational and functional requirements described in previous sections.

A description of the recommended sections are called out in the CTM 1.3 Guide**.** For an example description of a JOC-T, reference Annex A in the Action Officer's Handbook.

ANNEX B, APPENDIX 2

JOINT MISSION ENVIRONMENT (JME)
SYSTEM DESIGN DOCUMENT (SDD)

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1. Overview

The logical design provides a system-level viewpoint of the live, virtual, constructive (LVC) system component types, descriptions of the roles these components serve, and how they are intended to work together. The purpose of this section is to describe the abstract LVC component and component relationships that embody the critical operational and functional requirements described in previous sections.

2. Purpose and References

2.1. Purpose:

Provide instructions and an example end-to-end model of a joint architecture.

2.2. References:

Various Capability Test Methodology (CTM), DoD Architecture Framework (DoDAF), Unified Modeling Language (UML).

3. LVC Configuration Entity List

3.1. Functional Description Entity List

3.2. Logical Design Elements

4. Verification of Evaluator and Data Collection Information

4.1. Evaluator Strategy

4.2. DAP

4.3. Vignettes

5. LVC Component Description

The logical design is described in terms of JME foundation model (JFM) components, component elements, the capabilities of these component elements, and the logical relationships between the component elements. A *logical LVC component* refers to a discrete item of functionality identified as a key part of the system design. It is discrete in the sense that it is useful to segregate the component when describing the physical design in the next chapter. The next chapter describes the realization of the logical design in terms of the physical design with physical system components.

5.1. Functional Description Info for Each LVC Entity

5.2. JFM LVC Platform Behavior

5.3. LVC Environment Elements

5.4. Composition of Mission Function with Logical Design Elements

The LVC platforms and platform behaviors will enable mission functions. Describe briefly mission functions of focus (for example, kill chain, recon, and so forth). LVC platforms and platform behaviors could also be used to enable task level representations (for example, UJTL, AUTL, and so forth) (Table B-2-1).

Table B-2-1. Example Mission Function vs Design Elements

		Subsystem				Behavior					LVC Environment				
	Name	Mobility	Sensor	CommsDevice	Weapon	Control	Move	See	Shoot	Communicate	Terrain	Weather	Atmoshere	Features	Tactical Network
Platform	Attributes from Functional Description														
	Input Attributes from JFM														
	Output Attributes from JFM														
	Operations from Functional Description														
	Operations from JFM														
	External Calls from JMF														

6. Other LVC Component Types

Other component types include external operations from the JFM (for example, test executives, test control, test preparation, and so forth).

6.1. Test Execution Preparation Component Types

Examples:

- Data Preparation
- Pre-Execution
- Scenario Preparation
- LVC-DE Preparation
- Range Configuration and Instrumentation

6.2. Test Execution Management Component Types

Examples:

- System Startup
- System Initialization
- System Control

6.3. Test Execution Analysis Component Types

- Execution Recording
- Execution Presentation
- Execution Analysis

7. JME Logical Design Artifacts

This section contains the Department of Defense Architecture Framework (DoDAF) artifacts for the logical design. The DAP/IDRL should be mapped to these views.

7.1. Operational Views

7.2. System Views

ANNEX B, APPENDIX 3

JOINT MISSION ENVIRONMENT (JME)
SYSTEM DESIGN DOCUMENT (SDD)

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General Physical Design Approach
This appendix covers the physical design of the live, virtual, constructive distributed environment (LVC-DE) system. This includes the physical instantiations of distributed operations, as well as identification of the physical geographic locations of the ranges, and physical locations of intra-range components (instrumentation) included in these distributed operations. When complete, the logical design will be populated with realizable physical systems.

7.3. Key Computing and Transport Technologies

This section describes the utilization of the following technology areas.

7.3.1. Distributed SOA, Middleware and Infrastructure Technologies

Describe the approaches to middleware and infrastructure technologies, custom protocols, and gateways. These technologies will provide the framework and design trade-offs for distributed execution (rules, guidance, and product descriptions). This section should reference infrastructure characterization plans.

7.3.1.1. HLA

Identify which functions will be implemented via HLA.

7.3.1.2. Test and Training Enabling Architecture (TENA)

Identify those functions to be implemented via TENA.

7.3.1.3. Gateways

Identify functions which will need to communicate through gateways.

7.3.1.4. HWIL Interfaces

Identify transport mechanism requirements for HWIL implementation.

7.3.1.5. Service-Based Interfaces

Identify requirements for services-based (SOA) implementation.

7.3.2. Software Technologies

7.3.2.1. Software Components and APIs

Where two or more components interact directly there must be a well-defined interface. This section describes the components that may be implemented as API. For example, TENA is a middleware API.

7.3.2.2. Software Libraries

This section describes the components may be implemented as software libraries. Software libraries are considered stand-alone items that developers can incorporate within the structure of their software components.

7.3.2.3. Software Frameworks

Some of the components may take advantage of pre-built or auto-code generated software “frameworks”. These frameworks are similar to software

libraries in that developers can incorporate them within the structure of their software components. However frameworks often exist to facilitate specific functional capabilities, like providing an alternate means of implementing transport mechanisms.

7.3.3. Data Representation and Mediation

7.3.3.1. External Data Representation

This section describes the approach to represent external data requirements (for example, XML, text files). For example, external data formats may be required to feed data collection or post processing tools.

7.3.3.2. Terrain

This section should describe the terrain approach in context with following terrain attributes:

- Terrain data primitive (for example, cultural features and terrain elevation)
- Environmental coding (for example, signatures, textures, ray trace, and so forth)
- Spatial Reference (for example, geospatial and geo-referenced representation of coordinates, directions, and distances)

7.3.4. Computing Platforms & Compilers

The choice of computational platforms is a design issue that is also related to component software, middleware, and interface requirements. This section identifies the approach for these requirements

7.3.5. CPU Architectures

This section describes the utilization of 32-bit/64-bit CPU architectures.

7.3.6. Parallelization for Compute-Intensive Functions

Certain functions commonly implemented in a virtual/constructive environment, such as line-of-sight (LOS) propagation calculations, are computationally intensive and can over-burden a CPU's utilization. This section describes the capability requirement and strategy to overcome this issue (i.e., HPC resources).

7.4. Instrumentation

7.4.1. Range Instrumentation

7.4.2. Platform/SUT Instrumentation

8. Distributed Operation

8.1. Participating Organization Components – Range Configuration

8.2. Infrastructure Description

8.2.1. Network Functional Description

Table B-3-1. Test Infrastructure Characterization (Example).

Performance Parameter	Criteria	Objective/Threshold Values

8.2.2. Facilities and Site Configuration

8.2.3. Network Bridging

8.2.4. Data Transport/Middleware Requirements

8.3. Federates List

This is a listing of all the physical components.

8.4. SME Physical Component Artifacts

This is a detailed description of each physical component in the federates list. This includes DoDAF and UML/IDEF descriptions as required.

See examples that follow (Figures B-3-2 through B-3-4).

9. Logical Design to LVC System Component Mapping

This section presents the relative UML/DoDAF views to illustrate the mapping of physical components to the logical design.

10. Physical Data Flow Diagrams

10.1. Platform Behavior Physical Data Flow Diagrams

This section contains the SV-6, SV-10c Move, See, Shoot, etc. It is recommended that these be added in an appendix.

10.2. Mission Function Physical Data Flow Diagrams

This section contains the SV-6, SV-10c for desired mission functions enabled by the platform behavior physical data flows. It is recommended that these be added in an appendix.

10.3. Test Vignette Physical Data Flow Diagrams

11. Physical Database Schema (SV-11)

The databases consolidating test output into data which can be analyzed are of particular importance to the results of each test and its associated events. A physical database will have to be created to store test data.

ANNEX B, APPENDIX 4

JOINT MISSION ENVIRONMENT (JME)
SYSTEM DESIGN DOCUMENT (SDD)

APPENDIX 4
AV-2, INTEGRATED DICTIONARY

Overview (AV-2) (Example)

Term	Definition	Reference
Procedures	Encompasses the many forms of documented guidance and operational controls that affect all aspects of system development, integration, and operational functionality.	Procedures, Application, Infrastructure and Data (PAID) References
Applications	Encompasses the fundamental purpose and function for which any system is built -- its mission. The functional requirements specified by users to perform an operational activity are the very essence of the system application.	Procedures, Application, Infrastructure and Data (PAID) References
Infrastructure	The attribute that supports the establishment and use of a "connection" between systems or applications. This includes hardware, security equipment, and "system services" that facilitate systems operations and interactions, such as communication protocol stacks and object request brokers (i.e. TENA).	Procedures, Application, Infrastructure and Data (PAID) References
Data	Focuses on the information processed by the system. This attribute deals with both the data format (syntax) and its content or meaning (semantics).	Procedures, Application, Infrastructure and Data (PAID) References
JFM component	A cohesive, abstract package that contains particular types of JFM elements.	Model Driven Architecture (MDA) References

Term	Definition	Reference
JFM element	A member of a component. Elements contain the base attribute or operations and provide the basis for instantiated entities in the JME.	Model Driven Architecture (MDA) References
JFM entity	An instantiated JFM element or sub-element that contains realized attributes and operations, and has a distinct, separate existence.	Model Driven Architecture (MDA) References
JFM Interaction	An action that occurs when two or more component elements have an effect upon one another.	Model Driven Architecture (MDA) References
JFM Emergent Interaction	An action that occurs when a number of JME entities with associated LVC Platform Behaviors operate in the JME, forming more complex LVC Platform Behaviors as a collective.	Wikipedia
Application Programming Interface (API)	Implementation of an interface that allows access of a system to other system functions, and/or to allow data exchange between systems.	IEEE
Kluge Kluged Kluging	A system, especially a computer system, that is constituted of poorly matched elements or of elements originally intended for other applications.	Dictionary.com (System Engineering Slang)

ANNEX B, APPENDIX 5

JOINT MISSION ENVIRONMENT (JME)
SYSTEM DESIGN DOCUMENT (SDD)

APPENDIX 5
CONFIGURATION MANAGEMENT PLAN AND
EVENT MANAGEMENT PLAN

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1.5. TOEL/MSEL B-5-3

1.6. Networks B-5-3

1.7. Middleware B-5-3

1.8. Document Management B-5-3

2. JME Event Management Plan B-5-3

1. **Configuration Management Plan**

    1.1. **Data**

    1.2. **Software and Hardware Version**

    1.3. **IERs**

    1.4. **TTP**

    1.5. **TOEL/MSEL**

    1.6. **Networks**

    1.7. **Middleware**

    1.8. **Document Management**

2. **JME Event Management Plan**

ANNEX C - CAPABILITY EVALUATION METAMODEL (CEM)

The CEM provides the “rules” for relating capability concepts that are developed in the CTM, a capability measures framework, and analysis structures for joint mission effectiveness assessment activities. The CEM “star” model (Figure C-1) expands upon the systems engineering “Vee” model foundation in order to demonstrate analysis of joint mission effectiveness. This model provides guidelines for relating capability concepts developed in the Capability Test Methodology (CTM), the capability measures framework, and the analysis structures.

Capability "Star" Outputs

Each of the six different branches in the CEM has a main output that is developed as one follows the metamodel. The joint operational context for test (JOC-T) and evaluation strategy that are developed in branches one and two of the CEM flow into the characterize test plan which develops the capability test design. The capability subset chosen for the test event is then reflected in a test plan. The capability test design is instantiated into the joint mission environment in branch four. Branch five explains how the joint mission environment (JME) is executed in one or more test events. Ultimately, the final branch products from the test events help to evaluate the capability and provide direct input into the Joint Capability Evaluation (JCE).

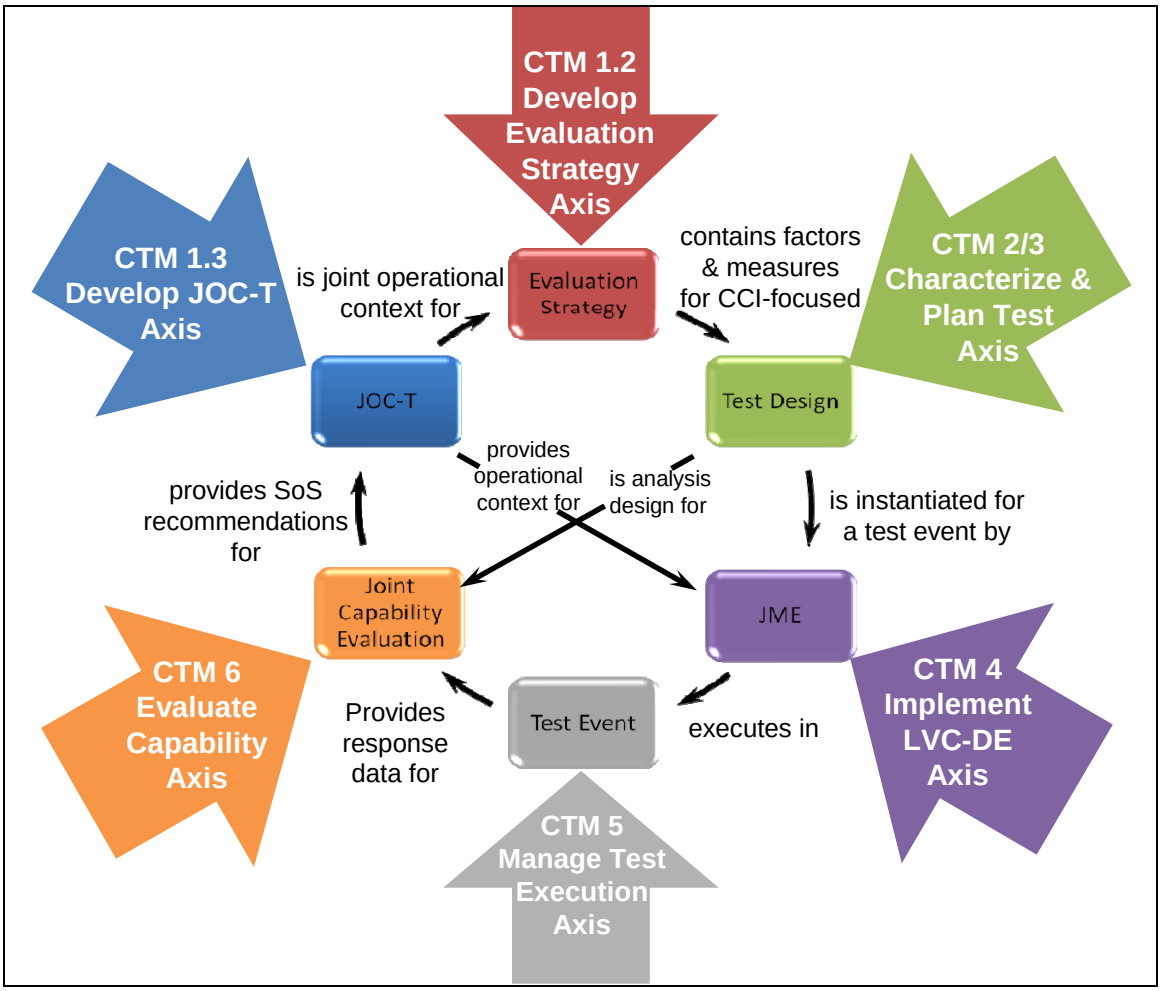

Figure C-1. Capability Evaluation Metamodel (CEM) Axes and Outputs

Each branch of the star has an output and output relationship dependencies. The JOC-T produced by the "develop and integrate joint capability" branch is the joint operational context for the evaluation strategy. The capability evaluation strategy contains design of experiment (DOE) factors and measures which are filtered to produce various capability test designs that are focused on one or more critical capability issues (CCI). The capability test design is instantiated into a test event using a JME. The JME is built from live, virtual, constructive (LVC) test technologies. Testers use the JME to execute the capability test design in an event which provides response data for a joint capability evaluation. JCEs are conducted based on analysis structures in the capability test design. These JCEs provide system/system of systems (SoS) recommendations for DoD acquisition and capability development managers. This model summarizes the evaluation strategy developed by Joint Test and Evaluation Methodology (JTEM), as well as providing consistent business rules for evaluation of both systems and SoS.

The Capability Evaluation Metamodel "Star" and the Systems Engineering "Vee" Model

The current DoD acquisition policy has a basis in the systems engineering "Vee" process model, shown in Figure C-2, which is recommended in the Defense Acquisition University's (DAU) Test and Evaluation (T&E) Management Guide. The T&E Management Guide's purpose is to help planners better understand how to plan T&E events. The "Vee" process and the Test and Evaluation Management Guide support phased verification testing that builds upon previous test event results. This phased testing is reflected in the Test and Evaluation Master Plan (TEMP) structure which has separate sections for developmental and operational test and evaluation. However, the "Vee" model was designed for testing one system with limited evaluation measures. JTEM developed the "Star" model as a way to address phased testing and allow consistency in assessing the system/SoS contributions to the JMe needs of the warfighter. The "Star" model is based on the CEM and depicts a set of business rules. The "Star" model provides better integration between T&E phases than the systems engineering "Vee" model because it indicates dependencies and provides traceability. It also introduces the concept of a CCI. CCIs are useful because they link the SoS attributes, operational tasks, and mission desired effects. The "Star" model should allow for traceability throughout the system/SoS life cycle development.

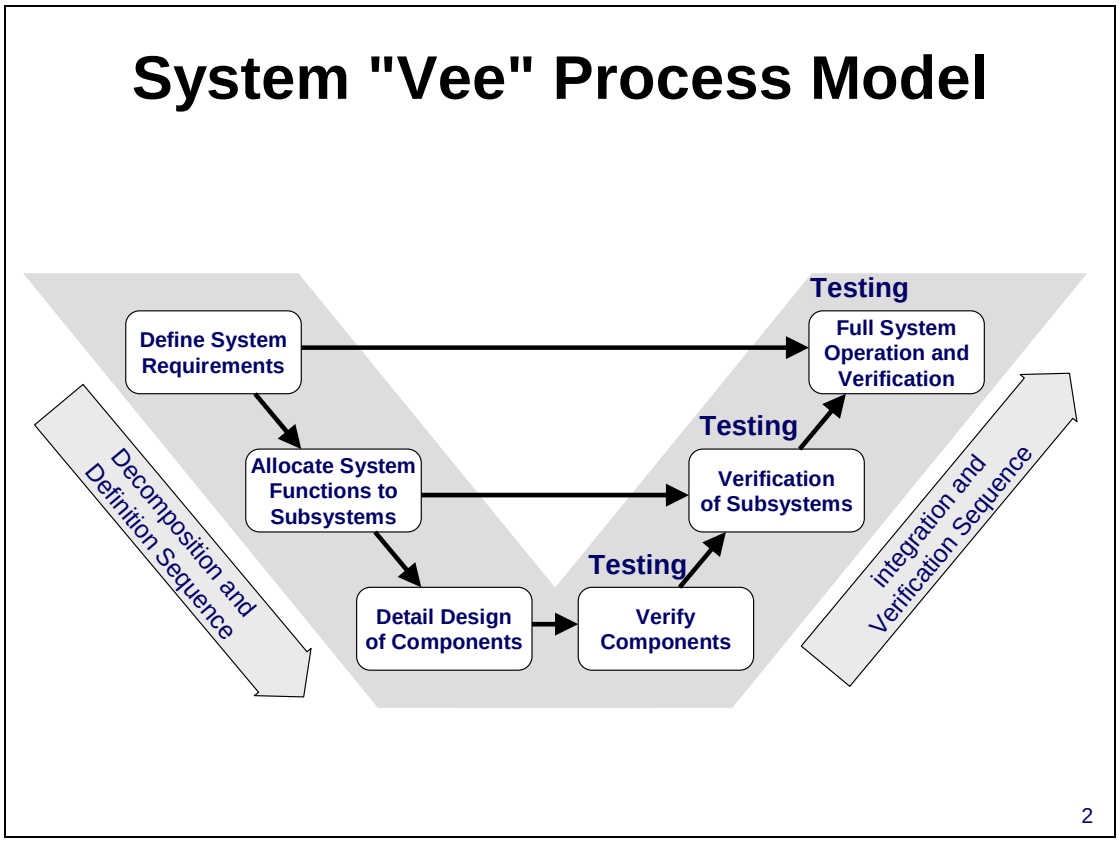

Figure C-2. Systems Engineering "Vee" Model as depicted in the Defense Acquisition University's (DAU) Test and Evaluation Management Guide

As systems become more complex, and the ability to evaluate and analyze performance at the SoS and joint mission levels evolve, an enhanced systems engineering process is needed to guide the logical sequence of analysis, design, test, and decision activities. The CEM, shown in Figure C-1, is an attempt to bring together the systems engineering "Vee" model and the DoD Test and Evaluation process. Behind each of the six branches in the CEM is a set of concepts and relations.

The CTM process branches produce the following CEM outputs:

- CTM 1.3: Develop and integrate joint capability branch produces the JOC-T
- CTM 1.2: Develop T&E Strategy branch produces the Evaluation Strategy, which includes a capability-focused measures framework at mission, task, and system/SoS levels
- CTM 2/3: Characterize/Plan Test branch produces the Capability Test Design
- CTM 4: Implement LVC Distributed Environment branch produces the JME
- CTM 5: Manages the Test Execution and produces the Test Event
- CTM 6: Evaluate Capability branch produces the Joint Capability Evaluation (JCE)

This "star" provides an underlying business rule structure or schema that helps to populate the assessment as the test event is planned and executed. The system lifecycle begins with the user needs expressed as constraints and required capabilities in order to satisfy mission objectives. The "Star" model includes up-front development of an integrated acquisition evaluation strategy. Using this model there are cyclical CCI assessment that could be done through various test events. The end result is a synthesis of performance results supporting joint missions.

The "star" model and the underlying CEM structure provide a systems engineering assessment methodology which can enhance the capabilities driven acquisition practice that is currently based on "Vee" and spiral evolutionary approach. The star incorporates DoD capability, SoS, analytic baseline, capability gap, and evaluation measures to provide better consistency in assessing the capability's contribution to the join mission effectiveness needs of the warfighter. It includes a cycle of six branches containing capability development and evaluation products. There is general cyclical sequence to the star's branches, but many products are iteratively developed or developed in parallel.

Capability vs. System Development

The "Star" CEM model has a capability focus as compared to the system focus of the systems engineering "Vee" model. The first branch, "develop and integrate joint capability," focuses on the systems engineering, development, and integration of the capability. This uses a requirements-based functional analysis and design synthesis approach to capability development and integration. The capability star shows requirements, gap identifications, and mission desired effects that are reflected in the ability to perform essential tasks. The systems engineering "Vee" model focuses on system requirements. The focus of the CEM at the capability level allows for the consideration of both materiel and non-materiel solutions to a capability gap solution across

both material and nonmaterial SoS resources. In contrast, the "Vee" model looks at the system and material integration focus during logical design. The star capability development starts with the capability, mission, and tasks as operational aspects. These operational aspects map to operational functions and logical system/SoS functions and services across DOTMLPF.

The logical design includes both material and non-material factors. In the logical design step the testers delineate and map the user needs, as defined by the COCOM and JCIDS analyses. This information may be part of a JCIDS ICD document or it could be from "other sources" such as COCOM Integrated Priority Lists (IPLs) and other quick reaction requirements gap documents. Then the mission is analyzed using the Analytic Agenda. The Universal Joint Task List (UJTL) and COCOM-derived Joint Mission Essential Task Lists (JMETL) help to formulate the user needs. JMETLs are an important aspect as they are a UJTL task populated with conditions. The CEM star model provides a context and method for this process. It is important to remember that the documents used are not static throughout the test and analysis process. These documents are revised throughout the acquisition cycle, and further levels of fidelity are added as the system development matures.

The CEM was developed to provide the underlying conceptual definitions and relationships to the JTEM methodology. It provides conceptual mapping to relate key methodology test and evaluation lexicon concepts. By viewing the CEM diagrams the user is better able to understand the noun-verb-noun relationships and business rules. The CTM lexicon is a cross-domain dictionary, and should be referenced whenever the user encounters unfamiliar terms.

CEM Branch 1 (Figure C-3)

The CTM uses the JCIDS definition of a capability as "the ability to achieve desired effects under specified standards and conditions through a combination of means and ways to perform a set of tasks." The "star" guides the user through the requirements analysis process. First a capability gap is identified, the mission desired effects are determined and the desired performance levels of the mission essential tasks are defined. Then the threat and environmental conditions, and their possible affects on performing the required essential tasks or achieving the desired mission effects are identified. As the system engineering focus transitions to functional analysis and allocation of assets, capability gaps are mapped to operational functions using the Joint Capability Area (JCA) taxonomy. This creates a systems engineering logical model with essential tasks and operational function gaps that are addressed by the blue (friendly) system/SoS logical design, and incorporates non-material aspects such as DOTMLPF considerations. The logical design is implemented into a physical design during the system engineering design synthesis activities later in the process. The main output of the first branch of the star is the JOC-T which is composed of mission, task, condition, and system/SoS aspects of a capability.

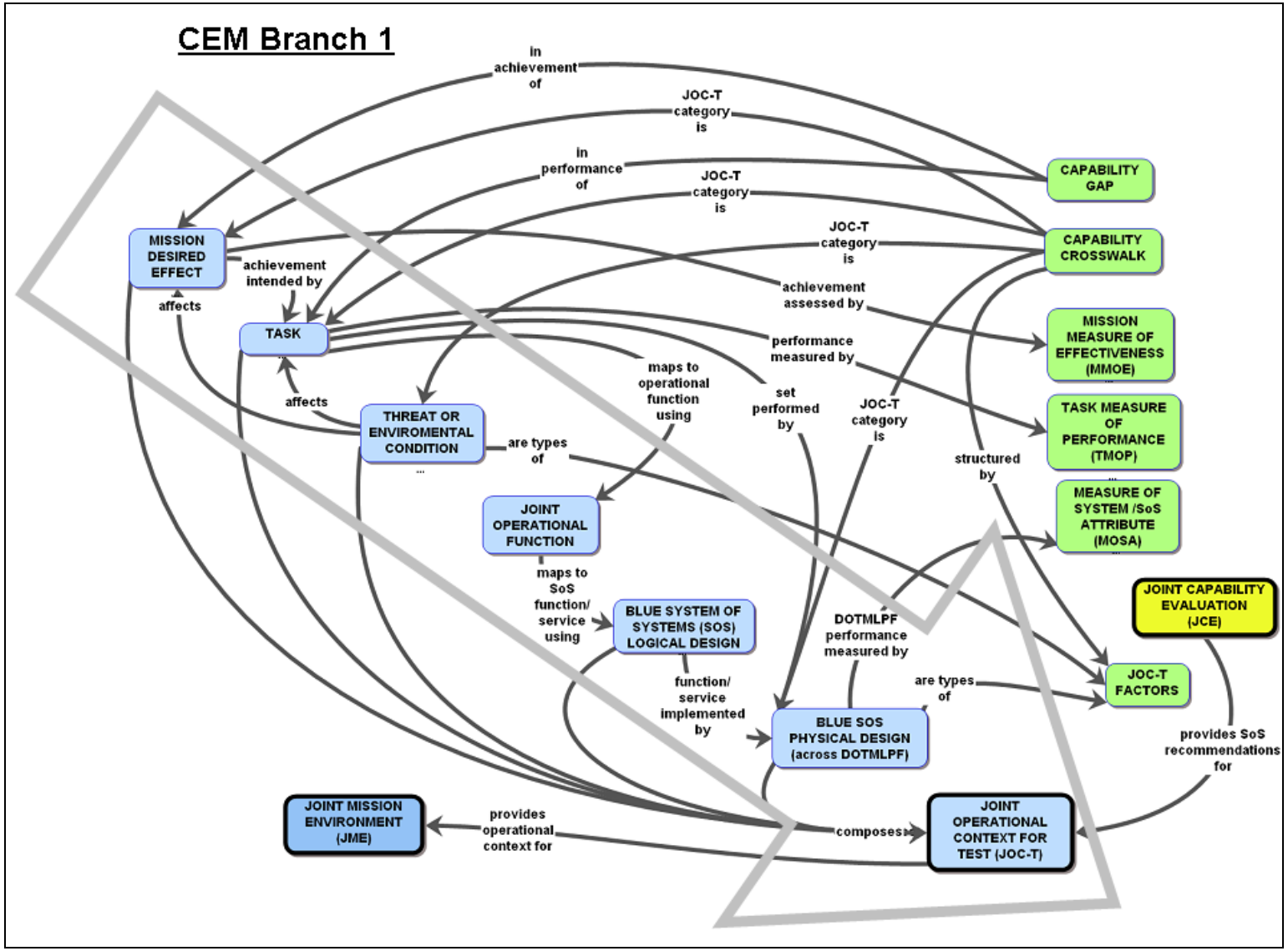

Figure C-3. Capability Evaluation Metamodel (CEM) Branch 1 - Joint Operational Context for Test (JOC-T)

CEM Branch 2 (Figure C-4)

Branches 2 through 6 address T&E challenges which relate to the right side of the "Vee" model "integration and verification sequence". As capability increments are developed and integrated, star model axes on the left side have a cycle of validation and verification (V&V) activities. The CEM stresses planning for mission desired effect validation, task performance verification, and system/SoS performance verification as integrated activities during the acquisition lifecycle. This incorporates the CEM dependent variables using three levels of assessment: Task measures of performance (Task MOP), Mission measures of effectiveness (MOE) and system attributes. The design of experiment handles the independent variables which may include (among others) DOTMLPF, threat, and environmental conditions. These independent factors are initially identified in Branch 2 and 3 activities of the CEM.

One of the first steps in Branch 2 is to identify information required by the decision maker. The required information includes evaluation of effectiveness and how well the system/SoS meets the user needs. It is important to delineate the types and quality of data needed, the results expected, and any analytical tools needed (DOE and Modeling and Simulation [M&S]). The JOC-T concepts that were part of Branch 1 should be reviewed as they form the joint operating concepts for the capability evaluation strategy. Any CCIs are also developed and should address the capability gaps described in the joint capabilities document. When comparing the CEM star to the systems engineering "Vee" model, the second branch looks more like right side of the "Vee" with different levels.

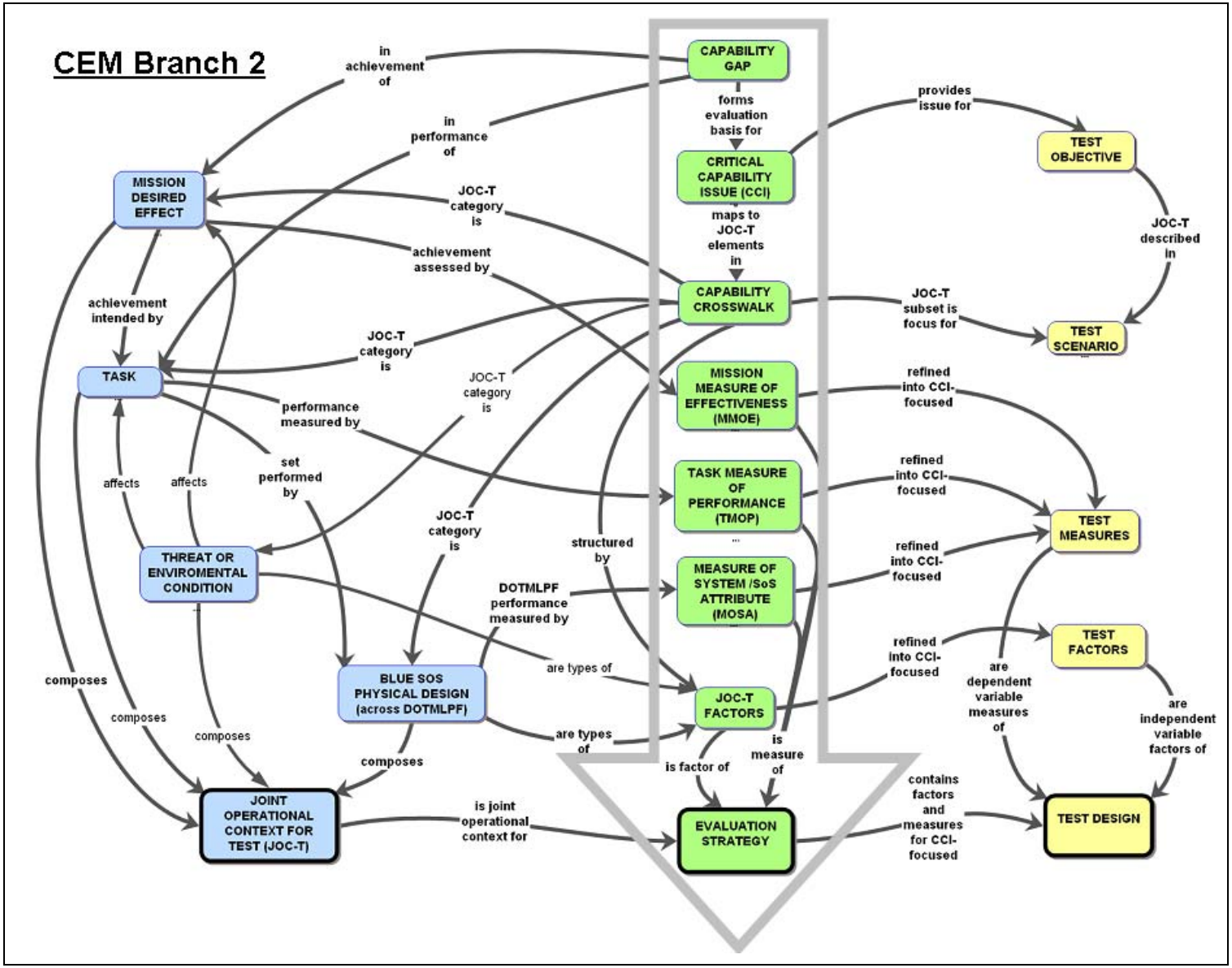

Figure C-4. Capability Evaluation Metamodel (CEM) Branch 2 - Evaluation Strategy

CEM Branch 3 (Figure C-5)

Branch 3 of the model focuses on the evaluation of the test. Specifically this branch incorporates the CEM dependent variables. The three variables are based on the three levels of assessment: Task MOPs, Mission MOEs and SoS/system attributes. The design of experiment handles the independent variables which may include DOTMLPF, threat, and environmental conditions. These independent factors are initially identified in Branch 2 and 3 activities.

For personnel experienced in testing, this should be a familiar branch moving from test goal to objective to vignette to trial. Then, following the model, evaluation measures that were established in Branch 2 are aligned with the test trial and different combinations. The third branch of the CEM decomposes the factors and levels into the integrated data elements that then feed into the capability test design, test plan, run and data management.

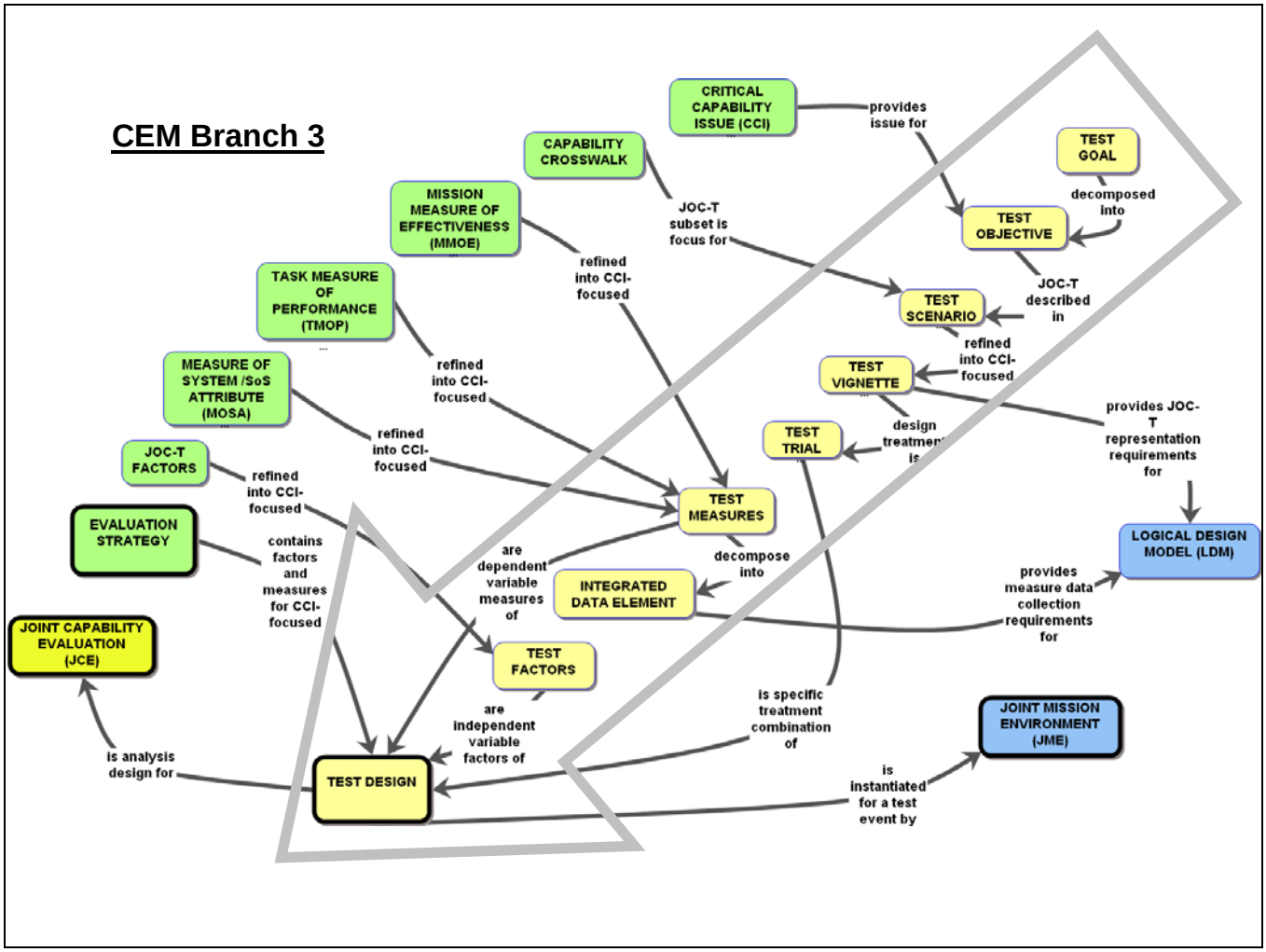

Figure C-5. Capability Evaluation Metamodel Branch 3 - Test Design

CEM Branch 4 (Figure C-6)

As you continue to move around the Star model the fourth branch is the "implement LVC-DE" branch. This branch is where the tester details the specific "ways" that tasks will be completed. In this branch the tester identifies the physical interfaces that will be used and then traces these back to the requirements. This tracing of the physical aspects back to requirements is essential in SoS testing as there can be multitudes of requirements from different sources and it is essential to ensure requirements traceability. When viewing the CEM model it is critical to remember that testing may be repeated at each level (SoS, system, component, etc.), the same as in the systems engineering "Vee" model. It is also important to ensure independent component and system testing prior to the SoS test so that the components will perform assigned functions during the test.

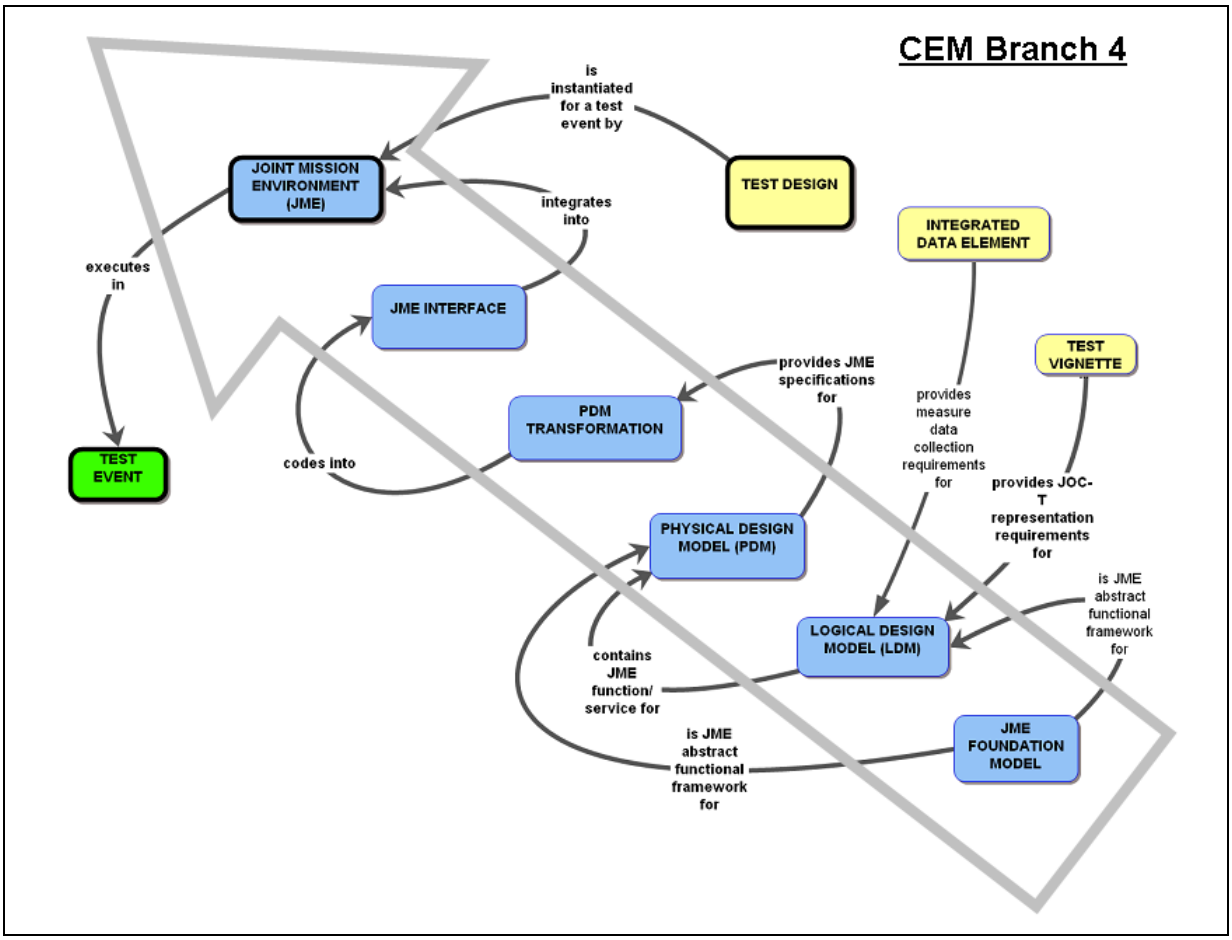

Figure C-6. Capability Evaluation Metamodel (CEM) Branch 4 - Joint Mission Environment (JME)

CEM Branch 5 (Figure C-7)

The fifth branch encompasses those activities directly related to running a test event. The distributed JME described in CEM Branch 4 allows numerous and varied customers to participate. However, the distributed nature and complexity of the JME and inclusion of multiple customers in the test event can make test event planning more complex. Specifically, data management, data collection, and data analysis can be a challenge when planning and executing tests in a distributed JME. Because each user will have distinct data collection needs, data collection requirements need to be identified early and continually refined throughout the entire test planning process. This includes determining data elements and data formats, and standardizing collection processes and procedures to minimize data error across the distributed environment.

The LVC-DE constructed to emulate the JME is used to generate and collect the event data. Dedicated data collection and reduction resources are needed to meet data requirements and standards. While the various customers will want to be responsible for their own individual system/SoS effectiveness analysis and interpretation, there should be one overarching plan to provide the details of the data collection and how the data are defined.

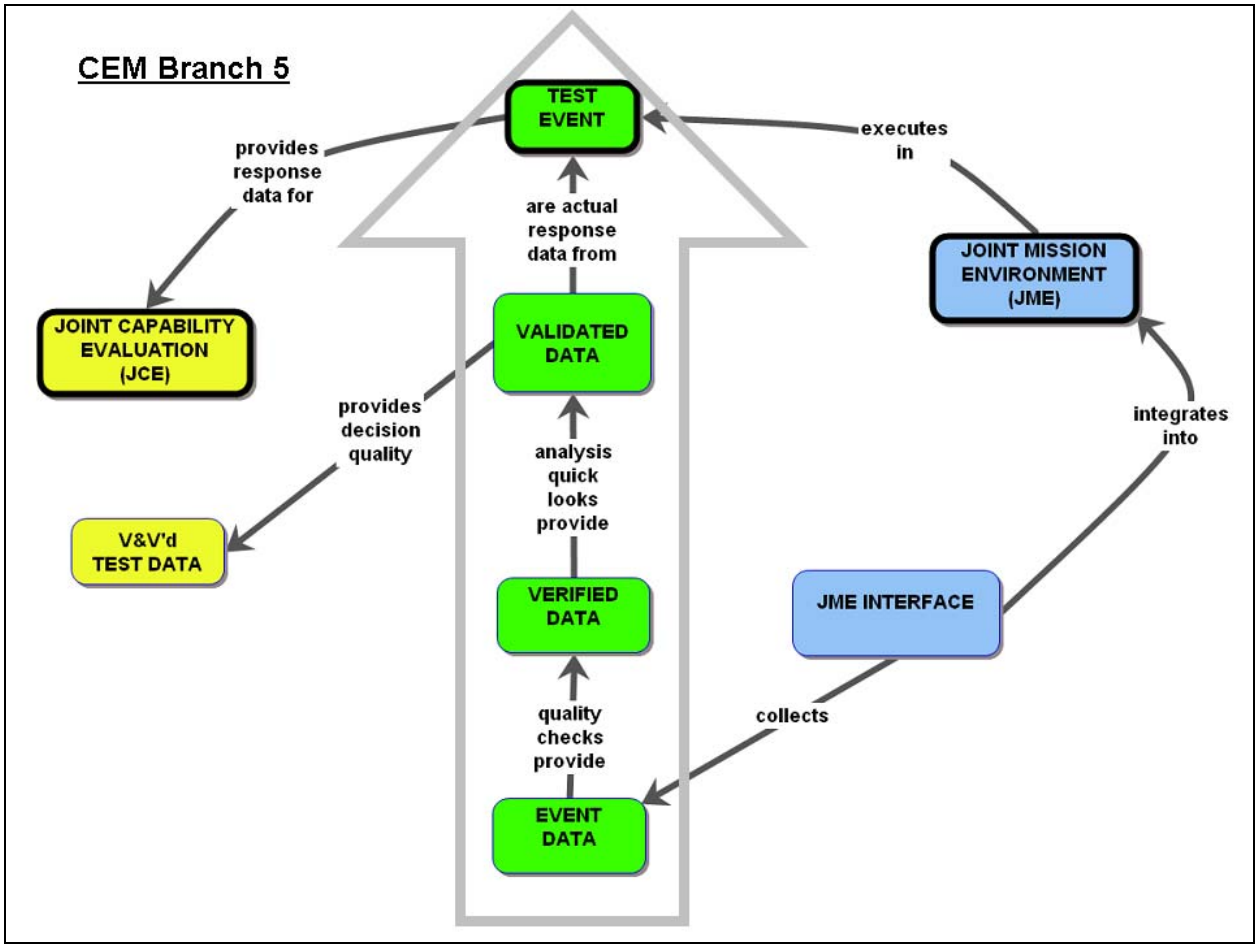

Figure C-7. Capability Evaluation Metamodel (CEM) Branch 5 - Test Event

CEM Branch 6 (Figure C-8)

The final branch of the CEM entails the synthesis and evaluation of information. Once the test data are compiled and the initial evaluation is completed the next step is to complete a comparison of the actual response with the desired/expected response. Using the processed test data, results of mission MOEs, task MOPs, and system/SoS performance can be delineated. The system/SoS attributes, Task MOPs, and Mission MOEs are then synthesized into capability findings. These test event results and the capability recommendations are fed into the Joint Capability Evaluation which allows the decision maker to decide a course of action.

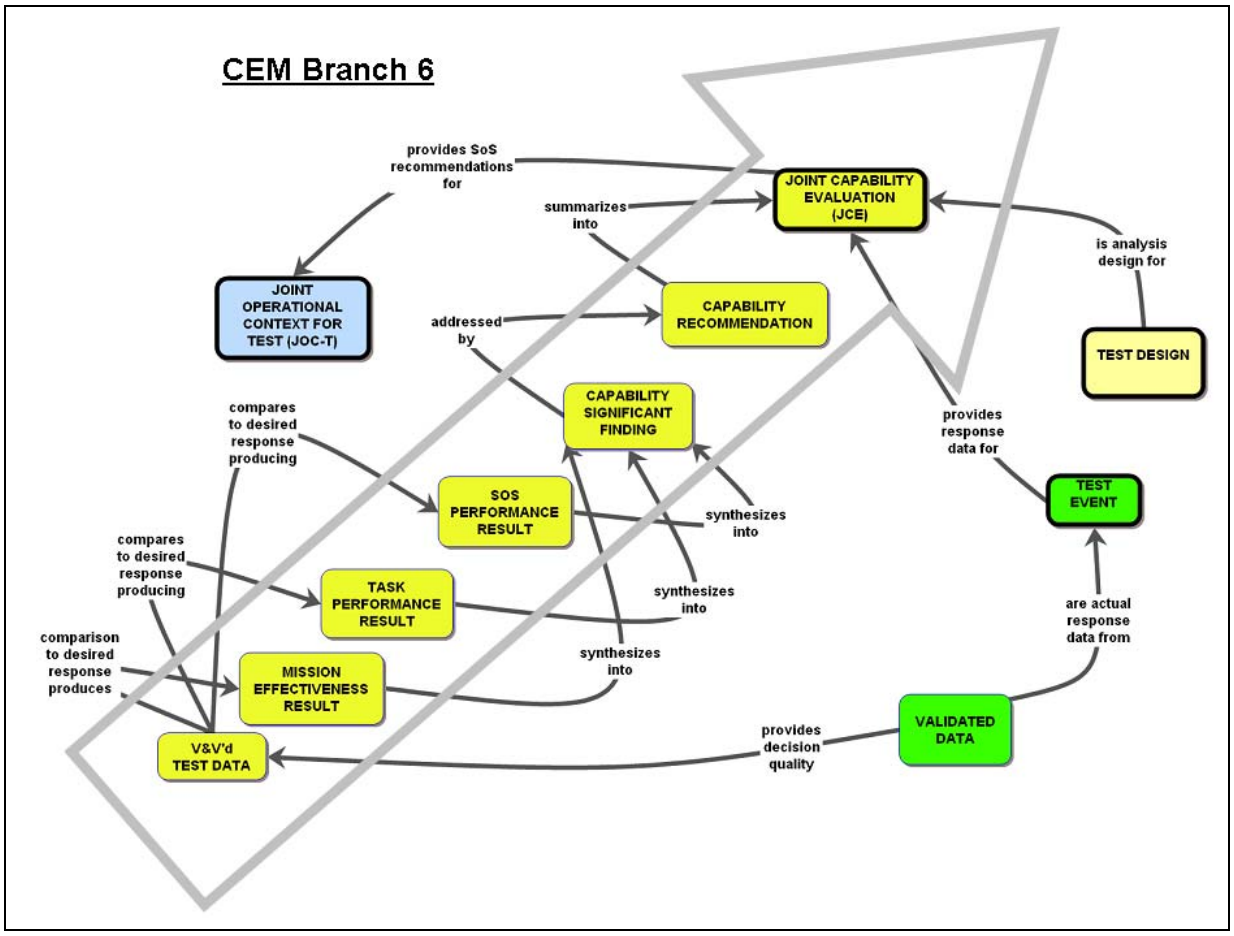

Figure C-8. Capability Evaluation Metamodel (CEM) Branch 6 – Joint Capability Evaluation (JCE)

Capability "Star" Model and CEM Concepts

One thing to note as you move through the different branches of the CEM is that there are fewer relationships as you progress through the model. There are fewer relationships because the combined information forms logical groupings of capability test design flows. The CCI measures aspects at the capability level; however the CEM can be used for measures at both the capability and system level.

The capability “Star” model provides many benefits to the user. The first is the incorporation of JCIDS capability concepts into the evaluation. The CEM also utilizes evaluation concepts such as CCIs and the CEM measures framework. The Star model includes a robust capability verification and validation (V&V) T&E cycle. It enhances capabilities-driven acquisition practice, currently based on “Vee,” spiral, and evolutionary approaches.

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ANNEX D – JOINT MISSION ENVIRONMENT FOUNDATION MODEL (JFM) DESCRIPTION

The JFM provides guidance for the systems engineering thread. It focuses on the consistent systems engineering used for a joint mission environment (JME).

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JOINT TEST AND EVALUATION METHODOLOGY (JTEM)
JOINT TEST AND EVALUATION (JT&E)

Joint Mission Environment Foundation Model (JFM) Description

January 9, 2009

Approved By:

_____

MAXIMO LORENZO, GS-15
Joint Test Director, JTEM JT&E

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1. Introduction

1.1. Purpose

The Joint Mission Environment (JME) Foundation Model (JFM) provides an authoritative framework for applying a logical capabilities-based process that can be robustly applied for reasoning among stakeholders in a wide range of situations and test capability applications. The JFM is a design template used to guide the reuse and development of LVC-DE systems and is a theoretical construct that represents physical processes. The foundation model is a conceptual model in this sense; it is constructed to enable implementation independent reasoning within an idealized conceptual framework about these processes. The end-state of the JFM is to provide a frame of reference for LVC-DE configuration design. The JFM description is an evolutionary document. It will be modified over time to promote the robustness of the model.

1.2. Scope

A great deal of work has been done within DoD attempting to improve interoperability between LVC-DE capabilities through the creation of standard infrastructures and middleware, e.g., Test and Training Enabling Architecture (TENA), High-Level Architecture (HLA), Distributed Interactive Simulation (DIS). Huge disparities can exist between different LVC-DE representations and standardization at infrastructure and middleware level does not address the disparities. The disparities can exceed the ability of any middleware to provide a standard data passing and control mechanism for a broad federation of LVC-DE systems. Some form of component relationship standardization is required to build a capability that can fully take advantage of the interoperability provided by standardized infrastructures, middleware and communications protocols.

The JFM is a first step in organizing the diverse requirements toward this objective by providing a semantic template that can be used to guide the design, development, and re-use of LVC-DE systems. The JFM is a p*rocedure* that provides an abstract, implementation independent representation of the LVC-DE a*pplications* and addresses semantic d*ata* interchange for the system "to-be" created that will utilize the *infrastructure* in support of test and evaluation events. JTEM defined a JFM based on applying the procedures,[1] applications,[2] infrastructure,[3] and data[4]

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[1] Procedures - encompasses the many forms of documented guidance and operational controls that affect all aspects of system development, integration, and operational functionality.

[2] Applications - encompasses the fundamental purpose and function for which any system is built -- its mission. The functional requirements specified by users to perform an operational activity are the very essence of the system application.

[3] Infrastructure - is the attribute that supports the establishment and use of a "connection" between systems or applications. This includes hardware, security equipment, and "system services" that facilitate systems operations and interactions, such as communication protocol stacks and object request brokers (i.e., TENA).

(PAID) principals to the Levels of Conceptual Interoperability Model (LCIM)[5] interoperability definitions to provide a common, but high-level modeling foundation that can significantly improve interoperability and complementary operations among LVC-DE systems. Figure 1-1 illustrates the principals in context with the LCIM definitions. Arguably, current LVC-DE implementations fall within level 0 or 1 interoperability standard according to the LCIM.

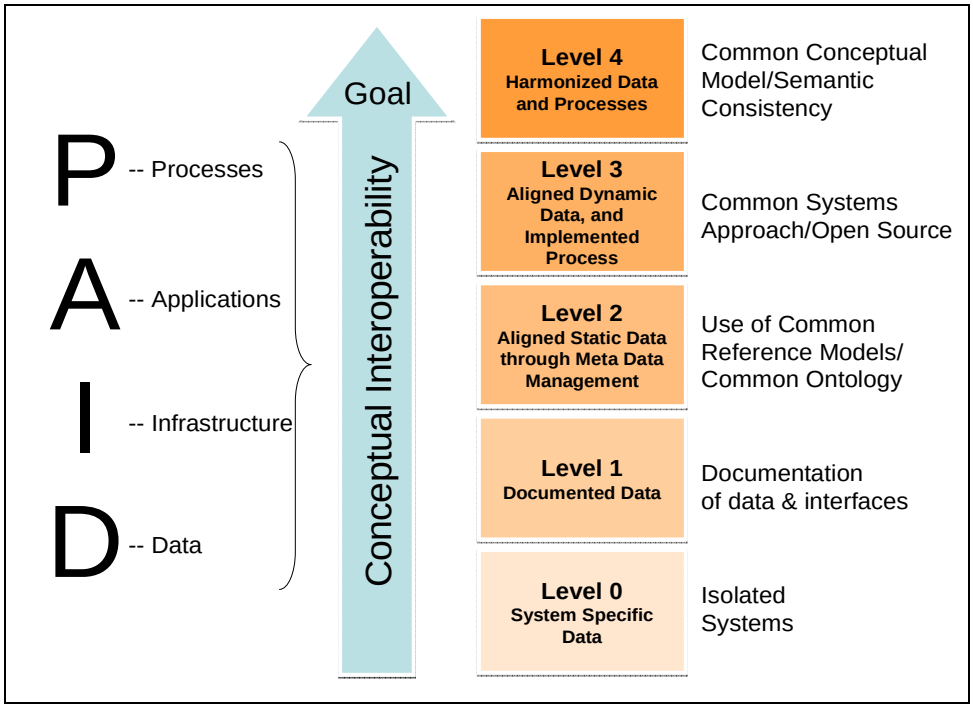

Figure 1-1. PAID in Context with the Levels of Conceptual Interoperability Model (LCIM)

The JFM focuses on the components, component elements and interactions that should or will exist. The JFM encapsulates the authoritative framework to allow stakeholders to address specific issues in design engineering, selection of algorithms to instantiate component element instances (existing legacy or new capabilities), formatting of data fields and data elements, and scoping the system to execute within the infrastructure, or address new infrastructure requirements to meet JME objectives. Applying a design within this framework will ultimately lead to the development of a robust JME application programming interface (API).[6] This design can be applied to implementing a LVC-DE baseline within this framework.

[4] Data - focuses on the information processed by the system. This attribute deals with both the data format (syntax) and its content or meaning (semantics).
[5] "The Levels of Conceptual Interoperability Model", Dr. Andreas Tolk, James A. Muguira. Virginia Modeling Analysis and Simulation Center (VMASC), College of Engineering and Technology, Old Dominion University.
[6] An application programming interface (API) is the implementation of an interface that allows access of a system to other system functions, and/or to allow data exchange between systems.

2. JME Foundation Model (JFM) Overview

The JFM has four core *components*[7] – LVC platform component, LVC platform behavior component, mission function component, and LVC environment component. Figure 2-1 illustrates the core components and their relationships, which is equivalent to the DoD Architecture Framework (DoDAF) Systems View (SV) SV-4 at level 1, comprising the functionality description of the JFM components. The JTEM modeling and analysis methods and processes to support this document are centered on the LVC platform behavior elements of an LVC platform with influences by the LVC environment. This approach is taken because it is the implemented LVC platform behaviors that determine what a LVC platform can or cannot do, and these form an emergent capability that enable mission functions. This relationship between the components will become clearer as the reader understands the JFM capabilities and requirements described throughout this document. The following are high-level descriptions and definitions of these components.

[7] A JFM component is a cohesive, abstract package that contains particular types of JFM elements.

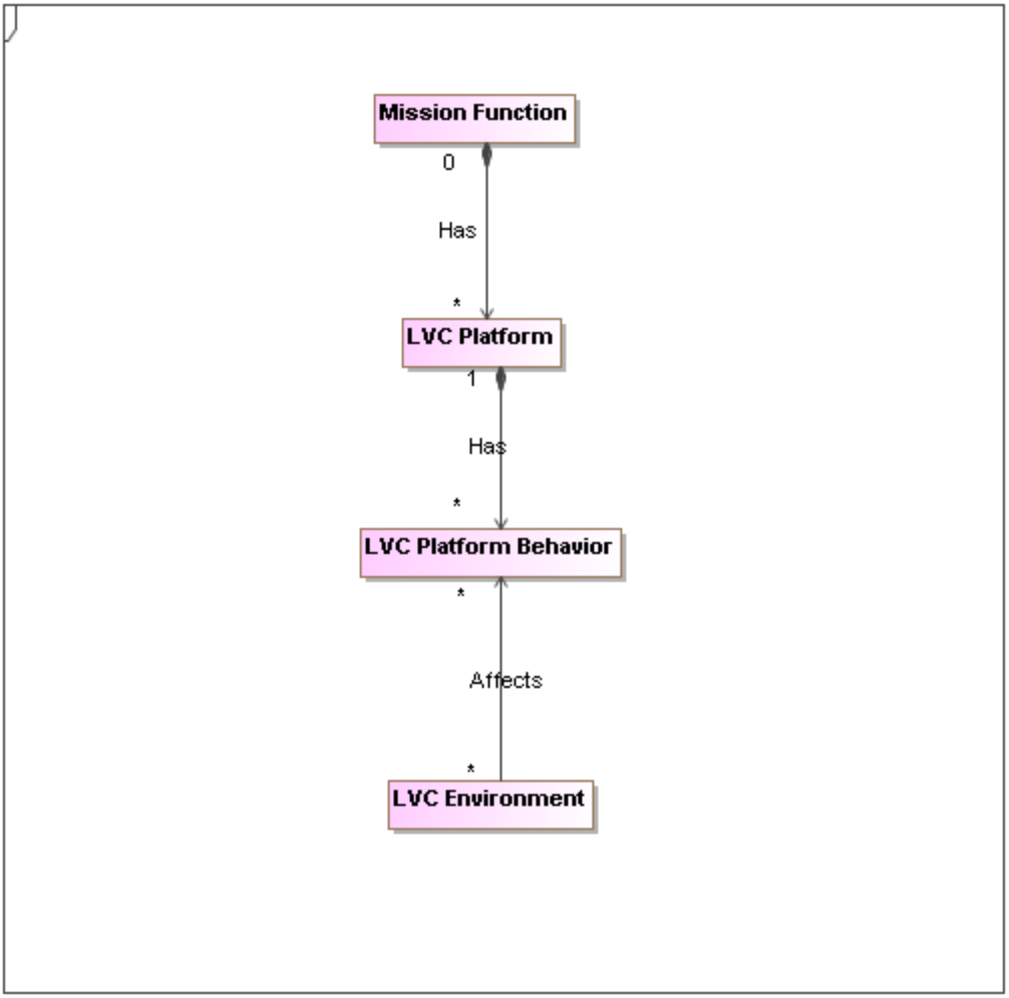

Figure 2-1. JFM Overview

2.1. LVC Platform Component

The LVC platform component specifies the LVC platform *elements*[8] (e.g., air platform, ground platform, littoral platform, etc.). The LVC platform elements describe common attributes of the *entities*[9] (e.g., T-72, M1A1, F-18, etc.) that will be instantiated in the JME and that store the state data for each entity and instance of an entity. **LVC platform elements** cover individual friendly fighting vehicles, threat force vehicles, joint, interagency, and multinational (JIM) support systems, aggregated platform representations and civilian objects (e.g., non-combatants).

[8] A JFM element is a member of a component. Elements contain the base attribute or operations and provide the basis for instantiated entities in the JME.
[9] A JFM entity is an instantiated JFM element or sub-element that contains realized attributes and operations, and has a distinct, separate existence.

2.2. LVC Platform Behaviors

LVC platform behaviors are the key dynamic component in this model and the basis for the platform operations in the JME. The LVC platform behavior component contains elementary and universal elements that determine the way LVC platform entities operate. The **LVC platform behavior component elements** provide the logical and mathematical operations that give the LVC platform entities within the JME their dynamic nature. The LVC platform behavior elements also provide the primary *interaction*[10] between the LVC platform and LVC environment.
LVC platform behavior elements enable general elementary battlespace operations (e.g., move, see, shoot, communicate, control (C2), etc.) that influence operations of LVC platforms. The LVC platform behavior elements play the primary role in providing the implemented LVC platform behaviors to a LVC platform.

2.3. LVC Environment

The LVC environment component specifies the environment or environmental representation elements and environmental effects elements in which the LVC platform entities exist and their LVC platform behaviors are influenced (i.e., moving over mud or asphalt). **LVC environment elements** describe the environment or environmental representation (e.g., terrain, weather, atmosphere, cultural features, tactical networks, etc) in which the LVC platform objects exist and their LVC platform behaviors are influenced (i.e., moving over mud or asphalt).

2.4. Mission Function

The mission function component is composed of:

- LVC platform
- LVC platform behavior
- LVC environment components to represent system of systems *emergent interactions*[11] (e.g., kill chain events such as find, fix, target, track, engage, and assess (F2T2EA))

The mission function is created specifically to associate the interactions of LVC platforms with LVC platform behaviors and the LVC environment in a particular JME test event. **Mission function elements** describe mission specific events, (i.e., command and control (C2), engagement or kill chain, recon, engineering, logistics, etc.). Generally, the emergent LVC platform behaviors of the instantiated LVC platforms (entities), their corresponding LVC platform behaviors, and the LVC environment enable mission functions.

---

[10] A JFM Interaction is an action that occurs when two or more component elements have an effect upon one another.
[11] A JFM Emergent Interaction is an action that occurs when a number of JME entities with associated LVC Platform Behaviors operate in the JME, forming more complex LVC Platform Behaviors as a collective.

3. JME Foundation Model (JFM) Views

The JFM is developed and documented using industry standard diagramming, such as DoDAF and Unified Modeling Language (UML). DoDAF was originally created to describe C4ISR architectures. The JFM taxonomy in this regard is not a one-to-one mapping into the DoDAF view definitions. Therefore, the definitions of the DoDAF views were tailored toward the UML 2.0 standard in order to apply them to this process. There is a close relationship between DoDAF and UML. The JFM is documented using both standards, and Table 3-1 illustrates the relationships and interchangeability between standards.

Table 3-1. DoDAF Views Used in the JFM

DoDAF View ID	DoDAF View Name	UML View	Application
AV-2	Integrated Dictionary	N/A	Dictionary of terms used in the JFM
OV-1	High-level Operational Concept	N/A	High-level description of the four (4) top-level JFM components
SV-4 Level 1	JFM Functional Decomposition Description: Level 1	UML Class Diagram	Define the relationships between the four top-level JFM components. This creates a high-level schema for semantic interactions within the entire JFM.
SV-4 Level 2	JFM Functional Decomposition: Level 2	UML Class Diagram	Captures the hierarchical structure (e.g., decomposition) of the JFM components.
SV-6	JFM Data Exchange Matrix	N/A	Identify the highest level of interactions and data exchange by the JFM components
SV-10c	JFM Event Trace Description	UML Sequence Diagram	Sequence diagrams that illustrate the activities of the JFM elements in relation to the JFM interactions
TV-1	Technical Standards Profile	N/A	Lists the technical standards and published guidelines for updating or using the JFM.

4. JME Foundation Model Description

Figure 4-1 depicts the core JFM components.

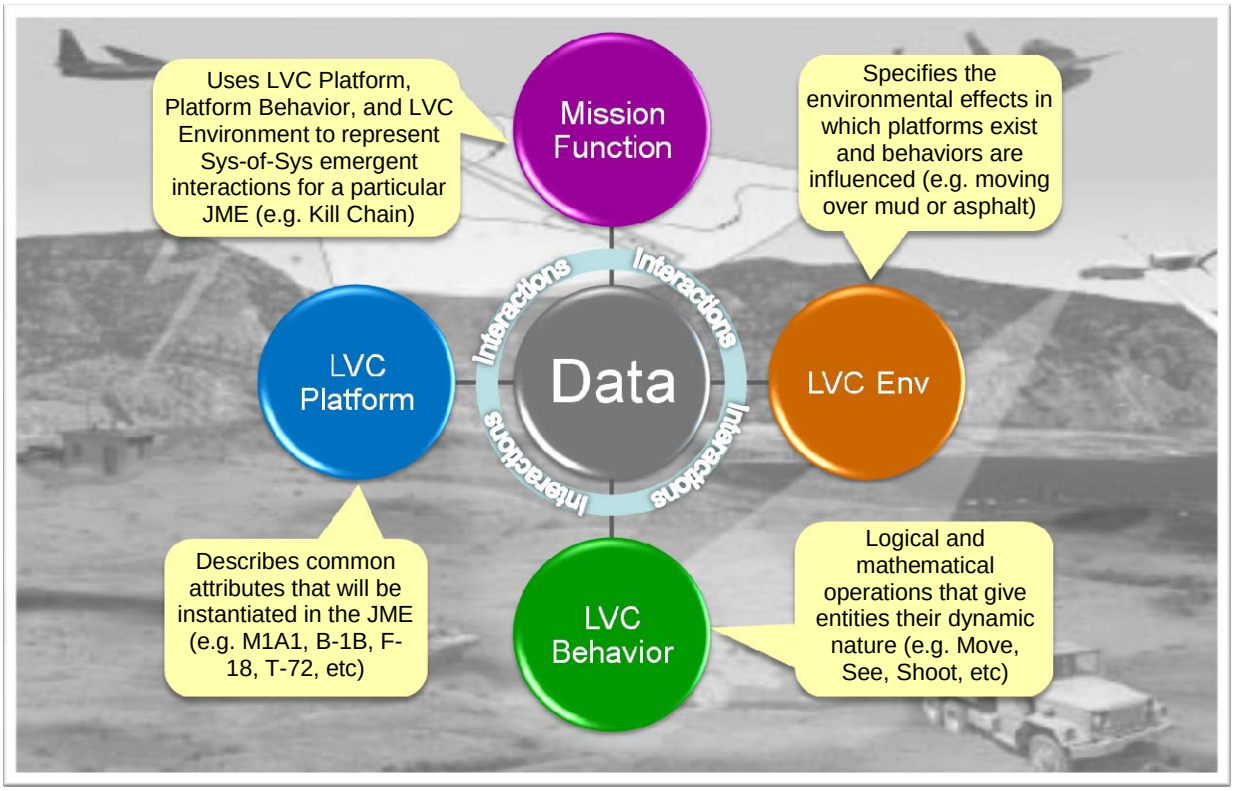

Figure 4-1. OV-1 JFM High-Level Operational Concept

4.1. OV-1 High-level Operational Concept: JFM Component Description

The JFM has four (4) core components – LVC platform component, LVC platform behavior component, mission function component, and LVC environment component. The component elements are the base definition for instantiated entities that interact with each other to accomplish operations and collect test data in a JME. LVC platform entities are the entities that will exist in the JME and that store the state data for each instance of an entity. The LVC platform behavior component contains the mathematic and logical algorithms that create interactions and give the LVC platforms their dynamic nature. The mission function component is universal, environmental, or specific situations that influence the way LVC platforms operate. The LVC environment component describes the environment in which the LVC platforms entities exist and the LVC platform behaviors operate.

4.2. SV-4 LEVEL 1 JFM Level 1 Functional Description

The “system nodes” for the JFM are the components in the model. The JFM is structured to allow the insertion of more detailed component element definitions

(e.g., further levels of decomposition). Figure 4-2 illustrates the JFM components and their relationships.

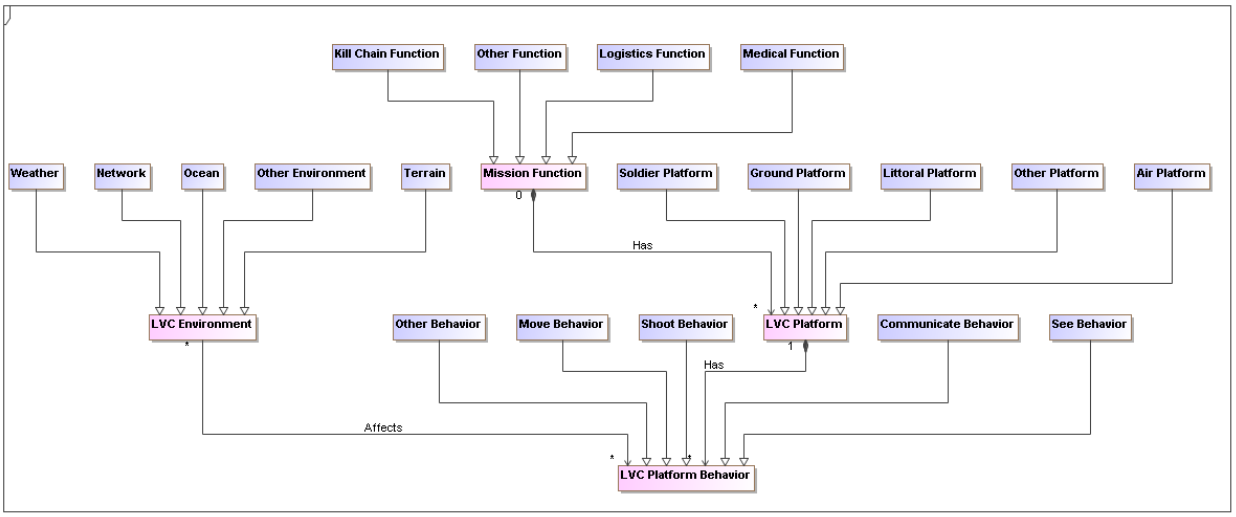

Figure 4-2. SV-4 LEVEL 1: JFM Component Relationships

4.2.1 LVC Platform Component Description

The LVC platform component contains representations of the friendly and threat combatants (i.e., soldier, ground, air, littoral, space, etc), and non-combatants. An example of LVC platform representation can be a live entity on a range, or a virtual/constructive representation in the JME. The LVC platform capabilities are composed of LVC platform behaviors (e.g., move, shoot, communicate, etc.). The LVC environment component (e.g., sensing, mobility, communications, etc.) influences the LVC platform behavior. Human entities are also represented as platforms whereas human effects can drive human LVC platform behavior implementations. Munitions are also examples of platforms as they have their own LVC platform behavior representations.

4.2.2 LVC Platform Behavior Component Description

The LVC platform behavior component contains the controls and influences the indoctrinated actions or reactions of an LVC platform entity in relation to LVC environment influences (e.g., effects). The representation of the complexity or required physics of the LVC platform behavior of an LVC platform is related to the fidelity requirement of that LVC platform behavior to answer evaluator questions (i.e., high fidelity mobility representation versus way-points). For example, the move LVC platform behavior element contains all operations necessary to move LVC platform entities in the JME in a manner that can represent the required physics. Control representation is also included in this component. Examples of control elements are the decision-making characteristics of a C2 cell, or the physical analog or digital (A/D) controls of a LVC platform, i.e., pilot controls, steering wheel, or gas pedal. LVC platform

behavior elements can also be implemented as instrumentation for integration of live entities. For example, a Move element implementation could be GPS instrumentation to track movement of a LVC platform entity within the JME.

4.2.3 LVC Environment Component Description

The LVC environment component provides the context within which the JME entities operate. The LVC environment component contains the data and representations of the terrain, ocean, weather, tactical networks, and physical phenomena that make LVC platform behavior, like sensing, moving, and communicating, meaningful. It also provides all of the data on the physical and man-made features that exist in the environment (e.g., cultural features). The LVC environment component is related to the LVC platform behavior component as a source of information that impacts the behavior element operations. For example, environment data has an important impact on the ability of platform entity to move from one location to another. This impact is represented by the interaction between the LVC environment and the move element of the LVC platform behavior component illustrated in the JFM SV-4 level 1. It has similar impacts on the ability of the platform entity to “see” the battlespace or to “communicate” with other entities in the battlespace.

4.2.4 Mission Function Component Description

The mission function component brings together a broad set of representations for common system of systems (SoS) operations. For example, most LVC platforms will have LVC platform behavior (e.g., move, see, and communicate, etc.) that will enable a specialized mission function. A combat vehicle would move, see, communicate, or shoot to enable the mission function of kill chain. A re-supply unit would move, see, and communicate followed by the supply of replacement parts, food, water, ammunition, etc. An external battle command cell would move, see, and communicate followed by the issuance of an order. An engineering unit’s function may be the creation or repair of a bridge, emplacement of a minefield, or the decontamination of vehicles. Finally, a medical unit’s function may be combat casualty care or medical care to civilians. In most cases, LVC platform behaviors are carried out for the purpose of enabling a mission function. There may be a need for special cases to address those functions outside the scope of the JFM.

Mission function will vary from test vignette to test vignette. The idea is to compose SoS emergent capabilities from elementary LVC platforms and LVC platform behavior within this model. The hypothesis is that there will be repeatable instances of platform behavior across multiple mission functions (e.g., a platform will move to accomplish a mission function of kill chain, a platform will also move to accomplish a recon mission function. In both cases, the platform will have the same move behavior). This allows for a composable, capabilities-based process to instance a JME. Mission function should also provide the glue to the corresponding task list (i.e., UJTL).

4.3. SV-4 LEVEL 2 JFM Functional Decomposition

The JFM is organized hierarchically from the components of the model. This current structure allows decomposition to elements within the components at a specified level, but can be extended as necessary. This decomposition structure allows organization of concepts with similar attributes and functionality.

4.3.1. LVC Platform Component Element Decomposition

The following are LVC Platform component element decomposition descriptions illustrated in the upper portion of Figure 4-3.

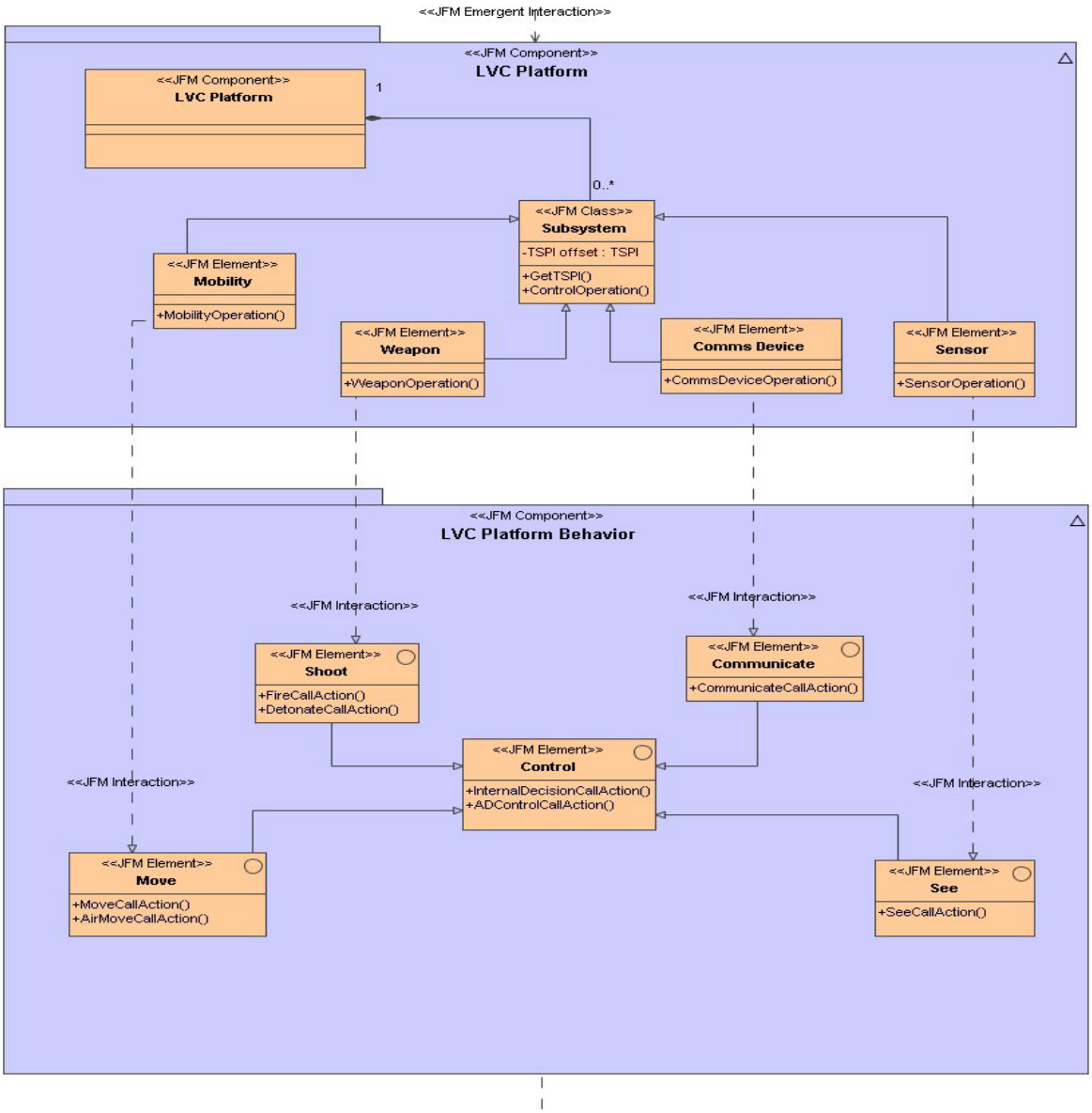

Figure 4-3. SV-4 LEVEL 2: LVC Platform Component and Platform Behavior Component Element Decomposition

4.3.1.1. Mobility

The mobility element contains representations for the movement of ground, air, sea, sub-sea, and non-combatant platforms. Implementation of the move LVC platform behavior govern ground, air, sea, and sub-sea movements.

4.3.1.2. LVC Platform Subsystem

The LVC platform subsystem element contains attributes for the offset and placement of subsystems. Subsystems can inherit from the subsystem element.

A. **Weapon -** A weapon is a launch platform for munitions (bullets, shells, missiles, etc.). Munitions are a LVC platform entity instance in the sense that it may have the ability to implement LVC platform behavior. A weapon implements the shoot LVC platform behavior, which is the discrete action of firing a munition.

B. **Communication Device** - A send/receive communication device represents the ability of a receiver to access information sent by a transmitter (i.e., radio or voice). The communication device instance is represented by the communicate LVC platform behavior.

C. **Sensor** - A sensor is a perception device of a LVC platform. The see LVC platform behavior represents the sensor device instance. The see LVC platform behavior represents the operations to acquire sensed information. For example, the see LVC platform behavior would represent the operations necessary for a perception device to acquire an image or radar cross section. A platform may have many sensors with different represented see LVC platform behaviors.

4.3.2. LVC Platform Behavior Component Element Decomposition

The following are LVC platform behavior component element decomposition descriptions. LVC platform behavior elements are closely related to LVC platform components. Figure 4-4 illustrates these relationships in the lower portion. Each of these behavior components also implements the required effects. Effects are dynamic environmental phenomena that are the effects of other actions, especially those taken by modeled entities. These include the propagation effects, disturbances, communication effects, sensor effects, and other effects on the environment, i.e., emission of smoke, obscurants, or dust.

4.3.2.1. Move

The move element contains the operations for the movement of ground, air, sea, sub-sea, and non-combatant platform entities. Ground, air, sea, and sub-sea movements imply the tactically appropriate movement for friendly

and threat military vehicles and units. Rules [e.g., Artificial Intelligence (AI)] or real humans playing in the JME govern human move representation. Move will provide operations for the LVC platform mobility element.

4.3.2.2. See

The see element contains the operations for the sensing of the battlespace. See is the process of perceiving the LVC environment; See will provide operations for the LVC platform sensor element.

4.3.2.3. Communicate

A communication device instance is represented by the communicate LVC platform behavior. A send/receive communication device represents the ability of a receiver to access information sent by a transmitter (i.e., radio or voice). A communicate LVC platform behavior can be represented implicitly (e.g., high fidelity) or statistically (e.g., low fidelity). Generally, the communicate LVC platform behavior is represented by the interaction of other JFM components to provide the representation of the tactical network and communication effects within the LVC environment.

4.3.2.4. Shoot

The shoot LVC platform behavior represents the actions of firing munitions from weapons.

4.3.2.5. Control

Control manages the LVC platform behavior of entities. This includes the internal battle command of an entity, or the operation of control instruments within an entity (i.e., steering wheel). Internal battle command is a control element that may be either an individual entity or a group of entities forming a unit (i.e., within a platform, or a small group of platforms) that uses its own situational understanding, through the internal organization of information and reasoning, on that information to make decisions.

4.3.3. LVC Environment Component Element Decomposition

Environmental representation is the data and dynamic representation of the environment and provides interactions that influence LVC platforms and their LVC platform behaviors. The following are LVC environment component element decomposition descriptions illustrated in Figure 4-4.

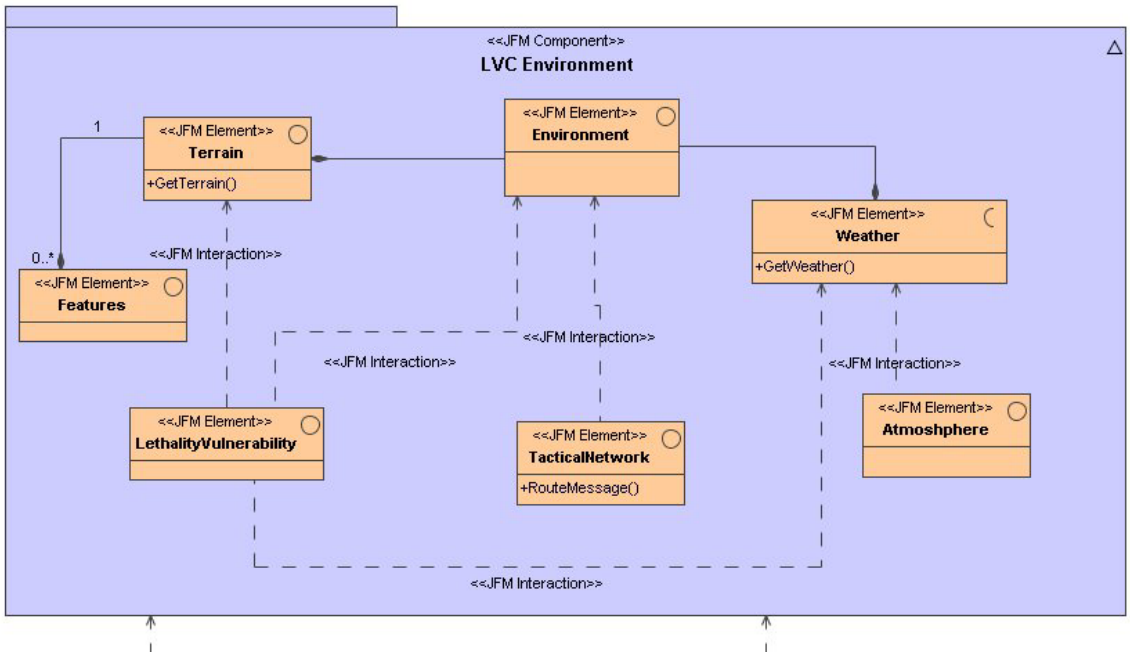

Figure 4-4. SV-4 LEVEL 2: LVC Environment Component Element Decomposition

4.3.3.1. Terrain

Terrain refers to the topographic representation of the lie of the land, and various other characteristics of physical geography (i.e., elevation, slope, materials, and orientation, etc.).

4.3.3.2. Weather

Weather is an all-encompassing term used to describe the Earth's tropospheric meteorological data (i.e., temperature, barometric pressure, wind speed/direction, rain, cloud cover, etc.). This type of data is synonymous to what one could get in the local weather forecast. Weather is normally represented over large 3-D cells usually at 10km resolution.

4.3.3.3. Atmosphere

Atmosphere is the general name for the representation of the varied phenomena that can occur within a tropospheric cell such as the representation of turbulence, fog, etc. The atmosphere provides the detailed information contained within a 10km weather cell.

4.3.3.4. Features

Features are composed of the natural and man-made elements in the environment. Natural features include things like trees, vegetation, and rivers. Man-made features include things like roads, bridges, fences, power lines, obstacles, and buildings. Feature elements also contain characteristic

data such as geometry and materials for interaction with other LVC environment elements and LVC platform behavior.

4.3.3.5. Tactical Network

All mission functions require tactical communication networks to provide information operations. Tactical communications include voice and data communications. The tactical network does not represent these operations, but is part of the environment and is essential toward making communication operations possible. A complete representation of information exchange requires representation of a network (e.g., physical layer, routing and topology, transport layer (i.e., TCP)).

4.3.3.6. Lethality/Vulnerability

The lethality/vulnerability elements report platform operational status, damage percentage state, and capability assessment of platforms. This is critical in assessing platform capabilities such as mobility and weapon firing. Platform owners can apply the results of the capability assessment derived from the vulnerability and lethality elements to platforms and modify the platform LVC platform behaviors. For example, if a platform were hit and rendered not movable, lethality/vulnerability would report which components were affected; the listener can then apply this state to platform in the JME and kill the mobility of the platform.

4.3.4. Mission Function Component Element Decomposition

Mission function elements describe mission specific events and are generally enabled by the emergent LVC platform behaviors of the instantiated LVC Platforms (entities), their corresponding LVC platform behaviors, and LVC environment influence. Figure 4-5 illustrates these relationships.

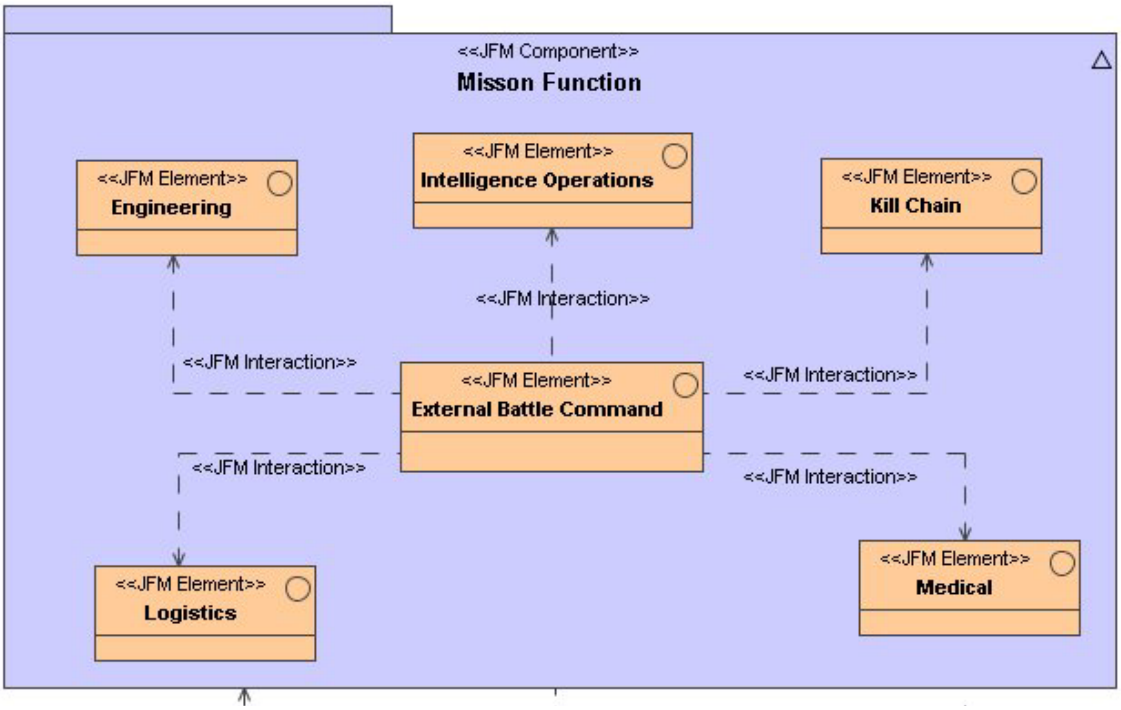

Figure 4-5. SV-4 LEVEL 2: Mission Function Component Element Decomposition

4.3.4.1. Kill Chain

The kill chain is one of the most prevalent mission functions. Entities may engage one another in a number of different ways. In each case the objective is for one entity to gain the advantage over the other by reducing the capability state (i.e., strength, health, knowledge, mobility, or effectiveness) of the other.

4.3.4.2. Intelligence Operations

Intelligence is a mission function to gain intelligence of the battlespace. This occurs through sensing or human intelligence.

4.3.4.3. Engineering

Engineering is a mission function that modifies the environment. Construction allows entities to create structures like bridges, buildings, and airstrips. Destruction allows the reverse of this to any battlespace entity that can be degraded or removed (i.e., bridges, obstacles, buildings, minefields). Mobility and counter-mobility operations are designed to improve or degrade the ability of a unit to maneuver. This may include working on bridges, but also includes working on roads and open terrain. Mine operations are the creation of minefields. Decontamination represents the engineer's actions to remove, retard, or destroy chemical, biological, radiological, and nuclear (CBRN) agents and materials.

4.3.4.4. Medical

Medical support is a mission function to provide combat casualty care following engagements. This mission function can also provide medical support to civilians and other entities that have incurred damage from sources other than combat.

4.3.4.5. Logistics

Logistics is a mission function that provides the maintaining of equipment; consuming perishables and spare parts; and re-supply and replacement of these consumables; transportation; and reinforcements.

4.3.4.6. External Battle Command

External battle command is a mission function to provide command, directing, and targeting. These activities represent the exchange of a mission between the element that plans it and the element that must execute it (e.g., internal battle command/control; see Section 5.3.2.5).

4.4. JFM Decomposition Summary

"Whereas logical information resources will remain relatively static, the physical resources will change dynamically."
- Bryce's Law

4.4.1. Logical Versus Physical Design

Physical aspects of distributed testing capabilities and resources, a.k.a. distributed testing "enterprise", are well understood by the owners and developers of those resources (e.g., instrumentation, virtual representation of tactical entities, databases, environmental representations, communication effects, visualization, etc.). The logical aspects of a distributed test capability are more abstract than the physical counterparts. Logical design components include platform, platform behavior, environment, and mission function and describe the relationships between these components.[12] The physical entities describe "how" the logical design construct will be implemented.

As Bryce's Law states, physical implementation is ultimately based on available technology and, as such, changes dynamically. In contrast, the logical side represents the inherent nature of a distributed testing "system" and only changes if the intent of that distributed testing system changes. Therefore, the logical design by nature is much less volatile that the physical design and implementation. This gives systems engineers and developers an enterprise view of the overarching distributed testing capability and allows for the evolutionary insertion of physical technology into that design as time progresses.

The JME Foundation Model is a metamodel, or logical design pattern, that is a precursor to the logical design. The JFM in this sense gives the logical designer a pattern (or template) to follow to map capabilities and behaviors into the logical design based on the mission function leading to an LVC-DE that supports testing in a joint environment. The logical design is a precursor to physical design where the physical implementation must provide a capability to meet the logical design requirement. The logical design should always precede physical design, and the two should evolve and mature in that respective order.

4.4.2. Capabilities re-engineering and the Logical Design

When enormous resources are committed to implement a particular physical solution, developers are often concerned that any deviation in implementation could have serious consequences. This includes migration to a more service oriented architecture approach to collaboratively design, build and share an enterprise capability. The reason for this is that development is more focused on physical implementation than the logical design characteristics of a distributed

[12] An additional component is the evaluator or evaluation. This component will be integrated in a future JFM version.

enterprise. Physical components are much more tangible, accessible, and less nebulous than logical constructs.

This process does not call for re-engineering existing stovepipe capabilities; rather it introduces a process for engineering an enterprise design to be implemented by various physical solutions. The physical solution could very well be an existing capability that is implemented within the logical design via an interface, or the exposure of a capability of interest within that existing solution for consumption by the other components in the JME. Existing gaps in our capabilities can easily be identified through this process to focus resources to fill those capability gaps based on a logical enterprise design.

The logical design provides the what, both qualitatively and quantitatively. The physical solution is “how” a logical design parameter is implemented. Before embarking on physical implementation of the distributed test enterprise, development should examine logical components understand the enterprise.

4.4.3. JFM Process Example

Figure 4-6 shows the abstract components and the logical and physical decompositions that result from the interaction with the mission function component. As the various logical components are defined through the aid of the JFM pattern, they are then linked to the physical components that implement them, thereby demonstrating how the physical solution satisfies the logical design.

- An example logical design model of a platform component will include a meta description of an Attack Aircraft implemented as an F-16
- A “See” Behavior (function) could have suitable physical implementations such as a virtual spectral imager associated with the F-16 that would “see” the target
- The Environmental component that affects the See behavior could be cloud cover, with a physical implementation of cumulonimbus, which would drastically affect the see behavior implemented by the spectral imager
- The end result is a implemented platform component with its implemented behavior(s) and the weather component that influences the behavior(s)
- Mission function component describes mission specific events or tasks and are generally enabled by the emergent platform representations with their associated behaviors along with environmental influences

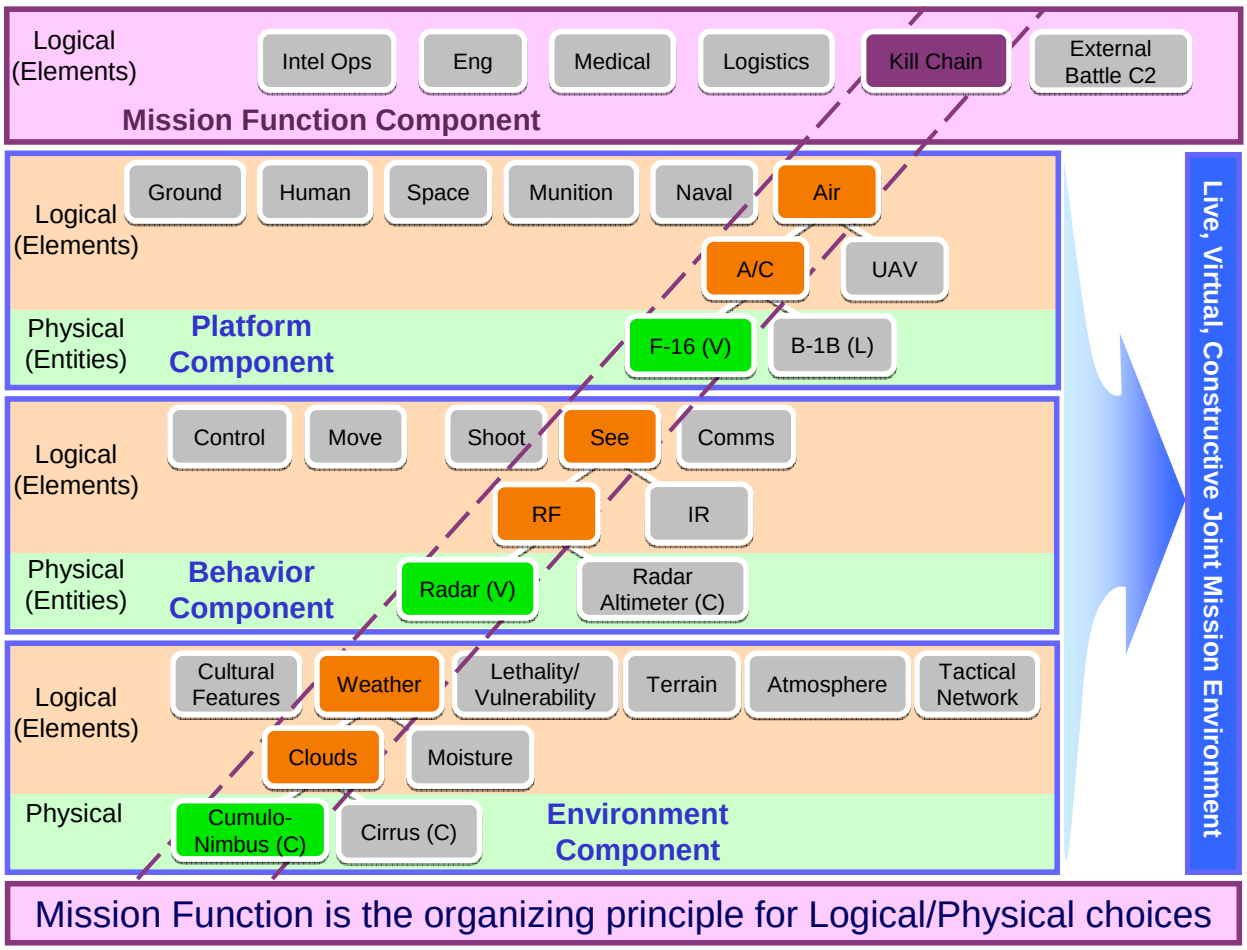

Figure 4-6. JFM Decomposition Summary

4.5. SV-6 JFM Data Exchange Matrix

The four components in the JFM contain information that is exchanged with each other. The definition of the information exchange at this level characterizes the type of information or relational attributes (reference Table 4-5. SV-6 Data Definitions). This view serves as the foundation of the "types" of information exchange. This view does not provide specific attributes, data formats, data frequencies, etc. These specific information characteristics will be defined in the physical design of the JME. Tables 4-1 to 4-4 describe the interactions of the JFM LVC platform, LVC platform behavior, LVC environment, and mission function components and elements, respectively.

Platform Interactions		Operations	Input Attributes (Complex Data Types)	Output Attributes (Complex Data Types)	External Calls	Description
Level 2	Level 3					
Ground Platform			ControlParameters, Environment	PlatformState; TSPI	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
	Wheeled Platform		Inherit Ground Platform	Inherit Ground Platform	Inherit Ground Platform	
	Tracked Platform		Inherit Ground Platform	Inherit Ground Platform	Inherit Ground Platform	
LittoralPlatform			ControlParameters, Environment	PlatformState; TSPI	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
	Ship		Inherit Littoral Platform	Inherit Littoral Platform	Inherit Littoral Platform	
	Boat		Inherit Littoral Platform	Inherit Littoral Platform	Inherit Littoral Platform	
	Submarine		Inherit Littoral Platform	Inherit Littoral Platform	Inherit Littoral Platform	
SpacePlatform			ControlParameters, Environment	PlatformState; TSPI	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
	Satellite		Inherit Space Platfform	Inherit Space Platfform	Inherit Space Platfform	
	Space Craft		Inherit Space Platfform	Inherit Space Platfform	Inherit Space Platfform	
	ICBM		Inherit Space Platfform	Inherit Space Platfform	Inherit Space Platfform	
Air Platform			ControlParameters, Environment	PlatformState; TSPI	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
	Rotary Platform		Inherit Air Platform	Inherit Air Platform	Inherit Air Platform	
	Winged Platform		Inherit Air Platform	Inherit Air Platform	Inherit Air Platform	
	Jet Platform		Inherit Air Platform	Inherit Air Platform	Inherit Air Platform	
HumanPlatform			ControlParameters, Environment	PlatformState; TSPI	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
Munition			ControlParameters, Environment	PlatformState; Detonate	MobilityOperation; SensorOperation; ControlOperation;CommsDevice Operation; WeaponOperation; ExternalBattleCommand	
	Balistic Munition		Inherit Munition	Inherit Munition	Inherit Munition	
	Guided Munition		Inherit Munition	Inherit Munition	Inherit Munition	
	CBRN		Inherit Munition	Inherit Munition	Inherit Munition	
	Mines		Inherit Munition	Inherit Munition	Inherit Munition	
Subsystem		GetTSPI(); ControlOperation();	ControlParameters, Environment			
	Comms Device	CommsDeviceOperation();	Inherit Subsystem	Signal	StatisticalComms; ImplicitComms;	
	Sensor	SensorOperation();	Inherit Subsystem	Graph	IRSee; VisualSee; SARSee; RadarSee; SeismicSee; AudioSee; HumanSee;	
	Weapon	WeaponOperation()	Inherit Subsystem	Fire		
	Mobility	MobililtyOperation()	Inherit Subsystem	TSPI	GroundMove; LittoralMove; SpaceMove; AirMove; HumanMove	

Table 4-1. LVC Platform SV-6

Behavior Interactions		Operations	Input Attributes (Complex Data Types)	Output Attributes (Complex Data Types)	External Calls	Description
Level 2	Level 3					
Control		ControlCallAction()	PlatformState; Environment; ControlParameters	ControlParameters	StatisticalAIModel; Human; ImplicitAIModel	
	A-DControl	A-DCallAction()	Inherit Control	Inherit Control	Inherit Control	
	InternalDecision	InternalDecisionCallAction()	Inherit Control	Inherit Control	Inherit Control	
INHERIT CONTROL						
Move		MoveCallAction()	PlatformState; Environment	TSPI	LiveGPSInstrumentation; StatisticalMobility; ImplicitMobility	
	GroundMove	GroundMoveCallAction()	Inherit Move	Inherit Move	Inherit Move	
	AirMove	AirMoveCallAction()	Inherit Move	Inherit Move	Inherit Move	
	LitoralMove	LitoralMoveCallAction()	Inherit Move	Inherit Move	Inherit Move	
	SpaceMove	SpaceMoveCallAction()	Inherit Move	Inherit Move	Inherit Move	
See		SeeCallAction()	PlatformState; Environment;	Graph	StatisticalSensorModel; LiveSensor; ImplicitSensorModel	
	IRSee	IRSeeCallAction()	Inherit See	Inherit See	Inherit See	
	VisualSee	VisualSeeCallAction()	Inherit See	Inherit See	Inherit See	
	SARSee	SARSeeCallAction()	Inherit See	Inherit See	Inherit See	
	RadarSee	RadarSeeCallAction()	Inherit See	Inherit See	Inherit See	
	SeismicSee	SeismicSeeCallAction()	Inherit See	Inherit See	Inherit See	
	AudioSee	AudioSeeCallAction()	Inherit See	Inherit See	Inherit See	
Communicate		CommunicateCallActions()	PlatformState; Enviroment;	Signal	StatisticalCommsEffects; ImplicitCommsEffects; LiveCommsEffects	
	RadioComms	RadioCommsCallAction()	Inherit Communicate	Inherit Communicate	Inherit Communicate	
	VerbalComms	VerbalCommsCallAction()	Inherit Communicate	Inherit Communicate	Inherit Communicate	
	VisualComms	VisualCommsCallAction()	Inherit Communicate	Inherit Communicate	Inherit Communicate	
Shoot		FireCallAction(); Det	PlatformState; Environment	Fire; Detonation	StatisticalFiresModel; LiveFires; ImplicitFiresModel	
	IndirectFire	IndirectFireCallAction()	Inherit Shoot	Inherit Shoot	Inherit Shoot	
	DirectFire	DirectFireCallAction()	Inherit Shoot	Inherit Shoot	Inherit Shoot	
	Mine	MineCallAction()	Inherit Shoot	Inherit Shoot	Inherit Shoot	
	NonLethal	NonLethalCallAction)	Inherit Shoot	Inherit Shoot	Inherit Shoot	

Table 4-2. LVC Platform Behavior SV-6

LVC Environment Interactions		Operations	Input Attributes (Complex Data Types)	Output Attributes (Complex Data Types)	External Calls	Description
Level 2	Level 3					
Terrain		TerrainCallAction()	PlatformState; Environment	TerrainAttributes	LiveTerrain; StatisticalTerrain; ImplicitTerrain	
	DEM	DEMCallAction()	Inherit Terrain	Inherit Terrain	Inherit Terrain	
	SpatialRepresentation	SpatialRepresentationCallAction()	Inherit Terrain	Inherit Terrain	Inherit Terrain	
	EnvironmentEncoding	EnvironmentEncodingCallAction()	Inherit Terrain	Inherit Terrain	Inherit Terrain	
Weather		WeatherCallAction()	TSPI	WeatherAttributes	LiveWeather; StatisticalWeather; ImplicitWeather	
	MET_Data	MET_DataCallAction()	Inherit Weather	Inherit Weather	Inherit Weather	
	Clouds	CloudsCallAction()	Inherit Weather	Inherit Weather	Inherit Weather	
	Fog	FogCallAction()	Inherit Weather	Inherit Weather	Inherit Weather	
	Precipitation	PrecipationCallAction()	Inherit Weather	Inherit Weather	Inherit Weather	
Atmosphere		AtmosphereCallAction()	TSPI; Environment	AtmosphereAttributes	LiveAtmoshpere; StatisticalAtmoshpere; ImplicitAtmosphere	
	Particles	ParticlesCallAction()	Inherit Atmosphere	Inherit Atmosphere	Inherit Atmosphere	
	Turbulence	TurbulenceCallAction()	Inherit Atmosphere	Inherit Atmosphere	Inherit Atmosphere	
Features		FeaturesCallAction()	TSPI; Environment	FeatureAttributes	LiveFeatures; StatisticalFeatures; ImplicitFeatures	
	Man-made	Man-madeCallAction()	Inherit Features	Inherit Features	Inherit Features	
	Natural	NaturalCallAction()	Inherit Features	Inherit Features	Inherit Features	
LethalityVunerability		L_VCallAction()	TSPI; Platform.PlatformState; Munition.PlatformState; Environment	FaultTree	LiveVL; StatisticalVL; ImplicitVL	
Tactical Network		TacticalNetworkCallAction()	ActiveNodes; RoutingTables;	TacticalNetworkAttributes	LiveNetwork; StatisticalNetwork; ImplicitNetwork	
	CommsNetwork	CommsNetworkCallAction()	Inherit Tactical Network	Inherit Tactical Network	Inherit Tactical Network	
	SensorNetwork	SensorNetworkCallAction()	Inherit Tactical Network	Inherit Tactical Network	Inherit Tactical Network	

Table 4-3. LVC Environment SV-6

Mission Function Interactions		Operations	Input Attributes (Complex Data Types)	Output Attributes (Complex Data Types)	External Calls	Description
Level 2	Level 3					
Kill chain/ Engagement		KillChainCallAction()	Battle Objectives; Recon Data; Environment; Environment effects	DamageAssement		
	Find	FindKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
	Fix	FixKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
	Target	TargetKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
	Track	TrackKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
	Engage	EngageKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
	Asses	AssesKillChainCallAction()	Inherit Kill Chain	Inherit Kill Chain	Inherit Kill Chain	
Recon		ReconCallAction()	Battle Objectives; Logistics data; Environement effects	TargetLocation; TargetCapability; IdentifiedTargetCount		
	Find	FindReconCallAction()	Inherit Recon	Inherit Recon	Inherit Recon	
	Fix	FixReconCallAction()	Inherit Recon	Inherit Recon	Inherit Recon	
	Target	TargetReconCallAction()	Inherit Recon	Inherit Recon	Inherit Recon	
	Track	TrackReconCallAction()	Inherit Recon	Inherit Recon	Inherit Recon	
	Assess	AssesReconCallAction()	Inherit Recon	Inherit Recon	Inherit Recon	
Engineering		EngineeringCallAction()	Battle Objectives;			
	Construction	ConstructionCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Destruction	DestructionCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Mobility	MobilityCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Counter-Mobility	CounterMobilityCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Mine Operations	MineOperationCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Fortification	FortificationCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
	Decontamination	DecontaminationCallAction()	Inherit Engineering	Inherit Engineering	Inherit Engineering	
Logistics		LogisticsCallAction()	Battle Objectives; Recon data; Environment	HealthStatus; wealthStatus;		
	Consumption	ConsumptionCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
	Maintenance	MaintenanceCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
	Resupply	ResupplyCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
	Transportation	TransportationCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
	Reinforcement	ReinforcementCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
	Replacement	ReplacementCallAction()	Inherit Logistics	Inherit Logistics	Inherit Logistics	
Medical		MedicalCallAction()	Battle Objectives; Recon data; Logistics data;	CasualityAssesment; HealthStatus; WealthStatus		
	Combat Casualty Care	CombatCasualtyCallAction()	Inherit Medical	Inherit Medical	Inherit Medical	
	CivilCasualtySupport	CivilCasualtySupportCallAction()	Inherit Medical	Inherit Medical	Inherit Medical	
	CivilGeneralSupport	CivilGeneralSupportCallAction()	Inherit Medical	Inherit Medical	Inherit Medical	
External Battle Command (EBC)		BattleCommandCallAction()	Battle Objectives			
	Gather Intelligence	IntelligenceCallAction()	Inherit EBC	Inherit EBC	Inherit EBC	
	Data Processing	DataProcessingCallAction()	Inherit EBC	Inherit EBC	Inherit EBC	
	BattleInstructions	BattleInstructionsCallAction()	Inherit EBC	Inherit EBC	Inherit EBC	
	Drections	DirectionCallAction()	Inherit EBC	Inherit EBC	Inherit EBC	

Table 4-4. Mission Function SV-6

Complex Data Type	Definition
Platform State	Platform State is a complex data structure that includes Platform status information, e.g. Health, Wealth, Location, Position, etc.
Environment	Environment is a complex data type that can also include other complex data types for terrain, weather, atmosphere, features, etc. The Environment data type contains the descriptional attributes of the environment
TSPI	TSPI is a complex data type that includes the Time, Space, Position Information of an entity, e.g. Orientation, velocity, acceleration, etc.
Signal	Signal is a complex data structure that include information about transmitted or received information, e.g. Frequency, Amplitude, content, modulation, etc.
Graph	Graph is a special type of signal that also includes sensor output information, e.g. image, plot (RCS, SAR), etc.
Fire	Fire is a complex data type that contains relevant data to indicate the lauch of a munition from a weapon
Detonation	Detonation is a complex data type that contains the relevant information to initiate the combustion process of a munition/warhead
Control Parameters	A control parameter is a complex data type that includes the attributes to control behavior of other systems or devices, e.g. steering parameters, joystick parameters, internal decision parameters, etc.
Inherit	Inherit annotates that the sub-element can acquire complex data types or operations from a parent element
ActiveNodes	This complex data type contains the information necessary to identify the active nodes on a network
RoutingTable	This complex data type contains the information necessary to identify how data is routed in the network
TacticalNetworkAttributes	This complex data type contains the information necessary to define the transport and physical layers of the network, e.g. TCP/UDP routers, wireless devices, etc.
FaultTree	This complex data type provides the damage state of a Platform, e.g. Health (damaged components), Wealth, capability assessment, etc.

Table 4-5. SV-6 Data Definitions

5. SV-10c JFM Event Trace Descriptions

The JME SV-10c describes the JFM at the highest level of abstraction in terms of LVC Platform Behavior. The UML based diagrams, Figures 5-1 thru 5-5, provide an illustration of JFM component elements, and the sequential trace of actions and reactions.

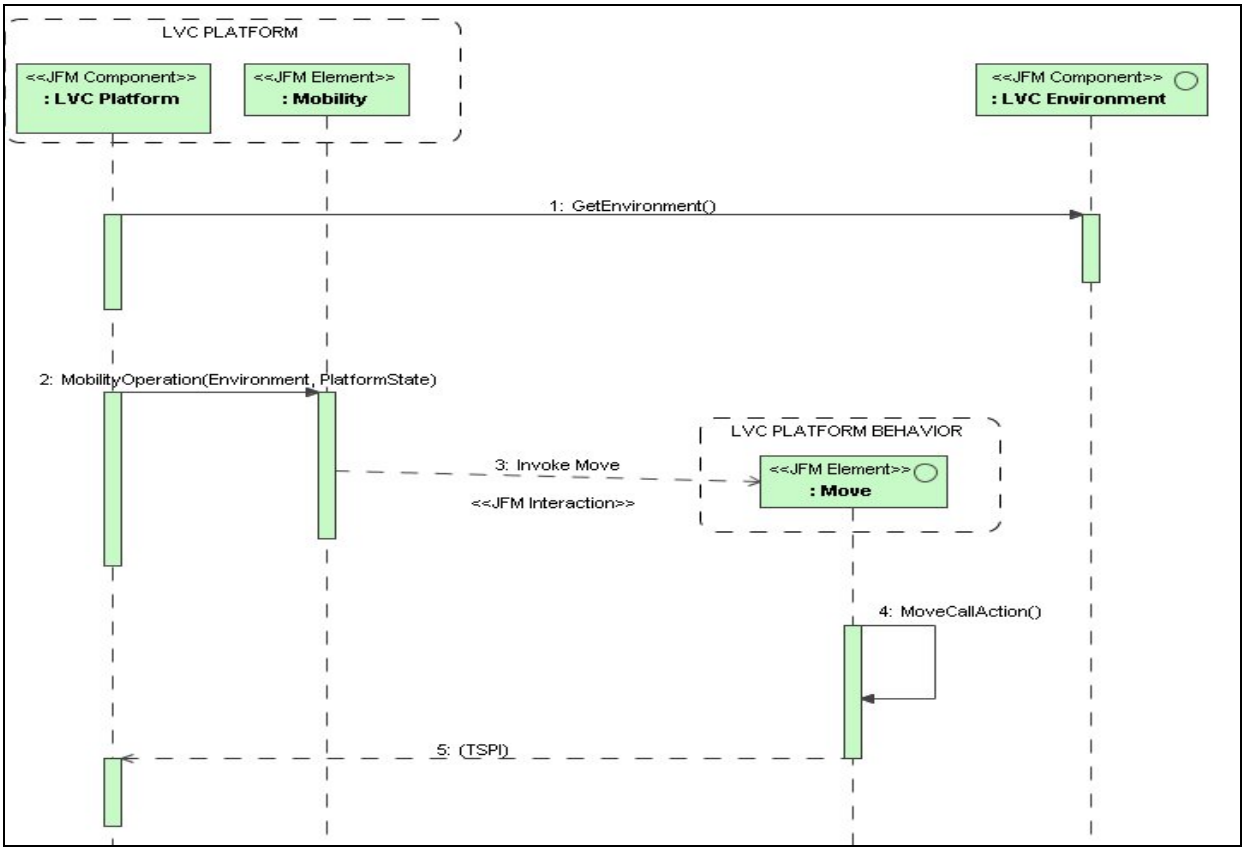

Figure 5-1. Move SV-10c

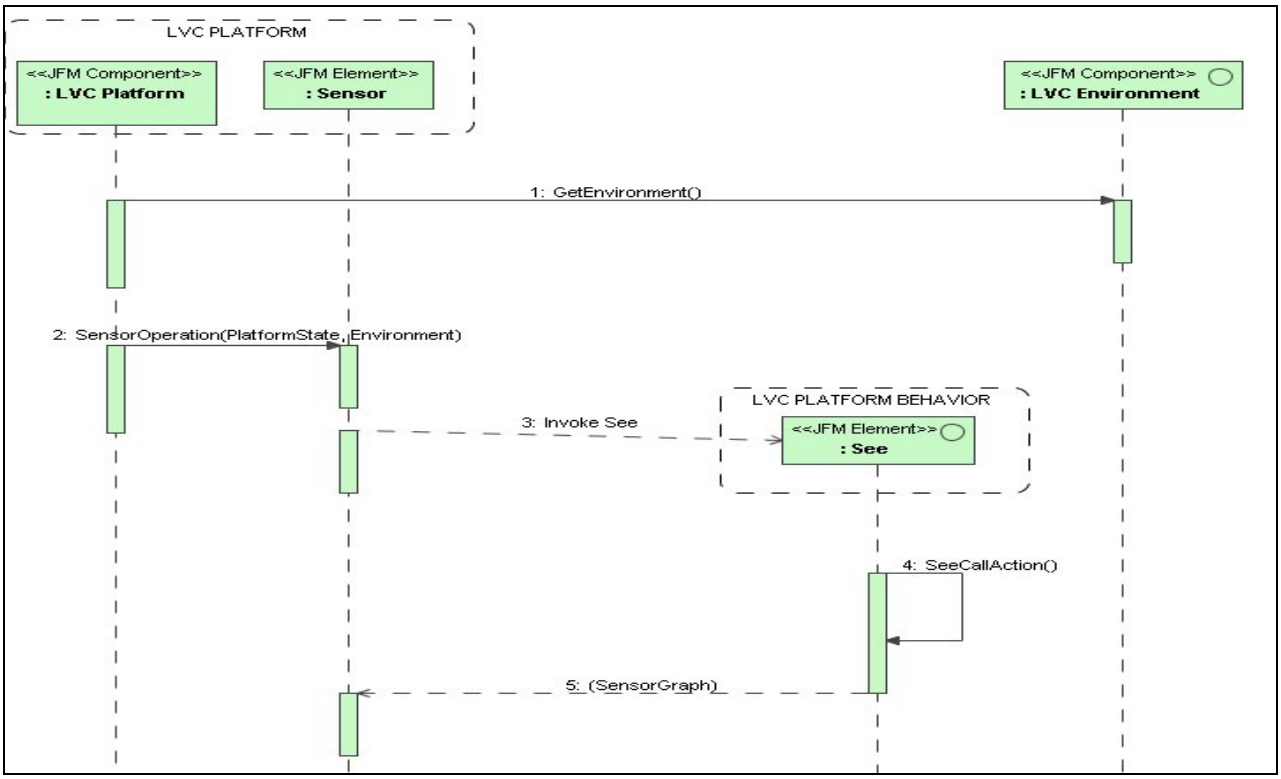

Figure 5-2. See SV-10c

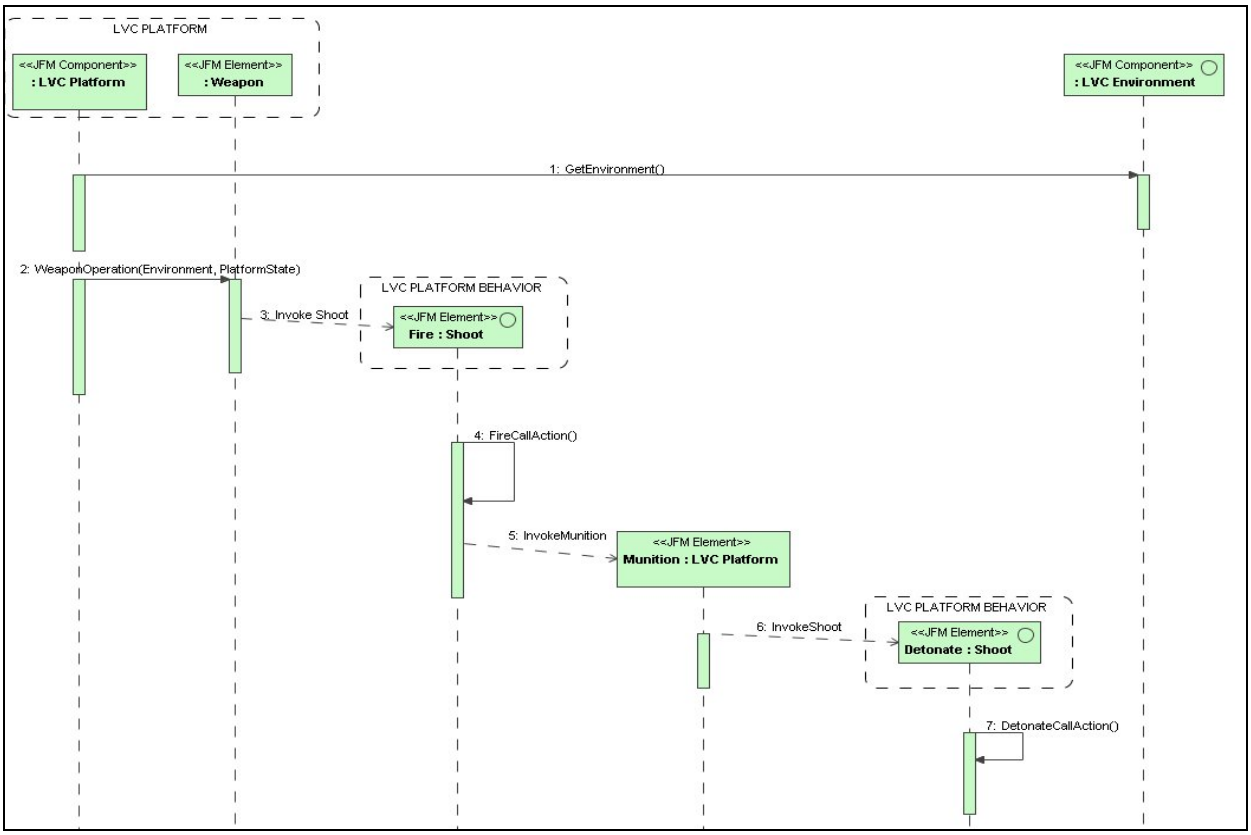

Figure 5-3. Shoot SV-10c

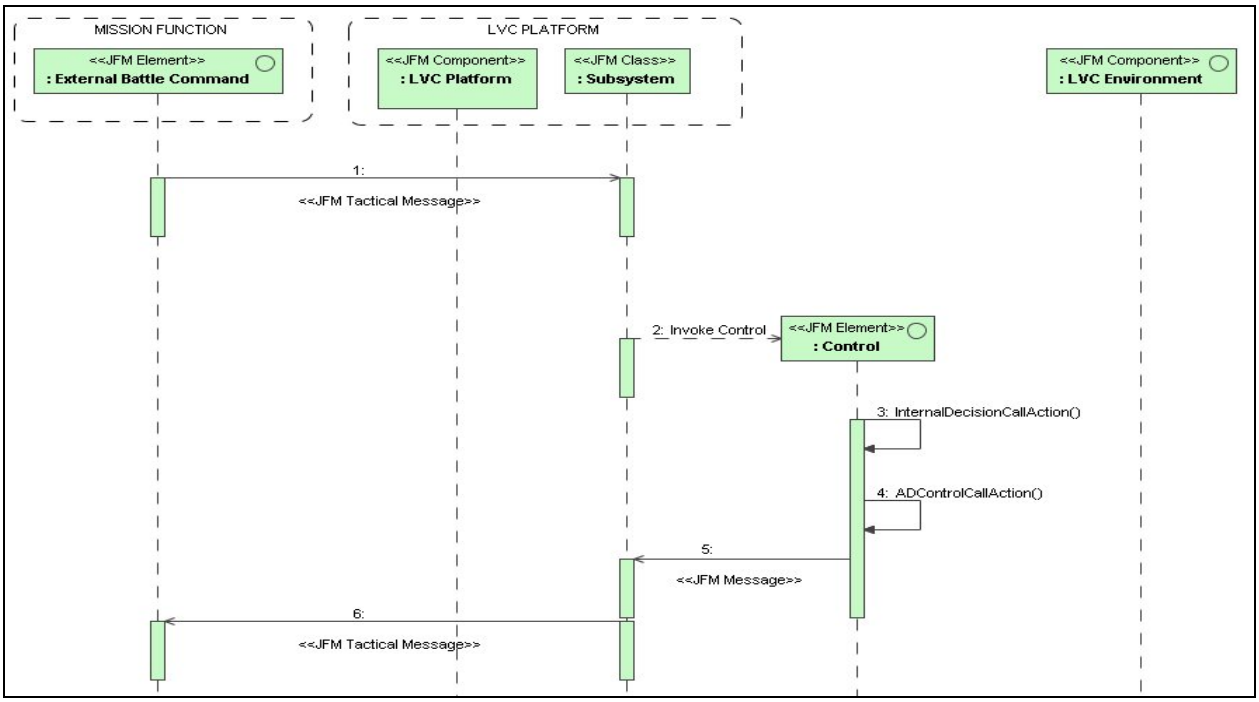

Figure 5-4. Control SV-10c

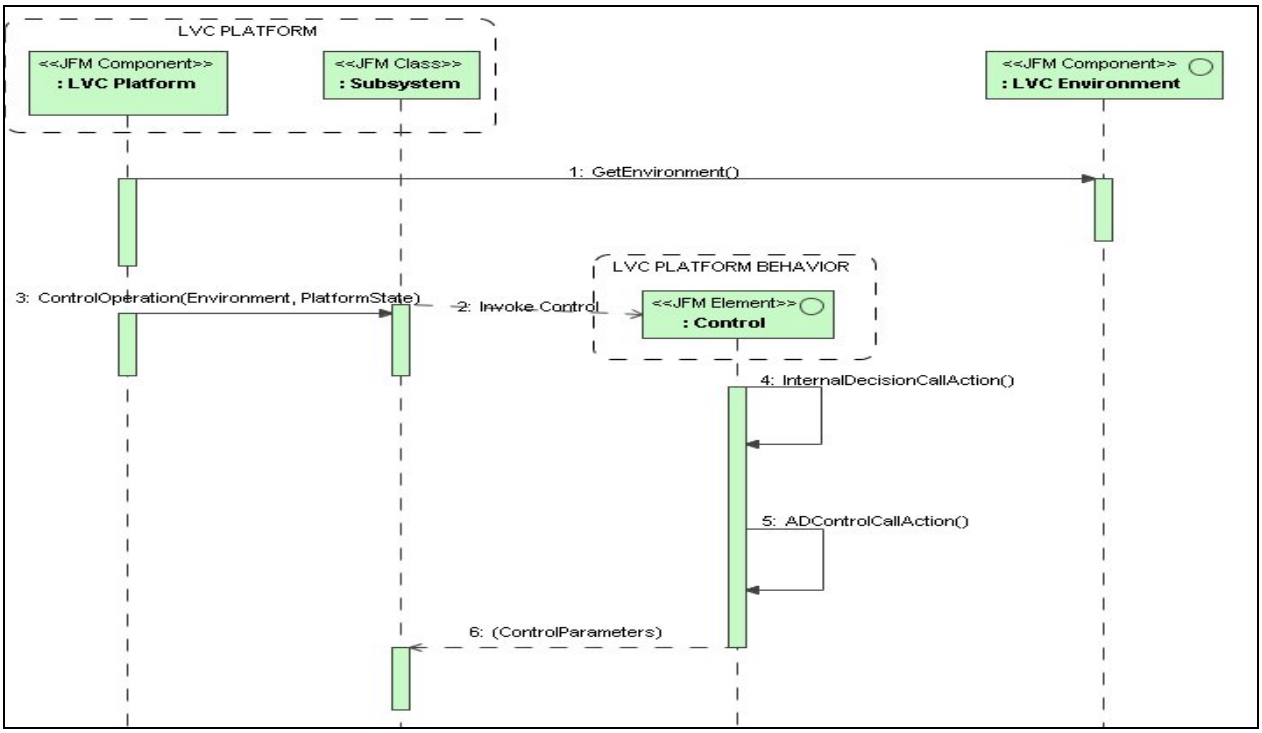

Figure 5-5. External Battle Command

6. JFM Dependencies

The end result of using the JFM will be implementation dependent on instrumentation, data collection, communication channels, and the overall test network.

7. Verification and Validation Process

The JFM will need to be verified against external sources to ensure that it captures the important LVC-DE capabilities that it is modeling.

8. AV-2 Integrated Dictionary

The AV-2, shown in Table 8-1, is an integrated dictionary of terms that are used within the architecture that may be unique or unfamiliar to the reading audience.

Table 8-1. AV-2 Integrated Dictionary

Term	Definition	Reference
Procedures	Encompasses the many forms of documented guidance and operational controls that affect all aspects of system development, integration, and operational functionality.	Procedures, Application, Infrastructure and Data (PAID) References
Applications	Encompasses the fundamental purpose and function for which any system is built - its mission. The functional requirements specified by users to perform an operational activity are the very essence of the system application.	Procedures, Application, Infrastructure and Data (PAID) References
Infrastructure	The attribute that supports the establishment and use of a “connection” between systems or applications. This includes hardware, security equipment, and “system services” that facilitate systems operations and interactions, such as communication protocol stacks and object request brokers (i.e., TENA).	Procedures, Application, Infrastructure and Data (PAID) References

Term	Definition	Reference
Data	Focuses on the information processed by the system. This attribute deals with both the data format (syntax) and its content or meaning (semantics).	Procedures, Application, Infrastructure and Data (PAID) References
JFM component	A cohesive, abstract package that contains particular types of JFM elements.	Model Driven Architecture (MDA) References
JFM element	A member of a component. Elements contain the base attribute or operations and provide the basis for instantiated entities in the JME.	Model Driven Architecture (MDA) References
JFM entity	An instantiated JFM element or sub-element that contains realized attributes and operations, and has a distinct, separate existence.	Model Driven Architecture (MDA) References
JFM **Interaction**	An action that occurs when two or more component elements have an effect upon one another.	Model Driven Architecture (MDA) References
JFM Emergent **Interaction**	An action that occurs when a number of JME entities with associated LVC Platform Behaviors operate in the JME, forming more complex LVC Platform Behaviors as a collective.	Wikipedia
Application Programming Interface (API)	Implementation of an interface that allows access of a system to other system functions, and/or to allow data exchange between systems.	IEEE
Kluge Kluged Kluging	A system, especially a computer system, that is constituted of poorly matched elements or of elements originally intended for other applications.	Dictionary.com (System Engineering Slang)

9. References

Procedures, Application, Infrastructure and Data (PAID)
Levels of Conceptual Interoperability Model (LCIM)
Model Driven Architecture (MDA)
UML 2.0
DoDAF
TENA
HLA
Battlespace Abstract Model
Conceptual Modeling
IEEE

ANNEX E – CHECKLIST EXTRACTS

CTM 1.1 Develop Capability/SoS Description Checklist

Recommended Input Info/Sources	Products	
1.1 Develop Capability/SoS Description		
▪ Joint Capability Areas (JCA) ▪ Initial Capabilities Document (ICD) ▪ Capability Development Document (CDD) ▪ Capability Production Document (CPD) ▪ Doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) Change Request (DCR) ▪ Other Test Plans (Developmental Test [DT], Operational Test [OT], Live Fire [LF] Test) ▪ Approved Analysis of Alternatives (AoA) Plan ▪ Analytical Baseline (DPS, MSFD, FYAB)	❑	a. Capability/SoS Description
	❑	b. Capability/SoS OV-1

CTM 1.2.1 Identify & Collect Evaluation Inputs and 1.2.2 Develop CCIs and COIs Checklists

Recommended Input Info/Sources	Products	
1.2 Develop Evaluation Strategy		
	❑	a. Evaluation Strategy
1.2.1 Identify & Collect Evaluation Inputs		
▪ Initial Capabilities Document/Capability Development Document ▪ Analysis of Alternatives ▪ Joint Capabilities Evaluation ▪ Joint Operational Context for Test (JOC-T)	❑	a. Functional Area Analysis Inputs
	❑	b. Functional Needs Analysis Inputs
	❑	c. Functional Solutions Analysis Inputs
	❑	d. Capability Description Inputs
	❑	e. Relevant Capability Analysis Designs and Results
	❑	f. Relevant Test &Evaluation Results
1.2.2 Develop CCIs and COIs		
▪ Functional Area Analysis Inputs ▪ Functional Needs Analysis Inputs ▪ Functional Solutions Analysis Inputs ▪ Relevant Capability Analysis Designs and Results ▪ Relevant T&E Results ▪ Joint Operational Context for Test (JOC-T) ▪ Joint Capability Area (JCA) – Universal Joint Task List (UJTL)/Service task mapping	❑	a. Critical Capability Issue (CCI)
	❑	b. Critical Operational Issue (COI)

CTM 1.2.3 Establish T&E Strategy Framework and 1.2.4 Develop Risks and Mitigations Checklists

Recommended Input Info/Sources		Products
1.2 Develop Evaluation Strategy		
1.2.3 Establish T&E Strategy Framework		
▪ Joint Operational Context for Test (JOC-T) ▪ Critical Capability Issues ▪ Critical Operational Issues ▪ Capability Crosswalk	❑	a. Independent factors: Joint mission(s)
	❑	b. Independent factors: Joint task(s)
	❑	c. Independent factors: Threat conditions
	❑	d. Independent factors: Environmental conditions
	❑	e. Independent factors: System/SoS configurations across DOTMLPF
	❑	f. Dependent measures: Mission measures of effectiveness (MMOEs)
	❑	g. Dependent measures: Task measures of performance (TMOPs)
	❑	h. Dependent measures: System/SoS attributes
1.2.4 Develop Risks and Mitigations		
▪ Evaluation Strategy	❑	a. Identified Risks and Mitigations
1.2.5 Develop Infrastructure Strategy		
▪ JOC-T	❑	a. Infrastructure Strategy
▪ Evaluation Strategy		

CTM 1.4 Develop/Refine Capability Crosswalk Checklist

Recommended Input Info/Sources		Products
1.4 Develop/Refine Capability Crosswalk		
▪ Evaluation Strategy (across life cycle including Development Test [DT] and Operational Test [OT])	❑	a. Capability Crosswalk Matrix

CTM 1.3 Develop JOC-T Checklist

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
▪ Capability/SoS Description ▪ Joint Capability Areas ▪ Universal Joint Task List (UJTL) ▪ Joint Operations Concept (JOpsC) Family (Joint Operating Concept [JOC], Joint Integrating Concept [JIC], Joint Functional Concept [JFC]) ▪ Initial Capabilities Document (ICD) ▪ Capability Development Document (CDD) ▪ Capability Production Document (CPD)	❑	a. Joint Operational Context for Test (JOC-T)
1.3.1 Analyze Mission		
1.3.2 Analyze Blue		
1.3.3 Analyze Environment		
1.3.4 Analyze Threat		
1.3.5 Compose (JOC-T)		
1.3.6 Validate (JOC-T)		

CTM 1.3.1 Analyze Mission Checklist

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
	❑	a. Joint Operational Context for Test (JOC-T)
1.3.1 Analyze Mission		
▪ Concept of Operations Summary ▪ Analytical Baseline (DPS, MSFD, FYAB) ▪ OV-1 High-Level Operational Concept ▪ Objectives	❑	a. Operational Overview
	❑	b. Mission Portion of OV-1

CTM 1.3.2 Analyze Blue Checklist

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
	❑	a. Joint Operational Context for Test (JOC-T)
1.3.2 Analyze Blue		
▪ Joint Tasks ▪ Forces and Related Conditions ▪ Tasks Steps/Mission Threads ▪ Capability Discussion ▪ System/SoS Capabilities Required for Current Increment ▪ SoS Synchronization ▪ OV-1 High-Level Graphic ▪ OV-5 Operational Activity Model ▪ OV-2 Operational Node Connectivity Description ▪ OV-4 Organizational Relationship Chart ▪ SV-1 System/SoS Interface Description ▪ SV-5 Operational Activity to System/SoS Function Traceability Matrix ▪ SV-4 System/SoS Functionality Description ▪ SV-6 System/SoS Data Exchange Matrix	❑	a. Task Portion of OV-1
	❑	b. Blue Forces
	❑	c. Blue High-Level Graphic (BOV-1)
	❑	d. Blue Operational Activity Model (BOV-5)
	❑	e. Blue Operational Node Connectivity Description (BOV-2)
	❑	f. Blue Notional Relationship Chart/Task Organization (BOV-4)
	❑	g. Blue SoS Interface Description (BSV-1)
	❑	h. Blue SoS Operational Activity to System/SoS Function Traceability Matrix Description (BSV-5)
	❑	i. Blue SoS Functionality Description (BSV-4)
	❑	j. Blue Information Exchange Matrix (BSV-6)

CTM 1.3.3 Analyze Environment and 1.3.4 Analyze Threat Checklists

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
	❑	a. Joint Operational Context for Test (JOC-T)
1.3.3 Analyze Environment		
▪ Physical Environment Conditions ▪ Civil Environment Conditions	❑	a. Physical Environment Description
	❑	b. Civil Environment Description
1.3.4 Analyze Threat		
▪ Analytical Baseline (DPS, MSFD, FYAB) ▪ Threat and Operational Environment ▪ Threat Summary ▪ Threat Conditions ▪ System/SoS Threat Assessment	❑	a. Threat Forces (SoS Threat Assessment)
	❑	b. Threat Actions (SoS Threat Assessment)
	❑	c. Threat Interactions (SoS Threat Assessment)
	❑	d. Threat High-Level Graphic (TOV-1)

CTM 1.3.5 Compose JOC-T Checklist

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
	❑	a. Joint Operational Context for Test (JOC-T)
1.3.5 Compose JOC-T		
▪ Blue Forces ▪ Blue Actions ▪ Blue Interactions ▪ Physical Environment ▪ Civil Environment ▪ Threat Actions (SoS Threat Assessment) ▪ Threat Interactions (SoS Threat Assessment) ▪ Threat Forces (SoS Threat Assessment)	❑	a. Joint Operational Context for Test (JOC-T)

CTM 1.3.6 Validate JOC-T Checklist

Recommended Input Info/Sources	Products	
1.3 Develop JOC-T		
	❑	a. Joint Operational Context for Test (JOC-T)
1.3.6 Validate JOC-T		
▪ Joint Operational Context for Test (JOC-T) ▪ Analytic Agenda (DPS, MSFD, Analytical Baseline) ▪ STAR ▪ JCAs ▪ JOpsC Family (CCJO, JOC, JFC, JIC) ▪ Task Lists (UJTLs, JMETLs, Service tasks) ▪ COCOM IPL ▪ JCIDS Documents (ICD, CDD, CPD) ▪ CONOPS Documents	❑	a. Validation documentation for V&V Report

CTM 2.1 Develop Test Concept Checklist

Recommended Input Info/Sources	Products	
2.1 Develop Test Concept		
	❑	a. Test Concept
2.1.1 Establish Overall Test Goal		
▪ Test and Evaluation Strategy ▪ Test and Evaluation Master Plan ▪ Other Test Plans ▪ Initial Capabilities Documents ▪ Capability Development Documents ▪ Capability Production Documents ▪ Joint Capability Areas ▪ DOTMLPF Change Requests	❑	a. Test Goal
2.1.2 Establish Test Objectives		
▪ Test Goal ▪ Test and Evaluation Strategy	❑	a. Test Objectives
2.1.3 Develop Test Approach		
▪ Test Objectives	❑	a. Test Approach

CTM 2.2 Refine Evaluation Strategy Checklist

Recommended Input Info/Sources	Products	
2.2 Refine Evaluation Strategy		
	❑	a. Refined Evaluation Strategy
2.2.1 Develop Initial Data Analysis Requirements		
▪ Test and Evaluation Strategy ▪ Test and Evaluation Master Plan ▪ Other Test Plans ▪ Initial Capabilities Documents, Capability Development Documents, & Capability Production Documents ▪ Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities (DOTMLPF) Change Request ▪ System of Systems / System Description ▪ Critical Capability Issues / Critical Operational Issues ▪ Joint Operational Context for Test (JOC-T)	❑	a. Capability Evaluation Subsets
	❑	a.1. Factors
	❑	a.2. Measures
	❑	a.3. Data Elements
2.2.2 Identify Additional Characterize Test Modeling Requirements		
▪ Known Modeling Requirements	❑	a. Additional Modeling Requirements
2.2.3 Develop Test Scenario		
▪ Capability Evaluation Subsets ▫ Factors ▫ Measures ▫ Data Elements ▪ Critical Capability Issues (CCI)/ Critical Operational Issues (COI) ▪ Joint Operational Context for Test (JOC-T)	❑	a. Test Scenario

CTM 2.3 Technical Assessment Checklist

Recommended Input Info/Sources	Products	
2.3 Technical Assessment		
	❑	a. Technical Assessment
2.3.1 Develop Initial LVC-DE Operational Description		
▪ Program Introduction Document ▪ JME Foundation Model ▪ Previous LVC-DE Estimates ▪ Test Concept	❑	a. LVC-DE OV-1
	❑	b. LVC-DE OV-2
	❑	c. LVC-DE OV-4
	❑	d. LVC-DE OV-5
	❑	e. LVC-DE SV-1
	❑	f. LVC-DE SV-4a
	❑	g. LVC-DE SV-4b
2.3.2 Develop LVC-DE Alternatives		
▪ LVC-DE OV-1 ▪ LVC-DE OV-2 ▪ LVC-DE OV-4 ▪ LVC-DE OV-5 ▪ LVC-DE SV-1 ▪ LVC-DE SV-4a ▪ LVC-DE SV-4b	❑	a. Distributed Range Capabilities Matrix
2.3.3 Analyze LVC-DE Alternatives		
▪ Distributed Range Capabilities Matrix	❑	a. High Level Schedule
	❑	b. Test Resource Estimate
	❑	c. Technical Recommendation
2.3.4 Develop Initial Verification and Validation Plan		
▪ Technical Recommendation	❑	a. Initial V&V Plan
2.3.5 Identify New Development & Integration Requirements		

CTM 2.3.4 Develop Initial V&V Plan Checklist

Recommended Input Info/Sources	Products	
2.3.4 Develop Initial V&V Plan		
	❑	a. Initial Accreditation Plan
	❑	b. Initial V&V Plan
	❑	c. Updated Technical Recommendation
2.3.4.1 Assess Impact/Risk of LVC-DE Use		
▪ JOC-T ▪ Risk Mitigation Plan ▪ Test Goal, Objective and Approach (Test Concept) ▪ Technical Recommendation	❑	a. LVC-DE Use Impact Assessment in Technical Recommendation (including User/Sponsor Needs)
2.3.4.2 Plan Accreditation Activities		
▪ Technical Recommendation (including Use Impact Assessment and Initial DRCM)	❑	a. Initial Accreditation Plan
2.3.4.3 Verify LVC-DE Objectives		
▪ Test Concept	❑	a. Verification results (in updated V&V Report)
	❑	b. Traceability information between Test Concept and User/Sponsor Needs (in updated V&V Report)
2.3.4.4 Define Acceptability Criteria		
▪ Joint Operational Context for Test (JOC-T) ▪ Verified Test Concept ▪ Initial Accreditation Plan ▪ Technical Recommendation ▪ Representational Capability MOEs & MOPs	❑	a. Initial Acceptability Criteria (in V&V Plan and Accreditation Plan)
	❑	b. Traceability description in V&V Plan and Accreditation Plan
2.3.4.5 Plan V&V Activities		
▪ Initial Accreditation Plan ▪ Initial Acceptability Criteria ▪ Verified Test Concept & Technical Recommendations	❑	a. Initial V&V Plan

CTM 3.1 Develop Test Design Checklist

Recommended Input Info/Sources	Products	
CTM 3.1 Develop Test Design		
	❑	a. Test Design
CTM 3.1.1 Develop Analysis Approach		
▪ Analytic Model Capabilities ▪ Test Measures and Data Elements ▪ Efficient Test Trial DOE	❑	a. Analytic Approach
CTM 3.1.2 Design Test Trials		
▪ Vignettes	❑	a. Test Trials
CTM 3.1.3 Develop Data Collection Requirements		
▪ Test Trials	❑	a. Integrated Data Requirements List (IDRL)
CTM 3.1.4 Identify Additional Plan Test Modeling Requirements		
▪ Vignettes ▪ Test Trials ▪ Integrated Data Requirements List (IDRL)	❑	a. Analytic Model Capabilities
CTM 3.1.5 Develop Vignettes		
▪ Test Scenario ▪ Test Trials	❑	a. Vignettes
CTM 3.1.6 Verify and Validate Scenario and Vignettes		
▪ Test Scenario	❑	a. Verified and Validated Test Scenario
▪ Vignettes	❑	b. Verified and Validated Vignettes

CTM 3.2 Perform LVC-DE Analysis Checklist

Recommended Input Info/Sources	Products	
3.2 Perform LVC-DE Analysis		
	❑	a. Perform LVC-DE Analysis
3.2.1 Develop Detailed LVC-DE Operational Description		
▪ JME Foundation Model ▪ Data Analysis Plan ▪ Test Concept ▪ System and Joint Mission Evaluation Strategy ▪ LVC-DE OV-1 High Level Operational Concept	❑	a. LVC-DE OV-6c
	❑	b. LVC-DE OV-7
3.2.2 Develop LVC-DE System Functional Description		
▪ LVC-DE OV-1 ▪ LVC-DE OV-2 ▪ LVC-DE OV-4 ▪ LVC-DE OV-5 ▪ LVC-DE OV-6c ▪ LVC-DE OV-7 ▪ LVC-DE SV-1 ▪ LVC-DE SV-4a ▪ LVC-DE SV-4b	❑	a. LVC-DE SV-6
	❑	b. LVC-DE SV-10c
	❑	c. Initial Configuration Management Plan
	❑	d. Environmental Specifications

CTM 3.3 Define Infrastructure Checklist

Recommended Input Info/Sources	Products	
3.3 Define Infrastructure		
	❑	a. Infrastructure architecture
3.3.1 Finalize Infrastructure Strategy		
▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ Live Virtual Constructive – Distributed Environment (LVC-DE) Test Approach Description ▪ Statement of Capability ▪ Test Support Plan ▪ Vignettes	❑	a. Infrastructure strategy
3.3.2 Develop Infrastructure Risk Mitigation		
▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ LVC-DE Test Approach Description ▪ Statement of Capability ▪ Test Support Plan ▪ Vignettes	❑	a. Logistics and Resources
3.3.3 Update Infrastructure		
▪ Infrastructure gaps and shortfalls	❑	a. Infrastructure requirements

CTM 3.5 Develop Test Plan Checklist

Recommended Input Info/Sources	Products	
3.5 Develop Test Plan		
	❑	a. Test Plan
3.5.1 Develop Roles and Responsibilities		
▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ Live Virtual Constructive – Distributed Environment (LVC-DE) Test Approach Description ▪ Statement of Capability ▪ Test Support Plan ▪ Vignettes	❑	a. Administration and Management
3.5.2 Deconflict Test Resources		
▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ LVC-DE Test Approach Description ▪ Statement of Capability ▪ Test Support Plan ▪ Vignettes	❑	a. Logistics and Resources
3.5.3 Develop Detailed Cost Estimate		
▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ LVC-DE Test Approach Description ▪ Statement of Capability ▪ Test Support Plan ▪ Vignettes	❑	a. Cost Estimate
3.5.4 Compose and Coordinate Test Plan		
▪ Administration and Management ▪ Cost Estimate ▪ Data Analysis Plan (DAP) with Test Design Trials, Integrated Data Requirements ▪ Logistics and Resources ▪ LVC-DE Test Approach Description ▪ Test Support Plan ▪ Vignettes	❑	a. Test Plan

CTM 4.1 Design LVC-DE Configuration Checklist

Recommended Input Info/Sources	Products	
4.1 Design LVC-DE Configuration		
	❑	a. LVC-DE System Design Document (SDD)
4.1.1 Perform JME LVC Logical Design		
▪ LVC-DE OV-1, 2, 4, 5, 6c, 7 ▪ LVC-DE SV-1, 4a, 4b, 6, 10c ▪ Data Analysis Plan ▪ Vignettes ▪ V&V Plan (Initial)	❑	a. LVC-DE SDD – Logical Design
4.1.2 Verify and Validate Logical Design		
	❑	a. LVC-DE SDD – System V&V
4.1.3 Perform JME LVC Physical Design		
▪ LVC-DE Logical Design Document ▪ JME Infrastructure Characterization Plan ▪ V&V Plan ▪ LVC-DE SV-11 ▪ Class / Object Models ▪ Middleware / SOA Interface Models	❑	a. LVC-DE SDD – Physical Design
4.1.4 Verify and Validate Physical Design		
	❑	a. LVC-DE SDD – System V&V
4.1.5 Characterize Test Infrastructure		
▪ Infrastructure Risk Mitigation	❑	a. JME Infrastructure Characterization Plan
	❑	b. JME Infrastructure Characterization Report

CTM 4.1.2 Verify and Validate Logical Design Checklist

Recommended Input Info/Sources	Products	
4.1.2 Verify and Validate Logical Design		
	❑	a. Updated V&V Report
4.1.2.1 Verify Logical Design		
▪ Joint Operational Context for Test (JOC-T) ▪ Test Goal, Objective and Approach (Test Concept) ▪ Verified & Validated Scenarios and Vignettes ▪ V&V Plan ▪ Logical Design	❑	a. Verification results in updated V&V Report (Task V&V Analysis SDD Appendix E)
	❑	b. Traceability information between Logical Design and Test Concept (Requirements Traceability Matrix in V&V Report)
4.1.2.2 Validate Logical Design		
▪ Joint Operational Context for Test (JOC-T) ▪ V&V Plan ▪ Acceptability Criteria ▪ Verified Logical Design	❑	a. Validation results in updated V&V Report (Task V&V Analysis Appendix)
	❑	b. Acceptability Criteria assessment (met/not met) in updated V&V Report
	❑	c. Characterization of representational errors that exceed Acceptability Criteria limits (where possible) in updated V&V Report
	❑	d. User/Sponsor approval of Logical Design

CTM 4.1.4 Verify and Validate Physical Design Checklist

Recommended Input Info/Sources	Products	
4.1.4 Verify and Validate Physical Design		
	❑	a. Updated V&V Report
4.1.4.1 Verify Physical Design		
▪ V&V Plan ▪ Verified & Validated Logical Design ▪ Federate Documentation ▪ Acceptability Criteria ▪ Physical Design	❑	a. Verification results in updated V&V Report (Task V&V Analysis Appendix)
	❑	b. Traceability information between Physical Design, Logical Design, Test Criteria and Requirements (Requirements Traceability Matrix in V&V Report)
	❑	c. Requirements verification results in updated V&V Report
	❑	d. Test Criteria verification results in updated V&V Report
4.1.4.2 Validate Physical Design		
▪ Joint Operational Context for Test (JOC-T) ▪ V&V Plan ▪ Verified & Validated Logical Design ▪ Federate Documentation ▪ Acceptability Criteria ▪ Verified Physical Design	❑	a. Validation results in updated V&V Report (Task V&V Analysis Appendix)
	❑	b. Acceptability Criteria assessment (met/not met) in updated V&V Report
	❑	c. Characterization of representational errors that exceed Acceptability Criteria limits (where possible) in updated V&V Report
	❑	d. User/Sponsor approval of Physical Design

CTM 4.2 Build/Configure LVC-DE Components Checklist

Recommended Input Info/Sources	Products	
4.2 Build/Configure LVC-DE Components		
▪ SDD Physical Design ▪ CM Plan ▪ V&V Plan ▪ Component V&V documents ▪ Physical Design V&V results ▪ SDD	❑	a. Instantiated LVC-DE Components

CTM 4.5 Integrate LVC-DE Checklist

Recommended Input Info/Sources	Products	
4.5 Integrate LVC-DE		
	❑	a. LVC-DE Integration, Check-Out, and VV&A
4.5.1 Integrate Local Systems		
▪ LVC-DE Components ▪ Configuration Management Plan ▪ V&V Plan ▪ Integrated JME Verification Documentation ▪ Local Configuration Reports	❑	a. LVC-DE Configuration Report
	❑	a. LVC-DE Technical Baseline
4.5.2 Pilot Check Out		
▪ LVC-DE Configuration Report ▪ LVC-DE Technical Baseline ▪ LVC-DE Integration Spiral Documentation ▪ Vignette Databases	❑	a. JME Check-Out Report
4.5.3 Verify, Validate, and Accredit LVC-DE		
	❑	a. V&V Report
	❑	b. Accreditation Report

CTM 4.5.3 Verify, Validate, and Accredit LVC-DE Checklist

Recommended Input Info/Sources	Products	
4.5.3 Verify, Validate, and Accredit LVC-DE		
	❑	a. Updated V&V Report
	❑	b. Accreditation Report
4.5.3.1 Verify LVC-DE		
▪ V&V Plan ▪ Verified & Validated Physical Design ▪ Data Management Plan ▪ Instantiated LVC-DE ▪ Raw Execution Output	❑	a. Raw Execution Federate Output verification results in V&V Report (Pilot Check-Out)
	❑	b. Instantiated LVC-DE Output verification results in V&V Report (Pilot Check-Out)
	❑	c. Information on any missing or erroneous output
4.5.3.2 Validate Physical Design		
▪ Joint Operational Context for Test (JOC-T) ▪ V&V Plan ▪ Acceptability Criteria ▪ Verified & Validated Physical Design ▪ LVC-DE Testing Results	❑	a. Validation results in updated V&V Report (Task V&V Analysis Appendix)
	❑	b. Acceptability Criteria assessment (met/not met) in updated V&V Report
	❑	c. Characterization of representational errors that exceed Acceptability Criteria limits (where possible) in updated V&V Report
	❑	d. Estimates of uncertainties associated with the representational errors in the LVC-DE results (in V&V Report)
	❑	e. Observed interoperability anomalies and their probable causes (in V&V Report)
4.5.3.3 Accredit LVC-DE		
▪ V&V Plan ▪ V&V Report ▪ Accreditation Plan ▪ LVC-DE Test Results ▪ LVC-DE Accreditation Assessment	❑	a. Accreditation/Acceptance Recommendations

CTM 5 Manage Test Execution Checklist

Recommended Input Info/Sources	Products	
5.1 Develop Event Management Plan		
	❑	a. Event Management Plan
5.1.1 Develop Event Schedule		
5.1.2 Develop Data Management Plan		
5.1.3 Coordinate Test Event Support		
5.2 Run Event		
5.2.1 Initialize Event		
5.2.2 Execute Test Scenario		
5.2.3 Control & Monitor JME		
5.2.4 Capture & Archive Data		
5.2.5 Assess Event & Infrastructure		
5.2.6 Debrief Event		

CTM 5.1 Develop Event Management Plan Checklist

Recommended Input Info/Sources	Products	
5.1 Develop Event Management Plan		
	❑	a. Event Management Plan
5.1.1 Develop Event Schedule		
▪ Test Scenario/Vignettes	❑	a. Event Execution Schedule
	❑	b. Master Scenario Event List (MSEL)
	❑	c. Time Ordered Event List (TOEL)
5.1.2 Develop Data Management Plan		
▪ IDRL	❑	a. Event Data Management Plan
	❑	b. Event Data Analysis Plan (s)
5.1.3 Coordinate Test Event Support		
	❑	a. Event Support Annexes

CTM 5.2 Run Event Checklist

Recommended Input Info/Sources	Products	
5.2 Run Event		
5.2.1 Initialize Event		
▪ Event Execution Schedule ▪ Time Ordered Event List (TOEL)	❑	
5.2.2 Execute Test Scenario		
▪ Event Execution Schedule ▪ Master Scenario Event List (MSEL) ▪ Time Ordered Event List (TOEL)	❑	
5.2.3 Control & Monitor JME		
5.2.4 Capture & Archive Data		
▪ Data Management Plan ▪ Data Analysis Plan ▪ Test Plan	❑	a. Archived Data
5.2.5 Assess Event & Infrastructure		
▪ Data Management Plan ▪ Data Analysis Plan ▪ Test Plan ▪ Test Data	❑	Quicklook evaluation
5.2.6 Debrief Event		

CTM 6.2 Analyze Data Checklist

Recommended Input Info/Sources	Products	
6.2 Analyze Data		
	❑	a. Capabilities Analysis Information
6.2.1 Prepare Analysis Tools		
▪ Processed Test Data	❑	a. Analysis Tool Requirements
	❑	b. Analytic Tools and Techniques
6.2.2 Conduct Analysis		
▪ Processed Test Data ▪ Reconstructed System Level Data ▪ Reconstructed Mission Level Data ▪ Reconstructed Task Level Data ▪ System of Systems Performance Information ▪ System Under Test Task Performance Information ▪ Joint Mission Effectiveness Information	❑	a. Summary Performance and Effectiveness Evaluation

CTM 6.3 Evaluate SoS and JMe Checklist

Recommended Input Info/Sources	Products	
6.3 Evaluate SoS and JMe		
	❑	a. Joint Capabilities Evaluation (JCE)
6.3.1 Integrate Pre-Event Analysis Results		
▪ Exploratory Analysis Results	❑	a. Summary Performance & Effectiveness Evaluation
6.3.2 Synthesize SoS - Task - JMe Evaluations		
▪ Summary Performance & Effectiveness Evaluation	❑	a. Critical Test Product Issues
6.3.3 Identify Significant Findings		
▪ Critical Test Product Issues	❑	a. Significant Findings for Acquisition
	❑	b. Joint Capabilities Evaluation (JCE)
6.3.4 Make Recommendations		
▪ Summary Performance Evaluation	❑	a. Significant Recommendations for Acquisition
	❑	b. Joint Capabilities Evaluation (JCE)

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ANNEX F – CAPABILITY TEST METHODOLOGY (CTM) PROCESS THREAD MODEL

The CTM Process Thread Model will be available at a later date.

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ANNEX G – ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Meaning
AB	Analytical Baseline
ABM	Agent Based Model
ABMS	Agent Based Modeling and Simulation
ABS	Agent-Based Simulation
ACMC	Assistant Commandant of the Marine Corps
ACV	Airspace Control Volume
AFATDS	Advanced Field Artillery Tactical Data System
AFB	Air Force Base
AFOTEC	Air Force Operational Test & Evaluation Center
AFPD	Air Force Policy Directive
AI	Area of Interest
Analyst's Handbook	Analyst's Handbook for Testing in a Joint Environment
ANOVA	Analysis of Variance
AO	Action Officer; Area of Interest
AO's Handbook	Action Officer's Handbook for Testing in a Joint Environment
AoA	Analysis of Alternatives
AOI	Area of Influence
AP	Analysis Plan
API	Application Programming Interface
ARSM	Advanced Response-Surface Methodology
ASD(NII)	Assistant Secretary of Defense for Networks and Information Integration
AT&L	Acquisition, Technology and Logistics
ATCCS	Army Tactical Command and Control System
AUTL	Army Universal Task List
AV	All View
AW	Air Warfare
AWACS	Airborne Warning and Control System
BCT	Brigade Combat Team
BOV	Blue Operational View
BSV	Blue Systems and Services View
C2	Command and Control
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAB	Combat Action Brigade
CADM	Core DoD Architecture Data Model
CAP	Capability Analysis Plan
CART	Classification and Regression Tree
CAS	Close Air Support
CBA	Capabilities-Based Assessment

Acronym/Abbreviation	Meaning
CBP	Capability-Based Planning
CCA	Close Combat Attack
CCD	Central Composite Design
CCI	Critical Capability Issue
CCJO	Capstone Concept for Joint Operations
CDD	Capability Development Document
CDR	Critical Design Review
CEM	Capability Evaluation Metamodel
CFF	Call for Fire
CGF	Computer Generated Forces
CIO	Chief Information Officer
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CLE	Nomenclature designation for a Continuous Learning Module
CM	Capability Manager
CMU	Connectivity Matrix Utility
COCOM	Combatant Command
COI	Critical Operational Issue
COIN	Counterinsurgency
COMBAT^{XXI}	Combined Arms Analysis Tool for the XXIst Century
CONOPS	Concept of Operations
COTS	Commercial Off-the-Shelf
CPD	Capability Production Document
CPM	Capability Portfolio Manager
CRN	Common Random Number
CSB	Controlled Sequential Bifurcation
CTA	Capstone Threat Assessment
CTM	Capability Test Methodology
CTM 1	CTM Step 1
CTM 2	CTM Step 2
CTM 3	CTM Step 3
CTM 4	CTM Step 4
CTM 5	CTM Step 5
CTM 6	CTM Step 6
CTO	Combine Test Organization
CTP	Critical Technical Parameter
d.f.	Degree of Freedom
DAB	Defense Acquisition Board
DAP	Data Analysis Plan
DARS	DoD Architecture Registry System
DAU	Defense Acquisition University
DAUVS	Digital Army USMTF VMF Stimulator
DCARS	Digital Collection, Analysis, and Review System

Acronym/Abbreviation	Meaning
DCIT	Distributed Capabilities Integration Toolbox
DCM	Data Collection Matrix
DCP	Data Collection Plan
DCR	DOTMLPF Change Recommendation
DD	Deputy Director
DD,AW	Deputy Director, Air Warfare
DE	Distributed Environment
DecSecDef	Deputy Secretary of Defense
DELT	Data Elements List Table
DIA	Defense Intelligence Agency
DIACAP	DoD Information Assurance Certification and Accreditation Process
DIS	Distributed Interactive Simulation
DMAP	Data Management and Analysis Plan
DMP	Data Management Plan
DoD	Department of Defense
DoDAF	DoD Architecture Framework
DoDI	DoD Instruction
DOE	Design of Experiment
DOT&E	Director, Operational Test and Evaluation
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DP	Decision Point; Design Point
DPG	Defense Planning Guidance
DPS	Defense Planning Scenario
DRCM	Distributed Range Capabilities Matrix
DRCT	Distributed Range Coordination Team
DSB	Defense Science Board
DSIG	Domain Special Interest Group
DT	Development Test; Developmental Test
DT&E	Developmental Test and Evaluation
DWS	Data Warehouse System
EA	Enterprise Architecture
EM	Event Manager
EMP	Event Management Plan
EPG	Electronic Proving Ground
ES	Executive Summary
EV	Evaluation View
EW	Electronic Warfare
FAA	Functional Area Analysis
FARA	Federal Acquisition Reform Act
FBCT	Force Brigade Combat Team
FCS	Future Combat System
FDD	Federation Object Model Document Data
FED	Federation Execution Data

Acronym/Abbreviation	Meaning
FFBD	Functional Flow Block Diagram
FID	Foreign Internal Defense
FNA	Functional Needs Analysis
FO	Forward Observer
FOM	Federation Object Model
FoS	Family of Systems
FOT&E	Follow-on Test and Evaluation
FPC	Final Planning Conference
FSA	Functional Solutions Analysis
FSE	Fire Support Element
FY	Fiscal Year
FYAB	Fiscal Year Analytical Baseline
GCCS-M	Global Command and Control System - Maritime
GIG	Global Information Grid
GIS	Geographic Information System
GL	Glossary
GOSC	General Officer(s) Steering Committee
GPS	Global Positioning System
GRSM	Generalized Response-Surface Methodology
HIMARS	High Mobility Artillery Rocket System
HITL	Human-in-the-Loop
HLA	High Level Architecture
HPCC	High Performance Computing Cluster
HSD	Honestly Significant Difference
HSLT	High Speed LAN TAP
ICD	Initial Capabilities Document
ICP	Integrated Capability Portfolio
IDEF	Integrated Definition for Data Modeling
IDFW	International Data Farming Workshop
IDRL	Integrated Data Requirements List
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IER	Information Exchange Requirement
IF	Indirect Fires
INC	Interface Network Controller
IOT&E	Initial Operational Test and Evaluation
IPC	Initial Planning Conference
IPL	Integrated Priority List
IPT	Integrated Product Team
ISR	Intelligence, Surveillance, and Reconnaissance
IT	Information Technology
ITWA	Initial Threat Warning Assessment
JAGS	Joint Air-to-Ground System
JBD2	Joint Battlespace Dynamic Deconfliction
JCA	Joint Capability Area

Acronym/Abbreviation	Meaning
JCAS	Joint Close Air Support
JCD	Joint Capabilities Document
JCE	Joint Capability Evaluation
JCER	Joint Capability Evaluation Report
JCIDS	Joint Capabilities Integration and Development System
JCS	Joint Chiefs of Staff
JDS	Joint Data Support
JE	Joint Environment
JFC	Joint Functional Concept
JFEO	Joint Forcible Entry Operation
JFIRES	Joint Fires
JFM	Joint Mission Environment (JME) Foundation Model
JIC	Joint Integrating Concept
JM	Joint Mission
JMe	Joint Mission Effectiveness
JME	Joint Mission Environment
JMET	Joint Mission Essential Task
JMETC	Joint Mission Environment Test Capability
JMETL	Joint Mission Essential Task List
JOA	Joint Operational Area
JOC	Joint Operating Concept
JOC-T	Joint Operational Context for Test
JOpsC	Joint Operations Concepts
JP	Joint Publication
JPD	Joint Potential Designator
JPME	Joint Professional Military Education
JROC	Joint Requirements Oversight Council
JS	Joint Staff
JSTARS	Joint Surveillance Target Attack Radar System
JT&E	Joint Test and Evaluation
JTAC	Joint Terminal Attack Controller
JTEM	Joint Test and Evaluation Methodology
JVMF	Joint Variable Message Format
KPP	Key Performance Parameter
KSA	Key System Attribute
LCIM	Level of Conceptual Interoperability Model
LDM	Logical Design Model
LF	Live Fire
LFT&E	Live Fire Test and Evaluation
LH	Latin Hypercube
LRIP	Low Rate Initial Production
LS	Launch System
LVC	Live, Virtual, Constructive
LVC-DE	Live, Virtual, Constructive Distributed Environment

Acronym/Abbreviation	Meaning
M&P	Methods and Processes
M&S	Modeling and Simulation
MADM	Multi-Attribute Decision Making
MANA	Map Aware Non-Uniform Automata
MARS	Multivariate Adaptive Regression Spline
MCO	Major Combat Operation
MDA	Milestone Decision Authority
METOC	Meteorological and Oceanographic
MFMEA	Matrix Failure Modes and Effects Analysis
MHS	Message Handling System
MIL-STD	Military Standard
Mission MOE	Mission Measure of Effectiveness
MMOE	Mission Measure of Effectiveness
MODAF	Ministry of Defence Architecture Framework (UK)
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOS	Measure of Suitability
MOSA	Measure of System/SoS Attribute
MPC	Mid-Planning Conference
MRSM	Modified Response-Surface Methodology
MSCO	Modeling and Simulation Coordination Office
MSEL	Master Scenario Events List
MSFD	Multi-Service Force Deployment
MSRR	Modeling and Simulation Resource Repository
MTBF	Mean Time Between Failure
MTM	Metamodel-Test-Metamodel
MTTR	Mean Time to Repair
MVR	Maneuver
NASA	National Aeronautics and Space Administration
NAVSTAR	Navigation Satellite Timing and Ranging
NBC	Nuclear, Biological, Chemical
NCE	Net-Centric Environment
NEW	Network Enabled Weapon
NLOS	Non-Line of Sight
NLOS-LS	Non-Line of Sight Launch System
NMS	National Military Strategy
NOLH	Nearly Orthogonal Latin Hypercube
NPS	Naval Postgraduate School
NSS	Naval Simulation System
ODUSD(A&T)SSE/DTE	Office of the Deputy Under Secretary of Defense for Acquisition and Technology, Systems and Software Engineering, Development Test and Evaluation
OMB	Office of Management and Budget
OneSAF	One Semi-Automated Forces

Acronym/Abbreviation	Meaning
OOS	OneSAF Objective System
OPLAN	Operational Plan
OPORD	Operation Order
ORSA	Operation Research Systems Analyst
OSD	Office of the Secretary of Defense
OSD (PA&E)	Office of the Secretary of Defense Program Analysis and Evaluation
OT	Operational Test
OT&E	Operational Test and Evaluation
OTA	Operational Test Agency
OTG	Over-the-Horizon Gold
OUSD(AT&L)	Office of the Under Secretary of Defense for Acquisition, Technology and Logistics
OUSD(P&R)	Office of the Under Secretary of Defense for Personnel and Readiness
OUSD(P)	Office of the Under Secretary of Defense for Policy
OV	Operational View
PA&E	Program Analysis and Evaluation
PAID	Process, Application, Infrastructure, Data
PDM	Physical Design Model
PDR	Preliminary Design Review
PI	Program Introduction
PID	Program Introduction Document
PM	Program Manager
PM's Handbook	Program Manager's Handbook for Testing in a Joint Environment
PMJ	Professional Military Judgment
PPBE	Planning, Programming, Budgeting, and Execution
PPBS	Planning, Programming, and Budgeting System
PTP	Program Test Plan
RCS	Restricted Cubic Spline
RCT	Regimental Combat Team
RGS	Requirements Generation System
ROE	Rules of Engagement
ROMO	Range of Military Operations
ROZ	Restricted Operating Zone
RPG	Recommended Practices Guide
RSM	Response-Surface Methodology
RTI	Runtime Infrastructure
RTO	Responsible Test Organization
SC	Statement of Capability
SCS	Simulation Collection System
SDD	System Design Document
SEED	Simulation Experiments and Efficient Design
SIPRNET	Secret Internet Protocol Router Network

Acronym/Abbreviation	Meaning
SME	Subject Matter Expert
SOA	Service Oriented Architecture
SOC	Statement of Capability
SoS	System of Systems; Systems of Systems
SPG	Strategic Planning Guidance
SQL	Standard Query Language
SSAA	System Security Authorization Agreement
STAR	System Threat Assessment Report
SUT	System under Test
SV	Systems and Services View
T&E	Test and Evaluation
TADIL	Tactical Digital Information Link
Task MOP	Task Measure of Performance
TBMCS	Theater Battle Management Core Systems
TCR	Test Concept Review
TD	Test Director
TEMP	Test and Evaluation Master Plan
TENA	Test and Training Enabling Architecture
TES	Test and Evaluation Strategy
TGOA	Test Goal, Objectives, and Approach
TIJE Roadmap	Testing in a Joint Environment Roadmap
TMOP	Task Measure of Performance
TOE	Table of Organization and Equipment
TOEL	Time Ordered Event List
TOV	Threat Operational View
TP	Test Plan
TPR	Test Plan Review
TRAC-MTRY	US Army Training and Doctrine Command Analysis Center in Monterey
TRR	Test Readiness Review
TSSG	Testing in a Joint Environment Roadmap Senior Steering Group
TTP	Tactics, Techniques, and Procedures
TV	Technical Standards View
UAS	Unmanned Aircraft System
UCP	Unified Command Plan
UJTL	Universal Joint Task List
UML	Unified Modeling Language
US	United States
USA	United States Army
USAF	United States Air Force
USC	United States Code
USD(AT&L)	Under Secretary of Defense for Acquisition, Technology and Logistics
USD(P)	Under Secretary of Defense for Policy

Acronym/Abbreviation	Meaning
USJFCOM	US Joint Forces Command
USMC	United States Marine Corps
USMTF	US Message Text Format
USN	United States Navy
V&V	Verification and Validation
VCJCS	Vice Chairman of the Joint Chiefs of Staff
VCNO	Vice Chief of Naval Operations
VCSA	Vice Chiefs of Staff of the US Army
VCSAF	Vice Chiefs of Staff of the US Air Force
VMF	Variable Message Format
VRT	Variance-Reduction Technique
VV&A	Verification, Validation, and Accreditation
WAN	Wide Area Network
WIPT	Working-level Integrated Product Team
XML	eXtensible Markup Language
XSD	XML Schema Definition

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ANNEX H – CTM LEXICON

In order to provide conceptual consistency and an underlying business rule structure for the Capability Test Methodology (CTM), Joint Test and Evaluation Methodology (JTEM) is employing an ontology approach. An ontology can be defined as "an explicit formal specification of how to represent the objects, concepts, and other entities that are assumed to exist in some area of interest and the relationships that hold among them." In keeping with this definition, the ontology supporting the CTM evaluation thread incorporates a *CTM Lexicon* to provide underlying conceptual definitions for the CTM. The *CTM Lexicon* is a cross-domain dictionary of CTM-relevant DoD terminology and definitions. Authoritative DoD sources are used, where possible, for JTEM terms and definitions. Modifications to current terminology or additional terms not currently defined in authoritative sources are noted as CTM version 3.0. This lexicon is one of the test products developed during the course of JTEM.

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Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Abstraction			
	▪ The act of identifying the essential characteristics of a thing that distinguish it from all other kinds of things. Abstraction involves looking for similarities across sets of things by focusing on their essential common characteristics. An abstraction always involves the perspective and purpose of the viewer; different purposes result in different abstractions for the same things. All modeling involves abstraction, often at many levels for various purposes.	DoDAF 1.5, Volume II Annex C C-1	04/2007
	▪ A kind of dependency that relates two elements that represent the same concept at different abstraction levels.	DoDAF 1.5, Volume II Annex C C-1	04/2007
Accreditation			
	▪ The official certification that a model or simulation is acceptable for use for a specific purpose.	DOD 5000.59-M Definitions P.2.1.7. 87	01/1998
Accuracy			
	▪ The degree to which a parameter or variable or set of parameters or variables within a model or simulation conform exactly to reality or to some chosen standard or referent. See resolution, fidelity, precision.	Recommended Practices Guide Fidelity RPG Special Topic --- 8	09/2000
Adaptable/Tailorable			
	▪ An adaptable/tailorable joint force is versatile in handling threat missions with equal success; scalable in applying appropriate mass and weight of effort; agile in shifting between different types of missions without loss of momentum; responsive to changing conditions and environments; and whose leaders are intellectually empowered by a background of experience and education. Adaptability ensures that the joint force can rapidly shift from one operation to another across the range of military operations, and adjust operations based on changing conditions. An adaptive mindset and flexible force capabilities are essential for success in countering the full spectrum of anticipated threats and challenges and enhance the joint force ability to respond with unmatched speed of decision and action. (See Joint Force Characteristics)	CCJO 2.0 4. Solution 4.E.5. 22	08/2005
Agile			
	▪ An agile joint force has the ability to move quickly and seamlessly to defuse (or help defuse) a crisis situation or effectively operate inside the decision loop of even the most capable adversary. Agility is about timeliness--thinking, planning, communicating, and acting in a manner that allows effective and efficient adaptation to an unfolding situation. Agility permits JFCs to exploit fleeting opportunities, protect friendly vulnerabilities, and adapt rapidly to changes in the operational environment--a characteristic essential to a force that is expected to succeed across the range of military operations. (See Joint Force Characteristics)	CCJO 2.0 4. Solution 4.E.10. 23	08/2005

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
All View (AV)					
	▪ There are some overarching aspects of an architecture that relate to all three views. These overarching aspects are captured in the AV products. The AV products provide information pertinent to the entire architecture but do not represent a distinct view of the architecture. AV products set the scope and context of the architecture. The scope includes the subject area and time frame for the architecture. The setting in which the architecture exists comprises the interrelated conditions that compose the context for the architecture. These conditions include doctrine; tactics, techniques, and procedures; relevant goals and vision statements; Concepts of Operations (CONOPS); scenarios; and environmental conditions. – AV-1 -- Overview and Summary Information: Scope, purpose, intended users, environment depicted, analytical findings. – AV-2 -- Integrated Dictionary: Architecture data repository with definitions of all terms used in all products.	DoDAF 1.5, Volume I 1	1.4.5	1-9	04/2007
Analysis					
	▪ An examination of a concept using quantitative and qualitative measures to assess potential capabilities. It produces metrics that are applied to assumptions and risks and to formulate recommendations and support decisions.	CJCSI 3010.02B Glossary	GL	GL-3	01/2006
Analysis of Alternatives (AoA)					
	▪ AoA are an important element of the defense acquisition process. An AoA is an analytical comparison of the operational effectiveness, suitability, and Life-Cycle cost of alternatives that satisfy established capability needs. Initially, the AoA process typically explores numerous conceptual solutions with the goal of identifying the most promising options, thereby guiding the Materiel Solution Analysis phase [previously, "Concept Refinement phase"] (see section 3.3.3). Subsequently, at Milestone B (which usually represents the first major funding commitment to the acquisition program), the AoA is used to justify the rationale for formal initiation of the acquisition program. An AoA normally is not required at Milestone C unless significant changes to threats, costs, or technology have occurred, or the analysis is otherwise deemed necessary by the Milestone Decision Authority. For a joint program, the lead DOD Component normally is responsible for the preparation of a single comprehensive analysis.	Defense Acquisition University Guidebook 3	3.3	---	12/2008
	▪ The evaluation of the performance, operational effectiveness, operational suitability, and estimated costs of alternative systems to meet a mission capability. The AoA assesses the advantages and disadvantages of alternatives being considered to satisfy capabilities, including the sensitivity of each alternative to possible changes in key assumptions or variables. The AoA is one of the key inputs to defining the system capabilities in the capability development document.	CJCSM 3170.01C Definitions	GL	GL-5	05/2007
Analysis of Alternatives Plan (AoAP)					
	▪ Approved by the Milestone Decision Authority in conjunction with the Concept Decision. It details the approach to be followed in conducting the AoA during the Materiel Solution Analysis phase [previously, "Concept Refinement phase"]. See Analysis of Alternatives.	DAU Glossary of Defense Acquisition Acronyms and Terms, 12th Edition Glossary	Appendix B	B-9	12/2008
Analysis Plan (AP)					
	▪ A capability level plan that denotes a detailed examination and application of disciplined techniques to evaluate joint mission effectiveness, system of systems performance, and joint task accomplishments.	CTM v3.0 ---	---	---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Analytic Agenda					
	▪ A timeline for the development of defense planning scenarios, multi-Service force deployment documents, and analytical baselines for use in strategic analyses; based upon scenario priorities identified by the Under Secretary of Defense for Policy.	CJCSI 3010.02B Glossary	GL	GL-3	01/2006
	▪ The Analytic Agenda is a Department-wide cooperative agreement to make major, joint analysis efforts more effective, and responsive. It seeks to align analytical efforts with strategic decision milestones and the budget process. The Analytic Agenda includes, but is not limited to, Defense Planning Scenarios (DPS), Multi-service Force Deployment (MSFD) documents, and Analytical Baselines (AB).	J8 Force Structure Resources and Assessment; http://www.jcs.mil/j8/ddfm.html Studies and Analysis Management Division	---	---	02/2008
Analytical Baseline					
	▪ Referred to as "baseline" in the text of this Instruction. A package comprising a scenario, concept of operations, and integrated data used by the DOD Components as a foundation for strategic analyses. Analytical baselines shall be produced and reviewed in an open, collaborative, and transparent environment.	DODI 8260.01 Definitions	E1.1.	6	01/2007
Assumption					
	▪ A supposition on the current situation or a presupposition on the future course of events, either or both assumed to be true in the absence of positive proof, necessary to enable the commander in the process of planning to complete an estimate of the situation and make a decision on the course of action.	JP 1-02 Appendix	A-1	49	03/2007
Attribute					
	▪ A quantitative or qualitative characteristic of a system of systems that is expressed in terms of joint Doctrine, Organization, Training, Material, Leadership and Education, Personnel, and Facilities (DOTMLPF).	CTM v3.0 ---	---	---	04/2009
Capability					
	▪ The ability to execute a specified course of action. (A capability may or may not be accompanied by an intention.)	JP 1-02 Appendix	A-1	77	03/2007
	▪ The ability to achieve a desired effect under specified standards and conditions through combinations of means and ways across the doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) to perform a set of tasks to execute a specified course of action. It is defined by an operational user and expressed in broad operational terms in the format of an initial capabilities document or a joint DOTMLPF change recommendation. In the case of materiel proposals/documents, the definition will progressively evolve to DOTMLPF performance attributes identified in the capability development document and the capability production document.	CJCSI 3170.01G Part II -- Definitions	Glossary	GL-3	03/2009

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Capability Development Document (CDD)					
	▪ A document that captures the information necessary to develop a proposed program(s), normally using an evolutionary acquisition strategy. The CDD outlines an affordable increment of militarily useful, logistically supportable, and technically mature capability. The CDD may define multiple increments if there is sufficient definition of the performance attributes (key performance parameters, key system attributes, and other attributes) to allow approval of multiple increments.	CJCSI 3170.01F Glossary	 GL	 GL-5	05/2007
Capability Evaluation Metamodel (CEM)					
	▪ A conceptual model to relate key capability test and evaluation concepts. The CEM provides the "rules" for conducting Joint Mission effectiveness (JMe) assessments of capability relational structures defined in a Joint Operational Context for Test (JOC-T) and are approximated by a Joint Mission Environment (JME). – Capability Test Methodology (CTM) process steps produce the following CEM structures: JOC-T; Capability Evaluation Strategy; Capability Test Design; Joint Mission Environment (JME); Test Event; and Joint Capability Evaluation (JCE). – The Joint Operational Context for Test (JOC-T) is the joint operational context for the Capability Evaluation Strategy. This Capability Evaluation Strategy contains design of experiment (DOE) factors and measures which are filtered to produce various Capability Test Designs focused on one or more Critical Capability Issues (CCI). – The Capability Test Design is instantiated in a test event using a JME, built from live, virtual, constructive (LVC) test technologies. Testers use the JME to execute the Capability Test Design in a test event, which provides response data for a joint capability evaluation (JCE). – JCEs are conducted based on analysis structures in the Capability Test Design. Such JCEs provide SoS recommendations for DOD acquisition and other capability development managers. The CEM is based on the definition of capability and its relationships from the Joint Capabilities Integration and Development System (JCIDS) in CJCSI 3170.01F.	CTM v3.0 ---	 ---	 ---	04/2009
Capability Gap					
	▪ The inability to achieve a desired effect under specified standards and conditions through combinations of means and ways to perform a set of tasks. The gap may be the result of no existing capability, lack of proficiency or sufficiency in existing capability, or the need to recapitalize an existing capability.	CJCSI 3170.01F Glossary	 GL	 GL-5	05/2007
Capability Lifecycle					
	▪ Capability generation lifecycle including business practice, information flow, and their associated attributes, directed toward the efficient, synchronized delivery of required system of systems capabilities.	CTM v3.0 ---	 ---	 ---	04/2009
Capability Manager/Capability Portfolio Manager (CM/CPM)					
	▪ Manages selected groupings of capabilities using integrated strategic planning, integrated architectures, measures of performance, risk management techniques, transition plans, and portfolio investment strategies. Portfolio management influences the Joint Capability Integration and Development System (JCIDS), the Planning Programming, Budgeting, and Execution process (PPBE), and the Defense Acquisition System, through the appropriate policy instructions. It delivers integrated capabilities, improves interoperability, identifies and captures efficiencies, reduces capability redundancies and gaps, and increases joint operational effectiveness.	CTM v3.0 ---	 ---	 ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Capability Production Document (CPD)					
	▪ A document that addresses the production elements specific to a single increment of an acquisition program.	CJCSM 3170.01C Glossary	GL	GL-7	05/2007
Capability Test Methodology (CTM)					
	▪ The Capability Test Methodology (CTM) is an integral part of the Defense Acquisition System, providing methods and processes that guide the design and execution of system-of-systems tests in the joint mission environment to produce high quality capability assessments and evaluations supporting Department of Defense development and investment decisions. CTM can involve developmental or operational testing during multiple phases of the acquisition lifecycle, including Materiel Solution Analysis, Technology Development, and Engineering and Manufacturing Development phases.	CTM v3.0 ---	---	---	04/2009
Capacity					
	▪ The number of instances of an object or detail that are simultaneously represented by a model or simulation; cardinality.	Recommended Practices Guide Fidelity RPG Special Topic	---	8	09/2000
Capstone Concept for Joint Operations (CCJO)					
	▪ The Capstone Concept for Joint Operations describes in broad terms [the CJS's] vision for how the joint force circa 2016-2028 will operate in response to a wide variety of security challenges. It proposes that future joint force commanders will combine and subsequently adapt some combination of four basic categories of military activity -- combat, security, engagement, and relief and reconstruction -- in accordance with the unique requirements of each operational situation. The concept is informed by current strategic guidance, but because it looks to the future, it is intended to be adaptable, as it must be, to changes in that guidance.	CCJO 3.0 Foreword	FW	iii	01/2009
Characteristic					
	▪ A desirable trait, quality, or property that distinguishes how the future joint force should conduct military operations.	CJCSI 3010.02B Glossary	GL	GL-3	01/2006
Command-linked Tasks					
	▪ Discrete activities or actions designated by a joint force commander or identified by the lead federal agency that must be performed by commands and combat support agencies outside the command or directive authority of the joint force, if the joint force is to successfully perform its missions. Command-linked tasks are selected by the supported command or lead federal agency and are normally scheduled for training, evaluated, and assessed by the organization providing the support.	CJCSM 3500.04E Glossary	GL-4	61	08/2008
Component					
	▪ A modular, deployable, and replaceable part of a system that encapsulates implementation and exposes a set of interfaces. A component is typically specified by one or more classifiers (e.g. implementation classes) that reside on it, and may be implemented by one or more artifacts (e.g., binary, executable, or script files).	DoDAF 1.5, Volume II Annex	C	C-2	04/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Concept of Operations (CONOPS)			
	▪ A verbal or graphic statement that clearly and concisely expresses what the joint force commander intends to accomplish and how it will be done using available resources. The concept is designed to give an overall picture of the operation. Also called commander's concept or CONOPS.	JP 1-02 Appendix A-1 112	03/2007
Condition			
	▪ Those variables of an operational environment or situation in which a unit, system, or individual is expected to operate and may affect performance. (See Joint Mission-Essential Task)	JP 1-02 Appendix A-1 112	03/2007
	▪ Variable of the operational environment, including a scenario that affects task performance.	CJCSM 3500.04E Glossary GL GL-4	08/2008
Constructive Model or Simulation			
	▪ Models and simulations that involve simulated people operating simulated systems. Real people stimulate (make inputs) to such simulations, but are not involved in determining the outcomes.	DOD 5000.59-P Definitions 36c A-6	10/1995
Credibility			
	▪ The criteria that the model, simulation, or federation of models and simulations needs to meet to be acceptable for its intended use.	IEEE Std 1516.4-2007 Definitions 3.1 4	12/2007
Criterion			
	▪ The minimum acceptable level of performance associated with a particular measure of task performance. It is often expressed as hours, days, percent, occurrences, minutes, miles, or some other command stated measure.	CJCSI 3500.01D Glossary GL GL-4	05/2007
Critical Capability Issue (CCI)			
	▪ A Critical Capability Issue is an analytical statement used to assess performance pertaining to capabilities which support joint missions. The essential elements of a CCI include a capability's essential tasks, mission desired effects, blue system of systems (SoS) across DOTMLPF, and conditions involving threat and environmental factors. These essential elements are contained in the Capability Crosswalk. – It is important to state how the test issue contributes to achieving the mission end state outcomes in terms of mission desired effects. The CCIs should address the SoS capability to perform joint operational tasks and/or the SoS, system, or service attribute performance. CCIs are of primary importance to the decision authority in reaching a decision to allow the system of systems to advance into the next phase of development. An example CCI format which captures the essential elements would be: Assess the ability to perform Task X under Conditions A by SoS Configuration Y to achieve Desired Effects Z.	CTM v3.0 --- --- ---	04/2009
Critical Operational Issue (COI)			
	▪ Critical Operational Issues are the operational effectiveness and operational suitability issues (not parameters, objectives, or thresholds) that must be examined in operational test and evaluation to evaluate/assess the system's capability to perform its mission.	Memorandum of Agreement on Multi-Service Operational Test And Evaluation Introduction Purpose 1	08/2004

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Critical Technical Parameter (CTP)			
	▪ The critical technical parameters of the system (including software maturity and performance measures) that will be evaluated (or reconfirmed if previously evaluated) during the remaining phases of developmental testing. Critical technical parameters are measurable critical system characteristics that, when achieved, allow the attainment of desired operational performance capabilities. They are not user requirements. Rather, they are technical measures derived from desired user capabilities. Failure to achieve a critical technical parameter should be considered a reliable indicator that the system is behind in the planned development schedule or will likely not achieve an operational requirement. Limit the list of critical technical parameters to those that support critical capability issues. The system specification is usually a good reference for the identification of critical technical parameters.	Defense Acquisition University Guidebook 9 9.10.1 ---	12/2008
Data Analysis Plan (DAP)			
	▪ The Data Analysis Plan (DAP) is a document that provides detailed procedures for the collection, reduction, collation, and analysis of data gathered to support determination of a system's/SoS's operational effectiveness and suitability. The DAP aligns with the test plan in terms of contribution to a successful test and is a planning tool to ensure procedures are in place for assessing data collection upon completion of test execution. The DAP is designed to provide the specifics for the analysis of operational effectiveness and suitability of an SoS. The DAP should be completed before the test event begins to ensure the needs of various system/SoS customers and that the resources are available to complete the capability analysis. The DAP should include the purpose of the data analysis, data sources (including a description and any limitations), key variables to be used, and the capability analysis methods. The capability manager should review the plan to ensure that the proposed capability analysis will answer relevant questions. Data analysis experts should review the plan to ensure that appropriate data and methods will be used, and the DAP should be approved by the capability manager.	CTM v3.0 --- --- ---	04/2009
Data Elements List Table (DELT)			
	▪ The data elements list table (DELT) begins the correlation between the issues and sub-issues to the measures, and data elements. The DELT will be refined and transformed into the IDRL once the units of measurement, sample size needed, data source, data media, data format, data structure, instrumentation, test variables, and individual test event have been specified. The DELT also forms the foundation for the Data Analysis Plan (DAP).	CTM v3.0 --- --- ---	04/2009
Data Management Plan (DMP)			
	▪ The purpose of the Data Management Plan (DMP) is to provide detailed procedures for the collection, reduction, collation, storage, and disposition of data gathered to support determination of a system's operational effectiveness and suitability. The DMP is both a planning tool to ensure procedures are in place for data collection, and a data management tool for tracking and assessing data collection during test execution.	CTM v3.0 --- --- ---	04/2009
Defense Planning Scenario (DPS)			
	▪ DPSs, written 8-20 years into the future, are used in CBA. These scenarios have classified CONOPS that provide a high level of specificity and defined parameters to aid in robust analysis of capabilities and a comparison of alternate solutions.	CJCSI 3010.02B Enclosure A 7.b.1.a. A-5	01/2006

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Department of Defense Architecture Framework (DoDAF)			
	▪ The DoDAF is a three-volume set that inclusively covers the concept of the architecture framework, development of architecture descriptions, and management of architecture data. – Volume I introduces the DoDAF framework and addresses the development, use, governance, and maintenance of architecture data. – Volume II outlines the essential aspects of architecture development and applies the net-centric concepts to the DoDAF products. – Volume III introduces the architecture data management strategy and describes the pre-release CADM v1.5, which includes the data elements and business rules for the relationships that enable consistent data representation across architectures.	DoDAF 1.5, Volume I Executive Summary ES ES-2	04/2007
Developmental Test and Evaluation (DT&E)			
	▪ Test and evaluation conducted to evaluate design approaches, validate analytical models, quantify contract technical performance and manufacturing quality measure progress in system engineering design and development, minimize design risks, predict integrated system operational performance (effectiveness and suitability) in the intended environment, and identify system problems (or deficiencies) to allow for early and timely resolution or correction. Decision-makers use DT&E results to minimize design risk, whereas OT&E evaluates military utility, and system effectiveness and suitability. DT&E usually includes contractor testing (AFPD 99-1).	AFOTEC OT&E Guide, 5th edition. Glossary Attch B B-9	06/2007
Distributed Range Coordination Team (DRCT)			
	▪ Team representing required additions to each development and operational test organization to provide expertise for tests in joint environments and to absorb the increased scope of such testing (reference: Testing in a Joint Environment Roadmap, paragraph 2.2.9). Roles and responsibilities for team members may include providing single points of contact for program managers and lead ranges to work with multiple distributed test organizations; providing top-level facilitation for activities spanning various functional and organizational elements across distributed test organizations; and making sure distributed planning, integration, execution, and analysis activities are regularly and frequently coordinated with all participants.	CTM v3.0 --- --- ---	04/2009
DOTMLPF			
	▪ Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities. (See Joint Doctrine, Joint Organization, Joint Training, Joint Materiel, Joint Leadership and Education, Joint Personnel, and Joint Facilities).	CJCSI 3170.01F Glossary GL GL-11	05/2007
Effect			
	▪ The physical or behavioral state of a system that results from an action, a set of actions, or another effect.	JP 1-02 Appendix A-1 176	03/2007
	▪ A change to a condition, behavior, or degree of freedom.	JP 1-02 Appendix A-1 176	03/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
	▪ The result, outcome, or consequence of an action.	JP 1-02 Appendix	A-1	176	03/2007
Element					
	▪ An atomic constituent of a model.	DoDAF 1.5, Volume II Annex	C	C-3	04/2007
End State					
	▪ The set of required conditions that defines achievement of the commander's objectives.	JP 1-02 Appendix	A-1	183	03/2007
	▪ The set of conditions, behaviors, and freedoms that defines achievement of the commander's mission.	CJCSI 3010.02B Glossary	GL	GL-4	01/2006
Enduring/Persistent					
	▪ This has both a mental and physical aspect. The mental aspect can be expressed as will, while the physical aspect can be expressed as the staying power of the joint force--in both cases, sustaining ours while breaking the adversaries. This characteristic is especially important given the interaction between the anticipated environment, joint force Operations, and unanticipated events in any complex and adaptive system. It demands that the joint force possess the depth and capacity to sustain operations over time, regardless of the situation or adversary. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	4.E.6.	22	08/2005
Engineering and Manufacturing Development (EMD)					
	▪ The purpose of the EMD Phase is to develop a system or an increment of capability; complete full system integration (technology risk reduction occurs during Technology Development); develop an affordable and executable manufacturing process; ensure operational supportability with particular attention to minimizing the logistics footprint; implement human systems integration (HSI); design for producibility; ensure affordability; protect CPI by implementing appropriate techniques such as anti-tamper; and demonstrate system integration, interoperability, safety, and utility. The CDD, Acquisition Strategy, SEP, and Test and Evaluation Master Plan (TEMP) shall guide this effort.	DODI 5000.2 Enclosure 2	Procedures	20	12/2008
Environment					
	▪ Includes the air, water, land, plants, animals, and other living organisms, man-made structures, historical and cultural resources, and the interrelationships that exist among them and with people.	DAU Glossary of Defense Acquisition Acronyms and Terms, 12th Edition Glossary	GL	B-56	12/2008
	▪ The aggregate of all external and internal conditions (such as temperature, humidity, radiation, magnetic and electric fields, shock vibration, etc.) either natural or man - made, or self - induced, that influences the form, performance, reliability or survival of an item.	DAU Glossary of Defense Acquisition Acronyms and Terms, 12th Edition Glossary	GL	B-56	12/2008

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Environmental Condition			
	▪ Those physical environment (land, sea, air, and space) condition variables of an operational environment or situation in which a unit, system, or individual is expected to operate. Those civil environment (political, cultural, and economic) condition variables of an operational environment or situation in which a unit, system, or individual is expected to operate and may affect performance.	CTM v3.0 --- --- ---	04/2009
Error			
	▪ The difference between an observed, measured, or calculated value and a correct value.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
Essential Task			
	▪ In the context of joint operation planning, a specified or implied task that an organization must perform to accomplish the mission. An essential task is typically included in the mission statement. (See Task)	JP 1-02 Appendix A-1 187	03/2007
	▪ Tasks based on mission analysis and approved by the commander that are absolutely necessary, indispensable, or critical to the success of a mission.	CJCSM 3500.04E Glossary GL 61	08/2008
Evaluation Strategy			
	▪ The evaluation strategy serves as the blueprint to assess a capability's joint mission effectiveness (JMe). Key elements of the evaluation strategy are Critical Capability Issues (CCI), evaluation independent factors, and evaluation dependent response measures. – Evaluation independent factors include: joint mission(s) and task(s); threat and environmental conditions; and system of systems (SoS) configuration options across doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) resources. – Evaluation dependent response measures are structured in three levels: mission measures of effectiveness (MMOEs), task measures of performance (TMOPs), and system/SoS attributes. These measures should be described in terms of their nature (e.g., qualitative and quantitative), measurement units, and desired fidelity. – Evaluation strategy elements can be refined and related using the Capability Crosswalk structure. Using the elements of the Joint Operational Context for Test (JOC-T), the evaluation strategy is created and refined to support Joint Mission Effectiveness (JMe) evaluation of a capability's joint task performance by a system of systems configuration (across DOTMLPF) under threat and environmental condition sets to achieve mission desired effects in a realistic joint environment.	CTM v3.0 --- --- ---	04/2009
Evaluation View (EV)			
	▪ A proposed view in the Department of Defense Architecture Framework (DoDAF) designed to capture the evaluation framework for assessing joint mission effectiveness, joint task performance, and system of systems performance. The Evaluation View(s) would include mission desired effects, mission measures of effectiveness, task measures of performance, system of systems attributes, and performance measures, and all associated data.	CTM v3.0 --- --- ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Event Management Plan (EMP)					
	▪ The Event Management Plan includes three sections. These three sections are the event schedule, the data management plan, and the coordinated event support. These sections are generally done by the test range facility in coordination with the customer and are specific to a test event and its iterations. The three sections outlined are the minimum items that should be included in the plan and coordinated before an event is run.	CTM v3.0 ---	 ---	 ---	04/2009
Event Manager (EM)					
	▪ Responsible for planning, coordinating, and executing an LVC-DE event supporting Capability Manager and Program Manager(s) requirements for Capability Test & Evaluation. In addition to coordination of event support, the EM develops and manages an integrated schedule and a data management plan, both addressing requirements from the CM(s) and PM(s). The EM function is generally done by the lead test range facility for a specific test event and its iterations.	CTM v3.0 ---	 ---	 ---	04/2009
Expeditionary					
	▪ An expeditionary joint force is organized, postured and capable of rapid and simultaneous deployment, employment, and sustainment. Implicit in this is a joint force that converges mission-tailored capabilities at the desired point of action from dispersed locations around the globe, regardless of anti-access or area-denial environments. As elusive and adaptive adversaries seek refuge in remote and inaccessible areas, the norm will be short-notice operations, austere operational environments, incomplete information and the requirement to fight on arrival throughout the battlespace and to dominate potential adversaries for the duration of a campaign. The future joint force will be immediately employable even in austere conditions and largely independent of existing infrastructure. As a situation evolves, these elements will be readily capable of transitioning to sustained operations, blending into new capability packages to execute follow-on or different operations, or dispersing until otherwise required. The term "expeditionary" also describes the joint force mindset that inculcates an expeditionary perspective into all aspects of force planning, training, and education. The future joint force will increasingly require a mechanism to enable global sourcing of military forces and capabilities; in order to leverage the most responsive, best positioned forces at the time of need. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	 4.E.4.	 21	08/2005
Fast					
	▪ Key to effectively controlling tempo is the ability to be faster than the adversary or situational events. The speed at which forces maneuver and engage, or decisions are made, or relief is provided, will largely determine operational successes or failures. Successfully overcoming future challenges may require speed of action across all domains. Acting fast is in itself a force multiplier and often a requisite for the effective application of military capabilities. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	 4.E.8.	 23	08/2005
Federate					
	▪ An application that may be or is currently coupled with other software applications under a Federation Object Model Document Data/Federation Execution Data (FDD/FED) and a runtime infrastructure (RTI). This may include federation managers, data collectors, real world ("live") systems (e.g., C4I systems, instrumented ranges, sensors), simulations, passive viewers, and other utilities.	IEEE Std 1516.4-2007 Definitions	 3.1	 4	12/2007
Federation					
	▪ A named set of federate applications and a common Federation Object Model (FOM) that are used as a whole to achieve some specific objective.	IEEE Std 1516.4-2007 Definitions	 3.1	 4	12/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Fidelity			
	▪ The description of a model, simulation, or federation of models and simulations and its associated data representational capabilities (e.g. resolution, error, precision, and sensitivity).	IEEE Std 1516.4-2007 Special Terms 3.2 5	12/2007
Fitness			
	▪ Providing the capabilities needed or being suitable for some purpose, function, situation or application.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
Implied Task			
	▪ A task that is not stated but necessary to do the mission.	CJCSM 3500.04E Glossary GL 61	08/2008
Increment			
	▪ A militarily useful and supportable operational capability that can be effectively developed, produced or acquired, deployed, and sustained. Each increment of capability will have its own set of threshold and objective values set by the user. Spiral development is an instance of an incremental development strategy where the end state is unknown. Technology is developed to a desired maturity and injected into the delivery of an increment of capability.	CJCSM 3170.01C Glossary GL GL-9	05/2007
Initial Capabilities Document (ICD)			
	▪ Documents the requirement for a materiel or non-materiel approach, or an approach that is a combination of materiel and non-materiel, to satisfy specific capability gap(s). It defines the capability gap(s) in terms of the functional area, the relevant range of military operations, desired effects, time and doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) and policy implications and constraints. The ICD summarizes the results of the DOTMLPF and policy analysis and the DOTMLPF approaches (materiel and non-materiel) that may deliver the required capability. The outcome of an ICD could be one or more joint DCRs or capability development documents.	CJCSM 3170.01C Glossary GL GL-10	05/2007
Integrated Capability Portfolio (ICP)			
	▪ Executive Level Management of capability groupings that cover the entire DOD budget authority.	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc Definitions --- 9	04/2007
Integrated Data Requirements List (IDRL)			
	▪ Serving as the foundation for the Data Analysis Plan (DAP), the IDRL correlates the issues to the sub-issues, measures, data elements, units of measurement, sample size, data source, data media, data format, data structure, instrumentation, test variables, and test event.	CTM v3.0 --- --- ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Integrated Priority List (IPL)			
	▪ A list of a combatant commander's highest priority requirements, prioritized across Service and functional lines, defining shortfalls in key programs that in the judgment of the combatant commander, adversely affect the capability of the combatant commander's forces to accomplish their assigned mission. The integrated priority list provides the combatant commanders' recommendations for programming funds in the planning, programming, and budgeting system process.	JP 1-02 Definitions --- 266	03/2007
Interaction			
	▪ A specification of how stimuli are sent between instances to perform a specific task. The interaction is defined in the context of a collaboration.	DoDAF 1.5, Volume II Annex C C-3	04/2007
Interagency Coordination			
	▪ Within the context of Department of Defense involvement, the coordination that occurs between elements of the Department of Defense and engaged US government agencies, for the purpose of achieving an objective.	CJCSM 3500.04E Glossary GL 62	08/2008
Interoperable			
	▪ Interoperability is a necessary prerequisite to integrated and interdependent joint operations. The future joint force will be able to share and exchange knowledge and services between units and commands at all levels. The interoperable joint force can act in an integrated and ultimately an interdependent way among joint force components and capabilities, facilitating more effective interoperability with interagency and multinational partners. Interoperability implies systems, capabilities and organizations working in harmony across all joint force elements; however, it involves more than systems and equipment. Interoperability includes a cultural change at all levels that extends through DOTMLPF. (See Joint Force Characteristics)	CCJO 2.0 4. Solution 4.E.3. 21	08/2005
JCA Decomposition			
	▪ JCAs are logically broken down from higher capability categories to further scope, bound, and clarify capability categories by providing greater granularity to facilitate detailed analysis or allow better mapping of resources to capabilities. The number of tiers/levels required to decompose a JCA down to its component capabilities is not a constant across the JCAs. This decomposition enhances JCA usefulness in DOD processes, (e.g., Integrated Priority List (IPL) submissions, Universal Joint Task List (UJTL) integration, roadmaps, and program and budget databases).	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc Definitions --- 9	04/2007
JCA Lexicon			
	▪ A collection of joint capability definitions that provide a common capabilities language for DOD in order to facilitate capabilities-based planning, analysis, and decision-making. (Modified from Joint Capability Area Management Plan).	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc Definitions --- 9	04/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
JCA Taxonomy			
	▪ The structure or framework of joint capabilities, used in conjunction with the JCA lexicon, to facilitate capabilities-based planning, analysis, and decision-making.	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc Definitions --- 9	04/2007
JFM Element			
	▪ A member of a component. Elements contain the base attribute or operations, and provide the basis for instantiated entities in the JME. [Model Driven Architecture (MDA) References].	CTM v3.0 --- --- ---	04/2009
Joint			
	▪ Connotes activities, operations, organizations, etc., in which elements of two or more Military Departments participate.	JP 1-02 Appendix A-1 281	03/2007
Joint Capabilities Document (JCD)			
	▪ The JCD identifies a set of capabilities that support a defined mission area utilizing associated Joint Operations Concepts (JOpsC), concept of operations (CONOPs), or Unified Command Plan or other assigned missions. The capabilities are identified by analyzing what is required across all functional areas to accomplish the mission. The gaps or redundancies are then identified by comparing the capability needs to the capabilities provided by existing or planned systems. The JCD will be used as a baseline for one or more functional solution analyses leading to the appropriate initial capabilities documents or doctrine, organization, training, materiel, leadership and education, personnel, and facilities change recommendation documents, but cannot be used for the development of capability development or capability production documents. The JCD will be updated as changes are made to the supported JOpsC, CONOPs, or assigned missions.	CJCSM 3170.01C Glossary GL GL-12	05/2007
Joint Capabilities Evaluation (JCE)			
	▪ The documented analysis of one or more capability test events used to support milestone A, B, or C acquisition decisions.	CTM v3.0 --- --- ---	04/2009
Joint Capabilities Integration and Development System (JCIDS)			
	▪ The Joint Capabilities Integration and Development System (JCIDS) is a joint-concepts-centric capabilities identification process that allows joint forces to meet future military challenges. The Joint Capabilities Integration and Development System process assesses existing and proposed capabilities in light of their contribution to future joint concepts. Joint Capabilities Integration and Development System, supported by robust analytic processes, identifies capability gaps and potential solutions.	Defense Acquisition University Guidebook 1 1.3 ---	12/2008

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Joint Capability Area (JCA)			
	▪ Collections of like DOD activities functionally grouped to support capability analysis, strategy development, investment decision making, capability portfolio management, and capabilities-based force development and operational planning.	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc --- --- ---	04/2007
Joint Doctrine			
	▪ Joint doctrine consists of fundamental principles that guide the employment of US military forces in coordinated action toward a common objective. Joint doctrine contained in joint publications also includes terms, tactics, techniques, and procedures. (See DOTMLPF)	CJCSI 5120.02 Enclosure A 1.a A.1	11/2004
Joint DOTMLPF Change Recommendation (DCR)			
	▪ A recommendation for changes to existing joint resources when such changes are not associated with a new defense acquisition program.	CJCSI 3170.01F Glossary GL GL-11	05/2007
Joint Environment (JE)			
	▪ Realistic test environment comprised of friendly forces and equipment, threats, and geophysical environments that are required to assess military capabilities that are 'born joint' as identified in JCIDS capability documents.	CTM v3.0; derived from "Testing in a Joint Environment (TIJE) Roadmap" 2.0 2.2.3 10	11/2004
Joint Exercise			
	▪ A joint military maneuver, simulated wartime operation, or other CJCS- or combatant commander-designated event involving planning, preparation, execution, and evaluation. A joint exercise involves forces of two or more Military Departments interacting with a combatant commander or subordinate joint force commander, involves joint forces and/or joint staffs, and is conducted using joint doctrine or joint tactics, techniques, and procedures.	CJCSM 3500.04E Glossary GL-5 62	08/2008
Joint Facilities			
	▪ Real property consisting of one or more of the following: a building, a structure, a utility system, pavement, and underlying land. Key facilities are selected command installations and industrial facilities of primary importance to the support of military operations or military production programs. A key facilities list is prepared under the policy direction of the Joint Chiefs of Staff. (See DOTMLPF)	CJCSM 3170.01C Glossary GL GL-13	05/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Joint Force Characteristics					
	▪ The joint force must have certain key characteristics. These particular characteristics are considered important because they will guide how the joint force is developed, organized, trained and equipped and must be reflected in all subordinate concepts in the JOpsC family. Such a force is designed to be a dominant national asset, compelling in all situations, and lethal when required. – Joint Force Characteristics include: Knowledge Empowered, Networked, Interoperable, Expeditionary, Adaptable/Tailorable, Enduring/Persistent, Precise, Fast, Resilient, Agile, and Lethal.	CCJO 2.0 4. Solution	 4.E.	 20	08/2005
Joint Functional Concept (JFC)					
	▪ Addresses broad enduring functions across the range of military operations (e.g., force application and battlespace awareness).	CCJO 2.0 2. Scope	 2.B.	 3	08/2005
Joint Functions					
	▪ Related capabilities and activities grouped together to help joint force commanders synchronize, integrate, and direct joint operations. Functions that are common to joint operations at all levels of war fall into six basic groups—command and control, intelligence, fires, movement and maneuver, protection, and sustainment.	JP3-0 Glossary	 GL	 GL-20	09/2006
Joint Integrating Concept (JIC)					
	▪ A JIC is an operational-level description of how a joint force commander, 8-20 years into the future, will perform a specific operation or function derived from a JOC and/or a JFC. JICs are narrowly scoped to identify, describe, and apply specific military capabilities, decomposing them into fundamental tasks, conditions, and standards. Further analysis and expansion of tasks, conditions, and standards is accomplished after JIC completion in order to effectively execute CBA. Additionally, a JIC contains illustrative vignettes to facilitate understanding of the concept.	CJCSI 3010.02B Enclosure A	 A-3	 13	01/2006
Joint Leadership and Education					
	▪ Professional development of the joint commander is the product of a learning continuum that comprises training, experience, education, and self-improvement. The role of Professional Military Education and Joint Professional Military Education is to provide the education needed to complement training, experience, and self-improvement to produce the most professionally competent individual possible. (See DOTMLPF)	CJCSM 3170.01C Glossary	 GL	 GL-13	05/2007
Joint Materiel					
	▪ All items (including ships, tanks, self-propelled weapons, aircraft, etc., and related spares, repair parts, and support equipment, but excluding real property, installations, and utilities) necessary to equip, operate, maintain, and support [joint] military activities without distinction as to its application for administrative or combat purposes. (See DOTMLPF)	CJCSM 3170.01C Glossary	 GL	 GL-13	05/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Joint Mission Effectiveness (JMe)			
	▪ Joint Mission Effectiveness (JMe) is the evaluation of a capability's joint task performance by a system of systems configuration (across DOTMLPF) under threat and environmental condition sets to achieve mission desired effects in a joint operational context for test (JOC-T). – Critical Capability Issues (CCI) are used to capture essential JMe elements in terms of an evaluation question (e.g., Can the Capability perform Task X by SoS Configuration Y under Condition Set A to achieve Mission Desired Effect Z? – JMe follows a traditional scientific methodology of empirical-inductive reasoning to evaluate causal relationships between capabilities and increased warfighting effectiveness. The scientific method employs a basic experimental design process to determine if a proposed capability A causes the anticipated military effect B. This can be stated in terms of an experimental hypothesis, "If the proposed capability, then an improved mission effectiveness". These relational concepts are reflected in a Capability Evaluation Metamodel (CEM), an underlying conceptual model that supports the Capability Test Methodology to frame the evaluation of Joint Mission Effectiveness (JMe). – A design of experiment (DOE) approach is used in the CEM to frame capability test designs in terms of independent variables (IVs), the causal condition A, and dependent variables (DVs), the effect B. CEM IVs are manipulated factors in the test whose presence or degree affects change in dependent variables. – There are three IV treatment dimensions in a CEM test design: joint mission(s) and task(s); threat and environmental conditions; and system of systems (SoS) configuration options across doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) resources. CEM DVs are response measures, whose changes are caused by the presence, or degree of IVs in the test. DVs are measured for increases and decreases in mission effectiveness across a set of test trials. – There are three levels of response measures: mission measures of effectiveness (mission MOE), task measure of performance (task MOP), and system or SoS attribute performance (system/SoS attribute).	CTM v3.0 --- --- ---	04/2009
Joint Mission Environment (JME)			
	▪ A subset of the joint operational environment composed of force and non-force entities; conditions, circumstances and influences within which forces employ capabilities to execute joint tasks to meet a specific mission objective.	TSSG Approved --- --- ---	06/2008
Joint Mission Environment Foundation Model (JFM)			
	▪ The purpose of the JME Foundation Model (JFM) is to provide an authoritative framework for applying a logical capabilities-based process that can be robustly applied for reasoning among Stakeholders in a wide range of situations and test capability applications. The JFM is a design template for the CTM system engineering M&P that can be used to guide the reuse and development of LVC-DE systems. The JFM is a theoretical construct that represents physical processes, with a set of logical and quantitative relationships between those components, and component interactions. The goal of the JFM is to provide a frame of reference for LVC-DE configuration design.	CTM v3.0 --- --- ---	04/2009
Joint Mission Essential Task (JMET)			
	▪ A mission task selected by a joint force commander deemed essential to mission accomplishment and defined using the common language of the universal joint task list in terms of task, condition, and standard. Also called JMET.	CJCSI 3500.01D Glossary GL GL-6	05/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Joint Mission Essential Task List (JMETL)					
	▪ A mission task selected by a joint force commander deemed essential to mission accomplishment and defined using the common language of the universal joint task list in terms of task, condition, and standard. Also called JMET.	CJCSM 3500.04E Glossary	GL	GL-5	08/2008
Joint Operating Concept (JOC)					
	▪ Individual joint operating concepts will address the joint contribution to dealing with each of these [five] challenges [1. win the Nation's wars; 2. deter potential adversaries; 3. develop cooperative security; 4. defend the homeland; and 5. respond to civil crises] in greater detail.	CCJO 3.0 3. National Security Challenges	---	7	01/2009
Joint Operating Environment					
	▪ The joint operating environment is the environment of land, sea, and/or airspace within which a joint force commander employs capabilities to execute assigned missions. It is the broad area of operations and key features of that area where a joint force commander is expected to operate.	CTM v3.0 ---	---	---	04/2009
Joint Operational Context for Test (JOC-T)					
	▪ The JOC-T is the appropriate combination of representative systems, forces, threats, and environmental conditions assembled for test in a Joint Mission Environment.	CTM v3.0 ---	---	---	04/2009
	▪ Alternately, it is the comprehensive description of the mission, forces, environment, and TTPs – and the dependencies among these – that must be addressed in the test environment. It includes a description of the resources, live, virtual, or constructive, that will be employed to create this environment for the purposes of testing.	CTM v3.0 ---	---	---	04/2009
	▪ The JOC-T describes capability concepts and relationships, as defined in JCIDS, including mission, task, condition, and system of systems (SoS). JOC-T mission aspects include the mission statement, mission desired effects, and mission end state. JOC-T task aspects include mission concept of operations (CONOPs), Blue force UJTL-based JMETs, Service tasks, and tactics, techniques, and procedures (TTP). JOC-T condition aspects include threat conditions (e.g., threat actions, threat order of battle, threat command and control structure, threat systems, threat force laydown), and environmental conditions (e.g., physical and civil environment). JOC-T Blue SoS aspects include joint capability area (JCA) operational functions and DOTMLPF materiel and non-materiel resource descriptions across DOTMLPF.	CTM v3.0 ---	---	---	04/2009
Joint Operational Environment					
	▪ Joint operational environment is defined as a composite of the conditions, circumstances and influences that affect the employment of capabilities and bear on the decisions of the commander. It includes: – Physical areas and factors (of the air, land, sea, and space domains). – The information environment. – Adversary, friendly, and neutral systems relevant to a specific joint operation.	CTM v3.0 ---	---	---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Joint Operations Concepts (JOpsC)			
	▪ JOpsC is a family of joint future concepts consisting of a Capstone Concept for Joint Operations, Joint Operating Concepts, Joint Functional Concepts, and Joint Integrating Concepts. They are a visualization of future operations and describe how a commander, using military art and science, might employ capabilities necessary to meet successfully challenges 8 to 20 years in the future. Ideally, they will produce military capabilities that render previous ways of warfighting obsolete and may significantly change the measures of success in military operations overall. JOpsC presents a detailed description of "how" future operations may be conducted and provides the conceptual basis for joint experimentation and capabilities-based assessments (CBAs). The outcomes of experimentation and CBA will underpin investment decisions leading to the development of new military capabilities beyond the Future Years Defense Program.	CJCSM 3170.01C Glossary GL GL-13	05/2007
Joint Organization			
	▪ A joint unit or element with varied functions enabled by a structure through which individuals cooperate systematically to accomplish a common mission and directly provide or support [joint] warfighting capabilities. Subordinate units/elements coordinate with other units/elements and, as a whole, enable the higher-level joint unit/element to accomplish its mission. This includes the joint manpower (military, civilian, and contractor support) required to operate, sustain, and reconstitute joint warfighting capabilities. (See DOTMLPF)	CJCSM 3170.01C Enclosure H (2) H-2	05/2007
Joint Personnel			
	▪ The personnel component primarily ensures that qualified personnel exist to support joint capabilities. This is accomplished through synchronized efforts of joint force commanders and Service components to optimize personnel support to the joint force to ensure success of ongoing peacetime, contingency, and wartime operations. (See DOTMLPF)	CJCSM 3170.01C Enclosure (6) H-3	05/2007
Joint Professional Military Education (JPME)			
	▪ A CJCS-approved body of objectives, outcomes, policies, procedures, and standards supporting educational requirements of joint officer management.	CJCSM 3500.04E Glossary GL-5 62	08/2008
Joint Training			
	▪ Training, including mission rehearsals, of individuals, units, and staffs using joint doctrine or joint tactics, techniques, and procedures to prepare joint forces or joint staffs to respond to strategic, operational, or tactical requirements considered necessary by the combatant commanders to execute their assigned or anticipated missions. (See DOTMLPF)	CJCSM 3170.01C Glossary GL GL-12	05/2007
Key Performance Parameter (KPP)			
	▪ Those attributes or characteristics of a system that are considered critical or essential to the development of an effective military capability and those attributes that make a significant contribution to the characteristics of the future joint force as defined in the Capstone Concept for Joint Operations. KPPs must be testable to enable feedback from test and evaluation efforts to the requirements process. KPPs are validated by the Joint Requirement Oversight Council (JROC) for JROC Interest documents, and by the DOD Component for Joint Integration, Joint Information, or Independent documents. Capability development and capability production document KPPs are included verbatim in the acquisition program baseline.	CJCSM 3170.01C Glossary GL GL-16	05/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Key System Attribute (KSA)					
	▪ An attribute or characteristic considered crucial in support of achieving a balanced solution/approach to a key performance parameter (KPP) or some other key performance attribute deemed necessary by the sponsor. KSAs provide decision makers with an additional level of capability performance characteristics below the KPP level and require a sponsor 4-star, Defense agency commander, or Principal Staff Assistant to change.	CJCSM 3170.01C Glossary	 GL	 GL-16	05/2007
Knowledge Empowered					
	▪ The future joint force will emphasize better decisions made faster throughout all levels of command. The fundamentals of this knowledge empowerment are experienced and empowered decision makers benefiting from an enhanced understanding of the environment, potential adversaries and cultures, as well as enhanced collaborative decision-making processes. Although we will never eliminate the fog of war, an increased level of understanding should empower leaders throughout the joint force. This will enable them to anticipate and act as opportunities are presented, apply innovative solutions, mitigate risk, and increase the pace, coherence, and effectiveness of operations even in complex environments. A knowledge empowered force, capable of effective information sharing across all agencies and partners, will be able to make better decisions quicker, increasing joint force effectiveness. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	 4.E.1.	 21	08/2005
Lethal					
	▪ This is the ability to destroy an adversary and/or his systems in all conditions and environments when required. It includes the use of kinetic and/or non-kinetic means, while leveraging technological advances in greater precision and more devastating target effects at both longer-ranges and in close combat. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	 4.E.11.	 23	08/2005
Live, Virtual, Constructive Distributed Environment (LVC-DE)					
	▪ The enterprise capability necessary to accurately and realistically test systems and systems of systems, and/or train individuals, units, and organizations, performing tasks in a Joint Operational Context. It is achieved when all required joint systems, personnel, and equipment to execute the task in real-world operations are present or accurately replicated, realistically exercised or tested, and evaluated. The LVC-DE is defined using non-materiel aspects and materiel aspects across the enterprise's Doctrine (business practice), Organization, Training, Materiel, Leadership & Education, Personnel, and Facilities (DOTMLPF).	CTM v3.0 ---	 ---	 ---	04/2009
Logical Design					
	▪ The logical design provides a system-level viewpoint of the LVC system component types, descriptions of the roles these components serve, and how they are intended to work together.	CTM v3.0 ---	 ---	 ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
M&P Effectiveness			
	▪ Within the context of the JTEM JT&E, effectiveness is how well JTEM-developed Capability Test Methodology (CTM) overall outputs satisfy end customer requirements, how well the outputs of every CTM process meet the input requirements of internal customers, and how well the inputs from CTM suppliers meet the requirements of the methodology. JTEM effectiveness specifically addresses (1) the extent to which the goals of the method and processes are attained for designing and executing system-of-systems tests in the JME; and (2) the extent to which the goals of the methods and processes are achieved for assessing performance pertaining to capabilities supporting joint missions. JTEM JT&E effectiveness metrics assess the following criteria areas: – Usability (product template and instruction/guidebook usefulness, helpfulness, and simplicity). – Consistency (alignment of product and processes structures within the M&P, and between relevant external DOD/service M&P). – Workflow (leanness of process sequencing, product input/output mappings). – Completeness (the sufficiency of JTEM M&P input/output products and processes to address customer needs). – Adaptability (how well M&P adapts to different enterprises, changing environments, compressed deliverable timelines, etc.). – Repeatability (the degree to which different groups of JTEM M&P users demonstrate similar actions and produce similar output products). – Timeliness (the latency of performing JTEM processes or the amount of processes performed in a work period).	CTM v3.0 --- --- ---	04/2009
M&P Suitability			
	▪ Within the context of JTEM JT&E, suitability is the degree to which JTEM M&P can be efficiently implemented and sustained in a Live, Virtual, Constructive (LVC) distributed range enterprise tasked with designing and executing system-of-systems tests in a JME. JTEM M&P suitability evaluation includes resource utilization, minimization, interoperability, and reuse across non-materiel and materiel criteria areas including: – Doctrine translates to M&P and policy related to JTEM (relates to issues concerning compatibility with current T&E M&P/policy, interoperability with external DOD domain M&P/policy including acquisition, JCIDS, training, and experimentation). – Organization (relates to migration/extensions from current T&E organizations and organization-policy change requirement issues). – Training (relates to M&P and external DOD business practice training issues). – Materiel (relates to M&P supporting materiel (hardware, software) and LVC distributed range materiel issues). – Leadership and education (relates to M&P leadership/governance change requirement issues, M&P personnel educational foundation issues).	CTM v3.0 --- --- ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
	– Personnel (relates to M&P personnel availability issues and personnel-organization change issues). – Facilities (relates to M&P supporting facility and LVC distributed range facility issues).		
Materiel Solution			
	▪ Correction of a deficiency, satisfaction of a capability gap, or incorporation of new technology that results in the development, acquisition, procurement, or fielding of a new item (including ships, tanks, self-propelled weapons, aircraft, etc., and related software, spares, repair parts, and support equipment, but excluding real property, installations, and utilities) necessary to equip, operate, maintain, and support military activities without disruption as to its application for administrative or combat purposes. In the case of family of systems and system of systems approaches, an individual materiel solution may not fully satisfy a necessary capability gap on its own.	CJCSI 3170.01F Glossary GL GL-15	05/2007
Materiel Solution Analysis Phase (MSAP)			
	▪ The purpose of this phase is to assess potential materiel solutions and to satisfy the phase-specific entrance criteria for the next program milestone designated by the MDA.	DODI 5000.2 Enclosure 2 Procedures 14	12/2008
Means			
	▪ Forces, units, equipment, and resources.	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc --- --- ---	04/2007
	▪ Applied to Testing in a Joint Environment, Means are Organization, Materiel, and Facility Resources required to instantiate a Joint Mission Environment (JME) System of Systems (SoS).	CTM v3.0 --- --- ---	04/2009
Measure			
	▪ A parameter that provides the basis for describing varying levels of task accomplishment.	CJCSM 3500.04E Glossary GL-5 62	08/2008
Measure of Effectiveness (MOE)			
	▪ Measures designed to correspond to accomplishment of mission objectives and achievement of desired effects.	CJCSI 3170.01F Glossary GL GL-15	05/2007
	▪ A criterion used to assess changes in system behavior, capability, or operational environment that is tied to measuring the attainment of an end state, achievement of an objective, or creation of an effect.	JP 1-02 Appendix A-1 333	03/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Measure of Performance (MOP)					
	▪ A criterion used to assess friendly actions that is tied to measuring task accomplishment. Also called MOP.	JP 1-02 Appendix	 A-1	 333	03/2007
Meteorological and Oceanographic (METOC)					
	▪ A term used to convey all meteorological (weather) and oceanographic (physical oceanography) factors as provided by Service components. These factors include the whole range of atmospheric and oceanographic phenomena, from the sub-bottom of the earth's oceans up to the space environment (space weather).	JP 1-02 Appendix	 A-1	 336	03/2007
Methods and Processes (M&P)					
	▪ Within the context of JTEM JT&E, methods and processes involve defining the DOD Capability Test Methodology (CTM) business practice doctrine, including guidance on processes, information products, and their associated dynamics.	CTM v3.0 ---	 ---	 ---	04/2009
Military Training					
	▪ The instruction of personnel to enhance their capacity to perform specific military functions and tasks.	CJCSM 3500.04E Glossary	 GL-6	 63	08/2008
	▪ The exercise of one or more military units conducted to enhance combat readiness.	CJCSM 3500.04E Glossary	 GL-6	 63	08/2008
Mission					
	▪ The task, together with the purpose, that clearly indicates the action to be taken and the reason therefore.	JP 1-02 Appendix	 A-1	 349	03/2007
	▪ In common usage, especially when applied to lower military units, a duty assigned to an individual or unit; a task.	JP 1-02 Appendix	 A-1	 349	03/2007
	▪ The dispatching of one or more aircraft to accomplish one particular task.	JP 1-02 Appendix	 A-1	 349	03/2007
Mission Measures of Effectiveness (MMOE)					
	▪ Those measures that evaluate achievement of desired mission end state outcomes in terms of mission desired effects.	CTM v3.0 ---	 ---	 ---	04/2009
Model					
	▪ A semantically complete abstraction of a system.	DoDAF 1.5, Volume II Annex	 C	 C-4	04/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Multi-Service Force Deployment (MSFD)					
	▪ Multi-Service Force Deployment (MSFD) products are DOD-approved theater campaign sets of ally and threat scenario data describing the full spectrum of conflict for future postulated scenarios outlined in the Defense Planning Scenarios. MSFDs consist of joint service coordinated, D-Day, H-Hour scenario depictions of forecasted and mobilized opposing air, land, sea and space forces in total battlespace environments. – They will provide standard threat baselines used by the acquisition, operational test and evaluation, war gaming, and joint modeling communities to accomplish studies and analysis under simulated combat conditions and are also used for DoD policy studies (e.g., the Quadrennial Defense Review). The MSFD products consist of a CONOPS, a 200-page description of how the postulated conflict unfolds to include 1) database, and 2) Orders of Battle, strategy/tactics at the operational level, axes of attack, defensive dispositions, TOEs, force allocation to missions, optempo/sortie rates, readiness factors, munitions, and sustainment.	CTM v3.0 ---	 ---	 ---	04/2009
Networked					
	▪ All joint force elements will be connected and synchronized in time and purpose to facilitate integrated and interdependent operations across the global battlespace. A networked joint force can extend the benefits of decentralization--initiative, adaptability, and increased tempo--without sacrificing the coordination or unity of effort emblematic of centralization. The joint force will capitalize on being networked by making user-defined information and expertise available anywhere within the network, and will exploit network connectivity among dispersed joint force elements to improve information sharing, collaboration, coordinated maneuver, and integrated situational awareness. Networks should extend to interagency and multinational partners, where possible, to support and enhance unified action. (See Joint Force Characteristics)	CCJO 2.0 4. Solution	 4.E.2.	 21	08/2005
Node					
	▪ A representation of an element of architecture that produces, consumes, or processes data.	DoDAF 1.5, Volume II Annex B	 ---	 B-5	04/2007
Non-Materiel Solution					
	▪ Changes in doctrine, organization, training, materiel, leadership and education, personnel, facilities, or policy (including all human systems integration domains) to satisfy identified functional capabilities. The materiel portion is restricted to commercial or non-developmental items, which may be purchased commercially or by purchasing more systems from an existing materiel program.	CJCSM 3170.01C Glossary	 GL	 GL-18	05/2007
Objective					
	▪ The clearly defined, decisive, and attainable goal toward which every operation is directed.	JP 1-02 Appendix	 A-1	 385	03/2007
	▪ The specific target of the action taken (for example, a definite terrain feature, the seizure or holding of which is essential to the commander's plan, or, an enemy force or capability without regard to terrain features).	JP 1-02 Appendix	 A-1	 385	03/2007

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Objective Value					
	▪ The desired operational goal associated with a performance attribute beyond which any gain in utility does not warrant additional expenditure. The objective value is an operationally significant increment above the threshold. An objective value may be the same as the threshold when an operationally significant increment above the threshold is not significant or useful.	CJCSM 3170.01C Glossary	 GL	 GL-19	05/2007
Operation					
	▪ A military action or the carrying out of a strategic, operational, tactical, service, training, or administrative military mission.	JP 1-02 Appendix	 A-1	 390	03/2007
	▪ The process of carrying on combat, including movement, supply, attack, defense, and maneuvers needed to gain the objectives of any battle or campaign.	JP 1-02 Appendix	 A-1	 390	03/2007
Operational Effectiveness					
	▪ Measure of the overall ability to accomplish a mission when used by representative personnel in the environment planned or expected for operational employment of the system considering organization, doctrine, supportability, survivability, vulnerability, and threat.	CJCSI 3170.01F Glossary	 GL	 GL-17	05/2007
Operational Test and Evaluation (OT&E)					
	▪ The field test, under realistic combat conditions, of any item of (or key component of) weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability of the weapons, equipment or munitions for use in combat by typical military users, and the evaluation of the results of such test.	AFOTEC OT&E Guide, 5th edition. Glossary	 Attch B	 B-26	06/2007
Operational Threat Environment					
	▪ A generalized overview of the operational, physical and technological environment in which the system will have to function during its lifetime. Developments and trends that can be expected to affect mission capability during the system's life span should be included. Areas to be covered should include all generations of threat as outlined by US Strategic Command. – Threats, first generation: Common hacker tools and techniques used in a non-sophisticated manner. Lone or possibly small groups of amateurs without large resources. – Threats, second generation: Non state-sponsored computer network attack, espionage or data theft. Common tools used in a sophisticated manner. Individuals or small groups supported by resources of a business, criminal syndicate or other trans-national group, including terrorists. – Threats, third generation: State-sponsored computer network attack or espionage. More sophisticated threat (than first and second) supported by institutional processes and significant resources.	CJCSI 6510.01E Glossary	 GL	 GL-13	08/2007
Operational View (OV)					
	▪ The OV captures the operational nodes, the tasks or activities performed, and the information that must be exchanged to accomplish DOD missions. It conveys the types of information exchanged, the frequency of exchange, which tasks and activities are supported by the information exchanges, and the nature of information exchanges. – OV-1 -- Operational Level Operational Concept Graphic: High-level graphical/textual description of operational concept.	DoDAF 1.5, Volume I 1	 1.4.2	 1-8	04/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
	– OV-2 -- Operational Node Connectivity Description: Operational nodes, connectivity, and information exchange need lines between nodes. – OV-3 -- Operational Information Exchange Matrix: Information exchanged between nodes and the relevant attributes of that exchange. – OV-4 -- Organizational Relationships Chart: Organizational, role, or other relationships among organizations. – OV-5 -- Operational Activity Model: Capabilities, operational activities, relationships among activities, inputs, and outputs; overlays can show cost, performing nodes, or other pertinent information. – OV-6a -- Operational Rules Model: One of three products used to describe operational activity—identifies business rules that constrain operation. – OV-6b -- Operational State Transition Description: One of three products used to describe operational activity—identifies business process responses to events. – OV-6c -- Operational Event-Trace Description: One of three products used to describe operational activity—traces actions in a scenario or sequence of events. – OV-7 -- Logical Data Model: Documentation of the system data requirements and structural business process rules of the Operational View.		
Physical Design			
	▪ The physical design identifies all of the services or components necessary to implement the logical design.	CTM v3.0 --- --- ---	04/2009
Precise			
	▪ The ability to act directly upon key elements and processes demands precisely executed joint actions. Precision extends beyond surgical strikes to the exact application of all joint force capabilities to achieve greater success at less risk. Knowledge gained in all dimensions will enhance the capability of the JFC to understand a situation, determine the effects desired, select a course of action and the forces to execute it, accurately assess the effects of that action and reengage as necessary. Regardless of its application in combat or noncombat operations, the capability to engage precisely allows commanders to shape situations or battlespace in order to generate the desired effects while minimizing unintended effects and contributing to the most effective use of resources. The overall effect of precision is far-reaching with considerable payoff in terms of combat effectiveness. (See Joint Force Characteristics)	CCJO 2.0 4. Solution 4.E.7. 22	08/2005
Precision			
	▪ The quality or state of being clearly depicted, definite, measured or calculated.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
	▪ A quality associated with the spread of data obtained in repetitions of an experiment as measured by variance; the lower the variance, the higher the precision.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
	▪ A measure of how meticulously or rigorously computational processes are described or performed by a model or simulation.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
Program Introduction (PI)			
	▪ The Program Introduction (PI) is the test customer's initial requirements document to the lead support agency. Within the context of the capabilities test methodology, the PI should include the test concept, the test evaluation strategy, and the joint operational context for test. The PI is also referred to as the program introduction document or PID.	CTM v3.0 --- --- ---	04/2009
	▪ The PI is the initial planning document submitted by a user to the support agency immediately on identification of the scope and duration of a program activity. The user should submit the PI using the best available information, enabling the support agency to initiate resource and technical planning. This information, while sometimes fragmentary and incomplete, is of substantial value to the support agency in determining the scope of the program. For many programs, the PI will eliminate further documentation except for conducting specific operations.	Universal Documentation System Handbook 501-97 https://wsmrc2vger.wsmr.army.mil/rcc/manuals/uds/501chaps.htm --- --- ---	11/1997
Program Manager (PM)			
	▪ The individual designated by the implementing command as having single-point management responsibility for an acquisition program. The program director may delegate specific program authority to system program office staff members as long as the authority is documented in management instructions or official correspondence.	AFOTEC OT&E Guide, 5th edition. Glossary Attch B B-28	06/2007
Referent			
	▪ The best or most appropriate codified body of information available that describes characteristics and behavior of the reality represented in the simulation from the perspective of validation assessment for intended use of the simulation.	The Referent Study Final Source (by D.K. Pace) Executive Summary --- ES-1	06/2004
Resilient			
	▪ To operate successfully, the future joint force must be able to protect and sustain its capabilities from the effects of adversaries or adverse conditions. It must also be able to withstand pressure or absorb punishment without permanently losing its focus, structure, momentum, or integrity. Resilience provides joint forces with the ability to sustain performance at high levels, despite losses, setbacks, or similar developments. The future joint force must be resilient to meet the demands of being successful across the ROMO [Range of Military Operations] in an uncertain future security environment. (See Joint Force Characteristics)	CCJO 2.0 4. Solution 4.E.9. 23	08/2005
Resolution			
	▪ The degree of detail used to represent aspects of the real world or a specified standard or referent by a model or simulation.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
	▪ Separation or reduction of something into its constituent parts; granularity.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Risk					
	▪ Probability and severity of loss linked to hazards.	JP 1-02 Appendix	A-1	465	03/2007
Scenario					
	▪ An account or synopsis of a projected course of action or events. For the purpose of this Instruction, the focus of scenarios is on strategic and operational levels of warfare. Scenarios include information such as threat and friendly politicomilitary contexts and/or backgrounds, assumptions, operational objectives, and other planning considerations.	DODI 8260.01 Definitions	E1.3.	6	01/2007
Sensitivity					
	▪ The ability of a component, model or simulation to respond to a low level stimulus.	Recommended Practices Guide Fidelity RPG Special Topic	---	8	09/2000
Service					
	▪ A distinct part of the functionality that is provided by a system on one side of an interface to a system on the other side of an interface.	DoDAF 1.5, Volume II 2. Architecture Basics	2-5	2-14	04/2007
Specified Task					
	▪ In the context of joint operation planning, a task that is specifically assigned to an organization by its higher headquarters.	CJCSM 3500.04E Glossary	GL-6	63	08/2008
Standard					
	▪ Quantitative or qualitative measures for specifying the levels of performance of a task.	CJCSM 3500.04E Glossary	GL-6	63	08/2008
Statement of Capability (SC)					
	▪ The SC is the support agency's response to the PI. The SC is a basic agreement between the user and the support agency. Within the context of the capabilities test methodology, the SC should incorporate the test concept, the test evaluation strategy, and the joint operational context for test. The SC is also referred to as the statement of capabilities or SOC.	CTM v3.0 ---	---	---	04/2009
	▪ The SC is the support agency's response to the PI. When properly signed, the SC is evidence that a program has been accepted for support by the support agency. Support conditions, qualifications, and resources, or other considerations are initially identified in this document which serves as a baseline reference for subsequent acceptance and commitment by the support agency.	Universal Documentation System Handbook 501-97 https://wsmrc2vger.wsmr.army.mil/rcc/manuals/uds/501chaps.htm ---	---	---	11/1997

Term	Definition	Source (Chapter, Paragraph, Page #)			Source Date
Strategic Analysis					
	▪ An analysis of force sufficiency and effectiveness conducted by the DOD Components to support the development and evaluation of the defense strategy. Such analyses address both forces and enablers (e.g., intertheater and intratheater lift capability, required language skill, and regional expertise capabilities).	DODI 8260.01 Definitions	 E1.4.	 6	01/2007
Supporting Task					
	▪ Specific activities that contribute to accomplishment of a joint mission-essential task. Supporting tasks associated with a command or agency's mission-essential task list are accomplished by the joint staff or subordinate commands or agencies.	CJCSM 3500.04E Glossary	 GL-6	 63	08/2008
System					
	▪ A functionally, physically, and/or behaviorally related group of regularly interacting or interdependent elements; that group of elements forming a unified whole.	JP 1-02 Appendix	 A-1	 523	03/2007
System Design Document (SDD)					
	▪ The System Design Document (SDD) is created during the CTM. The SDD Implement LVC-DE phase describes the Live/Virtual/Constructive Distributed Environment (LVC-DE) configuration for the JME and is a unique configuration of the LVC-DE baseline system that supports a particular capability test. The SDD will support the JME physical design specifications (Joint Mission Environment System Design Document Template).	CTM v3.0 ---	 ---	 ---	04/2009
System of Systems (SoS)					
	▪ A set or arrangement of interdependent systems that are related or connected to provide a given capability. The loss of any part of the system could significantly degrade the performance or capabilities of the whole. The development of an SoS solution will involve trade space between the systems as well as within an individual system performance.	CJCSM 3170.01C Glossary	 GL	 GL-21	05/2007
	▪ Systems that include hardware, software, data, personnel, procedures, and facilities (DOTMLPF & MOD Lines of Development).	Dandashi, SE DSIG-OMB UML Profile for DoDAF/MODAF; http://www.acq.osd.mil/osjtf/SOS/7_UML %20Profile%20for%20DODAF-MODAF_20050922.ppt ---	 ---	 Slide 4	06/2005
System Threat Assessment Report (STAR)					
	▪ The basic authoritative threat assessment, tailored for and focused on, a particular (i.e., single) U.S. major defense system. It describes the threat to be countered in the projected threat environment. The threat information should reference DIA-validated documents.	DoD 5200.1-M Definitions	 DL	 DL1.1. 30.	03/1994
System Under Test (SUT)					
	▪ An implemented capability increment during an acquisition program, which is the focus of evaluation during a capability test.	CTM v3.0 ---	 ---	 ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
System/System of Systems Attribute			
	▪ A quantitative or qualitative performance characteristic of a system or system of systems that make a significant contribution to the characteristics of the future joint force as defined in the Capstone Concept for Joint Operations or to other characteristics deemed necessary by the sponsor (e.g., suitability, survivability) across doctrine, organization, training, materiel, leadership & education, personnel, and facilities. System/System of Systems Attributes can include Key Performance Parameters (KPPs); Key System Attributes (KSAs); Critical Technical Parameters (CTPs); and system-level measures of performance (MOPs), measures of effectiveness (MOEs), or measures of suitability (MOS).	CTM v3.0 --- --- ---	04/2009
Systems and Services View (SV)			
	▪ The SV captures system, service, and interconnection functionality providing for, or supporting, operational activities. DOD processes include warfighting, business, intelligence, and infrastructure functions. The SV system functions and services resources and components may be linked to the architecture artifacts in the OV. These system functions and service resources support the operational activities and facilitate the exchange of information among operational nodes. – SV-1 -- Systems/Services Interface Description: Identification of systems nodes, systems, system items, services, and service items and their interconnections, within and between nodes. – SV-2 -- Systems/Services Communications Description: Systems nodes, systems, system items, services, and service items and their related communications laydowns. – SV-3 -- Systems-Systems/Services-Systems/Services-Services Matrix: Relationships among systems and services in a given architecture; can be designed to show relationships of interest, e.g., system-type interfaces, planned vs. existing interfaces, etc. – SV-4a -- Systems Functionality Description: Functions performed by systems and the system data flows among system functions. – SV-4b -- Services Functionality Description: Functions performed by services and the service data flow among service functions. – SV-5a -- Operational Activity to Systems Function Traceability Matrix: Mapping of system functions back to operational activities. – SV-5b -- Operational Activity to Systems Traceability Matrix: Mapping of systems back to capabilities or operational activities. – SV-5c -- Operational Activity to Services Traceability Matrix: Mapping of services back to operational activities. – SV-6 -- Systems/Services Data Exchange Matrix: Provides details of system or service data elements being exchanged between systems or services and the attributes of that exchange. – SV-7 -- Systems/Services Performance Parameters Matrix: Performance characteristics of Systems and Services View elements for the appropriate time frame(s). – SV-8 -- Systems/Services Evolution Description: Planned incremental steps toward migrating a suite of systems or services to a more efficient suite, or toward evolving a current system to a future implementation.	DoDAF 1.5, Volume I 1 1.4.3 1-8	04/2007

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
	– SV-9 -- Systems/Services Technology Forecast: Emerging technologies and software/hardware products that are expected to be available in a given set of time frames and that will affect future development of the architecture. – SV-10a -- Systems/Services Rules Model: One of three products used to describe system and service functionality—identifies constraints that are imposed on systems/services functionality due to some aspect of systems design or implementation. – SV-10b -- Systems/Services State Transition Description: One of three products used to describe system and service functionality—identifies responses of a system/service to events. – SV-10c -- Systems/Services Event-Trace Description: One of three products used to describe system or service functionality—identifies system/service-specific refinements of critical sequences of events described in the Operational View. – SV-11 -- Physical Schema: Physical implementation of the Logical Data Model entities, e.g., message formats, file structures, physical schema.		
Tactics, Techniques, and Procedures (TTP)			
	▪ Tactics -- The employment and ordered arrangement of forces in relation to each other.	JP 1-02 Appendix A-1 530	03/2007
	▪ Techniques -- Non-prescriptive ways or methods used to perform missions, functions, or tasks.	JP 1-02 Appendix A-1 537	03/2007
	▪ Procedures -- Standard, detailed steps that prescribe how to perform specific tasks.	JP 1-02 Appendix A-1 428	03/2007
Task			
	▪ An action or activity (derived from an analysis of the mission and concept of operations) assigned to an individual or organization to provide a capability. (See Essential Task)	CJCSM 3500.04E Glossary GL-6 63	08/2008
Task Measures of Performance (TMOP)			
	▪ Task Measures of Performance (TMOPs) are used to quantify mission task accomplishment. TMOPs are defined using the Universal Joint Task List (UJTL) structure of task, condition, and standard and are based on joint force commander mission tasks deemed essential to mission accomplishment using specified conditions and standards.	CTM v3.0 --- --- ---	04/2009
Technical Assessment			
	▪ Technical Assessment activities measure technical progress and the effectiveness of plans and requirements. Activities within Technical Assessment include the activities associated with Technical Performance Measurement and the conduct of technical reviews. A structured review process should demonstrate and confirm completion of required accomplishments and exit criteria as defined in program and system planning. Technical reviews are discussed in detail in section 4.3. Technical assessment activities discover deficiencies or anomalies that often result in the application of corrective action.	Defense Acquisition University Guidebook 4 4.2.3.3 ---	12/2008

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Technical Standards View (TV)			
	▪ The TV is the minimal set of rules governing the arrangement, interaction, and interdependence of system parts or elements. Its purpose is to ensure that a system satisfies a specified set of operational requirements. The TV provides the technical systems implementation guidelines upon which engineering specifications are based, common building blocks are established, and product lines are developed. It includes a collection of the technical standards, implementation conventions, standards options, rules, and criteria that can be organized into profile(s) that govern systems and system or service elements for a given architecture. – TV-1 -- Technical Standards Profile: Listing of standards that apply to Systems and Services View elements in a given architecture. – TV-2 -- Technical Standards Forecast: Description of emerging standards and potential impact on current Systems and Services View elements, within a set of time frames.	DoDAF 1.5, Volume I 1 1.4.4 1-9	04/2007
Test and Evaluation Master Plan (TEMP)			
	▪ All programs on the OSD T&E Oversight List are required to submit for OSD approval a master plan that describes the total T&E planning from component development through operational T&E into production and acceptance. The program manager, with T&E WIPT providing support, is responsible for producing the TEMP. It is an important document in that it contains the required type and amount of test and evaluation events, along with their resource requirements. The TEMP is considered a contract among the program manager, OSD, and the T&E activities. The program manager must follow the approved TEMP to budget for T&E resources and schedules, which is why it is imperative that all T&E stakeholders participate early in the T&E Strategy development and make timely updates when events or resource requirements change. Stakeholders should include representatives from USD(AT&L) (e.g., SE/AS) and DOT&E, as those offices ultimately will approve the TEMP.	Defense Acquisition University Guidebook 9 9.10 ---	12/2008
Test and Evaluation Strategy (TES)			
	▪ The TES is an early T&E planning document that describes the T&E activities starting with Technology Development and continuing through System Development and Demonstration into Production and Deployment. Over time, the scope of this document will expand, the TES will evolve into the TEMP due at Milestone B. The TES describes, in as much detail as possible, the risk reduction efforts across the range of activities (e.g., M&S, DT&E, OT&E, etc.) that will ultimately produce a valid evaluation of operational effectiveness, suitability, and survivability before full-rate production and deployment. It is a living document and should be updated as determined by the T&E WIPT during the Technology Development Phase.	Defense Acquisition University Guidebook 9 9.6.1.1 ---	12/2008
Test Approach			
	▪ A description of the overall scope of the live, virtual, and constructive test including estimated number and size of events, and estimated test schedule. Live operations are highlighted and locations identified, such as a DOD range or contractor facilities. Detailed planning for live operations is normally conducted at individual ranges or facilities using local procedures.	CTM v3.0 --- --- ---	04/2009
Test Concept			
	▪ The Test Goal, Objectives, and Approach (TGOA) necessary for a System Under Test (SUT) program manager to initially characterize a test to the organization orchestrating the LVC Distributed Environment.	CTM v3.0 --- --- ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Test Data			
	▪ Quantitative or qualitative information collected during one or more test events. Data to be collected during a test are identified in the integrated data requirements list contained in the test plan.	CTM v3.0 --- --- ---	04/2009
Test Event			
	▪ A collective term used to describe an event executed in consonance with an approved scenario. A test event occurs in a scheduled test venue using a combination of LVC components, with Service provided test resources, in a realistic joint mission environment for the purpose of generating and collecting SoS data. A test event is supported by a detailed test plan and typically consists of numerous test trials.	CTM v3.0 --- --- ---	04/2009
Test Goal			
	▪ The Test Goal provides a high-level understanding of the Joint Capability under test and its contribution to achieving the Joint Mission. These goals should include the following definitions: – The Joint Mission and statement for test, to include any key materiel and non-materiel system of systems information relevant to the test. – The relevant portion of the Family of Joint Future Concepts, CONOPS, or UCP-assigned mission to which Joint Capability contributes, and the desired end state (operational outcome). – The Joint system capabilities (key performance characteristics) that are to be tested to provide scope for the overall test. – The enabling capabilities that may be required to achieve the desired mission outcomes. – The traceability to relevant Defense Planning Scenarios (DPS) and Multi-Service Force Deployment (MSFD) documentation.	CTM v3.0 --- --- ---	04/2009
Test Objective			
	▪ Test Objectives focus the test goal on a specific capability subset defined by a Critical Capability Issue (CCI) to capability crosswalk mission desired effects, tasks, conditions (e.g., threat and environment), and system/SoS elements to set the stage for developing a capability test design. The test objective should reference a critical joint issue; a focused subset of the capability crosswalk; and a test scenario, derived from the Joint Operational Context for Test (JOC-T).	CTM v3.0 --- --- ---	04/2009
Test Plan			
	▪ The test plan will provide sufficient detail to identify data and resource requirements to support the assessment/evaluation. It will list CCIs, Task MOPs, and attribute measures as well as describe test limitations, safety and security issues, specific test events, scenarios, schedule, measures, data collection (who, what, when, where, why, and how), reduction, and analysis. – It will show linkages between data to be collected, information to be obtained, and conclusions needed. It will also show differences between LVC-DE scenarios versus operational scenarios and the tested system/SoS versus the planned operational system/SoS and describe how these differences (limitations) will be addressed. It can include a Data Analysis Plan (DAP).	CTM v3.0 --- --- ---	04/2009

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Test Run			
	▪ A Test Run is one instantiation of a test on a system or system of systems under a Joint Operational Context for Test (JOC-T). Multiple iterations of a test run with the same set of independent variables held at the same values would make a test trial.	CTM v3.0 --- --- ---	04/2009
Test Scenario			
	▪ An overarching narrative reflecting a realistic LVC joint mission environment containing necessary elements from the Joint Operational Context for Test as required by the Test Concept and Evaluation Strategy. The test scenario describes proposed test events in joint operational terms, generally without regard to how the joint test scenario will be implemented (except identify any live, virtual, or constructive requirements or constraints). The test scenario describes relevant operational organizations, resources, missions, and threats that will interact with the client system under test. The test scenario provides insight into what operational entities are required and how they interact as test events are executed. Any operational constraints imposed by requirements should be specified, such as organization behaviors and rules of engagement.	CTM v3.0 --- --- ---	04/2009
Test Trial			
	▪ A Test Trial is one or more test runs where a set of independent variables (joint mission vignettes, system of system material and non-material configurations, threat and environmental conditions) is held constant.	CTM v3.0 --- --- ---	04/2009
Test Vignette			
	▪ Test vignettes are subsets of the overall Test Scenario. Each vignette is focused on one or more test objectives from the Test Concept. Using an analogy, a vignette is a scene and the scenario is the movie or play. Each vignette will be comprised of sets of system of systems combinations and test conditions, i.e., controlled variables (or factors) under which the test systems and participants will be subjected for a test trial or set of test trials to measure system of systems performance and joint mission effectiveness (JMe).	CTM v3.0 --- --- ---	04/2009
Threat Condition			
	▪ Those threat (e.g., threat actions, threat order of battle, threat command and control structure, threat systems, threat force laydown) condition variables of an operational environment or situation in which a unit, system, or individual is expected to operate.	CTM v3.0 --- --- ---	04/2009
Threshold Value			
	▪ A minimum acceptable operational value below which the utility of the system becomes questionable.	CJCSM 3170.01C Glossary GL GL-21	05/2007
Tolerance			
	▪ The maximum permissible error or the difference between the maximum and minimum allowable values in the properties of any component, device, model, simulation or system relative to a standard or referent. Tolerance may be expressed as a percent of nominal value, plus and minus so many units of a measurement, or parts per million.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
	▪ The character, state or quality of not interfering with some thing or action.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
Universal Joint Task List (UJTL)			
	▪ A menu of capabilities (mission-derived tasks with associated conditions and standards, i.e., the tools) that may be selected by a joint force commander to accomplish the assigned mission. Once identified as essential to mission accomplishment, the tasks are reflected within the command joint mission essential task list.	JP 1-02 Appendix A-1 568	03/2007
Use Case [Class]			
	▪ The specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system.	DoDAF 1.5, Volume II Annex C C-5	04/2007
Validation			
	▪ For the purpose of this Directive, the process of determining the degree to which a model is an accurate representation of the real-world from the perspective of the intended uses of the model.	DOD 5000.59 Definitions E2.17. 7	08/2006
Validity			
	▪ The quality of being inferred, deduced, or calculated correctly enough to suit a specific application.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
	▪ The quality of maintained data that is found on an adequate system of classification (e.g., data model) and is rigorous enough to compel acceptance for a specific use.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
	▪ The logical truth of a derivation or statement, based on a given set of propositions.	Recommended Practices Guide Fidelity RPG --- 8 Special Topic	09/2000
Verification			
	▪ For the purpose of this Directive, the process of determining that a model implementation accurately represents the developer's conceptual description and specifications.	DOD 5000.59 Definitions E2.18. 7	08/2006
Vignette			
	▪ A concise narrative description that illustrates and summarizes pertinent circumstances and events from a scenario.	CJCSI 3010.02B Glossary GL GL-4	01/2006
Virtual Simulation			
	▪ A simulation involving real people operating simulated systems. Virtual simulations inject human-in-the-loop (HITL) in a central role by exercising motor control skills (e.g., flying an airplane), decision skills (e.g., committing fire control resources to action), or communication skills (e.g., as members of a C4I team).	DOD 5000.59 Definitions 36b A-6	08/2006

Term	Definition	Source (Chapter, Paragraph, Page #)	Source Date
Ways			
	▪ Doctrine, tactics, techniques, and procedures, competencies, and concepts.	Terms of Reference for Conducting a Joint Capability Area Baseline Reassessment; http://www.dtic.mil/futurejointwarfare/strategic/jca_tor9apr07.doc --- --- ---	04/2007
	▪ Applied to Testing in a Joint Environment, Ways are methods and processes, including the Capability Test Methodology (CTM), Capability Evaluation Metamodel (CEM), and the Joint Mission Environment Foundation Model (JFM) required to define and operate an instantiated Joint Mission Environment (JME) System of Systems (SoS).	CTM v3.0 --- --- ---	04/2009