Department of Defense

Modeling and Simulation (M&S) Glossary

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ACRONYMS AND ABBREVIATIONS

A

A/D	analog-to-digital
A2ATD	Anti-Armor Advanced Technology Demonstration
Aa	Achieved Availability
AA	Accelerated Acquisition; Analytic Agenda
AAAS	American Association for the Advancement of Science
AAAV	Advanced Amphibious Assault Vehicle
AAL	ATM Adaptation Layer
AAODL	Atmospheric Aerosols and Optics Data Library
AAR	After Action Review; After Action Report
AARS	After Action Review System
AAS	Advanced Automation System
AASP	Army Automation Security Program
AASPEM	Air-to-Air System Performance Evaluation Model
AATD	Army Advanced Technology Demonstration(s)
ABCS	Army Battle Command System
ABCSIM	Atmospheric, Biological, and Chemical Simulation
ABI	Application Binary Interface
ABM	Armor Breakpoint Model
ABS	Advanced Battle Simulation
ABU	Analog Backup
ACAAM	Air Courses of Action Assessment Model
ACAD	Advanced Computer-Aided Design
ACALS	Army Computer-Aided Acquisition and Logistics Support
ACC	Aegis Computer Center
ACDI	Asynchronous Communications Device Interface
ACEM	Advanced Campaign Effectiveness Model; Air Combat Evaluation Model
ACETEF	Air Combat Environment Test and Evaluation Facility
ACISD	Advanced Computational and Information Sciences Directorate
ACM	Association for Computing Machinery
ACMI	Air Combat Maneuvering Instrumentation
ACMT	Automated Configuration Management Tool
ACOE	Army Common Operating Environment
ACP	Allied Communications Publication
ACPT	Automated Corporate Planning Tool
ACQSIM	Acquisition Simulation
ACR	Advanced Concepts and Requirements
ACS	Access Control System
ACSIS	Army C4I and Simulation Initialization System
ACT	Advanced Concepts and Technology; Architecture Characterization Template
ACTD	Advanced Concept Technology Demonstration
ADDS	Advanced Data Distribution System; Automated Data Distribution System

ADEPT	Administrative Data Entry for Processing Transmission
ADL	Advanced Distributed Learning; Ada Design Language
ADLP	Advanced Data Link Program
ADM	Acquisition Decision Memorandum; Advanced Development Model; Application Distribution Module
ADMP	Army Data Management Program
ADO	Army Digitization Office
ADP	Automatic Data Processing
ADPA	American Defense Preparedness Association
ADPE	ADP Equipment
ADPSO	ADP Security Officer
ADPSSEP	ADP System Security Enhancement Program
ADPSSO	ADP System Security Officer
ADRG	Arc Digitized Raster Graphics
ADS	Advanced Distributed Simulation; Authoritative Data Source; Automated Data System; Agent-Directed Simulation
ADSI	Advanced Distributed System Interface
ADSIM	Air Defense Simulation
ADSS	Air Defense Simulation System; Army Data Standardization System; Advance Distributed Simulation System
ADST	Advanced Distributed Simulation Technology
ADTAM	Air Defense Tanker Analysis Model
ADUA	Administrative Directory User Agent
AFAM	Advanced Field Artillery Model
AFAMS	Air Force Agency for M&S
AFATDS	Advanced Field Artillery Tactical Data System
AFCENT	Allied Forces Central Europe
AFIN	Air Force Information Network
AFIT	Air Force Institute of Technology
AFMC	Air Force Materiel Command
AFMSIS	Air Force M&S Information Service
AFMSRR	Air Force M&S Resource Repository
AFNET	Air Force Network
AFO	Awaiting Further Occurrence
AFOR	Automated Forces
AFSAA	Air Force Studies and Analyses Agency
AFSATCOM	Air Force Satellite Communications
AFSCN	Air Force Satellite Control Network
AFWG	Acquisition Functional Working Group; Analysis Functional Working Group
AG	Application Gateway
AGCCS	Army Global Command and Control System
AGES	Air-to-Ground Engagement Simulation
AGIS	Analysis and Gaming Information System
AGRAM	Air-to-Ground Assessment Model
AGRMET	Agricultural Meteorological Model

AHP	Analytic Hierarchical Process
AHPCRC	Army High Performance Computer Research Center
AI	Artificial Intelligence
AI-ESTATE	AI and Expert System Tie to Automatic Test Equipment
AI2	Advanced Image Intensification
AID	AUTODIN Interface Device
AIN	Advanced Intelligent Network
AIRES	Automated Information Retrieval and Expert System
AirSAF	Air Semi-Automated Forces
AIS	Automated Information System
AISSAP	AIS Security Assessment Program
AISSO	AIS Security Officer
AITS	Advanced Information Technology Systems
AIU	Advanced Interface Unit
AJPO	Ada Joint Program Office
ALARM	Advanced Low-Altitude Radar Model
ALBAM	Air Land Battle Assessment Model
ALBE	Air Land Battlefield Environment
ALBM	Air Land Battle Management
ALES	Air Land Engagement Simulation
ALISS	Advanced Lightweight Influence Sweep System
ALM	Airlift Loading Model
ALS	Ada Language System
ALWSIM	Army Laser Weapon Simulation
AMASS	ATO Mission Analysis and Simulation System
AMG	Architecture Management Group
AMHS	Automated Message Handling System
AMIP	Army Model Improvement Program
AMM	Advanced Missile Model; Army Mobility Model
AMME	Automated Multi-Media Exchange
AMOS	Air Mobility Operations Simulation
AMP	Analysis of Mobility Platform
AMPE	Automated Message Processing Exchange
AMPES	Automatic Message Processing Exchange System
AMPS	Association of Modeling, Planning, and Simulation; Automated Mission Planning System; Aviation Mission Planning System
AMSAA	Army Materiel Systems Analysis Activity
AMSDL	Acquisition Management Systems and Data Requirements Control List
AMSEC	Army Model and Simulation Executive Council
AMSGOSC	Army Model and Simulation General Officer Steering Council
AMSMC	Army Model and Simulation Master Catalog
AMSMP	Army M&S Management Program
AMSO	Army Model and Simulation Office
AMSP	Allied M&S Publication
AMSS	Ammunition Management Standard System

ANDF	Application Neutral Data Format; Architecture Neutral Distribution Format
ANM	Automated Network Manager
ANN	Artificial Neural Networks
ANS	Artificial Neural Systems
ANSI	American National Standards Institute
AoA	Analysis of Alternatives
AOR	Area of Responsibility
APHIDS	Advanced Panoramic Helmet Interface Demonstrator System
AP	Application Protocol
API	Application Programmer's Initiative; Application Program Interface
APIMS	Army Project Information Management System
APIU	Adaptable Programmable Interface Unit
APM	Advanced Penetration Model
APMIS	Automated Program Management Information System
APMM	Activity Planning and Management Model
APP	Application Portability Profile
APS	Asynchronous Protocol Specification
APSE	Ada Programming Support Environment
AR	Augmented Reality
ARES	Advanced Regional Exploratory System
ARFORGEN	Army Force Generation
ARGUS	Advanced Real-Time Gaming Universal Simulation
ARI	Army Research Institute (for the Behavioral and Social Sciences)
ARIEM	Army Research Institute of Environmental Medicine
ARIES	Automated Real-Time Instrumented Experimentation System
AROC	Army Requirements Oversight Council
ARTBASS	Army Tactical Battlefield Simulation System
ARTDT	Advanced Real-Time Data Tool
ASAT	Anti-Satellite
ASC	Advanced Simulation Center; Aeronautical Systems Center (Air Force); American Standards Committee
ASCIET	All-Service Combat Identification Evaluation Team
ASCII	American Standard Code for Information Interchange
ASCM	Advanced Space Computing Module
ASD	Assistant Secretary of Defense
ASD(C3I)	Assistant Secretary of Defense for Command, Control, Communications, and Intelligence
ASD(NII)/DoD CIO	Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer
ASEM	Anti-Satellite Engagement Model
ASIC	Application-Specific Integrated Circuit
ASIS	Ada Semantic Interface Specification
ASME	American Society of Mechanical Engineers
ASN	Abstract Syntax Notation; Assistant Secretary of the Navy

ASNE MSEA	Air and Space Natural Environment Modeling and Simulation Executive Agent
ASSIST	Acquisition Streamlining and Standardization Information System
ASTC	Advanced Simulation Technology Center
ASTO	Advanced Systems Technology Office
ASTT	Advanced Simulation Technology Thrust
AT&L	Acquisition, Technology, and Logistics
ATB	Analytical Tool Box
ATCAL	Attrition Model Using Calibrated Parameters
ATD	Advanced Technology Demonstration
ATDL	Army Tactical Data Link; Automated Tactical Data Link
ATE	Automatic Test Equipment
ATF	Advanced Tactical Fighter
ATFM&S	Acquisition Task Force on M&S
ATM	Asynchronous Transfer Mode
ATO	Air Tasking Order
ATR	Automatic Target Recognition
ATRJ	Advanced Tactical Radar Jammer; Advanced Threat Radar Jammer
ATS	Automatic Telecommunication System; Automated Tracking System
ATTD	Advanced Technology Transition Demonstration
ATVSS	Automatic Tracking and (with) Video Scene Simulation System
AU	Access Unit
AURA	Army Unit Resiliency Analysis model
AUT	Application Under Test
AUTL	Army Universal Task List
AUTODIN	Automatic Digital Network
AWACS	Airborne Warning And Control System
AWD	Advanced Warfighting Demonstration; Alternate World Database
AWE	Advanced Warfighting Experiment; Area Weapons Effects
AWIPS	Advanced Weather Interactive Processing System
AWIS	Army Worldwide Information Systems

B

BADD	Battlefield Awareness and Data Dissemination
BASEWAM	Battlefield Surveillance Electronic Warfare Analysis Model
BASIC	Beginner's All-Purpose Symbolic Instruction Code
BASOPS	Base Operating Information System
BBN	Broadband Noise
BCBL	Battle Command Battle Lab
BCC	Base Communications Computer Center
BCCS	Battlefield Command and Control System
BCOM	Battalion Combat Outcome Model
BCS	Battery Computer System
BCTP	Battle Command Training Program
BDS	Battlefield Distributed Simulation
BDS-D	Battlefield Distributed Simulation - Developmental
BER	Basic Encoding Rules; Basic Error Rate; Bit Error Rate
BERT	Bit-Error-Rate Test
BEWSS	Battlefield Environment Weapon System Simulation
BFA	Battlefield Functional Area
BFM	Battlefield Forecast Model
BG	Battle Group
BGEM	Battle Group Effectiveness Model
BI	Bilinear Interpolation
BIA	Battlefield Information Architecture
BICES	Battlefield Information Collection and Exploitation System
BICM	Battlefield Intelligence Collection Model
BIS	Battlespace Information System; Built-In Simulation
BISDN	Binary Integrated Services Digital Network
BIT	Built-In Test
BITE	Built-In-Test Equipment
BLC	Base Level Computing
BLCI	Base Level Communication Infrastructure
BLCSE	Battle Lab Collaborative Simulation Environment
BLDM	Battalion Level Differential Model
BLERT	Block-Error-Rate Test
BLII	Base Level Information Infrastructure
BLOB	Binary Large Object
BLSM II	Base Level System Modernization Phase II (See also GCCS AF)
BM	Battlespace Management
BMC3	Battle Management Command, Control, and Communications
BMD	Bathymetric Model Data
BMDES	Ballistic Missile Defense Engagement Simulation
BMDO	Ballistic Missile Defense Organization
BMTA	Backbone Message Transfer Agent
BODAS	Brigade Operations Display and AAR System
BODESIM	Barrier/Obstacle Deployment and Effectiveness Simulation

BOM	Base Object Model
BOS	Battlefield Operating System; Basic Operating System
BOSM	Balance of Sustainment Model
BOSS	Binary Object Storage System
bps	bits per second
BPS	Battlefield Planning System
BRACE	Base Resource and Capability Estimator
BSC	Battle Simulation Center
BT	Behavioral Taxonomy
BTA	Best Technical Approach
BUCS	Back-Up Computer System
BULLET	Battalion/Unit Level Logistics Evaluation Tool
BV	Battlefield Visualization
BW	Bandwidth

C

C	C Programming Language
C&PD	Characteristics and Performance Descriptions
C-BML	Coalition-Battle Management Language
C-CS	Communications-Computer Systems
C2	Command and Control
C2I	Command, Control, and Intelligence
C2IEDM	Command and Control Information Exchange Data Model
C2IPS	Command and Control Information Processing System
C2IS	Command and Control Information Systems
C2W	Command and Control Warfare
C3	Command, Control, and Communications
C3CM	Command, Control, and Communications Counter Measures
C3I	Command, Control, Communications, and Intelligence
C3I/IS	Command, Control, Communications, and Intelligence/Information Systems
C3S	Command, Control, and Communications Systems
C3ISR	Command, Control, Communications, Intelligence, Surveillance, and Reconnaissance
C4	Command, Control, Communications, and Computers
C4I	Command, Control, Communications, Computers, and Intelligence
C4I2	Command, Control, Communications, Computers, and Intelligence Integration
C4IFTW	Command, Control, Communications, Computers, and Intelligence for the Warrior
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
C4SMP	Command, Control, Communications, and Computers System Master Plan
CAA	Center for Army Analysis
CAAM	Composite Area Analysis Model
CAAN	Combined Arms Assessment Network
CACE	Computer-Aided Cost Estimating
CACEAS	Computer-Assisted Circuit Engineering and Allocating System
CACTIS	Community Automated Counter-Terrorism Intelligence System
CAD	Computer-Aided Design
CAD/CAM	Computer-Aided Design/Computer-Aided Manufacturing
CADD	Computer-Aided Design and Drafting
CADDS	Computer-Aided Design and Drafting System
CADE	Computer-Aided Design Equipment
CADEX	Computer Adjunct Data Evaluator-X
CADIS	Communication Architecture for Distributed Interactive Simulation
CADMAT	Computer-Aided Design, Manufacture and Test
CADS	Computer-Assisted Display System
CAE	1. Common Application Environment

	2. Component Acquisition Executive 3. Computer-Aided Engineering 4. Computer-Aided Exercise
CAESAR	Computer-Aided Exploration of Synthetic Aperture Radar
CAETI	Computer-Aided Education and Training Initiative
CAFMS	Computer-Assisted Force Management System
CAI	Computer-Aided Instruction
CAINES	Computer-Assisted Instructional Evaluation System
CAIV	Cost as an Independent Variable
CAL	Computer-Aided Learning
CALOW	Contingency and Limited Objective Warfare
CALS	Computer-Aided Acquisition and Logistic Support; Continuous Acquisition and Life-Cycle Support
CAM	Civil Affairs Model; Computer-Aided Manufacturing
CAMAC	Computer-Aided Measurement and Control
CAMDSS	Common Architecture for Model Development and Simulation Support
CAMEO	Computer-Aided Management of Emergency Operations
CAMERA	Computational Algorithm for Missile Exhaust Radiation
CAMEX	Computer-Assisted Map Exercise
CAMMS	Condensed Army Mobility Model System
CAMPS	Computer-Aided Mission Planning System
CANES	Consolidated Afloat Networks and Enterprise Services
CAPE	Computer-Aided Project Engineering; Office of Cost Assessment and Program Evaluation
CAPP	Computer-Aided Process Plan
CAPS	Computer-Aided Paperless System; Contingency Analysis Planning System
CARD	Computer-Aided Remote Driving
CARDS	Catalog of Approved Requirements Documents; Central Archive for Reusable Defense Software; Comprehensive Approach to Reusable Defense Software
CARE	Computer Assistance Resource Exchange
CARES	Cratering and Related Effects Simulation
CASDM	Common Approach to Software Development and Maintenance
CASE	Computer-Aided Software Engineering; Computer-Assisted Software Engineering; Computer-Assisted Systems Engineering
CASES	Capabilities Assessment Expert System; Contingency Assessment Simulation and Evaluation System
CASMO	Combat Analysis Sustainability Model
CASP	Computer-Assisted Search Planning
CASS	Consolidated Automated Support System
CAST	Computer-Aided Software Testing
CASTFOREM-DIS	Combined Arms and Support Task Force Evaluation Model with DIS
CATIA	Computer-Aided Three-Dimensional Interactive Application
CATIS	Computer-Aided Tactical Information System; Computer-Assisted Tactical Information System

CATT	Combined Arms Tactical Trainer
CAU	Cell Adapter Unit
CAVE	Cave Automatic Virtual Environment
CAX	Computer-Assisted Exercise (NATO); Computer-Aided Exercise; Combined Arms Exercise
CB	Compromise Band
CBAM	Combat Base Assessment Model
CBI	Computer-Based Instruction
CBITS	Computer-Based Instructional Training System
CBL	Computer-Based Learning
CBR	Constant Bit Rate
CBS	Corps Battle Simulation
CBS-ATCCS	Corps Battle Simulation-Army Tactical Command and Control System Interface
CBT	Computer-Based Training
Cbt STTAR	Combat Synthetic Test and Training Assessment Range
CC	Cubic Convolutions
CCB	Configuration Control Board
CCBD	Configuration Control Board Directives
CCDR	Combatant Commander
CCEB	Combined Communications-Electronics Board
CCF	Central Computer Facility
CCH	Computer-Controlled Hostiles
CCIB	Command and Control Interoperability Board
CCIR	Commander's Critical Information Requirement
CCIS	Command and Control Information System; Command, Control, and Intelligence System (NATO)
CCOMEN	Conventional Collateral Mission Effectiveness Model
CCSIL	Command and Control Simulation Interface Language
CCSP	Consolidated Computer Security Program
CCTB	Close Combat Test Bed
CCU	Computer Control Unit
CD-R	Compact Disk-Recordable
CD-ROM	Compact Disk-Read Only Memory
CD-V	Compact Disk-Video
CD-WO	Compact Disk-Write Once
CDA	Central Design Activity; Cognitive Decision Aids
CDAd	Component Data Administrator
CDB	Cartographic Database; Common Database
CDD	Common Data Dictionary
CDDI	Copper Distributed Data Interface
CDE	Common Desktop Environment
CDI	Compact Disk Interactive
CDIN	CONUS Defense Integrated Network
CDP	Classified Data Processing; Commander's Dissemination Policy
CDRL	Contract Data Requirements List

CDS	Cross Domain Solutions; Congressional Data Sheets
CDU	Control Display Unit
CE	Command Entity
CEM	Concepts Evaluation Model
CEOI	Communications-Electronics Operating Instructions
CERS	Combat Environment Realism System
CERT	Computer Emergency Response Team
CET	Computers and Electronic Technology
CEWI	Communications Electronic Warfare Intelligence
CFAM	Combat Forces Assessment Model
CFAW	Contingency Force Analysis War Game
CFDB	Conventional Forces Database
CFE	Center for Engineering; Contractor-Furnished Equipment; Conventional Forces in Europe
CFII	Center for Integration and Interoperability
CFOR	Command Forces
CGF	Computer-Generated Forces
CGI	Computer-Generated Imagery; Computer Graphics Interface
CGM	Computer Graphics Metafile
CHANCES	Climatological and Historical Analysis of Cloud for Environmental Simulations
CHAS	Chemical Hazard Assessment System
CHS	Common Hardware/Software
CI	Configuration Item
CIC	Combat In Cities; Combat Information Center
CICS	Customer Information Control System
CIDNE	Combined Information Data Network Exchange
CIDS	Computerized Information Delivery Service
CIE	Computer Integrated Engineering
CIE-PAT	Computer Integrated Engineering-Process Action Team
CIG	Computer Image Generation; Computer Image Generator
CIM	Computer-Integrated Manufacturing; Corporate Information Management
CIM/EI	Corporate Information Management/Enterprise Integration
CIMNET	Center for Information Management Network
CIMP	Cartographic Imaging Modeling Program; Corporate Information Management Plan
CIO	Chief Information Officer
CIP	Critical Infrastructure Protection; Capital Investment Plan; Combat Information Processor; Combined Interoperability Program
CIRIS	Completely Integrated Reference Instrumentation System
CIRRUS	Clouds, IR, Real, for Use in Simulations
CIS	CASE Integration Services; Combat Instruction Set; Command Information System
CISC	Complex Instruction Set Computer
CISS	Center for Information Systems Security
CITS	Combat Information Transport System

CIU	Cell Interface Unit
CIWG	Communications Interoperability Working Group
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	CJCS Instruction
CL	Closed Loop
CLA	Conventional Land Attack
CLAP	C++ Library Actor Programming
CLCGF	Corps Level Computer Generated Forces
CLCGF-HS	Corps Level Computer Generated Forces-Hybrid State
CLD	Center Line Data
CLDGEN	Cloud Scene Generator
CLDSIM	Cloud Simulation
CLEAR	Campaign Logistics Expenditure and Replenishment Model
CLNP	Connection-Less Network Protocol
CLNS	Connection-Less Network Service
CM	Configuration Management
CMAS	Crisis Management ADP System
CMI	Computer-Managed Instruction
CMIP	Common Management Information Protocol
CMIS/P	Common Management Information Services and Protocols
CMMS	Conceptual Model of the Mission Space
CMP	Configuration Management Plan
CMR	Common Model Repository
CMSD	Core Manufacturing Simulation Data
CMT	Confederation Management Tool
CMTC	Combat Maneuver Training Center
CMWG	Configuration Management Working Group
CN	Communications Network
CNA	Computer Network Attack
CNAD	Conference of National Armament Directors (NATO)
CNC	Communications Network Control
CND	Computer Network Defense
CNMS	Consolidated Network Management System
COA	Course of Action
COADS	Comprehensive Ocean Atmosphere Data Set
COAST	Course of Action Selection Tool
COBOL	Common Business-Oriented Language
COBRA	Combat Outcome Based on Rules of Attrition
COCOM	Combatant Command
COE	Common Operating Environment
COI	Community of Interest
COIN	Counterinsurgency
COLD	Computer Output to Laser Disk
COM	Computer Output Microform
COMBIC	Combined Obscurant Model for Battlefield-Induced Contaminants

COMBIC/STATIC	Combined Obscuration Model for Battlefield-Induced Contaminants/Statistical Texturing Applied to Battlefield-Induced Contaminants
COMINT	Communications Intelligence
COMNET	Communications Network
COMPASS	Common Operational Modeling, Planning, And Simulation Strategy
COMPUSEC	Computer Security
COMSAT	Communications Satellite
COMSEC	Communications Security
CONMOD	Conflict Model
CONOPS	Concept of Operations
CONUS	Continental United States
COP	Common Operational Picture
CORBA	Common Object Request Broker Architecture
CORBAN	Corps Battle Analyzer
CORDIVEM	Corps/Division Evaluation Model
CORN	Computer Resource Nucleus
COSAGE	Combat Sample Generator
COSE	Common Open Software Environment
COTS	Commercial-Off-The-Shelf
COVART	Computation of Vulnerable Area and Repair Time
CP-36	Career Program 36
CPCI	Computer Program Configuration Item
CPIPT	Cost/Performance Integrated Process Team
CPM	Critical Path Method
CPOF	Command Post of the Future
CPU	Central Processing Unit
CPX	Command Post Exercise
CRB	Configuration Review Board
CRLCMP	Computer Resource Life-Cycle Management Plan
CRMP	Computer Resources Management Plan
CROSSBOW-S	Construction of a Radar to Operationally Simulate Signals Believed to Originate Within the Soviet Union
CRRA	Capabilities Review and Risk Assessment
CRRB	Capabilities Requirements Review Board
CRT	Cathode Ray Tube
CRWG	Computer Resource Working Group
CS	Constraint Set; Content Staging; Computer Science
CSC	Computer Software Component
CSCI	Computer Software Configuration Item
CSE	Common Support Equipment; Computer Science Engineering
CSERIAC	Crew System Ergonomics Information Analysis Center
CSIDS	CENTCOM/SOCOM Integrated Data System
CSII	Center for Systems Interoperability and Integration
CSL	Computer Systems Laboratory
CSM	Computer Software Module

CSP	Communications Service Processor; Common Software Package
CSPEI	Computer Software Product End Item
CSPI	COTS Discrete Event Simulation Package Interoperability
CSPM	Communication System Performance Model
CSRDF	Crew Station Research and Development Facility (Army)
CSS	Communications Support System
CSSBL	Combat Service Support Battle Lab
CSSCS	Combat Service Support Computer System
CSSFAM	Combat Service Support Functional Area Model
CSSM	Cloud Scene Simulation Model
CSSTSS	Combat Service Support Tactical Simulation System; Combat Service Support Training Simulation System
CSU	Computer Software Unit
CT	Computer Tomography
CTAPS	Contingency Tactical Air Planning System; Contingency Theater Automated Planning System
CTDB	Compact Terrain Data Base
CTC	Critical Technical Characteristics; Combat Training Center
CTE	Center for Test and Evaluation
CTEIP	Central Test and Evaluation Investment Program
CTF	Common Technical Framework
CTIA	Common Training Instrumentation Architecture
CTIS	Combat Terrain Information System; Command Tactical Information System
CTLS	Concurrent Theater Level Simulation
CTO	Chief Technology Officer
CTOS	Convergent Technologies Operating Systems
CTP	Common Tactical Picture
CTSF	Central Technical Support Facility
CUTM	Computer Understandable Terrain Model
CVF	Compressed Volume File
CVGA	Color Video Graphics Array
CVSA	Combat Vehicle Simulation Architecture
CVTS	Combat Vehicle Training System
CW	Cyber Warfare
CWASAR	Cruise Weapon Analysis Simulation and Research
CWM	Composite Warfare Model

D

D/A	Digital-to-Analog
DA	Developmental Agent; Department of the Army; Data Administrator
DAA	Designated Approving Authority
DAB	Defense Acquisition Board
DACS	Data and Analysis Center for Software; Digital Access and Cross-Connect System
DAD	Data Administrator
DAdm	Data Administration
DADS	Dynamic Analysis and Design System
DAE	Defense Acquisition Executive
DAES	Defense Acquisition Executive Summary
DAG	Data Analysis Group; Data Authentication Group; Defense Acquisition Guidebook
DAI	Distributed Artificial Intelligence
DAISY	Defense Automated Information System
DAMIS	Defense Analysis and Management Information System
DAP	Data Access Protocol; Data Administration Program; Directory Access Protocol
DAPG	Data Analysis Programming Group
DAPM	Data Administration Program Manager; Domain Analysis Process Model
DAPMO	Data Administration Program Management Office
DAPS	Data Acquisition and Processing System
DARIC	Defense Automation Resources Information Center
DARMP	Defense Automation Resources Management Program
DARPA	Defense Advanced Research Projects Agency
DASD	Direct Access Storage Device; Deputy Assistant Secretary of Defense
DASD(DT&E)	Deputy Assistant Secretary of Defense for Developmental Test and Evaluation
DASD(IM)	Deputy Assistant Secretary of Defense for Information Management
DASP	Data Administration Strategic Plan
DAU	Data Acquisition Unit; Defense Acquisition University
DAWN	Defense Attached Worldwide Network
dB	decibel
DB	Database
DBA	Design-Based Analysis; Dominant Battlespace Awareness
DBAd	Database Administrator
DBAdM	Database Administration
DBD	Database Document
DBK	Dominant Battlespace Knowledge
DBMS	Database Management System
DBOF	Defense Business Operations Fund
DCA	Data Collection and Analysis
DCAC	Digital Concepts Analysis Center

DCE	Distributed Computing Environment
DCI	Data Communication Interface; Director for Central Intelligence
DCID	Director for Central Intelligence Directive
DCN	Defense Communications Network
DCP	Decision Coordinating Paper; Distributed Collaborative Planning
DCPDS	Defense Civilian Personnel Data System
DCPS	Data Communications Protocol Standards
DCT	Desktop Computer Terminal; Digital Communication Terminal
DCTN	Defense Commercial Telephone Network
DCTS	Defense Collaboration Tool Suite
DCW	Digital Chart of the World
DD/DS	Data Dictionary/Directory System
DDA	Domain Defined Attribute
DDARS	Distributed Data Archive and Retrieval System
DDBMS	Distributed Database Management System
DDDS	Defense Data Directory System
DDI	Director of Defense Information
DDL	Data Definition Language
DDM	Distributed Data Management
DDMS	DoD Discovery Metadata Specification
DDN	Defense Data Network
DDR	DoD Data Repository
DDR&E	Director of Defense Research and Engineering
DDS	Digital Data Service; Direct Digital Synthesizer; Distributed Data System; Distributed Defense Simulation
DDSS	Distributed Defense Simulation System
DE	Data Engineering
DEA	Data Exchange Agreement
DECA	Digital Electronic Control Assembly
DECC	Defense Enterprise Computing Center
DED	Data Extraction Device
DEEM	Dynamic Environmental Effects Model
DEF	Data Exchange Format
DELTA	Data Element Tool-Based Analysis
DEM	Digital Elevation Model
DES	Discrete Event Simulation; Digital Encryption Standard; Data Encryption Standard
DESCEM	Dynamic Electromagnetic Systems Combat Effectiveness Model
DESP	Data Element Standardization Program
DESS	Differential Equation System Specifications
DET	Dynamic Environment and Terrain
DEVS	Discrete Event System Specifications; Discrete Event Simulation
DEWCOM	Divisional Electronic Warfare Combat Model
DEXES	Deployable Exercise System
DFAD	Digital Features Analysis Data
DFNS	Data File Management System

DFON	Derived Federation Object Model
DFSAM	Direct Fire Stand-Alone Model
DGCC	Defense Information Systems Agency Global Control Center
DGDEM	Dynamic Generalized Digital Environmental Model
DGIS	Direct Graphics Interface Standard
DGIWG	Defense Geospatial Information Working Group
DGSA	Defense Goal Security Architecture
DHIS	Distributed Heterogeneous Information Systems
DI	Date Integrity; Dismounted Infantry
DIA	Defense Intelligence Agency
DIAL	Distributed Intelligent Architecture for Logistics
DIB	Defense Information Base; Directory Information Base
DICE	DARPA Initiative for Concurrent Engineering; Distributed Interactive C31 Effectiveness Simulation Program
DID	Data Item Description; Digital Interface Device
DIDHS	Deployed Intelligence Data Handling System
DIDOP	Digital Image Data Output Product
DIF	Data Interchange Format
DIGEST	Digital Geographic Information Exchange Standard
DII	Defense Information Infrastructure
DIICC	Defense Information Infrastructure Control Concept
DIM	Director of Information Management
DIME	Diplomatic, Information, Military, and Economic; Digital Integrated Modeling Environment
DIRSP	Dynamic Infrared Scene Projector
DIS	Distributed Interactive Simulation; Defense Information System
DISA	Defense Information Systems Agency
DISA/CI	Defense Information Systems Agency/Center for Information
DISA-IS	Defense Information Systems Agency Information System
DISA-LO	Defense Information Systems Agency – Liaison Officer
DISANet	Defense Information Systems Agency Information Network
DISC	Defense Information System Council
DISC4	Director of Information Systems Command, Control, Communications, and Computers
DISN	Defense Information Systems Network
DISP	Directory Information Shadowing Protocol
DISR	Defense Information Technology Standards Registry
DISS	Distributed Interactive Simulation and Stimulation
DISSIT	Distributed Interactive Simulation Synthesis with Interactive Television
DISSP	Defense Information System Security Program
DIST	Defense Integration Support Tool
DIST-EAGLE	Distributed Interactive System for Eagle
DISTAR	Distributed Interactive Simulation Technologies in after Action Review
DITPRO	Defense Information Technical Procurement Office
DIVE	Dismounted Infantry in a Virtual Environment
DJS	Director Joint Staff

DKP	Distributed Knowledge Processing
DL	Data Link; Distance Learning
DLC	Dynamic Link Compatible
DLI	Data Link Interface
DLMS	Digital Land Mass System
DLPS	Data Links Processor System
DMA	Defense Mapping Agency (Now National Geospatial Intelligence Agency (NGA))
DMAP	Data Management and Analysis Plan
DMD	Digital Message Device
DME	Distributed Management Environment; Distance Measuring Equipment
DMF	Data Management Facility
DMG	Digital Map Generator
DMGMP	Database Generation/Modification Program
DMO	Distributed Mission Operations
DMS	Defense Message System; Digital M&S; Distributed Models and Simulations
DMSCC	Defense M&S Coordination Center
DMSI	Defense M&S Initiative
DMSIS	Defense M&S Information System
DMSO	Defense M&S Office (Now M&S Coordination Office (M&SCO))
DMSP	Defense Message System Program
DMSTTIAC	Defense Modeling, Simulation, and Tactical Technology Information Analysis Center
DNSIX	DODIIS Network Security for Information Exchange
DNVT	Digital Non-Secure Voice Telephone
DoDAF	Department of Defense Architecture Framework
DoDCSEC	Department of Defense Computer Security Evaluation Center
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DoDIIS	Department of Defense Intelligence Information System
DoDISS	Department of Defense Index of Specifications and Standards
DoDMSEA	Department of Defense M&S Executive Agent
DOE	Design of Experiments; Department of Energy; Distributed Object Environment
DOF	Degree of Freedom
DOIM	Directors of Information Management
DOMF	Distributed Object Management Facility
DONMSMO	Department of the Navy, M&S Management Office
DONMSTSG	Department of the Navy, M&S Technical Support Group
DOORS	Demonstration of Dynamic Object Oriented Requirements System
DOS	Disk Operating System
DOT	Distributed Object Technologies
DOT&E	Director of Operational Test and Evaluation
DOTBF	Digitization of the Battlefield

DOTMLPF	Doctrine, Organizations, Training, Materiel, Leadership and Education, Personnel, and Facilities
DP	Data Processing
DPA	Defense Production Act; Demand Protocol Architecture
DPDB	Digital Product Database
DPDE	Data Product Development Environment
DPI	Data Processing Installation
DPPDB	Digital Point Positioning Database
DPS	Digital Production System
DR	Data Repositories; Dead Reckoning
DRAM	Dynamic Random Access Memory
DRDA	Distributed Relational Database Architecture
DREN	Defense Research and Engineering Network
DRFM	Digital RF Memory
DRN	Data Representation Notation
DRRB	Data Requirements Review Board
DRSN	Defense Red Switch Network
DRTWG	Data and Repositories Technology Working Group
DRU	Data Retrieval Unit; Direct Reporting Unit
DQ	Data Quality
DS	Data Security; Digital Signal; Direct Support
DSA	Directory System Agent; Distribution Systems Analyzer
DSAMS	Defense Security Assistance Management System
DSB	Defense Science Board
DSCS	Defense Satellite Communications System
DSE	Data Storage Equipment; Dynamic Synthetic Environments
DSEEP	Distributed Simulation Engineering and Execution Process
DSF	Display Simulation Facility
DSI	Defense Simulation Internet
DSMAC	Digital Scene Matching Area Correlator
DSMC	Defense Systems Management College
DSN	Defense Switched Network
DSP	Defense Standardization Program; Digital Signal Processing
DSPO	Defense Standardization Program Office
DSREDS	Digital Storage and Retrieval Engineering Data System
DSRS	Defense Software Repository System
DSS	Decision Support System; Distribution Standard System; Digital Signature Standard
DSSA	Domain-Specific Software Architecture
DSSCS	Defense Special Security Communications System
DSSE	Developmental Software Support Environment
DSSEP	Developmental Software Support Environment Plan
DSTS-G	DISN Satellite Transmission Services - Global
DSU	Data Service Units; Digital Signal Unit
DSVT	Digital Secure Voice Terminal; DoD Standards Vetting Tool
DT&E	Developmental Test and Evaluation

DTAD	Digital Terrain Analysis Data
DTAMS	Digital Terrain Analysis Mapping System
DTAP	Defense Technology Area Plan
DTD	Data Transfer Device
DTE/DCE	Data Terminal Equipment/Data Circuit-terminating Equipment
DTED	Digital Terrain Elevation Data
DTED1	Digital Terrain Elevation Data, Level 1
DTED2	Digital Terrain Elevation Data, Level 2
DTIC	Defense Technical Information Center
DTLOMS	Doctrine, Training, Leader Development, Organization, Materiel, and Soldier
DTLS	Distributed Theater-Level Simulation
DTM	Data Transfer Module; Digital Terrain Matrix
DTMP	DCPS Technical Management Plan
DTOP	Digital Topographic Data
DTS	Data Terminal Set; Digital Terrain System
DVD	Digital Video Disk
DVW	Dynamic Virtual Worlds
DWS	Distributed Wargaming System
DYNAMO	Dynamic Models

E

E-MAIL	Electronic Mail
E-R	Entity-Relationship Model
E1DIS	Environmental Effects for Distributed Interactive Simulation
E3	Electromagnetic Environmental Effects; End-To-End Encryption
E3SM	Electromagnetic Environmental Effects and Spectrum Management
EA	Environmental Assessment; Evaluation Authority; Evolutionary Acquisition; Executive Agent
EAC	Echelon Above Corps
EAD	Executive Agent Developer
EADSIM	Extended Air Defense Simulation
EAM	Emergency Action Message
EAR	Entity Attribute Relationship
EAROM	Electrically Alterable Read Only Memory
EBB	Electronic Bulletin Board
EBBS	Electronic Bulletin Board System
EBCDIC	Extended Binary-Coded Decimal Interchange Code
EBM	Entity-Based Model
EC/EDI	Electronic Commerce/Electronic Data Interchange
EC	Electronic Combat
ECCM	Electronic Counter Countermeasures
ECDES	Electronic Combat Digital Evaluation Simulation
ECDIS	Electronic Chart Display and Information System
ECESL	Electronic Combat Evaluation and Simulation Laboratory
ECM/EOCM	Electronic Countermeasures/Electro-Optical Countermeasures
ECM	Electronic Countermeasures
ECSRL	Electronic Combat Simulation Research Laboratory
EDA	Electronic Design Automation
EDCS	Environmental Data Coding Specification (SEDRIS)
EDECSIM	Extended Directed Energy Combat Simulation
EDI	Electronic Data Interchange; Electronic Document Interchange
EDIF	Electronic Document Interchange Format
EDIFACT	Electronic Data Interchange For Administration, Commerce, and Transportation
EDIM	Enhanced Diagnostic Inference Model
EDM	Electronic Document Management Program; Engineering Development Model
EDP	Electronic Data Processing; ELINT Data Processor
EEAT	Environmental Effects Architecture Toolkit
EEI	External Environment Interface
EEM	Environmental Event Modeler
EEPROM	Electrically Erasable/Programmable Read Only Memory
EGA	Enhanced Graphics Adapter
EGM	Earth Gravity Model; Earth Gravitational Model

EHF	Extremely High Frequency
EHP	Entity Handover Protocol
EKMS	Electronic Key Management System
ELINT	Electronic Intelligence
ELIST	Enhanced Logistics Intratheater Support Tool
ELMC	Electronics Maintenance Company model
EM	Electro-Magnetic
EMA	Electronic Messaging Association
EMB	Extended Memory Block
EMD	Engineering and Manufacturing Development
EMI	Electromagnetic Interference
EMIS	Environmental Management Information System
EMP	Electromagnetic Pulse
EMPRS	Electronic Military Personnel Records System
EMS	Engineering Modeling Software
ENIAC	Electronic Numerical Integrator And Computer
ENSOP	Environmental/Nuclear Simulation Oversight Panel
EO	Electro-Optical
EOB	Electronic Order of Battle
EOC	End of Conversion
EOD	Erasable Optical Disk
EOF	End of File
EOI	End of Identity
EOJ	End of Job
EOSAEL	Electro-Optical Systems Atmospheric Effects Library
EOSDIS	Earth Observing System Data and Information System
EOSS	Electro-Optical Simulation System
EOTDA	Electro-Optical Tactical Decision Aids
EPIU	Enhanced Protocol Interface Unit
EPL	ELINT Parameter List
EPROM	Electronic Programmable Read Only Memory
ERD	Entity Relationship Diagram
ERDAS	Earth Resources Data Analysis System
ERIM	Environmental Research Institute of Michigan
EROM	Erasable Read-Only Memory
ERTWG	Environmental Representation Technical Working Group
ESC	Electronic Systems Center (Air Force)
ESD	Exploitation Support Data
ESDD	Earth Science Data Directory
ESDI	Enhanced Small Data Interface
ESP	External Simulation Protocol
ESPDU	Entity State Protocol Data Unit
ESTEL	E-2C Simulation Test and Evaluation Laboratory
ETDA	Environmental Tactical Decision Aids
EW	Electronic Warfare
EWIRD	Electronic Warfare Integrated Reprogrammable Database

EXRTAS	Exercise Temporal Analysis System

F

FA57	Functional Area 57 Simulation Operations
FAC	Feature Analysis Code
FADAC	Field Artillery Digital Automatic Computer
FADT	Feature Analysis Data Table
FAMSIM	Family of Simulations
FAQ	Frequently Asked Questions
FAR	Federal Acquisition Regulation
FAST	Federal Automated System for Travel; Field Assistance in Science and Technology; Framework for Advanced Simulation Technology
FASTALS	Force Analysis and Simulation of Theater Administrative and Logistic Support
FASTC	Foreign Aerospace Science and Technology Center
FDAD	Functional Data Administrator
FDB	Functional Description of the Battlespace
FDC	Functional Data Coordinator
FDD	Federation Object Model Document Data
FDDI	Fiber Digital Data Interface
FDM	Force Design Model
FDMS	Functional Description of the Mission Space
FE	Finite Element
FEBA	Forward Edge of the Battle Area
FECFR	Fidelity, Exercise Control, and Feedback Requirements
FED	Federation Execution Date; Federation Execution Data
FEDEP	Federation Development and Execution Process
FEM	Finite Element Method
FFRDC	Federally Funded Research and Development Center
FI	Field Instrumentation
FIFO	First In, First Out
FILO	First In, Last Out
FIM	Functional Information Manager
FIP	Federal Information Process
FIPC	Federal Information Processing Center
FIPS	Federal Information Processing Standards
FIRESTORM	Federation of Intelligence, Reconnaissance, Surveillance and Targeting Operations, and Research Models
FIRMA	Federal Information Resources Management Act
FIRMR	Federal Information Resources Management Regulation
FIS	Federal Information System
FLAMES	Force Level Analysis and Mission Effectiveness System
FLOPS	Floating Point Operations Per Second
FLOT	Forward Line of Own Troops
FLS	Force Level Simulation
FLTSATCOM	Fleet Satellite Communications

FMO	Frequency Management Office
FOA	Field Operating Agency
FODA	Feature-Oriented Domain Analysis
FODDS	Fact-Oriented Data Distribution System
FOF	Force-on-Force
FOHMD	Fiber-Optic Helmet-Mounted Device; Fiber-Optic Helmet-Mounted Display
FOM	Federation Object Model
FON	Fiber Optic Network
FORCEGEN	Force Generation for M&S
FORCEM	Force Concepts Evaluation Model; Force Evaluation Model
FORCES	Force and Organization Cost Estimating System
FORGE	Force Evaluation Model Gaming Evaluator
ForMAT	Force Management and Analysis Tool
FORTRAN	Formula Translation
FOV	Field of View
FPDC	Federal Procurement Data Center
FPM	Force Protection Model
FQT	Formal Qualification Testing
FRAM	Fleet Requirements Analysis Model
FRED	Federation Required Execution Details
FRT	Faster than Real Time
FSK	Frequency Shift-Keying
FSM	Finite State Machine
FTAM	File Transfer, Access, and Management
FTM	Fault Tree Mode
FTP	File Transfer Protocol
FV	Functional Validation
FWG	Functional Working Group
FY	Fiscal Year
FYDP	Future-Years Defense Plan

G

G/IDEP	Government/Industry Data Exchange Program
G-WARS	Ground Wars (Computer Simulation Model)
GA	Genetic Algorithms
GAIS	Government-Automated Information System
GAMS	Generalized Algebraic Modeling System
GAR	Gateway Access Request
GASS	Generic Acoustic Stimulation System
GATERS	Ground Air Teleported Robotic System
GAWS	Graphical Analysis Workstation
GBS	Global Broadcast System; Global Broadcasting System; Global Broadcasting Service
GCCS	Global Command and Control System
GCDIS	Global Change Data and Information System
GCSS	Global Command Support System
GCSS-AF	Global Combat Support System Air Force
GDAS	Global Deployment Analysis System
GDD/D	Global Data Dictionary and Directory
GDDM	Graphics Data Display Manager
GDEM	Generalized Digital Environmental Model
GDI	Graphics Device Interface
GDIP	General Defense Intelligence Program
GDMS	Global Data Management System
GDSS	Global Decision Support System
GEM	GIG Enterprise Management
GENESSIS	Generic Scene Simulation Software
GEOINT	Geospatial Intelligence
GEOLOC	Geographic Location
GEOREF	Geographic Reference
GeoTIFF	Geographically Tagged Image File Format
GFE	Government-Furnished Equipment
GFI	Government-Furnished Information
GFM	Government-Furnished Material
GFP	Government-Furnished Property
GFS	Government-Furnished Software
GHz	Giga Hertz
GI	Geospatial Information
GIAC	Graphical Input Aggregate Control
GIANT	GPS Interference and Navigation Tool
GICOD	Good Idea Cutoff Data
GIF	Graphic Imagery Files; Graphics Interchange Format
GIG	Global Information Grid
GII	Global Information Infrastructure
GIN	Graphics Input

GIS	Geospatial Information System; Geographic Information System
GKS	Graphical Kernel System
GLM	General Linear Model
GMF	Ground Mobile Force
GMT	Greenwich Mean Time
GNC	Global NETOPS Center
GNCC	Global NETOPS Control Center
GND	GIG Network Defense
GNMP	Government Network Management Profile
GNO	Global Network Operations
GNSC	Global NETOPS Support Center
GOB	Ground Order of Battle
GOCO	Government-Owned, Contractor-Operated
GOE	Government-Owned Equipment
GOGO	Government-Owned, Government-Operated
GOSC	General Officer Steering Committee
GOSG	General Officer Steering Group
GOSIP	Government Open System Interconnection Protocol
GOTS	Government-Off-The-Shelf
GPS	Global Positioning System
GPSS	General Purpose Simulation System
GPU	Graphics Processing Unit
GREWMS	Global Requirements Estimator for Wartime Medical Support
GRWSIM	Ground Warfare Simulation
GSCC	Global Simulation Coordination Center
GSD	Ground Sample Distance
GSM	Global Shared Memory
GSS	Generalized Stimulation Simulation
GST	Greenwich Sidereal Time
GTCT	Global Tropical Cyclone Tracks Database
GTDB	Generic Transformed Database
GTE	Ground Threat Emitter
GTM	Ground Truth Model
GTMV	Ground Target Modeling and Validation
GTN	Global Transportation Network
GTSIMS	Georgia Tech Simulations Integrated Modeling System
GTWAPS	Global Theater Weather Analysis and Prediction System
GUI	Graphical User Interface
GWEF	Guided Weapons Evaluation Facility

H

H/W	Hardware
HAMPS	Host AUTODIN Message Processing System
HAP	Host Access Protocol
HBM	Human Behavior Modeling
HBTWG	Human Behavior Technology Working Group
HBV	Human Behavior Variables
HCI	Human-Computer Interaction; Human-Computer Interface
HD	Hard Disk; High Density
HDF	Hierarchical Data Format
HDL	Harry Diamond Laboratories
HDLC	High-Level Data Link Control Protocol
HDR	High-Data-Rate
HDS	High Definition Systems
HDTV	High Definition Television
HDU	Helmet Display Unit
HEFS	Hierarchical Environmental Feature Structure
HELIPAC	Helicopter-Piloted Air Combat Model
HERO	Heuristic Route Organization
HF	High Frequency
HFE	Human Factors Engineering
HFEA	Human Factors Engineering Analysis; Human Factors Engineering Assessment
HITL	Human-In-The-Loop; Hardware-In-The-Loop
HLA	High-Level Architecture
HMD	Helmet-Mounted Display
HMI	Human-Machine Interface
HMMRSS	Helmet-Mounted Mission Rehearsal Simulation System
HMS	Helmet-Mounted Sight
HMS/DS	Helmet-Mounted Sight/Display System
HMU	Helmet-Mounted Unit
HOL	High Order Language
HOM	Higher Order Model
HOTMAC	High Order Turbulence Model for Atmospheric Circulations
HPC	High Performance Computer; High Performance Computing
HPCC	High Performance Computing and Communications
HPCCIT	High Performance Computing, Communications, and Information Technology
HPCMP	High Performance Computing Modernization Program
HPMWAM	High Power Microwave Weapon Assessment Model
HPPI	High Performance Parallel Interface
HQ	Headquarters
HRCP	High Resolution Cloud Prognosis Model
HRIS	Human Resource Information System

HS	High Speed
HSC	Human Systems Center (Air Force)
HSCBM	Human Social Culture Behavior Models
HSDC	High Speed Digital Chart
HSI	Human Systems Integration; High speed Serial Interface
HTML	Hyper Text Mark-Up Language
HTTP	Hyper Text Transfer Protocol
HTU	Handheld Terminal Unit; Handheld Thermal Unit
HUMINT	Human Intelligence
HW/SWIL	Hardware/Software-in-the-Loop
HWIL	Hardware-in-the-Loop
HYTIME	Hypermedia/Time-Based Structuring Language

I

I-CLCGF-CBS	Integrated CLCGF Combat Battle Simulation
I-CRRA	Integrated Capabilities Review and Risk Assessment
I-Plan	Implementation Plan
I/DBTWG	Information/Database Technology Working Group
I/ITSEC	Interservice/Industry Training, Simulation, and Education Conference
I&M	Improvement and Modernization
I3	Intelligent Integration of Information
IA	Information Assurance
IAC	Information Analysis Center
IADS	Integrated Air Defense System
IAS	Intelligence Analysis System
IAVM	Information Assurance Vulnerability Management
IC	Individual Combatant; Image Computer; Integrated Circuit; Intelligence Community
ICA	Integrated Communications Architecture
ICASE	Integrated Computer-Aided Software Engineering
ICATT	Intelligent Computer-Assisted Training Test Bed
ICC	Integrated Control Center
ICCOG	Intelligence Community Coordination Group
ICD	Interface Control Document
ICDB	Integrated Communications Database
ICM	Intelligence Correlation Model
ICMP	Internet Control Message Protocol
ICOC	Integrated Combat Operations Center
ICODES	Integrated Computerized Deployment System
ICOM	Input, Control, Output, and Mechanism
ICW	Interactive Courseware
IDB	Integrated Database
IDBEF	Integrated Database Extract Format
IDBTF	Integrated Database Transaction Format
IDEA	Integrated Design/Engineering Aide
IDEEAS	Interactive Distributed Early Entry Analysis Simulation
IDEF	Integration Definition
IDEF0	Integration Definition for Function Modeling
IDEF1X	Integration Definition Language for Information Modeling
IDHS	Intelligence Data Handling System
IDIQ	Indefinite Delivery Indefinite Quantity
IDL	Interface Definition Language; Interface Design Language
IDM	Improved Data Modem; Information Dissemination Management
IDP	Initial Domain Part
IDPS	Integrated Database Preparation System
IDRL	Integrated Data Requirements List
IEC	International Electrotechnical Commission of ISO

IEEE	Institute of Electrical and Electronics Engineers
IER	Information Exchange Requirement
IFIP	International Federation for Information Processing
IFM	Ionospheric Forecast Model
IFOR	Intelligent Forces
IG	Image Generator
IGES	Initial Graphics Exchange Standard; Initial Graphics Exchange Specification
IGO	Inter-Governmental Organization
IGOSS	Industry/Government Open System Specification
IHADSS	Integrated Helmet and Display Sight System
IIS	Intelligence Information System
IM	Information Management
IMA	Information Mission Area
IMAG	Information Management and Analysis Group
IMB	Interoperability Management Board
IMD	Information Management Directorate
IMDS	Integrated Maintenance Data System
IMINT	Imagery Intelligence
IMIT	Interoperability Management Information Tool
IMP	Information Management Plan
IMR	Information Management Representative
IMS	Information Management System
IMSP	Information Management Support Plan
INCA	Intelligence Communications Architecture
INCOMMS	Individual Combatant M&S
INFOCON	Information Operations Condition
INFORMS	Institute for Operations Research and Management Science
INFOSEC	Information Security
INMARSAT	International Maritime Satellite
INMS	Integrated Network Management System
INST	Information Standards and Technology Standardization
InterTEC	Interoperability Test and Evaluation Capability
INX	Information Exchange
IO	Information Operations; input/output
IOC	Initial Operational Capability; Industrial Operations Command (Army)
IODA	Information-Oriented Decision Architecture
IOT&E	Initial Operational Test and Evaluation
IP	Internet Protocol; Information Processor; Image Processor
IPA	Imagery Product Archive
IPB	Intelligence Preparation of the Battlefield
IPC	Information Policy Council
IPM	Interpersonal Messaging
IPMS	Interpersonal Messaging System
IPPM	Integrated Product Process Model
IPR	In-Process Review

IPS	Illustrative Planning Scenarios; Interim Polar System
IPTL	Integrated Priority Target List
IPv4	Internet Protocol Version 4
IPv6	Internet Protocol Version 6
IR&D	Independent Research and Development
IRDS	Information Resource Dictionary System
IRIAC	Infrared Information Analysis Center
IRIAM	Integrated Radar and Infrared Analysis and Modeling
IRIG	Inter-Range Instrumentation Group
IRIS	Inter-netted Range Interactive Simulations
IRM	Information Resource Management
IS	Information System; International Standardization; Interface Specification; International Staff (NATO); Information Superiority
ISA	Integrated Support Activity; Information System Architecture; Industry Standard Architecture
ISAT	Information Science and Technology
ISATS	Information System ADP Tracking System
ISC	Information Systems Command (Army)
ISDN	Integrated Services Digital Network
ISEE	Integrated Software Engineering Environment
ISEM	Integrated Space Environmental Model
ISG	Industry Steering Group
ISGMS	Industry Steering Group on M&S
ISLE	Integrated Simulation Language Environment
ISM	Industrial, Scientific, and Medical
ISMC	Imagery Standards Management Committee
ISO	International Organization for Standardization
ISR	Intelligence, Surveillance, and Reconnaissance
ISSA AV	Integrated Space Situational Awareness - Analyst Version
ISSAA	Information Systems Selection and Acquisition Agency
ISSC	Information Systems Software Center
ISSM	Information Systems Security Manager
ISSO	Information System Security Officer
ISSPM	Information Systems Security Program Manager
IT	Information Technology
ITAM	Interdiction Tanker Analysis Model
ITD	Interim Terrain Data; Interim Terrain Database
ITDN	Integrated Tactical Data Network
ITEM	Integrated Theater Engagement Model
ITEMM	Integrated Terrain-Environment-Multipath Model
ITEMS	Interactive Tactical Environment Management System
ITMRA	Information Technology Management Reform Act
ITN	Identification Tasking and Networking
ITPB	Information Technology Policy Board
ITRI	Information Technology Reuse Initiative
ITRUS	Information Technology Reuse

ITS	Individual Training Standards; Intelligent Tutoring System
ITSDN	Integrated Tactical/Strategic Data Network
ITSPO	Information Technology Standards Program Office
ITTS	Instrumentation Targets and Threat Simulators
ITU	Information Transport Utility
ITV	Interactive Television
ITVGS	Interactive Television Generic Server
IUSS	Integrated Unit Simulation System
IV&V	Independent Verification and Validation
IVEPSS	Immersive Virtual Environment Prototyping Simulation System
IVIS	Inter-Vehicular Information System
IW	Information Warfare; Irregular Warfare
IWG	Interface Working Group
IWS	Imagery Work Station
IWSDB	Integrated Weapon Systems Database
IWSS	Interactive Weapon System Simulation

J

J-2	Intelligence Directorate of a Joint Staff
J-3	Operations Directorate of a Joint Staff
J-4	Logistics Directorate of a Joint Staff
J-5	Plans Directorate of a Joint Staff
J-6	Communications System Directorate of a Joint Staff
J-SPACES	Joint Space Combat Environment Simulation
JAC	Joint Analysis Center
JACG	Joint Aeronautical Commanders Group
JACTS	Joint Aircrew Combat Training System
JADS	Joint Advanced Distributed Simulation
JADS-I	Joint Advanced Distributed Simulation-Improved
JADS/JFS	Joint Advanced Distributed Simulation Joint Feasibility Study
JAFLME	Joint Automated Field Logistics Model for Employment
JAMC	Joint Amphibious Mine Countermeasure
JANNAF	Joint Army, Navy, NASA, Air Force
JANUS-A	Joint Army-Navy Uniform Simulation-Army
JAWS	Joint Analytic Warfare Systems
JBC	Joint C4ISR Battle Center
JC2WC	Joint Command and Control Warfare Center
JC3IEDM	Joint C3 Interface and Exchange Data Model
JCALS	Joint Computer-Aided Acquisition and Logistics Support
JCAS	Joint Command and Control Attack Simulation
JCATS	Joint Conflict and Tactical Simulation
JCCC	Joint Communications Control Center
JCCD	Joint Camouflage, Concealment, and Deception
JCG	Joint Commanders Group
JCG(T&E)	Joint Commanders Group (Test and Evaluation)
JCIDS	Joint Capabilities Integration and Development System
JCISA	Joint Command Information Systems Activity
JCM	Joint Conflict Model
JCMO	Joint CALS Management Organization
JCOS	Joint Countermine Operational Simulation
JCS	Joint Chiefs of Staff
JCSE	Joint Command Support Element; Joint Communications Support Element
JCSS	Joint Communications Simulation System
JCTD	Joint Capability Technology Demonstration
JDA	Japan Defense Agency
JDAL	Joint Duty Assignment List
JDBE	Joint Database Elements
JDC	Joint Doctrine Center (See also JWFC)
JDISS	Joint Deployable Intelligence Support System
JDL	Joint Director of Laboratories
JDN	Joint Data Network

JDS	Joint Data Support
JDSS	Joint Decision Support System
JEAP	Joint Electronic Analysis Program
JECEWSI	Joint Electronic Combat Electronic Warfare Simulation
JEDMICS	Joint Engineering Data Management Information and Control System
JECG	Joint Exercise Control Group
JEL	Joint Electronic Library
JEPES	Joint Engineering Planning and Execution System
JESS	Joint Exercise Support System
JETTA	Joint Environment for Testing, Training, and Analysis
JEWC	Joint Electronic Warfare Center(See also JC2WC)
JFACC	Joint Force Air Component Commander
JFAST	Joint Flow and Analysis System for Transportation
JFC	Joint Force Commander
JFCC	Joint Functional Component Commands
JFMO	Joint Frequency Management Office
JIC	Joint Intelligence Center
JIEO	Joint Interoperability and Engineering Organization
JIMB	Joint Information Management Board
JINTACCS	Joint Interoperability of Tactical Command and Control System
JIOC	Joint Information Operations Center
JIPTL	Joint Integrated Prioritized Target List
JITC	Joint Interoperability Test Command
JITF	Joint Integration Test Facility
JKDDC	Joint Knowledge Development and Distribution Capability
JKO	Joint Knowledge Online
JLASS	Joint Land, Aerospace, and Sea Simulation
JLC	Joint Logistics Commanders
JLOG	Joint Task Force Logistics Management Information System
JLOTS	Joint Logistics Over The Shore
JLVC	Joint Live, Virtual, Constructive
JMASS	Joint M&S System
JMCIS	Joint Maritime Command Information System
JMEM	Joint Munitions Effectiveness Manual
JMETC	Joint Mission Environment Test Capability
JMETL	Joint Mission Essential Task Lists
JMSEL	Joint Master Scenario Events List
JMSWG	Joint Multi-TADIL Standards Working Group
JMUL	Joint Master Unit List
JNCC	Joint NETOPS Control Center
JNETS	Joint Network Simulation
JOA	Joint Operations Area
JOC	Joint Operations Center
JOISIM	Joint Operations Information Simulation
JOPES	Joint Operation Planning and Execution System
JOTS-VIDS	Joint Operations and Tactical System-Visually-Integrated Data System

JOUST	Joint Operations on Urban Synthetic Terrain
JOVE	Joint Operations Visualization Environment
JP	Joint Publication
JPG	Joint Planning Group
JPL	Jet Propulsion Laboratory
JPO	Joint Program Office
JPSD	Joint Precision Strike Demonstration
JQRR	Joint Quarterly Readiness Review
JRFL	Joint Restricted Frequency List
JRISS	Joint Recruiting Information Support System
JRMB	Joint Requirements and Management Board
JROC	Joint Requirements Oversight Council
JRSOI	Joint Reception, Staging, Onward Movement, and Integration
JRTC	Joint Readiness Training Center
JSAN	Joint Staff Automation of the Nineties
JSEAD	Joint Suppression of Enemy Air Defense
JSF	Joint Strike Fighter
JSIPS	Joint Services Imagery Processing System
JSME	Joint Spectrum Management Element
JSMMPG	Joint Services Medical Modeling and Planning Group
JSOR	Joint Service Operational Requirement
JSOW	Joint Stand-Off Weapon
JSP	Joint Service Program
JSPS	Joint Strategic Planning System
JSRB	Joint Software Review Board
JSSA	Joint Stealth Strike Aircraft
JSTARS	Joint Surveillance and Target Attack Radar System
JSTASL	Joint Scenario Tool Architecture and Script Language
JSTE	Joint Services Training Exercise
JT&E	Joint Test and Evaluation
JTA	Joint Technical Architecture
JTAGS	Joint Tactical Ground Station
JTAMS	Joint Tactical Missile Signatures
JTASC	Joint Training, Analysis, and Simulation Center
JTAV	Joint Total Asset Visibility System
JTC	Joint Technical Committee; Joint Training Confederation
JTC3A	Joint Tactical Command, Control, and Communications Agency
JTCTS	Joint Tactical Combat Training System
JTEN	Joint Training and Experimentation Network
JTF	Joint Task Force
JTF-GNO	Joint Task Force-Global Network Operations
JTFS	Joint Task Force Simulation
JTIDS	Joint Tactical Information Distribution System
JTIEC	Joint Training Integration and Evaluation Center
JTLS	Joint Theater-Level Simulation
JTMP	Joint Training Master Plan

JTP	Joint Training Program
JTS	Joint Tactical Simulation; Joint Training System
JTSP	Joint Training Simulation Plan
JTSSG	Joint Telecommunications Standards Steering Group
JTWSG	Joint Theater of War Scenario Generator
JUDI	Joint Universal Data Interpreter
JULLS	Joint Universal Lessons Learned System
JUSTIS	Joint Uniform Services Technical Information System
JVIDS	Joint Visually Integrated Display System
JVL	Joint Virtual Laboratory
JVM	Java Virtual Machine
JVMF	Joint Variable Message Format
JWAC	Joint Warfare Analysis Center
JWCA	Joint Warfighting Capability Assessment
JWFC	Joint Warfighting Center
JWICS	Joint Worldwide Intelligence Communications System
JWID	Joint Warrior Interoperability Demonstration
JWSOL	Joint Warfare Simulation Object Library
JWSTP	Joint Warfighting Science and Technology Plan

K

Ka	Kurtz-Above Band
KA	Knowledge Acquisition
KASC	Korean Air Simulation Center
KBE	Knowledge-Based Extraction
KBI	Knowledge-Based Information
KBLPS	Knowledge-Based Logistics Planning Shell
kbps	kilobits per second
KBS	Knowledge-Based System
KBSC	Korean Battle Simulation Center
KDEC	Kinetic Energy Weapons Digital Emulation Center
KDR	Kill/Detection Ratio
KE	Knowledge Engineering
kHz	Kilo Hertz
KI	Knowledge Integration
KIPPL	Key Intelligence Programs Priority List
KM	Knowledge Management
KNACK	Knowledge Acquisition Kernel
KOPS	Kilo Operations per Second
KPP	Key Performance Parameters
KRS	Knowledge Retrieval System
KSS	Knowledge Support System
Ku	Kurtz-Under Band
KWIC	Key Word In Context
KWOC	Key Word Out of Context

L

LAD	Logistics Anchor Desk
LAM	Louisiana Maneuvers
LAN	Local Area Network
LANACS	Local Area Network Asynchronous Connection Server
LAPM	Link Access Procedure for Modems
LASER	Light Amplification by Stimulated Emission of Radiation
LAT	Local Access Terminal
LAU	LAN Access Unit
LAWN	Local Area Wireless Network
LBJS	Littoral Battlespace Joint Service
LBTS	Lower Bound on the Time Stamp
LCC	Life-Cycle Cost
LCCE	Life-Cycle Cost Estimate
LCD	Liquid Crystal Display
LCM	Life-Cycle Management; Life-Cycle Model
LCOM	Logistics Composite Model
LCSEC	Life-Cycle Software Engineering Center
LCSS	Life-Cycle Software Support
LCSSA	Life-Cycle Software Support Activity
LCSSE	Life-Cycle Software Support Environment
LCU	Laptop Computer Unit; Last Cluster Used; Lightweight Computer Unit
LDM	Logical Data Model; Long Distance Modem
LDR	Low-Data-Rate
LEC	Local Exchange Carrier
LED	Light-Emitting Diode
LEE	Leading Edge Environment
LEEGCCS	Leading Edge Environment for the Global Command and Control System
LEM	Language Extension Module
LFF	Logistics Factors File
LFT&E	Live Fire Test and Evaluation
LHN	Long-Haul Network
LIFO	Last In, First Out
LIVID	Language Identification and Voice Identification
LLNL	Lawrence-Livermore National Laboratory
LMS	Learning Management System
LNE	Local Network Element
LOC	Lines of Code; Lines of Communication
LOCAASS	Low-Cost Anti-Armor Submunition Simulation
LOCIS	Library of Congress Information System
LOD	Level of Detail
LOE	Level of Effort
LoF	Loss of Function
LoF (P)	Loss of Function for Personnel

LOGAIS	Logistics Automated Information System
LOGGEN	Logistics Plan Generator
LOGSAFE	Logistics Sustainability Analysis and Feasibility Estimator
LOGSIM	Logistics Simulation
LOTS	Logistics Over The Shore
LOTSSIM	Logistics Over The Shore Simulation
LP	Linear Programming
LPD	Low Probability of Detection
LPI	Low Probability of Intercept
LPM	Lines per Minute
LRC	Learning Resource Center
LRI	Line Replacement Item
LRIP	Low-Rate Initial Production
LRM	Language Reference Manual
LRN	Local Range Network
LRU	Line Replaceable Unit
LSA	Logistics System Analysis
LSB	Least Significant Bit
LSC	Least Significant Character
LSE	Local Subscriber Environment
LSTF	Life Sciences Test Facility
LT2	Live Training Transformation
LVC	Live, Virtual, and Constructive
LVC-IA	Live, Virtual, and Constructive Integrating Architecture
LVC ITE	Live, Virtual, and Constructive Integrated Training Environment
LVCAR	Live, Virtual, Constructive Architecture Roadmap
LWIR	Long Wave Infrared
LWTB	Land Warrior Testbed
LWTC	Littoral Warfare Training Complex

M

M&S	Modeling & Simulation
M&SCO	M&S Coordination Office
M&S IPT	M&S Integrated Process Team
M&S SC	M&S Steering Committee
M&SF	M&S Foundations
M2DBMS	Multi-Model, Multi-Lingual Database Management System
MAC	Medium Access Control
MACATAK	Maintenance Capabilities Attack Model
MACH	Model of Atmospheric Chemical Hazards
MACIPS	Military Airlift Command Information Processing System
MACS	Mutually Agreeable Commercial Software
MAD	Message Address Directory
MADCAP	Mobilization and Deployment Capability Assurance Project
MAHCA	Multiple Agent Hybrid Control Architecture
MAIS	Major Automated Information System; Mobile Automated Instrumentation Suite
MAISRC	Major Automated Information System Review Council
MAJCOM	Major Command
MAMO	Maintenance Model
MAPP	Modern Aids to Planning Program
MARISIM	Maritime Simulation
MASC	Modeling Analysis and Simulation Center (Air Force)
MASDA	Model and Simulation Decision Aid
MASE	Message Administration Service Element
MASINT	Measurement and Signature Intelligence
MASS	Mobility Analysis Support System
MATT	Mapping and Analysis Tool for Transportation
MBE	Multi-Band Emitter
MBO	Management by Objectives
Mbps	Megabits per Second
MC	Military Committee (NATO)
MC&G	Mapping, Charting, and Geodesy
MC4	Medical Communications for Combat Casualty Care
MCAD	Mechanical Computer-Aided Design
MCB	Memory Control Block
MCBL	Maneuver Command Battle Lab
MCCR	Mission Critical Computer Resources
MCEB	Military Communications-Electronic Board
MCGA	Multicast Group Agent
MCMSMO	Marine Corps M&S Management Office
MCMSWG	Marine Corps M&S Working Group
MCS	Message Conversion System
MCTL	Militarily Critical Technology List

MCTSSA	Marine Corps Tactical Systems Support Activity
MDA	Milestone Decision Authority; Model-Driven Architecture; Missile Defense Agency
MDAd	MAJCOM Data Administrator
MDAP	Major Defense Acquisition Program
MDDC	Missile Defense Data Center
MDE	Model-Driven Engineering
MDR	Medium-Data-Rate
MDS	Meteorological Data System
MDSE	Message Delivery Service Element
MDT	Message Distribution Terminal
MDT2	Multi-Service Distributed Training Testbed
MEL	Master Environmental Library; Master Events List
MERIT	Model Evaluation Requirements Integration Tool
METL	Mission Essential Task List
METT-T	Mission, Enemy, Troops, Terrain, and Time
MFG	Multi-Function Gateway
MFIP	Multi-Function Interoperability Processor
MGED	Multi-Device Graphics Editor
MGRS	Military Grid Reference System
MHS	Message Handling System
MHz	Mega Hertz
MIB	Management Information Base
MICSS	Marine Corps Individual Combatant Simulator System
MIDAS	Model for Inter-Theater Deployment by Air and Sea
MIDS	Multifunction Information Distribution System
MIDS-LVT	Multi-Functional Information Distribution System-Low Voltage Terminal
MIIDS/IDB	Military Integrated Intelligence Data System/Integrated Database
MILDEP	Military Department
MILNET	Military Network
MIMD	Multiple-Input, Multiple Data; Multiple-Instruction, Multiple-Data
MIME	Multipurpose Internet Mail Extension
MIMI	MADCAP Integration Management Initiative
MINX	Multimedia Information Exchange network
MIPR	Military Interagency Procurement Requisition
MIPS	Millions of Instructions per Second
MIS	Management Information System
MISD	Management Information Systems Directorate
MISMA	Model Improvement and Study Management Agency (Army)
MISSI	Multi-level Information System Security Initiative
MIST	Multiple Input Sensor Terminal
MIT	Management Information Tree; Massachusetts Institute of Technology
MITL	Man-In-The-Loop
ML	Machine Language
MLS	Multi-Level Security
MM	Multi-Media

MMHS	Military Message Handling System
MMI	Man-Machine Interface
MMS	Multilevel Mail Server
MMU	Mass Memory Unit; Memory Management Unit
MMW	Millimeter Wave
MMWPROP	Millimeter Wave Propagation Prediction Model
MNC	Major NATO Command (NATO); Major NATO Commander (NATO)
MNOI	Messages Not of Interest
MNS	Mission Needs Statement
MOBA	Military Operations in Built-Up Areas
MOBACS	Military Operations in Built-Up Areas Combat Simulation
MOBCEM	Mobilization Capabilities Evaluation Model
MOBSAM	Mobilization Station Assessment Model
MODAS	Modular Ocean Data Assimilation System
ModSAF	Modular Semi-Automated Forces
MOE	Measure of Effectiveness
MOHLL	Machine-Oriented High Level Language
MOM	Management Object Model; Measure of Merit (MOMs encompass MOEs, MOOs, and MOPs)
MOO	Measure of Outcome
MOOTW	Military Operations Other Than War
MOP	Measure of Performance
MORIMOC	More Operational Realism in Modeling of Combat
MORS	Military Operations Research Society
MOSAIC	Models and Simulations: Army-Integrated Catalog; Modeling System for Advanced Investigation of Countermeasures
MOSART	Moderate Spectral Atmospheric Radiance and Transmittance Code
MOUT	Military Operations in Urban Terrain
MPC	Micro Portable Computer
MPD	Message Preparation Directory
MPDU	Message Protocol Data Unit
MPF	Maritime Prepositioned Force
MPN	MSE Packet Network
MR	Mixed Reality
MRA	Model Range of Accuracy
MRCI	Modular Reconfigurable C4I Interface
MRM	Multi-Resolution Modeling; Medical Regulating Model
MRSE	Message Retrieval Service Element
MS	Message Store; Milestone
MS&A	Modeling, Simulation, and Analysis
MS3	M&S Standards Subgroup (NATO)
MSAC	M&S Architecture Council
MSAS	Military Simulation Assessment System
MSC	Major Subordinate Command; Major Subordinate Commander
MSCC	M&S Coordination Center
MSCCTF	M&S Coordination Center Task Force

MSCO	M&S Coordination Office (NATO)
MSCR	M&S Capability Requirement
MSD	Mass Storage Device
MSDDB	Master Seafloor Digital Database
MSDL	Military Scenario Definition Language
MSDOS	Microsoft Disk Operating System
MSDS	Master Simulation Data System; Mission Scenario Data System
MSE	Mobile Subscriber Equipment; Multiple Simulation Exercise
MSEA	M&S Executive Agent
MSEL	Master Scenario Events List
MSI	Multi-Spectral Imagery
MSIAC	M&S Information Analysis Center
MSIC-CLUTTER	Missile-Space and Intelligence Center-CLUTTER Model
MSIM	Master Simulation Datalink
MSIM LAN	Master Simulation Datalink Local Area Network
MSIP	M&S Investment Plan
MSIS	M&S Information System
MSL	Mean Sea Level
MSMP	M&S Master Plan
MSOSA	M&S Operational Support Activity
MSP	Message Security Protocol
MSR	Missile Simulation Round
MSRR	M&S Resource Repository
MSS	Millimeter Simulation System
MSSE	Message Submission Service Element
MT	Message Transfer
MTA	Message Transfer Agent
MTADME	Military Thinking and Decision Making Exercises
MTDS	Marine Corps Tactical Data System
MTF	Message Text Format; Message Transfer Format; Modulation Transfer Function
MTM	Model-Test-Model
MTOPS	Millions of Theoretical Operations per Second
MTS	Message Transfer System
MTTF	Mean Time to Failure
MTW	Major Theater War
MTWS	MAGTF Tactical Warfare Simulation
MUSE	Multiple UAV Simulation Environment
MUTES	Multiple Threat Emitter Systems
MWARS	Maneuver-Warfare Analytical Research System
MWIR	Midwave Infrared
MWTB	Mounted Warfare Testbed

N

NADM-V	NORAD Air Defense Model-Visual
NAIC	National Air Intelligence Center
NALCOMIS	Naval Aviation Logistics Command Information System
NAM	Network Assessment Model
NARDAC	Navy Regional Data Automation Center
NAS	National Academy of Sciences
NASI	Netware Asynchronous Services Interface
NASM	National Air and Space (Warfare) Model
NASMP	Naval Aviation Simulation Master Plan
NASNET	Naval Aviation Simulator Network Training
NATO	North Atlantic Treaty Organization
NATSIM	National Simulation System
NAU	Network Addressable Unit
NBS	National Bureau of Standards (now National Institute of Standards and Technology (NIST))
NCA	National Command Authorities
NCARAI	Navy Center for Applied Research in Artificial Intelligence
NCC	Network Control Center; National Coordinating Center
NCCS	Nuclear Command and Control System
NCDC	National Climatic Data Center
NCS	National Communications System; Network Computing System; Network Control Station
NCSA	National Center for Super-Computing Applications
NCSC	National Computer Security Center
NCSL	National Computer System Laboratory
NCTE	Navy Continuous Training Environment
NDL	Network Data Language
NDOF	Nodal Degree of Freedom
NERF	Naval Emitter Reference File
NES	Network Encryption System
NESDIS	National Environmental Satellite Data and Information Service
NESSE	Near Earth Simulated Space Environment; Near Earth Space Synthetic Environment
NET	Network Entity Title; New Equipment Training
NETOPS	Network Operations
NETT	New Equipment Training Team
NEWC	New and Emerging Warfighter Capabilities
NFDD	NGA Feature Data Dictionary
NFS	Network File Server
NGA	National Geospatial-Intelligence Agency
NGCR	Next Generation Computer Resources
NGO	Non-Governmental Organization
NIC	Network Information Center

NIDR	Network Information Discover and Retrieval
NII	National Information Infrastructure
NIMA	National Imagery and Mapping Agency (Now National Geospatial-Intelligence Agency (NGA))
NIPRNET	Non-Secure Internet Protocol Router Network
NIR	Network Information Retrieval; Near Infrared
NISO	National Information Standards Organization
NISP	National Individual Security Program
NIST	National Institute of Standards and Technology (formerly National Bureau of Standards (NBS))
NITC	National Information Technology Center
NITES	Naval Integrated Tactical Environmental System; Navy Integrated Tactical Environment Subsystem
NITF	National Imagery Test Facility; National Imagery Transmission Format
NLSP	Network Layer Security Protocol
NMCC	National Military Command Center
NMCS	National Military Command System
NMRS	Near-Term Mine Reconnaissance System
NMS	Network Management System
NMSG	NATO M&S Group
NMSO	Navy M&S Office
NMSSP	NATO M&S Standards Profile
NN	Nearest Neighbor
NODC	National Oceanographic Data Center
NODDS	Navy Oceanographic Data Distribution System
NOGAPS	Navy Operational Global Atmospheric Prediction System
NORAD	North American Aerospace Defense Command
NORAPS	Naval Operational Regional Atmospheric Predictions System
NOS	Network Operating System
NOSC	Network Operations and Security Center
NOVAM	Navy Oceanic Vertical Aerosol Model
NREN	National Research and Education Network
NRL	Naval Research Laboratory
NRT	Near Real Time
NSA	National Security Agency; NATO Standardization Agency
NSC	National Simulation Center
NSDE	Non-Standard Data Element
NSDI	National Spatial Data Infrastructure
NSEP	National Security Emergency Preparedness
NSF	National Science Foundation
NSG	National System for Geospatial Intelligence
NSIDC	National Snow and Ice Data Center
NSO	Network Security Officer; NATO Standardization Organization
NSRD	National Software Reuse Directory
NSS	Naval Simulation System; National Security System
NSTAC	National Security Telecommunications Advisory Committee

NSTC	National Science and Technology Council
NSTL	National Software Testing Labs
NTACMS	Navy Tactical Missile System
NTC	National Training Center
NTC-IS	National Training Center-Instrumentation System
NTCS-A	Navy Tactical Command Systems-Afloat
NTCSS	Naval Tactical Command Support System; Navy Tactical Command Support System
NTDS	Navy Tactical Data System
NTF	National Test Facility
NTIC	Naval Technical Intelligence Center
NTIS	National Technical Information Service
NTU	New Threat Upgrade
NUI	Network User Interface
NUSSE	Non-Uniform Simple Surface Evaporation Model
NV&EOL	Night Vision and Electro-Optics Laboratory
NVD	Night Vision Device
NVE	Night Vision Equipment
NVESD	Night Vision and Electronic Sensors Directorate
NVG	Night Vision Goggles
NVRAM	Non-Volatile Random Access Memory
NVS	Night Vision System
NW	Network Warfare
NWARS	National Wargaming System
NWP	Numerical Weather Prediction Model
NWTDB	Naval Warfare Tactical Database

O

OA	Operational Architecture
OAI	Open Applications Interface
OAML	Oceanographic and Atmospheric Master Library
OASIS	Operations Analysis and Simulation Interface System
OATS	Office Automation and Technology Services
ODI	Open Datalink Interface
ODM	Organizational Domain Modeling
ODP	Open Distributed Processing
OEA	Ocean Executive Agent
OGA	Other Government Agency
OII	Operations-Intelligence Interface
OIRA	Office of Information and Regulatory Affairs
OIS	Office Information System
OLE	Object Linking and Embedding
OMA	Object Management Architecture
OMEGA	Operational Multi-Scale Environment Model with Grid Adaptivity
OMFTS	Operational Maneuver from the Sea
OMG	Object Management Group
OMO	Other Military Operations
OMT	Object Model Template
ONC	Open Network Computing
ONS	Operational Needs Statement
OO	Object-Oriented
OOA	OO Analysis
OOD	OO Design
OODA	OO Design with Assemblies
OODB	OO Database
OODBMS	OO Database Management System
OOM	OO Modeling
OOP	OO Programming
OOT	OO Technologies
OOTW	Operations Other Than War
OPCON	Operational Control
OpenMSA	Open M& S Architecture
OPFOR	Opposing Forces
OPLAN	Operation Plan
OPORD	Operation Order
OPSEC	Operations Security
OPT	Operations Planning Tool
OPTADS	Operations Tactical Data Systems
OR	Operations Research; Object Relationship
ORACLE	Operational Research and Critical Link Evaluation
ORB	Object Request Broker

ORD	Operational Requirements Document
ORSA	Operations Research Systems Analysis
ORSMC	Off-Route Smart Mine Clearance
ORT	OSD Review Team
OS	Operating System
OSAMS	Open System Architecture for M&S
OSE	Open System Environment
OSEA	Organization for Synthetic Environment Architecture
OSF	Open Software Forum
OSI	Open Systems Interconnection
OSINT	Open Source Intelligence
OSIRIS	Optimized Synthetic Infrared Interactive Simulation
OSP	Other Service Program
OSRM	Open System Reference Model
OSS	Operations Support System
OT&E	Operational Test and Evaluation
OTAU	Over The Air Updating
OTDR	Optical Time Domain Reflector
OTI	Office of Technical Integration
OTSA	Open Training System Architecture
OUSD(A&T)	Office of the Under Secretary of Defense for Acquisition and Technology
OWL	Web Ontology Language

P

PADIL	PATRIOT Air Defense Information Language
PADS	Position Azimuth Determining System
PAL	Public Ada Library
PALOS	Planning Assistant for Logistics Systems
PAMS	Predictive Aircraft Maintenance System
PAN	Personal Area Network
PATGEN	Patient Generator
PATRIOT	Phased Array Tracking to Intercept Of Target
PC	Personal Computer
PCB	Printed Circuit Board
PCE	Process-Centered Environment
PCIS	Portable Common Interface Set
PCM	Production Cost Model; Pulse Coded Modulation
PCMCIA	PC Memory Card International Association
PCMT	PC Message Terminal
PCTE	Portable Common Tools Environment
PDES	Product Data Exchange using STEP
PDL	Programmable Design Language
PDR	Preliminary Design Review
PDSS	Post Deployment Software Support
PDU	Protocol Data Unit
PEGASUS	Perspective View Generator and Analysis Systems for Unmanned Sensors
PEM	Program Element Monitor
PERT	Program Evaluation Review Technique
PHIGS	Programmer's Hierarchical Interactive Graphics Standard
PID	Protocol Identifier Data
PIF	Picture Interchange Format
PIN	Personal Identification Number; Process Identification Number
PIO	Processor Input/Output
PIPS	Polar Ice Prediction System
PLA	Plain Language Address
PLAD	Plain Language Address Designator
PLEXUS	Phillips Laboratory Expert User System
PM	Program Manager
PMESII	Political, Military, Economic, Social, Information, and Infrastructure
PMSP	Preliminary Message Security Protocol
PNP	Plug and Play
POP	Point of Presence
POP-Ds	Proof-of-Principle Demonstrations
PORTSIM	Port Simulation Model
POSIX	Portable Operating System Interface (Unix)
PPBE	Planning, Programming, Budgeting, and Execution
PPDB	Point Positioning Database

PPF	Platform Proto-Federations
PPP	Point-to-Point Protocol
Pre-BADD	Pre-Battlefield Awareness Data Dissemination
PRETT	PATRIOT Radar Emulator Test Tool
PRF	Pulse Repetition Frequency
PRIMES	Preflight Integration of Munitions and Electronic Systems
PRISM	Parameterized Real-Time Ionospheric Specification Model; Portable, Reusable, Integrated Software Modules
PROM	Programmable Read-Only Memory
PSDB	Perceived Situation Database
PSM	Portable Space Model
PSYOP	Psychological Operations
PTADB	Planning Terrain Analysis Database
PTCCN	Prototype Tactical Cryptological Communications Network
PTOS	PATRIOT Tactical Operations Simulation
PUA	Profiling User Agent
PVC	Permanent Virtual Circuit
PVD	Plan View Display
PWL	Piecewise Linear

Q

Q/I	Question/Issue
QA	Quality Assurance
QAE	Quality Assurance Evaluator
QBE	Query by Example
QBF	Query by Form
QC	Quality Control
QDE	Quality Data Evaluation
QDOS	Quick and Dirty Operating System
QDR	Quadrennial Defense Review; Quality Deficiency Report
QFA	Quick File Access
QJM	Quantified Judgment Model
QMR	Quarterly Management Review
QOS	Quality of Service

R

R&A	Review and Analysis
R&D	Research and Development
R-T	Real Time
RA	Response Action
RAC	Reliability Analysis Center
RADGUNS	Radar-Directed Gun System
RADIUS	Research and Development for Image Understanding Systems
RAM	Random Access Memory; Reliability, Availability, and Maintainability
RASS	Random Access Storage System
RASSP	Rapid Prototyping of Application-Specific Signal Processors
RAV	Robotic Air Vehicle
RBBS	Remote Bulletin Board System
RC	Routing Control
RCAS	Reserve Component Automation System
RD&A	Research, Development, and Acquisition
RDA	Remote Database Access; Research, Development, and Acquisition
RDADS	R-T Data Acquisition and Display System
RDAISA	Research, Development, and Acquisition Information Systems Agency
RDB	Relational Database
RDBMS	Relational Database Management System
RDMS	Range Data Management System; Relational Data Management System
RDT	Remote Debriefing Tool
REA	Remote Entity Approximation
REDCAP	R-T Electronic Digitally-Controlled Analyzer Processor
RESS	Radar Environment Simulator System
REVVA	Reference for VV&A
RF	Radio Frequency
RFS	Remote File Sharing
RG	Remote Gateway
RID	RTI Initialization Data
RIMS	Radar Image Modeling System; R& D Information Management System
RIP	Routing Information Protocol
RIS	Range Instrumentation Systems
RISC	Reduced Instruction Set Computer; Reduced Instruction Set Code
RISM	Reduced Instruction Set Model
RITN	R-T Information Transfer and Networking
RLF	Reuse Library Framework
RMSD	Requirements, Models, Software, and Data
ROAMS	Reusable Object Access and Management System
ROI	Return on Investment
ROM	Read Only Memory; Rough Order of Magnitude
ROMC	Required Operational Messaging Characteristics
ROSE	Remote Operation Service Element

ROV	Range of View; Remotely-Operated Vehicle
ROW	Rest of the World
RPC	Remote Procedure Call
RPG	Resource Prioritization Group; Recommended Practices Guide
RPR FOM	R-T Platform Reference Federation Object Model
RRDB	Rapidly Reconfigurable Database
RRDS	Reduced Resolution Data Set
RS	Relay System
RSC	Regional Service Center
RSFCT	Road Simulator for Fire Control Testing
RSOI	Reception, Staging, Onward Movement and Integration
RSS	Remote Satellite Simulation
RSSC-LO	Regional Space Support Center-Liaison Officer
RTA	Research and Technology Agency
RTAD	Relocatable Targets Analysis Data
RTCA	R-T Casualty Assessment
RTCS	R-T Clock System
RTF	Rich Text Format; Regional Task Force
RTI	Run-Time Infrastructure
RTIC	R-T Information in the Cockpit
RTO	Research and Technology Organization
RTOS	R-T Operating System
RTV	R-T Video
RWM	Read-Write Memory; Relocatable Window Model

S

S/W	Software
S&M	Simulation and Modeling
S&T	Science and Technology
S&TP	Science and Technology Program
SA	Situational Awareness; Studies and Analysis; Systems Architecture
SAAE	Software Architecture Attribute Engineering
SADS	Simulated Air Defense System
SAE	Service Acquisition Executive
SAF	Semi-Automated Forces
SAFOR	Semi-Automated Forces
SALT	Society for Applied Learning Technology
SAMSON	S&M Supporting Operational Needs
SARP	Space Analysis Research Portal
SAS	Statistical Analysis Software
SASER	Synthetic Atmosphere and Space Environment Representations
SATCOM	Satellite Communications
SAWE-RF	Simulating Aerial Weapon Effect-Radio Frequency
SBA	Simulation-Based Acquisition
SBB	Synthetic Battle Bridge
SBD	Simulation-Based Design
SBDS	Simulation-Based Design System
SBIS	Sustaining Base Information System
SBITS	Simulation-Based Intelligent Tutoring System
SBLC	Sustaining Base Level Computer
SCCB	Software Configuration Control Board
SCDL	Surveillance and Control Data Link
SCI	Sensitive Compartmented Information
SCIF	Sensitive Compartmented Information Facility
SCIPMIS	Standard Civilian Personnel Management Information System
SCM	Software Configuration Management
SCORES	Scenario-Oriented Recurring Evaluation System
SCORM	Sharable Content Object Reference Model
SCORM SIM	SCORM-Simulation Interface Standards
SCRAM	System Configuration Reconfiguration Automation Module
SCS	Society for M&S International
SDA	Software Design Activity
SDD	System Design Document
SDF	Software Development File
SDL	Sensor Data Link; Software Development Library
SDLC	Synchronous Data Link Control (IBM)
SDM	Sub-Rate Data Multiplexer
SDNS	Secure Data Network System
SDP	Software Development Plan

SDRB	Specifications and Data Review Board
SDSA	Software Development and Support Activity
SDSF	Software Development and Support Facility
SE	Synthetic Environment
SEAROADS	Simulation, Evaluation, Analysis, and Research on Air Defense Systems
SecDef	Secretary of Defense
SECOMO	Software Engineering Cost Model
SED	Software Engineering Directorate
SEDEP	Synthetic Environment Development and Exploitation Process
SEDRIS	Synthetic Environment Data Representation and Interchange Specification
SEE	Software Engineering Environments; Synthetic Environment Exercise
SEES	Security Exercise Evaluation System
SEI	Software Engineering Institute
SEM	Simulation, Engineering, and Modeling; Spherical Earth Model; System Engineering and Modeling
SESG	Software Engineering Support Group
SF	Synthetic Forces
SFCTMP	Surface Temperature model
SFTS	Synthetic Flight Training Systems
SGD	Symbolized Graphics Data
SGEN	Signal Generator
SGML	Standard Generalized Markup Language
SHAPE	Supreme Headquarters Allied Powers Europe
SHF	Super-High Frequency
SI	Le Système International d'Unitès (official abbreviation)
SIAM	Space Impact Assessment Methodology
SIDS	Standard Interoperable Datalink System
SIF	Standard Interchange Facilities; System Integration Facilities; Standard Interchange Format
SIFT	Simulation Interface Toolset
SIG	Special Interest Group
SIGINT	Signals Intelligence
SIGS	Synthetic Imagery Generation System
SIL	System Integration Laboratories
SIM	Sensor Interaction Model
Sim/Stim	Simulation/Stimulation
SiMAN	Simulation Management
SIMD	Single Instruction Multiple Data
SIMITAR	Simulation in Training for Advanced Readiness
SIMNET	Simulation Network; Simulator Networking
SIMTECH	Simulation Technology Program
SIMULOGS	Simulation of Logistics Systems
SIMWG	Simulation Working Group
SIPRNET	Secret Internet Protocol Router Network
SIRAS	Simulation, Instrumentation, Reduction, and Analysis System
SISL	Secure Integration Simulation Laboratory

SISO	Simulation Interoperability Standards Organization
SJFHQ	Standing Joint Force Headquarters
SL	Simulation Language
SLA	Service Level Agreement
SLF	Scalability Logger Format
SLIP	Serial Line Internet Protocol
SLOD	Simulator Level of Detail
SMART	S&M Anchored in Real-World Testing; Susceptibility Model Assessment with Range Test
SMC	Space and Missile Center (Air Force)
SMDS	Switched Multi-Megabit Data Service
SME	Subject Matter Expert
SMI	Soldier-Machine Interface
SMS	Simulated Mission Space
SMSE	Super Multiple Simulation Exercise
SMSP	Soil Moisture Strength Prediction Model
SMTA	Subordinate Message Transfer Agent
SMTP	Simple Mail Transfer Protocol; Simple Message Transfer Protocol
SNA	System Network Architecture
SNAP	Simulator Network Analysis Project
SND	Standardized Nomenclature Database
SNMP	Simple Network Management Protocol
SNNAP	Statistical Neural Network Analysis Package
SNODEP	Snow Depth Model
SNP	Sub-Network Protocol
SNR	Signal-to-Noise Ratio
SNS	Secure Network Server
SOAP	Simple Object Access Protocol
SOAR	State Operator and Result
SOE	Standard Operating Environment; Synthetic Operating Environment
SOFATS	Special Operations Forces Aircrew Training System
SOFPARS	Special Operations Forces Planning and Rehearsal System
SOL	Simulation-Oriented Language
SOM	Simulation Object Model; Satellite Communications Operational Manager
SONET	Synchronous Optical Network
SOO	Statement of Objectives
SPAAT	Sensor-Platform Allocation Analysis Tool
SPCR	Software Problem Change Requests
SPD	Standards Planning Database
SPPD	Signal Processor Package Design
SPRAE	Stochastic Predictor of Artillery Effectiveness
SPS	Software Product Specification
SQA	Software Quality Assurance
SQEP	Software Quality Evaluation Plan
SQL	Structured Query Language
SQL/DS	Structured Query Language/Data System

SQP	Software Quality Program
SQPP	Software Quality Program Plan
SQuASH	Stochastic Quantitative Analysis of System Hierarchies
SRF	Summary Reference File
SRM	Spatial Reference Model (SEDRIS)
SRML	Simulation Reference Markup Language
SRP	Software Reuse Program
SRR	System Readiness Review; Software Readiness Review; System Requirement Review
SRS	Software Requirements Specification; System Requirements Specification
SRT	Slower than R-T
SS&T	Space, Science, and Technology
SSA	Standard Simulation Architecture; Software Support Activity
SSC	Small-Scale Contingency
SSCDB	Subsurface Currents Database
SSDB	Standard Simulator Database
SSE	Simulation Support Environment; Single Simulation Exercise; SATCOM Systems Expert
SSF	Software Support Facility; Software Support Function
SSG	Synthetic Signature Generator
SSGM	Synthetic Scene Generation Model
SSID	Standard Simulation Interface Design
SSM	Soldier System Modeling
SSMC	Symbology Standards Management Committee
SSP	Simulation Support Plan
SSPO	Simulation Strategic Planning Office
SSR	Software Specification Review
SSSE	Small Single Simulation Exercise
SSTORM	Structured Scenario Torpedo Operational Requirements Model
STAARS	Sustainment Training for Army Aviation Readiness through Simulation
STADLS	Surrogate Threat Air Defense Laser System
STAF	Simulation/Test Acceptance Facility
STAFLO	Strategic Transportation Analysis Unit Force Flow
STAGE	Scenario Toolkit and Generation Environment
STAMIS	Standard Army Management Information System
STANAG	Standardization Agreement (NATO)
STARS	Software Technology for Adaptable, Reliable Systems; Software Technology for Adaptable, Reliable Software; Standard Accounting and Reporting System
STDL	Submarine Tactical Data Link program
STDN	Secure Tactical Data Network
STE	Software Test Environment; Special Test Equipment; Surface Threat Emitter
STEMS	Software Test and Evaluation Message System
STEP	Standard for the Exchange of Product Model Data; Standardized Tactical Entry Point; Simulation, Test, and Evaluation Process

STF	SEDRIS Transmittal Format
STM	Synchronous Transfer Mode
STORM	Synthetic Theater Operations Research Model
STP	Software Test Plan
STR	Software Trouble Reports
STSC	Software Technology Support Center
STVLS	Surrogate Threat Visible Laser System
SUAWACS	Soviet Union Airborne Warning and Control System
SUE	System Unique Equipment
SUMM	Semantic Unification Meta-Model
SUMMITS	Scenario Unrestricted Mobility Model for Intra-Theater Simulation
SURVIAC	Survivability/Vulnerability Information Analysis Center
SUT	System Under Test
SVS	Soldier Visualization Station
SWCI	Software Configuration Item
SWEG	Simulated Warfare Environment Generator (Navy)
SWIL	Software-In-the-Loop
SWIP	Software Improvement Program
SWIR	Shortwave Infrared
SWOE	Smart Weapon Operability Enhancement
SWPS	Strategic War Planning System
Syn	Synonym
SYNB	Synthetic Battlefield
SYNC	Synchronous
SYSCON	Systems Control System of Metric Weights and Measures
SYSGEN	System Generator
SYSLOG	System LOG
SysML	Systems Modeling Language

T

T&E	Test and Evaluation
T&S	Training and Simulation
TA	Technical Architecture
TAA	Technology Area Assessment
TACCIMS	Theater Automated Command Control Information Management System
TACCSF	Theater Air Command and Control Simulation Facility
TACDEW	Tactical Advanced Combat Direction and Electronic Warfare (Navy)
TACDEWEGCS	Tactical Advanced Combat Direction and Electronic Warfare, Environmental Generation, and Control System
TACSAT	Tactical Satellite
TACTICS	Tri-service Advanced Countermeasures and Threats Integrated Combat Simulation
TACTS	Tactical Aircrew Combat Training System
TADIL	Tactical Digital Information Link
TADSS	Training Aids, Devices, Simulators, and Simulations
TAFIM	Technical Architecture Framework for Information Management
TAFSM	Target Acquisition Fire Support Model
TAIS	Telecommunications and Automated Information Systems
TAM	Theater Analysis Model
TAMD	Theater Air and Missile Defense
TAMMIS	Theater Army Medical Management Information System
TAMPS	Tactical Aircraft Mission Planning System
TAMS	Transportation Analysis, Modeling, and Simulation
TAP	Technology Area Plan
TAR	Technology Area Review
TARGET	Theater Analysis and Replanning Graphical Execution Toolkit
TATR	Technical Advisory Team for Reuse
TBIS	Technology Base Investment Strategy
TBMCS	Theater Battle Management Core Systems
TCC	Telecommunications Center
TCG	Time Code Generator
TCIM	Tactical Communications Interface Module
TCIS	Tactical Communications Interface Software
TCP/IP	Transmission Control Protocol/Internet Protocol
TCSEC	Trusted Computer System Evaluation Criteria
TCT	Time-Critical Targets
TCU	Transportable Computer Unit
TD/CM	Technical Data/Configuration Management
TD/CMS	Technical Data/Configuration Management System
TDC	Theater Deployable Communications
TDDS	Tactical Data Distribution System
TDG	Tactical Decision Games
TDI	Trusted Database Interpretation

TDL	Tactical Data Link
TDM	Time-Division Multiplexer
TDMA	Time-Division Multiple Access
TDP	Technical Data Package; Test Design Plan; TSPI Data Processor
TDPS	Terrain Data Preparation System
TDS	Tactical Data System
TDSS	Training Devices, Simulations, and Simulators
TDT	Tactical Data Terminal
TEAM	Threat Engagement Analysis Model
TEED	Tactical End-to-End Encryption Device
TEGEN	Tactical Environment Generator
TEM	Terrain Effects Model; Terrain Evaluation Model
TEMITS	Test and Evaluation Management Information and Tracking System
TEMO	Training, Exercises, and Military Operations
TEMP	Test and Evaluation Master Plan
TENA	Test and Training Enabling Architecture
TERIS	Test and Evaluation Range Internet System
TERSIM	Terrain Simulation
TES	Tactical Engagement Simulation
TESS	Tactical Engagement Simulation System; Tactical Environmental Support System
TEXIS	Theater Exercise and Intelligence Simulation
TFA	Transparent File Access
TFDD	Text File Device Driver
TFG	Terrain and Feature Generation
TFT	Time Flexible Training
TFTP	Trivial File Transfer Protocol
TIBS	Tactical Information Broadcast Service
TID	Touch Interactive Display
TIDES	Threat Intelligence Data Extraction System
TIDS	Tactical Information Distribution System
TIE	TACWAR Integrate Environment
TIES	Terrain Imagery Exploitation System
TIIP	Topographic Imagery Integration Prototype
TIM	Technical Integration Manager; Theater Information Management
TIREM	Terrain-Integrated Rough-Earth Model
TJTN	Theater Joint Tactical Network
TLCSC	Top-Level Computer Software Component
TLD	Top-Level Demonstrations
TLSP	Transport Layer Security Protocol
TMDA	Target Management and Development Application
TMDSE	Theater Missile Defense System Exerciser
TMIP	Theater Medical Information Program
TMPO	Terrain Modeling Project Office
TMS	Target Management System; Telecommunications Management System
TNC	Theater NETOPS Center

TNCC	Theater NETOPS Control Center
TNI	Trusted Network Interpretation
TOPIT	Touched Objects Positioned in Time
TOPS	Thermodynamic Ocean Prediction System
TOSL	Tactical Ocean Simulation Laboratory
TPFDD	Time-Phased Force and Deployment Data
TPFDL	Time-Phased Force and Deployment Listing
TPN	Tactical Packet Network
TRANSCAP	Transportation Systems Capability Model
TREEGEN	Tree Generation Model
TRI-TAC	Tri-service Tactical Communications
TRM	Technical Reference Model
TRS	Training, Readiness, and Simulation
TSCAM	Team Signal Communications Analysis Model
TSIG	Trusted Systems Interoperability Group
TSMO	Threat Simulator Management Office
TSO	Time Stamp Ordered
TSPI	Time, Space, and Position Information
TTD	Tactical Terrain Data
TTP	Tactics, Techniques, and Procedures
TTS	Tactical Training Strategy
TWG	Technical Working Group; Technology Working Group
TWSEAS	Tactical Warfare Simulation, Evaluation, and Analysis System

U

UA	User Agent
UAGC	Upper-Air Gridded Climatology Database
UCCATS	Urban Combat Computer-Assisted Training System
UCI	User-Computer Interface
UD	User Domain
UDP	User Datagram Protocol
UFO	Ultrahigh Frequency Follow-On
UFSP	Underground Facilities Signature Program
UGDF	Uniform Gridded Data Field
UHF	Ultrahigh Frequency
UIDL	User Interface Definition Language
UIMS	User Interface Management System
UISRM	User Interface System Reference Model
UJTL	Unified Joint Task List
ULANA	Unified Local Area Network Architecture
ULCS	Unit-Level Command Simulation
ULMS	Unit-Level Message Switch
UMEDS	User-Oriented Minimum Essential Data Sets
UML	Unified Modeling Language
UNC	United Nations Command
UNMA	Unified Network Management Architecture
URL	Universal Resource Location
USAF	U.S. Air Force
USAISEC	U.S. Army Information Systems Engineering Command
USD(A&T)	Under Secretary of Defense for Acquisition and Technology
USFK	U.S. Forces, Korea
USMTF	U.S. Message Transfer Format; U.S. Message Text Format
USNI	Universal Simulator Network Interface
USO	Unix Software Organization
USR	Universal Space Rectangular
UTC	Universal Time Coordinated
UTE	Unmanned Threat Emitter
UTM	Universal Transverse Mercator
UTSS	Universal Threat System for Simulators
UUCP	Unix-to-Unix Copy
UW	Unconventional Warfare
UWEF	Underwater Evaluation Facility

V

V&V	Verification and Validation
VAIDC	Video Artificial Intelligence Data Collection
VALAD	Voice-Activated Logistics Anchor Desk
VBR	Variable Bit Rate
VBS2	Virtual Battlespace 2
VCOMM-CLCGF	Virtual Communications in a Corps-Level Computer Generated Forces
VE	Value Engineering; Virtual Environment
VFM	Variable Format Message
VGDEM	Variable Generalized Digital Environmental Model
VHSIC	Very High Speed Integrated Circuit
VIC	Vector in Commander
VICTORS	Variable Intensity Computerized Training System
VISTA	Variable Stability In-Flight Simulator Test Aircraft
VIT	Virtual Interactive Target
VLSHSIC	Very Large-Scale High-Speed Integrated Circuitry
VM	Virtual Memory
VMAP	Vector MAP
VME	Virtual Memory Extension
VMF	Variable Message Format
VMS	Virtual Memory System
VMU	Voice Message Unit
VNIR	Visible and Near Infrared
VPD	Virtual Prototype Demonstration
VPG	Virtual Proving Ground
VPL	Virtual Programming Language
VR	Virtual Reality
VRML	VR Modeling Language
VRPE	VR Presentation Engine
VRT	Variable Resolution Terrain Model
VSR	Visual Stimulation Research
VSTI	Vehicle Signature Test Instrumentation
VSU	Virtual Simulation Units
VT	Virtual Terminal
VTC	Video Teleconference
VTT	Video Tele-Training
VTTR	Virtual Test and Training Range
VUAV	Virtual Unmanned Aerial Vehicle
VV&A	Verification, Validation, and Accreditation
VV&C	Verification, Validation, and Certification

W, X, Y & Z

WAIS	Wide Area Information Server
WAM	Wave Amplitude Model; Wide Area Mine
WAN	Wide Area Network
WASPS	War-At-Sea Planning System
WAVES	Weather and Atmospheric Visualization Effects for Simulation
WB	War Breaker
WBMOD	Wide Band Scintillation Model
WBPDU	White Board Protocol Data Unit
WBSS	Wideband Digital Switching System
WBSV	Wideband Secure Voice
WEAM	Weapons Effectiveness Analysis Model
WEEMS	Weapons Effects and Environments M&S
WEST	Weapons Effectiveness Simulated Threat; Weather Environment Simulation Technology
WGS 84	World Geodetic System 1984
WISDIM	Warfighting and Intelligence Systems Dictionary for Information Management
WISSARD	What-If Simulation System for Advanced R&D
WMASC	Weapons Modification and Simulation Capability
WMS	Web Mapping Service
WPC	Warrior Preparation Center
WPE	Word Processing Equipment
WPS	Wideband Packet Switch; Worldwide Port System
WR	Warfighter Readiness
WRAP	Wide Area Rapid Acoustic Prediction; Warfighter Rapid Acquisition Program
WSDL	Web Service Definition Language
WWOLS	Worldwide On-Line System
WWW	Worldwide Web
X3D	XML 3-Dimensional
XMI	XML Metadata Interchange
XML	Extended Mark-Up Language; Extensible Mark-Up Language

TERMS AND DEFINITIONS

A

3-D. Three-dimensional, refers to the visual display that exhibits breadth, height and thickness or depth.

6 DOF. Six degrees of freedom, refers to the number of simultaneous directions or inputs a sensor can measure. Typically used to describe the combination of spatial positions (X, Y, Z) and orientation (roll, pitch, yaw).

absolute error. The absolute deviation, taken without regard to sign, from the corresponding true value.

absolute gravity. The acceleration of gravity directly determined by a device that measures time and length.

absolute orientation. The scaling and leveling to ground control (in a photogrammetric instrument) of a relatively-oriented stereoscopic model or group of models.

absolute positioning. A precise location. The determination of the position of a point with respect to the next positioned body, for example the center of mass of the Earth as defined in the DoD World Geodetic System.

absolute timestamp. An absolute timestamp is used when simulation application clocks are synchronized to Universal Coordinated Time (UTC).

absorbing Markov chain model. A Markov chain model that has at least one absorbing state and in which, from every state, it is possible to get to at least one absorbing state.

absorbing state. In a Markov chain model, a state that cannot be left once it is entered.

abstraction. 1. The process of selecting the essential aspects of a simuland to be represented in a model or simulation while ignoring those aspects that are not relevant to the purpose of the model or simulation. The set of elements produced by this process. 2. The act or process of separating the inherent qualities or properties of something from the actual physical object or concept to which they belong. 3. Process of generalization by reducing the information content of a concept or an observable phenomenon, typically in order to retain only information which is relevant for a particular purpose.

acceptance. The decision to use a simulation for a specific purpose. (See also “accreditation”).

accessibility. The ease of approaching, entering, obtaining, or using.

accreditation. The official certification that a model, simulation, or federation of models and simulations and its associated data are acceptable for use for a specific purpose.

accreditation agent. The organization designated by the accreditation sponsor to conduct an accreditation assessment for an M&S application.

accreditation authority. The organization or individual responsible to approve the use of models, simulations, and their associated data for a particular application.

accreditation criteria. A set of standards that a particular model, simulation, or federation must meet to be accredited for a specific purpose.

accreditation plan. The plan of action for certifying a model, simulation, or simulation federation as acceptable for specific purposes. The accreditation plan specifies the reviews, testing, and other accreditation assessment processes, as appropriate, needed to certify that the model or simulation has met the acceptability criteria.

accreditation process. The procedure followed by the M&S application sponsor that culminates in the accreditation determination.

accreditation sponsor. The DoD Component or other organization with the responsibility for accrediting a model, simulation, or federation of models and/or simulations for a specific use or series of uses (e.g., for joint training or a Defense Acquisition Board milestone review).

accreditor. A role; a person, or an organization that accredits assets for use and reuse for specific purposes or categories of purposes. An accreditor is responsible for certifying that a federation has been verified and validated, and authorizes the use of the federation for its intended use.

accuracy. 1. The measure of the maximum deviation of an attribute or a parameter value in the simulation or federation from reality or some other chosen standard or referent. 2. The degree of conformity with a standard, or the degree of perfection attained in a measurement. Accuracy relates to the quality of a result, and is distinguished from precision, which relates to the quality of the operation by which the result is obtained and can be repeated. 3. The degree of exactness of a model or simulation, high accuracy implying low error.

accuracy/resolution. The smallest change in magnitude a sensor can detect.

activity. A task that consumes time and resources and whose performance is necessary for a model or simulation to move from one event to the next.

activity-based simulation. A discrete simulation that represents the components of a system as they proceed from activity to activity; for example, a simulation in which a manufactured product moves from station to station in an assembly line.

activity model. A model of the processes that make up the functional activity showing inputs, outputs, controls, and mechanisms through which the processes of the functional activity are or will be conducted.

adaptive systems. A system that is able to adapt its behavior according to changes in its environment or in parts of the system itself.

adjunct tool. Software and/or hardware used to provide part of a simulation environment or to transform and manage data used by or produced by a simulation environment. Differentiated from a model in that a tool does not model anything.

advanced distributed learning. An evolution of distributed learning (distance learning) that emphasizes collaboration on standards-based versions of reusable objects, networks, and learning management systems, that may be delivered synchronously or asynchronously and may include some legacy methods and media.

advanced distributed simulation. A set of disparate models or simulations operating in a common synthetic environment in accordance with the Distributed Interactive Simulation (DIS) standards. The advanced distributed simulation may be composed of three modes of simulation (live, virtual and constructive), which can be seamlessly integrated within a single exercise.

Affine Representation. Coordinate system that is defined by using the location of feature points in an image.

affine transformation. A transformation in which straight lines remain straight and parallel lines parallel. Angles may undergo changes and differential scale changes may be introduced.

agent. A computer system capable of autonomous action to some extent. This includes deciding for itself what it needs to do to satisfy its design objectives, and capable of interacting with other agents (i.e., a 3D character that exhibits human or human like behavior). Also known as a virtual human.

agent-based model. Generates simulated data that can be analyzed inductively. Unlike typical induction, however, the simulated data come from a rigorously specified set of rules rather than direct measurement of the real world.

agent-based modeling. A specific logical model representation intended for replication and use in computer simulation. Agent-based modeling is intended to depict an intrinsically cognitive and social representation that manifest themselves in the actions and characteristics of the agents that are influenced by the actions and characteristics of other real or modeled agents in a social system.

agent-based simulation. Agent-based simulation focuses on the implementation of agents and the sequence of actions and interactions of the agents over periods of time. Agent-based computer simulations are individual-based computational representations extensively related to the theme in complex systems, emergence, Monte Carlo Method, computational sociology, multi-agent systems, and evolutionary programming.

agent-directed simulation. Promoted as a unified and comprehensive framework that extends the narrow view of using agents simply as system or model specification metaphors.

aggregate (unit). A group of entities or a group of other aggregates. The substitution of the word "unit" is used to avoid phrases like "aggregate aggregate."

aggregation. 1. The ability to group entities while preserving the collective effects of entity behavior and interaction while grouped. 2. Process of changing the resolution to represent items in a simulation in less detail.

Air and Space Natural Environment M&S Executive Agent (ASNE MSEA). The ASNE MSEA works to enable Joint and Service M&S customers to represent the air and space natural environment rapidly, thoroughly, and consistently in a manner that promotes cost-effectiveness,

ready access, interoperability, re-use, and confidence. The ASNE MSEA is a member of the M&S Foundations Integrated Process Team.

algorithm. A prescribed set of well-defined unambiguous rules or processes for the solution of a problem in a finite number of steps.

algorithm checks. A rigorous verification of the mathematics of an algorithm to ensure freedom from any errors in the expression (e.g., incorrect signs, incorrect variables applied in the equations, derivation errors) and to ensure that the algorithms are consistent with their stated intents.

aliasing. Having jagged edges, as a result of a discrete approach to scan conversion in which each pixel either is replaced with the primitive's color or is left unchanged.

alternate key. A property or characteristic that can be used as a secondary identifier for an entity or entity class.

analysis. The systematic, thoughtful, and rigorous employment of the scientific method to examine a problem, scenario, or issue in order to gain insights into relationships between constituent components, understand underlying principles, or answer a specific set of pre-identified questions.

analytical model. A model consisting of a set of solvable equations; for example, a system of solvable equations that represents the laws of supply and demand in the world market.

analytical modeling. An analytical model is the abstraction of a system based on probability theory. The analytical model represents the description of a formal system consisting of equations used to estimate the performance of the system.

angle of field. A property of a lens. The angle subtended by lines that pass through the center of the lens and locate the diameter of the maximum image area within the specified definition of the lens. Lenses are generally classified according to their angles of coverage, as follows: narrow angle; wide-angle; normal angle; and super-wide angle or ultra-wide angle. Also called angle of coverage; angular field.

animation. 1. Used to experience a simulation in real-time (e.g., training simulations). 2. Graphics play-back and visualization are techniques that allow the analyst to see the M&S behavior through time. This is particularly useful for validating representations of vehicle/unit movement, weapons firings and interactions.

application layer (layer 7). The layer of the Open Systems Interconnection reference model that provides the means for simulation applications to access and use the network's communications resources.

application programming interface. 1. A formalized set of software calls and routines that can be referenced by an application program in order to access supporting network services. 2. Serves as a virtual interface (exchange) between two functions. For example, it specifies how a programmer writing an application accesses the behavior and state of classes and objects. The Windows application programming interface includes code for an assortment of dialog box controls.

architecture. The structure of components in a program or system, their interrelationships, principles, and guidelines governing their design and evolution over time.

area of interest displays. Generating and displaying imagery in the direction in which the user is looking at any given moment.

areal feature. 1. A topographic feature, such as sand, swamp, or vegetation, that extends over an area. It is represented on the published map or chart by a solid or screened color, by a prepared pattern of symbols, or by a delimiting line. 2. (digital mapping) Any area enclosed by a delimiting line that has any unique characteristic (e.g., forest, residential) 3. (raster) A block of grid cells which represent a homogeneous portion of the earth.

areal object. A synthetic environment object that is geometrically anchored to the terrain with a set of at least three points that comes to a closure.

articulated part. A visible part of a simulated entity that is able to move relative to the entity itself.

articulation parameter record. Used to represent the state of the movable parts of an entity.

artificial intelligence. Intelligence as exhibited by a man-made, non-natural, or manufactured entity.

aspect ratio. Numerical ratio of picture width to height.

asset. 1. A collection of associated artifacts that together composes a system or subsystem. May exist in two types: resource asset and support asset. 2. A reusable collection of associated artifacts that together composes a system or subsystem. An asset has capability or content useful beyond its original application, has been developed or enhanced to be of sufficient generality and quality to support reuse, has been approved for reuse, has been documented with pertinent metadata, and has been placed into a repository.

associative entity. An entity that inherits its primary key from two or more other entities (those that are associated). An associative entity is used to represent many-to-many relationships.

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.

astronomical unit. A unit of length equal to 149,600,000 kilometers (adopted 1960) used for measuring distances within the solar system. This distance approximates the mean distance of the Earth from the Sun.

asynchronous transfer mode. A form of packet transmission using fixed-size packets, called cells. Asynchronous transfer mode does not provide error control and flow control mechanisms.

asynchronous transmission. Transmission in which each information character is individually synchronized, usually by the use of start elements and stop elements.

atmosphere. 1. The air surrounding the Earth. 2. The mass of air surrounding the earth and the features embedded within it, including clouds, smoke, and fog. 3. A kind of mission space entity representing the atmosphere.

attached part. A visible part of a simulated entity that may or may not be present (e.g., a bomb on an aircraft wing station).

attribute. 1. A property or characteristic of one or more entities (e.g., color, weight, sex). 2. A property inherent in an entity or associated with that entity for database purposes. 3. A named characteristic of an object class or object instance.

attribute overloading. The ability of an attribute to carry one of two or more separate facts.

attribute ownership. The property of an instance attribute that gives a joined federate the capability to supply values for that instance attribute to its federation execution.

attributive entity. An entity that has the same primary key as the parent and additional attributes that eliminate the occurrence of repeating groups in the parent.

augmented reality. A type of virtual reality in which synthetic stimuli are registered with and superimposed on real world objects, often used to make information otherwise imperceptible to human senses perceptible.

augmented reality (wearable). With augmented reality, a participant wears a see-through display or views video of the real world with an opaque head mounted display that allows graphics or text to be projected in the real world.

augmented reality/mixed reality. A field of computer research which deals with the combination of real-world and computer-generated data. The merging of real-world and virtual reality to produce new environments where physical and digital objects can co-exist and interact in real time, to include augmented reality.

authoring system. Any development tool suitable for developing a useable computer-based application; for example, Computer Based Training, hypertext markup language code for viewing on the Internet, modeling and simulation applications, computer- or Internet-based tests and surveys.

authoritative data source. A data source whose products have undergone producer data verification, validation, and certification activities.

authoritative representation. Models, algorithms, and data that have been developed or approved by a source which has accurate technical knowledge of the entity or phenomenon to be modeled and its effects.

automated forces. Computer-generated forces that require little or no human interaction.

automated information system. A combination of computer hardware and computer software, data, or telecommunications that performs functions such as collecting, processing, storing, transmitting, and displaying information. Excluded are computer resources, both hardware and software, that are: physically part of, dedicated to, or essential in real-time mission performance

of weapon systems; used for weapon system specialized training, simulation, diagnostic test and maintenance, or calibration; or used for research and development of weapon systems.

autonomous. A battlefield entity that does not require the presence of another battlefield entity in order to conduct its own simulation in the battlefield environment. All Distributed Interactive Simulation (DIS) -compliant battlespace entities are autonomous in that they are responsible for creating their own view of the environment.

avatar. A virtual object used to represent a participant or physical object in a virtual world; the representation, typically visual, may take any form.

azimuth angle. 1. An angle measured clockwise in the horizontal plane between a reference direction and any other line. 2. (astronomy) The angle 180 degrees or less between the plane of the celestial meridian and the vertical plane containing the observed object, reckoned from the direction of the elevated pole. In astronomic work, the azimuth angle is the spherical angle at the zenith in the astronomic triangle which is composed of the pole, the zenith, and the star. In the geodetic work, it is the horizontal angle between the celestial pole and the observed terrestrial object. 3. (surveying) An angle in triangulation or in a traverse through which the computation of azimuth is carried. In a simple traverse, every angle may be an azimuth angle. Sometimes, in a traverse, to avoid carrying azimuths over very short lines, supplementary observations are made over comparatively long lines, the angles between which form azimuth angles. In triangulation, certain angles, because of their size and position in the figure, are selected for use as azimuth angles, and enter into the formation of the azimuth condition, equation (azimuth equation).

B

ballistic munition. Any munition that follows a predetermined ballistic trajectory.

ballistics. The motion, behavior, appearance, or modification of missiles or other vehicles acted upon by propellants, wind, gravity, temperature, or any other modifying substance, condition, or force.

baselining. A configuration management term that implies that the item is placed under formal control so that it cannot be changed without going through a formal review process.

bathymetric model data. Soundings from the Bathymetric Archive Data layer selected to form the Bathymetric Model Data layer. These soundings form the model of the ocean floor for the compilation of Nautical Charts.

bathymetry. The science of determining and interpreting ocean depths and topography.

battlefield view. A battlefield entity incorporates a direct soldier/machine interface that replicates the soldier/machine interface of the actual battlefield entity.

battlespace. Refers both to the physical environment in which the simulated warfare will take place and to the forces that will conduct the simulated warfare. All elements that support the front line forces (e.g., logistics, intelligence) are included in this definition of battlespace.

battlespace database. Database that defines the specific domain of an engagement. It includes the parametric data needed to generate an operating version of the simulated world. When combined with the session database (which provides the scenario and other simulation-specific data), the battlespace can generate an exercise. Battlespace is also used as a shortened notation for "battlespace database".

battlespace entity. A simulation entity that corresponds to actual equipment, supplies, and personnel that can be seen or sensed on a real battlefield.

behavior. For a given object, how attribute value changes affect (or are affected by) the object attribute value changes of the same or other objects.

behavior database entity. Collection of gathered behavior data.

behavioral modeling. Model of a human activity in which individual or group behaviors are derived from the psychological or social aspects of humans. Behavioral models include a diversity of approaches. The most prevalent computational approaches to human behavior modeling are social network models and multi-agent systems.

benchmark. An accepted representation or standard of a process being modeled or simulated against which the results of other models or simulations are compared or judged.

benchmarking. The activity of comparing the results of a model or simulation with an accepted representation of the process being modeled.

best effort service. A communication service in which transmitted data is not acknowledged. Such data typically arrives in order, complete and without errors. However, if an error occurs, nothing is done to correct it (e.g., there is no retransmission).

bilinear interpolation. A method of image re-sampling that derives a new pixel value based on the gray levels of the four nearest neighbors.

bit. The smallest unit of information in the binary system of notation.

black box model. A model whose inputs, outputs, and functional performance are known, but whose internal implementation is unknown or irrelevant. Contrast with: glass box model, white box model.

black box testing. Outputs are determined correct or incorrect based upon inputs; inner workings of the module are ignored.

boundary condition. The values assumed by the variables in a system, model, or simulation when one or more of them is at a limiting value at the edge of the domain of interest. Contrast with: final condition; initial condition.

bounding box. A prism which encloses all the vertices of a given 3D object.

bounding volume. The six-sided, rectangular enclosing space whose width, length and height are aligned with spatial extents of the entity.

broadcast. A transmission model in which a single message is sent to all network destinations, i.e., one-to-all. Broadcast is a special case of multicast. Contrast with: multicast; unicast.

browsing. Opportunity for users to freely examine and peruse through the contents of a database.

C

cardinal point effect. The increased intensity of a line or group of returns on the radarscope occurring when the radar beam is perpendicular to the rectangular surface of a line or group of similarity aligned features in the ground pattern.

Cartesian coordinates. A coordinate system in which locations of points in space are expressed by reference to three mutually perpendicular planes, called coordinate planes. The three planes intersect in three straight lines called coordinate axes.

cartographic database. A database of map graphics captured from a map or used to produce a map. A cartographic database incorporates a hierarchy for feature displacement.

catalog. An enumeration of M&S data or other items arranged systematically with descriptive details such as setup time, running time, developer, point of contact, etc.

causal methods. A linear combination of the state and derivative values at time instants t_{I-m} to t_{i-1} with coefficients chosen to minimize the error from the computed estimate to the real value.

cave automatic virtual environment. A mechanism for manifesting a virtual reality experience that involves placing the participant within a room like space that is surrounded by computer generated imagery.

celestial sphere. An imaginary sphere of infinite radius concentric with the Earth, on which all celestial bodies except the earth are imagined to be projected.

cell. Variable size rectangular geographic area, often designated by latitude and longitude boundaries. Typically organized one degree by one degree units.

cellular automaton. a collection of cells arranged in a grid, such that each cell changes state as a function of time according to a defined set of rules that includes the states of neighboring cells.

central station. A computer connected to a local area network that transmits and receives simulation management protocol data units at the direction of the simulation manager.

centralized architecture. An architecture with a central location for the execution of the transformation and control functions of the system.

chaos. A system whose long-term behavior is unpredictable. Tiny changes in the accuracy of the starting value can rapidly diverge to anywhere in its possible state space. There can, however, be a finite number of available states, so statistical prediction can still be useful.

civilian-military teams. Temporary organizations of civilian and military personnel that provide an optimal mix of capabilities and expertise to accomplish specific operational and planning tasks, or to achieve objectives at the strategic, operational, or tactical levels. Civilian-military teams may conduct both overt and clandestine operations.

class. A description of a group of items with similar properties, common behavior, common relationships, and common semantics.

class word. A word in the name of a data element describing the category to which the data element belongs (e.g., "date," "name," or "code"). The word establishes the general structure and domain of a standard data element.

client-server architecture. Architecture that distinguishes between client processes, or requestors, and server processes, or task completers.

clock skew. Clock skew is a phenomenon in synchronous circuits in which the clock signal sent from the clock circuit arrives at different components at different times. This is typically due to two causes. The first is a material flaw, which causes a signal to travel faster or slower than expected. The second is distance. If the signal has to travel the entire length of a circuit, it will likely arrive at different parts of the circuit at different times, depending on the circuit's size.

closed-form solution. In dynamic models, a method in which the states or status of resources are described as explicit and computationally tractable functions of time. Thus, the status of a resource at time "t" can be found by evaluating the appropriate function at "t" without having to simulate combat from the start of that combat through time "t".

closed standard. A file format, protocol, or program which does not comply with the requirements for a free or open standard. Examples include file formats or protocols whose specifications are not publicly available, software whose source code is not available, and patent-encumbered technologies. Closed standards are typically developed by private companies with limited public or even industry participation.

cloud. Cloud-like symbols in a network diagram are used to reduce an entire communications network into points of entry and exit. It infers that although there may be any number of computers, switches, routers, trunks, and other network devices within the cloud, the point of interconnection to the cloud is the only technical issue in the diagram. Clouds are often used to depict a wide area network, or WAN.

cluster computing. A group of linked computers working closely together, thus, in many respects forming a single computer. The components of a cluster are commonly, but not always, connected to each other through fast local area networks.

code verification. A rigorous audit of all compilable code to ensure that the representations of verified logic have been properly implemented in the computer code.

coenetic variable. In modeling, a variable that affects both the system under consideration and that system's environment.

cohesion. The degree to which the contents of a module are logically related.

collaboration. Work by more than one person or organization on a single project or event. May be synchronous, when the collaborators exchange information and assets in real-time through face-to-face, teleconference, or web-enabled interactions; or asynchronous, when one collaborator posts artifacts or assets to a repository where they are later reused by another collaborator. The asynchronous method is sometimes called "store and forward" collaboration.

collaborative environment. Multiple users interacting within a simulation that enables interaction among participants, not necessarily manifested in virtual reality (VR). A collaborative VR environment can be referred to as multi-presence or multi-participant.

collimate. To render parallel to a certain line or direction, when applied to physics and astronomy. To render parallel, as rays of light; to adjust the line of sight or lens axis of an optical instrument so that it is in its proper position relative to the other parts of the instrument.

combatant command. A unified or specified command with a broad continuing mission under a single commander established and so designated by the President, through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff. Combatant commands typically have geographic or functional responsibilities.

combination models. The approach of combining models learned from multiple batches of data as contrasted with the practice of learning one model from all the available data (e.g., the data combination approach).

command. The authority that a commander in the Military Services lawfully exercises over subordinates by virtue of rank or assignment. Command includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling military forces for the accomplishment of assigned missions.

command and control. The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission.

command and control system. The facilities, equipment, communications, procedures, and personnel essential to a commander for planning, directing, and controlling operations of assigned and attached forces pursuant to the missions assigned.

command and control warfare. The integrated use of operations security, military deception, psychological operations, electronic warfare, and physical destruction, mutually supported by intelligence, to deny information to, influence, degrade, or destroy adversary command and control capabilities, while protecting friendly command and control capabilities against such actions.

command post exercise. An exercise in which the forces are simulated, involving the commander, his staff, and communications within and between headquarters.

commercial off-the-shelf. A commercial off-the-shelf product is sold, leased, or licensed to the general public; offered by a vendor trying to profit from it; supported and evolved by the vendor, who retains the intellectual property rights; available in multiple, identical copies; and used without source code modification.

common operational picture. A single identical display of relevant information shared by more than one command. A common operational picture facilitates collaborative planning and assists all echelons to achieve situational awareness.

Common Training Instrumentation Architecture (CTIA). The CTIA is the foundation architecture of the Live Training Transformation Family of Training Systems (LT2-FTS) strategy. The CTIA is the product-line architecture that provides commonality across training instrumentation systems and interoperability across live, virtual, constructive, and joint training systems. It consists of the architecture services, software components, standards and protocols to be used by systems developers and is the core software component of the Army live-training instrumentation systems. The CTIA is a component-based, domain-specific, product-line architecture that enables the U.S. Army's LT2 the ability to leverage the high degree of commonality of requirements amongst the U.S. Army's instrumented ranges and home-stations. With significant emphasis on commonality, the CTIA will improve the quality of training while significantly reducing development, training, logistics, and sustainment costs.

common-use M&S. M&S applications, services, or materials provided by a DoD Component to two or more DoD Components.

commonality. A quality that applies to materiel or systems: a. possessing like and interchangeable characteristics enabling each to be utilized, or operated and maintained, by personnel trained on the others without additional specialized training; b. having interchangeable repair parts and/or components; and c. applying to consumable items interchangeably equivalent without adjustment.

communicate. To use any means or method to convey information of any kind from one person or place to another.

communications security. The protection resulting from all measures designed to deny unauthorized persons information of value that might be derived from the possession and study of telecommunications, or to mislead unauthorized persons in their interpretation of the results of such possession and study.

communications system. Communications networks and information services that enable joint and multinational warfighting capabilities.

community of interest. A collaborative group of people that must exchange information in pursuit of its shared goals, interests, missions, or business processes and therefore must have a shared vocabulary for the information it exchanges.

complex adaptive systems. Natural systems (e.g., brains, immune systems, ecologies, or societies) and artificial systems, such as parallel and distributed computing systems, that cannot be characterized in a single quantitative manner.

complex data. Data that cannot be characterized as a single concept or atomic data element. Complex data includes most scientific and technical data. It has been recently categorized by the Complex Data Task Force into: a. Highly derived data (e.g., probability of a hit or kill); b. Objects utilizing the concepts of multiple inheritance (e.g., student-assistant is subclass of student class and employee class), multiple root hierarchies (e.g., a tank is a vehicle and a tank is

a weapon where "vehicle" and "weapon" are each roots), and polymorphic attributes (e.g., "capacity" for different types of aircraft may mean number of people, pounds of cargo, or gallons of fuel); c. Compositions such as command hierarchies, road networks, images (binary large objects), compound documents; and, d. Artifacts of legacy systems and physical constraints (e.g., aircraft category and mission in one data element or intelligence facility code where the first few bytes define how the rest of the field is used).

complexity. The interaction of many parts, giving rise to difficulties in linear or reductionist analysis due to the non-linearity of the inherent circular causation and feedback effects.

compliance tests. Tests conducted to evaluate the consistency and correctness of Protocol Data Unit (PDU) interpretation and utilization by a simulation.

component. A subset of the physical realization and the physical architecture of the system to which a subset of the system's function have been or will be allocated. A component could be integrated hardware and software, a group of people, facilities, or a combination of all of these.

composite attribute. A single attribute that is composed of a specific set of identifiable pieces of information (e.g., an address made up of a street number, street name, city, State, and zip code).

composability. 1. The ability to rapidly select and assemble components to construct meaningful simulation systems to satisfy specific user requirements. Composability includes the framework, body of knowledge, tools, techniques, and standards necessary to enable effective integration, interoperability, and reuse. 2. A system design principle that deals with the interrelationships of components, each of which are considered self-contained and stateless, and that can be combined/recombined to test/satisfy specific user requirements.

composable. The degree and ease with which M&S components can be arranged to conduct or model a specific event.

compression. Any of several techniques that reduce the number of bits required to represent information in data transmission or storage, therefore conserving bandwidth and/or memory, wherein the original form of the information can be reconstructed; also called compaction.

computational model. A model consisting of defined procedures that can be executed on a computer. For example, a model of the stock market, in the form of a set of equations and logic rules.

computer assisted exercise. An exercise where computers simulate the operational environment and provide event resolution that may be used in a distributed or non-distributed form or a combination of both.

computer based training. Coursework that is facilitated either online or by use of curricula on a computer.

computer generated forces. 1. A generic term used to refer to computer representations of forces in simulations that attempts to model human behavior sufficiently so that the forces will take some actions automatically, without requiring man-in-the-loop interaction. Also referred to as Semi-Automated Forces. DoD programs addressing various levels of computer automation of forces include Command Forces, Intelligent Forces, Modular Semi-Automated Forces, Integrated

Tactical Environment Management System, and Close Combat Tactical Trainer Semi-Automated Forces. 2. Simulation of entities on the virtual battlefield. Computer generated forces may be fully autonomous, needing no human direction, or semi-autonomous, requiring some direction by a human controller who is not a participant in the virtual events. Computer generated forces represent friendly, opposing, and neutral battlefield participants not portrayed by manned simulators.

computer graphics. The pictorial synthesis and rendering of real or imaginary objects from their computer-based models.

computer hardware. Devices capable of accepting and storing computer data, executing a systematic sequence of operations on computer data, or producing control outputs. Such devices can perform substantial interpretation, computation, communication, control, or other logical functions.

computer networks. Multiple computers connected together using a telecommunication system for the purpose of communicating and sharing resources.

computer network attack. Actions taken through the use of computer networks to disrupt, deny, or degrade information resident in computers or computer networks or the computers and networks themselves.

computer network defense. Actions taken to protect, monitor, analyze, detect, and respond to unauthorized activity within the DoD information systems and computer networks.

computer resources. The totality of computer hardware, firmware, software, personnel, documentation, supplies, services, and support services applied to a given effort.

computer security. The protection resulting from all measures to deny unauthorized access and exploitation of friendly computer systems.

computer simulation. A dynamic representation of a model, involving some combination of executing code, control/display interface hardware, and interfaces to real-world equipment. See: machine simulation.

computer software (or software). A set of computer programs, procedures, and associated documentation concerned with the operation of a data processing system, e.g., compilers, library routines, manuals, and circuit diagrams.

computer software documentation. Technical data or information, including computer listings and printouts, which documents the requirements, design, or details of computer software, explains the capabilities and limitations of the software, or provides operation instructions for using or supporting computer software during the software's operational life.

computer war game. A technique by which different concepts, different pieces of hardware, or different military plans can be investigated in a multi-sided confrontation using a computer to generate displays of the battlefield and perform computations of outcomes.

conceptual model. 1. A statement of the content and internal representations that are the user's and developer's combined representation of the model. It includes logic and algorithms and

explicitly recognizes assumptions and limitations. 2. An abstraction of the real world that serves as a frame of reference for federation development by documenting simulation-neutral views of important entities and their key actions and interactions. The federation conceptual model describes what the federation will represent, the assumptions limiting those representations, and other capabilities needed to satisfy the user's requirements. 3. A simulation implementation-independent representation of the exercise architect's understanding of the exercise objectives, requirements, and environment. The model includes logic and algorithms and explicitly recognizes assumptions and limitations.

conceptual model of the mission space. First abstractions of the real world that serve as a frame of reference for simulation development by capturing the basic information about important entities involved in any mission and their key actions and interactions. They are simulation-neutral views of those entities, actions, and interactions occurring in the real world.

conceptual schema. Descriptive representation of data and data requirements that supports the "logical" view or data administrator's view of the data requirement. This view is represented as a semantic model of the information that is stored about objects of interest to the functional area. This view is an integrated definition of the data that is unbiased toward any single application of data and is independent of how the data is physically stored or accessed.

concrete model. A model in which at least one component represented is a tangible object; for example, a physical replica of a building.

concurrent engineering. A systematic approach to the integrated, concurrent design of products and their related processes, including manufacture and support. This approach is intended from the onset to cause the developers to consider all elements of the product life cycle from conception through disposal, including quality, cost, schedule, and user requirements.

condition. The values assumed at a given instant by the variables in a system, model, or simulation. See: boundary condition; final condition; initial condition; state.

conditional event. A sequentially dependent event that will occur only if some other event has already taken place. See: time-dependent event.

configuration. A collection of products' descriptive and governing characteristics. These can be expressed in (a) functional terms such as what performance the product is expected to achieve and (b) in physical terms such as what the product should look like and consist of when completed.

configuration management. 1. The application of technical and administrative direction and surveillance to identify and document the functional and physical characteristics of a model or simulation, control changes, and record and report change processing and implementation status. 2. A discipline applying technical and administrative direction and surveillance to: (1) identify and document the functional and physical characteristics of a configuration item; (2) control changes to those characteristics; and (3) record and report changes to processing and implementation status.

conformal map projection. A map projection on which the shape of any small area of the surface mapped is preserved unchanged and all angles around any point are correctly represented. Also called orthomorphic map projection.

conservative event simulation. Implies that events are processed in a manner that never violates the correct chronology.

consistency. Data maintained so that it is free from variation or contradiction.

constant. A quantity or data item whose value cannot change.

constraint. 1. The state of being checked, restricted, or compelled to avoid or perform some action. 2. In the context of joint operation planning, a requirement placed on the command by a higher command that dictates an action, thus restricting freedom of action.

constructive model. Models that involve simulated people operating simulated systems. Real people stimulate (make inputs) to such simulations, but are not involved in determining the outcomes.

constructive simulation. A constructive simulation includes simulated people operating simulated systems. Real people stimulate (make inputs) to such simulations, but are not involved in determining the outcomes. A constructive simulation is a computer program. For example, a military user may input data instructing a unit to move and to engage an enemy target. The constructive simulation determines the speed of movement, the effect of the engagement with the enemy and any battle damage that may occur.

continuous model. A mathematical or computational model whose output variables change in a continuous manner. Contrast with: discrete model.

continuous simulation. 1. A simulation that uses a continuous model. Contrast with: discrete simulation. 2. Implies that the state (dependent) variables change in a continuous manner over time.

continuous simulation model. See: continuous system. Note: A continuous model is not always used to model a continuous system.

continuous system. A system for which the state variables change continuously with respect to time.

control loading system. A system that produces feel forces, on the simulators controls, which accurately reflect those felt by the operator in real world conditions (i.e., pilot in actual flight).

control station. A facility that provides the interfaces for individual responsible for manipulating the simulation and also provides the capability to implement simulation control as Protocol Data Units on a Distributed Interactive Simulation network.

control study. Divides participants into experimental and control groups. The subjects in the experimental group perform the experiments as specified in the protocol, while the subjects in the control group do not.

controllability. With respect to user interface, the ability of a user to dynamically change the tactics or behavior of an entity force during the course of an exercise easily and efficiently. For all exercises this can include the ability to stop and restart an exercise from some interim point in time.

coordinates. 1. Linear or angular quantities that designate the position that a point occupies in a given reference frame or system. 2. A general term to designate the particular kind of reference frame or system, such as Cartesian coordinates or spherical coordinates.

coordinate axes. Geometrical images of mathematical scales or algebraic numbers.

coordinate system. Abstract entities that establish the one-to-one correspondence between the elements of the Euclidean three-space and coordinates. A coordinate system is said to be associated with a frame if the coordinates of the frame points are time invariant.

coordinate transformation. Relabeling of each element in Euclidean space with new coordinates according to a certain algorithm.

critical event simulation. A simulation that is terminated by the occurrence of a certain event; for example, a model depicting the year-by-year forces leading up to a volcanic eruption, that is terminated when the volcano in the model erupts. See: time-slice simulation.

critical infrastructure protection. Actions taken to prevent, remediate, or mitigate the risks resulting from vulnerabilities of critical infrastructure assets. Depending on the risk, these actions could include: changes in tactics, techniques, or procedures; adding redundancy; selection of another asset; isolation or hardening; guarding, etc.

cross domain solutions. An information assurance solution that provides the ability to manually and/or automatically access and/or transfer between two or more differing security domains.

cross-functional integration. The melding of acquisition functions (such as design analysis with logistics analysis) involving shared modeling and simulation data and information.

cubic convolution. An image re-sampling method that uses a cubic polynomial that approximates a Sine function. This approach samples the four nearest pixels in each direction rather than the entire frequency space.

culling. Culling based on views, makes use of the fact that not all polygons in the virtual world are visible at all times and eliminates those polygons that are not visible.

cultural features. Features of the environment that have been constructed by man including such items as roads, buildings, canals, marker buoys; boundary lines, and, in a broad sense, all names and legends on a map.

cyber warfare/operations. The use of computers and the internet in conducting warfare in cyberspace.

cybernetics. The study of human control functions and the mechanical and electronic systems designed to replace or emulate them, including computers. "Cyber," as a prefix, denotes

anything related to computer environments, especially things that involve extensive interaction by the user.

cybersickness. A form of motion sickness that results from interaction with or immersion in virtual environments. Its main symptoms are eye strain, disorientation, postural instability, sweating, pallor, drowsiness, nausea, and (in rare cases) vomiting.

cyberspace. A global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the internet, telecommunications networks, computer systems, and embedded processors and controllers.

D

data. Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by humans or by automatic means. Any representations such as characters or analog quantities to which meaning is or might be assigned.

data administration. The responsibility for definition, organization, supervision, and protection of data within an enterprise or organization.

data administrator. A person or group that ensures the utility of data used within an organization by defining data policies and standards, planning for the efficient use of data, coordinating data structures among organizational components, performing logical database design, and defining data security procedures. See: data steward.

data architecture. The framework for organizing and defining the interrelationships of data in support of an organization's missions, functions, goals, objectives, and strategies. Data architectures provide the basis for the incremental, ordered design and development of databases based on successively more detailed levels of data modeling.

data asset. An entity that is comprised of data. For example, a database is a data asset that is comprised of data records. A data asset may be a system or application output file, database, document, or web page. A data asset also includes a service that may be provided to access data from an application. For example, a service that returns individual records from a database would be a data asset. Similarly, a web site that returns data in response to specific queries would be a data asset. A human, system, or application may create a data asset.

data attribute. A characteristic of a unit of data, such as length, value, or method of representation.

data center. An organization that serves as a conduit between data sources and data customers. The data center may transform these data as necessary to meet the operational requirements, format, security, as well as the verification, validation, and certification provisions of its sources and supported users.

data certification. 1. The determination that data have been verified and validated. 2. Data user certification is the determination by the application sponsor or designated agent that data have been verified and validated as appropriate for the specific M&S usage. 3. Data producer certification is the determination by the data producer that data have been verified and validated against documented standards or criteria.

data collection. The process of obtaining information that supports a functional activity or information requirement.

data dictionary. 1. A table or set of records whose values define the allowable content and meaning of attributes. 2. A specialized type of database containing metadata that is managed by a data dictionary system; a repository of information describing the characteristics of data used to design, monitor, document, protect, and control data in information systems and databases.

data dictionary system. An automated system such as an information resource dictionary system that can support one or more data dictionaries. A system specifically designed for managing a data dictionary.

data distribution management. Allows each federate to further refine runtime infrastructure data distribution by providing filters scoped to particular object instances or particular regions of the simulation environment.

data element. A basic unit of information having a meaning and subcategories (data items) of distinct units and values (e.g., address).

data element standardization. The process of documenting, reviewing, and approving unique names, definitions, characteristics, and representations of data elements according to established procedures and conventions.

data entity. An object of interest to the enterprise, usually tracked by an automated system.

data exchange standard. Formally defined protocols for the format and content of data messages used for interchanging data between networked simulations and/or simulator nodes used to create and operate a distributed time and space coherent synthetic environment.

data integrity. The condition in which data is accurate, current, consistent, and complete.

data item. A subunit of descriptive information or value classified under data element.

data logger. Device that accepts protocol data units from the network and stores them for later replay according to either the time sequence in which they were originally received or the time sequence as indicated by their time stamps.

data model. 1. The user's logical view of the data in a database, in contrast to the physically stored data or storage structures. 2. A description of the organization of data in a manner that reflects the information structure of an enterprise. 3. Abstract but formal representation of entities or objects (e.g., distinguishable persons, places, things, events, or concepts) about which information is kept regarding their properties, and relationships among the entities and/or properties. May be constructed to describe high-level or detailed concepts, such as conceptual and logical data models, or instantiations of data structures such as XML documents or relational databases (known as physical data models).

data quality. The correctness, timeliness, accuracy, completeness, relevance, and accessibility that make data appropriate for use. Quality statements are required for source, accuracy (positional and attribute), timeliness, logical consistency, completeness (feature and attribute), clipping indicator, security classification, and releasability.

data repository. A specialized database containing information about data, such as meaning, relationships to other data, origin, usage, format, and the information resources needed by an organization.

data security. The protection of data from accidental or intentional modification or destruction and from accidental or intentional disclosure to unauthorized personnel.

data source. An organization or subject matter expert who, because of either mission or expertise, serves as a data producer.

data standardization. The process of documenting, reviewing, and approving unique names, definitions, characteristics, and representations of data according to established procedures and conventions.

data steward. The person or group that manages the development, approval, and use of data within a specified functional area, ensuring that it can be used to satisfy data requirements throughout the organization.

data structure. 1. The logical relationships that exist among units of data and the descriptive features defined for those relationships and data units. 2. A way of storing data in a computer so that it can be used efficiently.

data synchronization. The timing requirements of a data element, or between or among data elements.

data validation. The documented assessment of data by subject area experts and its comparison to known values. Data user validation is the documented assessment of data as appropriate for use in an intended model. Data producer validation is a documented assessment within stated criteria and assumptions.

data value. A value associated with a data element. One of the allowable values of a data element.

data verification. Data producer verification is the use of techniques and procedures to ensure that data meets constraints defined by data standards and business rules derived from process and data modeling. Data user verification is the use of techniques and procedures to ensure that data meets user specified constraints defined by data standards and business rules derived from process and data modeling, and that data are transformed and formatted properly.

data verification and validation. The process of verifying the internal consistency and correctness of data and validating that it represents real-world entities appropriate for its intended purpose or an expected range of purposes.

data verification, validation, and certification. The process of verifying the internal consistency and correctness of data, validating that it represents real-world entities appropriate for its intended purpose or an expected range of purposes, and certifying it as having a specified level of quality or as being appropriate for a specified use, type of use, or range of uses. The process has two perspectives: producer and user process.

database administration. The activity responsible for the enforcement of the policies and standards established by the data administrator, to include providing technical support for physical database definition, design, implementation, maintenance, integrity, and security; and coordinating with computer operations technicians, system developers, vendors, and users. Database administration is oriented toward technical support for databases and the effective and efficient use of information technology resources.

database administrator. A person or group that enforces policy of "how," "where," and "in what manner" data is stored and maintained in each database. Provides information to the data administrator on organizational use of data within the subject database.

database directory. A database of entries, each of which represents information about a database or a directory of databases. Information often includes the name of a database or directory, ownership, point of contact, access path to the database or directory, and a description of the purpose of database.

database management system. A system that provides the functionality to support the creation, access, maintenance, and control of databases, and that facilitates the execution of application programs using data from these databases.

database systems. A system or software designed to manage a database and run operations on the data requested.

datagram. A unit of data that is transferred as a single, non-sequenced, unacknowledged unit.

dead reckoning. 1. A method for the estimation of the position/orientation of an entity based on a previously known position/orientation and estimates of time and motion. 2. Dead reckoning algorithms are used to reduce communications processing within distributed simulations. See: remote entity approximation.

decentralized architecture. Architecture with multiple, specific locations at which the same or familiar transformational or control functions are performed.

declaration management. Allows each federate to designate filters on High Level Architecture run time infrastructure notifications about the existence of particular types of remote objects, changes to particular object attributes, and particular interaction events.

declared attributes. The set of class attributes of a particular object class that are listed in the Federation Object Model (FOM) as being associated with that object class in the object class hierarchy tree.

declared parameters. The set of parameters of a particular interaction class that are listed in the Federation Object Model (FOM) as being associated with that interaction class in the interaction class hierarchy tree.

defense information systems network. Integrated network, centrally managed and configured to provide long-haul information transfer services for all DoD activities. It is an information transfer utility designed to provide dedicated point-to-point, switched voice and data, imagery, and video teleconferencing services.

defense simulation internet. A wide-band telecommunications network operated over commercial lines with connectivity to both military and civilian satellites, allowing users to be linked on a worldwide wide-area network. Note: superseded with enhanced internet protocol services in the defense information system network.

Defense Standardization Program. Identifies, influences, develops, manages, and provides access to standardization processes, products, and services for warfighters, the acquisition

community, and the logistics community in order to promote interoperability, reduce total ownership costs, and sustain readiness.

defense switched network. Component of the Defense Communications System that handles DoD voice, data, and video communications.

Degree-of-Freedom. Capability of motion in translation or rotation. There are potentially six degrees of freedom for a rigid body: translation along X, translation along Y, translation along Z; rotation around X, rotation around Y, and rotation along Z.

dependent variable. A variable whose value is dependent on the values of one or more independent variables. Contrast with: independent variable.

descriptive model. A model used to depict the behavior or properties of an existing system or type of system (e.g., a scale model or written specification used to convey to potential buyers the physical and performance characteristics of a computer).

design of experiments. Formulation of information gathering attempts where variation is present and which may or may not be under the full control of the experimenter. Process consists of four steps; 1. Hypothesis generation, 2. Data Collection, 3. Fitting data through some mathematical or statistical process, and 4. Assessing whether model fits hypothesis.

design validity. Congruence between the Originating Requirements Document and the derived requirements.

deterministic. Pertaining to a process, model, simulation, or variable whose outcome, result, or value does not depend upon chance. Contrast with: stochastic.

deterministic algorithm. A process that yields a unique and predictable outcome for a given set of inputs.

deterministic model. A model in which the results are determined through known relationships among the states and events and in which a given input will always produce the same output (e.g., a model depicting a known chemical reaction). Contrast with: stochastic model.

deterministic simulation model. A simulation model that does not contain any probabilistic (i.e., random) components.

deterministic system. A system in which the new state of the system is completely determined by the previous state and by activity.

developmental agent. Develops and provides life-cycle management for software components of an M&S solution.

difference equations. The use of algebra and a spreadsheet to construct a simulation of a continuous system.

digital elevation model. A numerical model of the elevations of points on the earth's surface. Digital records of terrain elevations for ground positions at regularly spaced horizontal intervals.

Data are available for some US Geological Survey 7.5 minute topographic quadrangles and 1: 250,000 scale maps.

digital feature analysis data. A database consisting of selected natural and cultural planimetric features type classified as point, line, or area features as a function of their composition and size. Each feature is assigned a code and further described with limited attribution. The data are stored in polygon format and segregated into one-degree tiles. Primary applications are radar return, simulation, navigation, targeting, and terrain obstruction studies. When combined with digital terrain elevation data, an off-line database is created for use by simulators.

digital feature data. 1. (cultural data) Man-made, natural, and landscape features in digital form, including all man-made features on the earth's surface (e.g., lines of communication, built-up areas (cities), transmission lines, and landmark structures). 2. (hydrographic data) Data derived from the measurement and description of physical features of the oceans, lakes, rivers, and other waters and their adjoining coastal areas, with particular reference to navigational usage, in digital form. 3. (landscape feature data) Data of all natural features and man's alteration to those features in digital form. 4. (natural feature data) Natural features on the Earth's surface that are not man-made, in digital form.

digital simulation. 1. A simulation that is designed to be executed on a digital computer system. 2. A simulation that is designed to be executed on an analog system but that represents a digital system. 3. A simulation of a digital circuit. Contrast with: analog simulation.

digital terrain elevation data. A uniform matrix of terrain elevation values produced by the National Geospatial - Intelligence Agency. Level 2 post spacing is 1 arc second latitudinally. Level 1 post spacing is 3 arc seconds latitudinally. For both, longitudinal spacing varies with latitude.

diopter. A unit of measurement of the power of a lens, especially a spectacle type lens. The power in diopters equals the reciprocal of the focal length in meters. Thus, a lens whose local length is 20 centimeters has a power of 5 diopters.

diplomatic information (military and economic). Factors to study various threats and their effect on real-time decision-making or inter-agency rapid response, generally using analysis of non-kinetic and low attribution solutions.

direct means. Meeting security objectives through the U.S.-led application of military power.

direction cosine. Cosine of angle between any two unit vectors

$l1 = \cos\theta\cos\psi$
$l2 = \cos\theta\sin\psi$
$l3 = -\sin\theta$

where θ and ψ are the angles between each vector and a reference axis.

disaggregate. Activity that decomposes an aggregated entity into multiple entities representing its components. Contrast with: aggregate.

disaggregation. 1. The ability to represent the behavior of an aggregated unit in terms of its component entities. If the aggregate representation did not maintain state representations of the individual entities, then the decomposition into the entities can only be notional. Contrast with: aggregation. 2. The process of changing the resolution of an aggregate to represent it in more detail.

discovery metadata. A type of metadata that describe or summarize key attributes and concepts and allows assets (e.g., a model, simulation, or data) to be found using enterprise search capabilities.

discrete event simulation specification. A modeling formalism that can complement the High Level Architecture by providing a modeling methodology and model specification framework. Discrete event simulation specification has a theoretical foundation that makes it, in principle, independent of various programming languages and hardware platforms.

discrete model. A mathematical or computational model whose output variables take on only discrete values; that is, in changing from one value to another, they do not take on the intermediate values; for example, a model that predicts an organization's inventory levels based on varying shipments and receipts. Contrast with: continuous model.

discrete event simulation. A simulation that uses a discrete model where the dependent variables (i.e., state indicators) change discretely at points in time referred to as events. Contrast with: continuous simulation.

discrete system. A system for which the state variables change instantaneously at separate points in time referred to as events.

distributable. The ability of M&S components that are primarily geographically separated to operate in concert.

distributed architecture. Architecture in which there are two or more autonomous processors connected by a communications interface and running a distributed operating system.

distributed exercise. An exercise where the training audience can be at different locations, e.g., different cities, countries or continents due to operational, technical, or financial reasons. A distributed exercise can be supported by distributed or centralized models and simulations.

Distributed Interactive Simulation (DIS). A time- and space-coherent synthetic representation of world environments designed for linking the interactive, free-play activities of people in operational exercises. The synthetic environment is created through real-time exchange of data units between distributed, computationally autonomous simulation applications in the form of simulations, simulators, and instrumented equipment interconnected through standard computer communicative services. The computational simulation entities may be present in one location or may be distributed geographically.

DIS compatible. Two or more simulations and/or simulators are DIS compatible if they are DIS-compliant and their models and data that send and interpret protocol data units support the realization of a common operational environment among the systems, that is, coherent in time and space.

DIS compliant. A simulation that can send or receive protocol data units in accordance with IEEE Std 1278.1 and IEEE Std 1278.2. A specific statement must be made regarding the qualifications of each protocol data unit.

DIS exercise. Consists of one or more interacting simulation applications using DIS-compliant protocol data units. The DIS Protocol Data Units issued by all simulation applications participating in the same exercise shall share one identifying number called the exercise identifier.

DIS network manager. A specified agency with the responsibility to manage the physical network used for distributed simulation. Responsibilities include: ensuring security of network; scheduling of utilization; establishing network priorities; monitoring execution of scheduled usage; coordinating functional, technical, and user communities' network requirements.

DIS protocol data unit. A set of data specified in a protocol of a given layer and consisting of protocol control information of that layer, and possibly user data of that layer.

distributed mission operations network. A network connecting Air Force wing simulators, contractor facilities, and Distributed Mission Operations Center.

distributed simulation. 1. A networking of geographically dispersed simulators of model components that execute as a single overall model. 2. A simulation that has multiple modules, which can be run on multiple processors. The processors can be located in the same room or in remote sites.

Distributed Simulation Engineering and Execution Process (DSEEP). A high-level framework for the development and execution of distributed simulation environments. The intent of the DSEEP is to specify a set of guidelines for the development and execution of these environments that stakeholders can leverage to achieve the needs of their application.

distributed virtual environment. A virtual environment is said to be distributed if it resides on two or more networked computers, which share the simulation computational load.

DoD community. A DoD activity area, enabled by M&S, that has an established executive-level management structure. Activities that meet these criteria include Acquisition, Analysis, Experimentation, Intelligence, Planning, Testing and Evaluation, and Training.

DoD Information Technology Standards Registry (DISR). An online repository of IT standards formerly captured in the Joint Technical Architecture (JTA), Version 6.0. DISR replaces JTA.

DoD M&S Enterprise Catalog. A capability that enables the discovery of metadata about M&S Assets to facilitate visibility into the resources available across the DoD M&S Enterprise and within other federal and non-federal agencies engaged in M&S, and federated with the DoD M&S Enterprise. Sources of the M&S Assets described by the discovery metadata are maintained by DoD Components and other authoritative data and software repositories. Visibility into the discovery metadata enables a user or developer of M&S tools, data, or services to identify potential reuse opportunities relative to their requirements.

DoD World Geodetic System (WGS). A unified world datum based on a combination of all available astrogeodetic, gravimetric, and satellite tracking observations. Previous World

Geodetic Systems were WGS 59, WGS 60, WGS 66, and WGS 72. The current system is WGS 84. The system is revised as new geodetic, gravimetric, and satellite data materials change the currently accepted values.

domain. The physical or abstract space in which the entities and processes operate. The domain can be land, sea, air, space, undersea, a combination of any of the above, or an abstract domain, such as an n-dimensional mathematics space, or economic or psychological domains.

dynamic model. A model of a system in which there is change, such as the occurrence of events over time or the movement of objects through space (e.g., a model of a bridge that is subjected to a moving load to determine characteristics of the bridge under changing stress).

dynamic natural environment. The natural environment is constantly changing as a result of man-made efforts (e.g., battlefield smoke) and natural phenomena (e.g., weather).

dynamic simulation model. Systems whose response to an input is not instantaneously proportional to that input or disturbance and whose behavior can be characterized by either an n-th order differential equation, a transfer function, or a set of n simultaneous first order differential equations.

E

earth coordinate system. The Earth's frame triad e_1, e_2, e_3 . e_1, e_2, e_3 represent base vectors with e_1 representing the prime meridian base vector, e_3 representing the Earth's spin axis, and e_2 completes the triad using the cross product of e_1 and e_3 (right hand rule).

earth fixed coordinate system. Any coordinate system in which the axes are stationary with respect to the Earth.

economics of M&S. Return on investment of M&S based on quantifiable and non-quantifiable benefits. To achieve warfighter return on investment, the M&S must be credible, and the users must accept the validity of the representation of tactical performance.

effects-based warfare. 1. The application of armed conflict to achieve desired strategic outcomes through the effects of military force. 2. Operations conceived and planned in a systems framework that considers the full range of direct, indirect, and cascading effects - effects that may with different degrees of probability be achieved by the application of military, diplomatic, psychological and economic instruments.

electromagnetic spectrum management. Planning, coordinating, and managing joint use of the electromagnetic spectrum through operational, engineering, and administrative procedures. The objective of spectrum management is to enable electronic systems to perform their functions in the intended environment without causing or suffering unacceptable interference.

electro-optical. A type imagery that is collected in that portion of the electromagnetic spectrum ranging from ultraviolet through long wave infrared wavelength regions.

emergence. Interactions among objects at one level give rise to different types of objects at another level.

emergent behavior. An emergent behavior or emergent property can appear when a number of simple entities (agents) operate in an environment, forming more complex behaviors as a collective. If emergence happens over disparate size scales, then the reason is usually a causal relation across different scales. In other words, there is often a form of top-down feedback in systems with emergent properties. These are two of the major reasons why emergent behavior occurs: intricate causal relations across different scales and feedback.

emission security. The component of communications security that results from all measures taken to deny unauthorized persons information of value that might be derived from intercept and analysis of compromising emanations from crypto-equipment and telecommunications systems.

emitter. A device that is able to discharge detectable electromagnetic, seismic, or acoustic energy.

empirical. Pertaining to information that is derived from observation, experiment, or experience.

emulate. To represent a system by a model that accepts the same inputs and produces the same outputs as the system represented. For example, to emulate an 8-bit computer with a 32-bit computer.

emulation. A model that accepts the same inputs and produces the same outputs as a given system.

emulator. A device, computer program, or system that performs emulation.

encapsulation. The process of hiding the details of an object that do not contribute to its essential characteristics.

endogenous variable. A variable whose value is determined by conditions and events within a given model. Synonym: internal variable. Contrast with: exogenous variable.

enterprise. An arbitrarily defined functional and administrative entity that exists to perform a specific, integrated set of missions and achieve associated goals and objectives, encompassing all of the primary functions necessary to perform those missions.

enterprise model. An information model(s) that presents an integrated top-level representation of processes, information flows, and data.

entity. Any component in a system that requires explicit representation in a model. Entities possess attributes denoting specific properties.

entity header. Externally visible part of model such as the model name and parameters as well as terminals and signal ports.

entity coordinates. Location with respect to a simulation entity.

entity coordinate system. A system whereby location with respect to a simulation entity is described by three right-hand Cartesian coordinates.

entity perspective. The perception of the synthetic environment held by a simulation entity based on its knowledge of itself and its interactions with the other simulation entities. This includes not only its own view of the simulated physical environment (terrain, air, and sea), but also its own view of itself, the other entities in the synthetic environment, and of the effects of the other entities on itself and the synthetic environment. Synonym: world view.

entity relationship diagram. A model of the data structures for data entities and the relationships between data entities.

environment. The texture or detail of the natural domain, that is terrain relief, weather, day, night, terrain cultural features (cities or farmland), sea states, etc.; and the external objects, conditions, and processes that influence the behavior of a system.

environmental effect model. A numerical model, parametric model, or database for simulating a natural environmental effect on an entity of a simulation exercise, such as a sensor or platform.

environmental entity. A simulation entity that corresponds to dynamic elements of the natural state of the geographic, atmospheric, and bathyspheric environment, of the synthetic environment, that can be seen or sensed on a real battlefield; for example, craters, smoke, building collapse, weather conditions, and sea state.

environmental features. An individual element of the natural environment (i.e., a rain system, fog, cloud).

environmental model. A numerical model, parametric model, or database designed to produce an accurate and consistent data set for one or more parameters that characterize the state of the natural environment.

environmental representation. An authoritative representation of all or a part of the natural, including permanent or semi-permanent man-made features.

environmental simulation. A simulation that depicts all or part of the natural or manmade environment of a system; for example, a simulation of the radar equipment and other tracking devices that provide input to an aircraft tracking system.

equilibrium. See: steady state.

error model. 1. A model used to estimate or predict the extent of deviation of the behavior of an actual system from the desired behavior of the system; for example, a model of a communications channel, used to estimate the number of transmission errors that can be expected in the channel. 2. In software evaluation, a model used to estimate or predict the number of remaining faults, required test time, and similar characteristics of a system.

Euler angles. A set of three angles used to describe the orientation of an entity as a set of three successive rotations about three different orthogonal axes (x, y, and z). The order of rotation is typically first about z by angle (psi), then about the new y by angle (theta), then about the newest x by angle (phi). Angles psi and phi range between +/- pi, while angle theta ranges only between +/- pi/2 radians. These angles specify the successive rotations needed to transform from the world coordinate system to the entity coordinate system. The positive direction of rotation about an axis is defined by the right-hand rule.

event. A change of object attribute value, an interaction between objects, an instantiation of a new object, or a deletion of an existing object that is associated with a particular point on the federation time axis. Each event contains a time stamp indicating when it is said to occur.

event list. An ordered list that contains the time all events will occur.

event-oriented simulation. A simulation in which attention is focused on the occurrence of events and the times at which those events occur; for example, a simulation of a digital circuit that focuses on the time of state transition.

event routine. A subprogram that updates the system state when a particular type of event occurs (there is one event routine for each event type).

executable model. A model that runs, i.e., it implements a conceptual model in a form (presumably computer compatible) that can be used for some purpose.

exercise. 1. A military maneuver or simulated wartime operation involving planning, preparation, and execution. 2. One or more sessions with a common objective and accreditation. 3. The total process of designing, assembling, testing, conducting, evaluating, and reporting on an activity.

exercise manager. Test director or training officer who manages the setup, control, and feedback of a simulation exercise after the computer network is activated. Synonym: simulation manager.

exogenous variable. A variable whose value is determined by conditions and events external to a given model. Synonym: external variable. Contrast with: endogenous variable.

experiment. A technology transition mechanism used to develop and assess concept-based hypotheses to identify and recommend the best value-added solutions for changes to doctrine, organizational structure, training, materiel, leadership and education, people, and facilities required to achieve significant advances in future joint operational capabilities.

experimental frame entity. Specifies the conditions under which a system is observed or examined with.

expert system. An expert system is a knowledge collection combined with an inference engine capable of interpreting queries and chaining together separate items of knowledge to develop new inferences. The knowledge is typically causally represented as a system of rules. In some cases, expert systems can retrace their paths of inference on demand, thus explaining their conclusions and reasoning.

exportable. Ease with which objects, data or components can be moved from one domain or event and used in another.

extensibility. The ability of a data structure to accommodate additional values or iterations of data over time without impacting the initial design.

external schema. A logical description of an enterprise that may differ from the conceptual schema upon which it is based in that some entities, attributes, or relationships may be omitted, renamed, or otherwise transformed.

extrapolation. Estimation of a value of data based on an established set of collected data outside of the data range.

F

face validation. The process of determining whether a model or simulation seems reasonable to people who are knowledgeable about the system under study, based on the model's performance. This process does not review the software code or logic, but rather reviews the inputs and outputs to ensure they appear realistic or representative.

face validity. Is measured by comparing actual output results by individuals familiar with the real system.

factors. Input parameters and structural assumptions composing a model.

fair fight. 1. Two or more simulations may be considered to be in a fair fight when differences in the simulations' performance characteristics have significantly less effect on the outcome of the conflict than actions taken by the simulation participants. 2. A condition when the differences between the performance characteristics of two or more interoperating simulations have significantly less effect on the outcome of a simulated situation than the actions taken by or resources available to the simulation participants. 3. Obtained when the systems are interoperable and the system performance capabilities of the simulators are complimentary for a given task throughout the simulation environment. Fair Fight is also task dependent and includes items such as similarity in the equality made in use of the synthetic environment features, automated force behaviors, etc. Equality of use is determined within pre-determined tolerances.

fast time. 1. Simulated time with the property that a given period of actual time represents more than that period of time in the system being modeled; for example, in a simulation of plant growth, running the simulation for one second may result in the model advancing time by one full day; that is, simulated time advances faster than actual time. 2. The duration of activities within a simulation in which simulated time advances faster than actual time. Contrast with: real time; slow time.

fault. 1. A manifestation of an error in software. A fault, if encountered, may cause a failure. 2. an imperfection in a device or machine. 3. equipment failure attributable to some defect in a circuit (loose connection or insulation failure or short circuit etc.)

fault tolerance. A system is fault tolerant when its behavior in the presence of faults is the same as it would have been in the absence of faults. A system gracefully degrades (called graceful degradation) if under certain fault conditions, its behavior differs from the fault-free behavior but is still acceptably close to it. Fault tolerance can be described in terms of the mean time to failure.

feature. A static element of the synthetic environment that exists but does not actively participate in synthetic environment interactions. Features are represented in the simulated environment by cartographic databases that are used by simulation assets. Entities can interact with features (building them, destroying them, colliding with them, etc.), but features are passive in that they do not initiate action. When features are dynamic (i.e., dynamic terrain) they are called environmental entities.

feature analysis code number. A unique number (usually sequential) assigned to an area or feature portrayed on a feature manuscript and used to relate feature analysis data table information to the digital information which portrays the shape of the feature.

federate. 1. An application that may be or is currently coupled with other software applications under a federation object model document data and a runtime infrastructure. This may include federation managers, data collectors, real world ("live") systems (i.e., C4I systems, instrumented ranges, sensors), simulations, passive viewers, and other utilities. See: federate application and joined federate. 2. A member of a High Level Architecture federation. All applications participating in a federation are called federates. This may include federation managers, data collectors, real world ("live") systems (i.e., C4I systems, instrumented ranges, sensors), simulations, passive viewers and other utilities.

federation. 1. A named set of federate applications and a common federation object model that are used as a whole to achieve some specific objective. 2. In High Level Architecture, named set of interacting federate applications, a common object model, and software infrastructure through which they communicate that are used as a whole to achieve some specific objective.

Federation Development and Execution Process (FEDEP). The actual process used to develop and execute High Level Architecture federations can vary significantly within or across different user applications. For instance, the types and sequence of low-level activities required to develop and execute analysis-oriented federations is likely to be quite different from those required to develop and execute distributed training exercises. At a more abstract level, it is possible to identify a sequence of seven very basic steps that all High Level Architecture federations should follow to develop and execute their federations.

federation execution. The actual operation, over time, of a set of joined federates that are interconnected by a runtime infrastructure.

federation management. Administers the set of participating runtime infrastructure instances within the federation.

federation object model. A specification defining the information exchanged at runtime to achieve a given set of federation objectives. This includes object classes, object class attributes, interaction classes, interaction parameters, and other relevant information.

fidelity. 1. The identification of key parameters for a system and the degree to which the aggregate of those parameters match a baseline system. The components of fidelity include functional, physical, psychological, tactile, visual, and wallpaper. 2. The degree to which the representation within a simulation is similar to a real-world object, feature, or condition in a measurable or perceived manner. 3. The accuracy of the representation when compared to the real world.

fidelity characterization. A tool for comparing disparate M&S by standardizing the metrics for enumerating capabilities and organizing the data for entry into the M&S repository.

field. A series of contiguous bits treated as an instance of a particular data type that may be part of a higher-level data structure.

field instrumentation. An internal or external recording, monitoring, or relaying device employed by live instrumented entities, usually platform, facility, or exercise-unique, and not typically part of the operational system or equipment. These devices provide an independent source of data to assess the performance of operational systems involved in an exercise.

field-of-view. The angular extent of the observable world that is seen at any given moment.

file management. A computer program that provides a user interface to work with file systems.

file transfer protocol. A computer network protocol that allows users to move data in the form of files between their local system and any system they can reach on the network.

final condition. The values assumed by the variables in a system, model, or simulation at the completion of some specified duration of time. Synonym: equilibrium condition. Contrast with: boundary condition; initial condition.

final state. The values assumed by the state variables of a system, component, or simulation at the completion of some specified duration of time. Contrast with: initial state.

flexible. Adaptable or variable; able to change M&S components created for a specific event to be useful in another event.

force feedback. Force Feedback provides real-time feedback to a virtual object, with respect to object weight, inertia and other pertinent dynamic characteristics.

formalisms. (when applied to modeling) Method for capturing the essence of thing or process; as an example, two data modeling formalisms are entity-attribute-relationship models and object relationship models.

frame rate. The rate at which a complete image is displayed on a display device.

framework for modeling and simulation. Defines entities and their relationships that are central to the M&S enterprise.

frequency management. The requesting, recording, de-confliction and issuance of authorization to use frequencies (operate electromagnetic spectrum dependent systems) coupled with monitoring and interference resolution processes.

functional architecture. 1. Logical architecture that defines what the system must do, a decomposition of the system's top-level function. This very limited definition of the functional architecture is the most common and is represented as a directed tree. 2. Logical model that captures the transformation of inputs into outputs using control information. This definition adds the flow of inputs and outputs throughout the functional decomposition. 3. Logical model of a functional decomposition plus the flow of inputs and outputs, to which input/out requirements have been traced to specific functions and items (inputs, outputs, and controls).

functional area. A functional area encompasses the scope (the boundaries) of a set of related functions and data for which an OSD Principal Staff Assistant or the Chairman of the Joint Chiefs of Staff has DoD-wide responsibility, authority, and accountability. A functional area

(e.g., personnel) is composed of one or more functional activities (e.g., recruiting), each of which consists of one or more functional processes (e.g., interviews).

functionality. Set of functions required to produce a particular output. Simple functionality is an ordered sequence of functional processes that operate on a single input to produce a specific output. There may be many inputs required to produce the output in question, but this simple functionality is only related to one of the inputs. Complete functionality is a complete set of coordinated processes that operate on all the necessary inputs for producing a specific output.

G

game. A physical or mental competition in which the participants, called players, seek to achieve some objective within a given set of rules. See: game theory.

game theory. The study of situations involving competing interests, modeled in terms of the strategies, probabilities, actions, gains, and losses of opposing players in a game. See: game, management game; war game.

gateway. A device that connects two systems, especially if the systems use different protocols. For example, a gateway is needed to connect two independent local networks, or to connect a local network to a long-haul network.

General Purpose Simulation System. A discrete time simulation language, where a simulation clock advances in discrete steps. A system is modeled as transactions enter the system and are passed from one service (represented by blocs) to another. This is particularly well suited for problems such as a factory.

general-use M&S. Specific representations used by, or common to, many models and simulations (e.g., physical environment or environmental effects such as terrain, atmospheric, or hydrographic effects).

genetic algorithms. A search heuristic that mimics the process of natural evolution. This heuristic is routinely used to generate useful solutions to optimization and search problems.

generic domain. A domain type where the attribute is constrained only by the data type assigned by the data base management system, or implied by the record type in a flat file, whichever is applicable.

generic element. The part of a data element that establishes a structure and limits the allowable set of values of a data element. A generic element has no functional or application context other than to define a general class of data and ensure consistency in structure and domain.

geocentric coordinates. (terrestrial) Coordinates that define the position of a point with respect to the center of the Earth. Geocentric coordinates can be either Cartesian (x,y,z) or spherical (geocentric latitude and longitude, and radial distance).

geoid. The equi-potential surface in the gravity field of the Earth which approximates the undisturbed mean sea level extended continuously through the continents. The geoid is the surface reference for astronomic observation and for geodetic leveling.

geometric modeling. Describes the shape of virtual objects (polygons, triangles, vertices, splines) as well as their appearance (surface texture, surface illumination, and color).

geometric transformation. Includes translation, scaling, and rotation transformations of points, vectors, and more complex shapes.

gesture interfaces. Devices that measure the real-time position of the user's fingers (and sometimes wrist) or other appendages in order to allow natural, interaction with the virtual environment.

glass box model. A model whose internal implementation is known and fully visible; for example, a model of a computerized change-return mechanism in a vending machine, in the form of a diagram of the circuits and gears that make the change. Contrast with: black box model. Synonym: white box model.

Global Combat Support System. Demand-driven, joint initiative designed to accelerate delivery of combat support applications and databases (i.e., logistics, engineering, finance, medical, etc.) to the warfighter. Focus is on providing user access to these applications from a single workstation.

global event ordering. The time-ordering of events based on the global simulation time associated with each event.

Global Information Grid. The globally interconnected, end-to-end set of information capabilities, associated processes and personnel for collecting, processing, storing, disseminating, and managing information on demand to warfighters, policy makers, and support personnel. The Global Information Grid includes owned and leased communications and computing systems and services, software (including applications), data, security services, other associated services and National Security Systems.

global time. A federation-standard representation of time synchronized to Greenwich Mean Time or Universal Time [Coordinated] with or without some offset (positive or negative) applied.

government off-the-shelf. 1. A term for software and hardware products that are typically developed by the technical staff of the government agency for which it is created. 2. Software developed for a government agency with funding and specification from the agency that is made available to other government agencies. Government off-the-shelf includes technology/system transfers from other government agencies.

graphical model. A symbolic model whose properties are expressed in diagrams; for example, a decision tree used to express a complex procedure. Contrast with: mathematical model; narrative model; software model; tabular model.

graphical user interface. A computer environment or program that displays, or facilitates the display of, on-screen options, usually in the form of icons (pictorial symbols) or menus (lists of alphanumeric characters) by means of which users may enter commands.

graphics display. A computer interface that presents images to users, for example a computer interface that presents synthetic world images to one or several user interacting with the virtual world.

graphics pipeline. The rasterizing stage, which is done in hardware, in order to gain speed.

Greenwich Mean Time. A measure of time that conforms, within a close approximation, to the mean diurnal rotation of the Earth and serves as the basis of civil time-keeping.

ground sample distance. the size of the pixels in a remotely sensed image expressed in ground units. For example, if an image has a 1.0 meter ground sample distance, then each pixel represents a ground area measuring 1 meter x 1 meter.

ground truth. 1. The actual facts of a situation, without errors introduced by sensors or human perception and judgment. 2. A term coined for data/information obtained from actual ground measurement of surface/subsurface features to aid in the interpretation of remotely sensed data. Also called ground data; ground information.

grid computing. The combination of computer resources from multiple administrative domains to reach a common goal. The grid can be thought of as a distributed system with non-interactive workloads that involve a large number of files. What distinguishes grid computing from conventional high performance computing systems such as cluster computing is that grids tend to be more loosely coupled, heterogeneous, and geographically dispersed.

guise. A function that provides the capability for an entity to be viewed with one appearance by one group of participants, and with another appearance by another group.

H

haptic. Refers to all the physical sensors that provide a sense of touch at the skin level and force feedback information from muscles and joints.

hardware in-the-loop simulation. Simulation and simulators that employ one or more pieces of operational equipment (to include computer hardware) within the simulation/simulator system.

head mounted display. Widely used as a visual device for virtual reality and personal video monitors. Graphic images are displayed on a screen or a pair of screens (one for each eye) in the helmet. A tracking sensor attached to the participant's head tells the computer system where the participant is looking. The computer quickly displays a visual image from the vantage point appropriate to the participant's position. Thus, the participant is able to look about a computer-generated world in a manner similar to the real world.

heterogeneous simulation network. A collection of simulations with partially consistent behaviors and/or partially correlated databases. Examples include simulators of different fidelity, mixed virtual and live simulations, and mixes of virtual and constructive simulations.

hierarchical model. A model of information in which data are represented as trees of records connected by pointers.

hierarchy. Hierarchy is a ranking or ordering of abstractions.

High Level Architecture (HLA). 1. A family of related standards that together describe a unified approach and common architecture to constructing interoperable simulation systems. The HLA provides a general framework within which simulation developers can structure and describe their simulation applications. The use of runtime infrastructure software is required to support operations of a federation execution. The runtime infrastructure software provides a set of services, as defined by the federate interface specification, used by federates to coordinate operations and data exchange during a runtime execution. HLA is composed of three parts: the HLA rules, the HLA interface specification, and the object model template. 2. Major functional elements, interfaces, and design rules, pertaining as feasible to all DoD simulation applications, and providing a common framework within which specific system architectures can be defined.

HLA time axis. A totally ordered sequence of values in which each value typically represents an HLA instant of time in the physical system being modeled. For any two points T1 and T2 on the time axis, if T1 < T2, T1 represents an instant of time that occurs before the instant represented by T2.

high resolution model. High resolution simulations are entity level simulations where singular military objects, i.e., a soldier, a tank, an aircraft, are the primary objects represented. They are typically designed for the lower military echelons such as platoon, company and battalion. They can also be used for operational level exercises. In high resolution models the resolution of terrain data is higher than low resolution models, i.e., sometimes up to the plans of individual buildings.

higher order model. A computer model representing combat elements, their functions and/or the terrain they operate on in an aggregated manner. A higher order model may represent a battalion as a specific entity that is a conglomeration or averaging of the characteristics of its real-world components. "Higher Order" generally refers to echelons battalion and above with greater than 100m terrain resolution (i.e., 3km, and with faster than real-time performance, days compressed into minutes, hours into seconds). See: war game.

highly aggregated model. Highly aggregated simulations are aggregate level simulations where collections of military assets, i.e., units, are the primary objects represented. They are designed for the higher military echelons such as corps level. They typically use lower resolution terrain data but they can simulate in very large areas as large as continents.

homogeneous network. A network of objects with fully consistent behaviors and fully correlated databases.

host computer. A computer that supports one or more simulation applications. All host computers participating in a simulation exercise are connected by network(s) including wide area networks, local area networks, and RF links.

human behavioral model. See: behavioral modeling

human behavior representation. The use of a computer based model within a simulation that mimics either the action of a single human or the collective action of a team of humans. Human behavior representation models aspects of the complicated facets of human behavior including ability to reason, ability to change the environment, reaction to comfort or discomfort, susceptibility to injury and illness, emotional response, communication with others, ability to sense the environment and physical capabilities and limitations.

human centered modeling and simulation. Simulations with a human in the loop and/or one that models human activity and behavior. Human centered M&S is distinguished from science and process based simulations where human intervention and modeling does not occur.

human factors. 1. The discipline or science of studying man-machine relationships and interactions. The term covers all biomedical and psychological considerations; it includes, but is not limited to, principles and applications in the areas of human engineering, personnel selection, training, life support, job performance aids, and human performance evaluation. 2. The psychological, cultural, behavioral, and other human attributes that influence decision-making, the flow of information, and the interpretation of information by individuals or groups.

human-in-the-loop. 1. A model that requires human interaction during runtime. See: interactive model. 2. Simulation and simulators that employ one or more human operators in direct control of the simulation/simulator or in some key support function.

human-machine simulation. A simulation carried out by both human participants and computers, typically with the human participants asked to make decisions and a computer performing processing based on those decisions.

human, social, cultural and behavior models. Designed to help understand the structure, interconnections, dependencies, behavior, and trends associated with any collection of

individuals. The human, social, cultural and behavior effort seeks to create models for social behavior from the small unit level, such as tribes, militias, small military units, terrorist cells, etc., to the macro level of nations, religions, cultures, ethnic groups and international organizations, and to integrate the two.

hyper text transfer protocol. An application-level protocol for distributed, collaborative, hypermedia information systems.

hypothesis testing. An algorithm or statistical approach that states the alternative to minimize certain risks.

I

iconic model. A physical model or graphical display that looks like the system being modeled; for example, a non-functional replica of a computer tape drive used for display purposes. See: scale model.

identity simulation. A simulation in which the roles of the participants are investigated or defined; for example, a simulation that identifies aircraft based on their physical profiles, speed, altitude, and acoustic characteristics.

immersion. Sensation of being in an environment; can be a purely mental state or can be accomplished through physical means.

implementation. 1. The means by which a synthetic environment, or portions of a synthetic environment, is realized. 2. To give practical effect to and ensure of actual fulfillment by concrete measures.

in-basket simulation. A simulation in which a set of issues is presented to a participant in the form of documents on which action must be taken; for example, a simulation of an unfolding international crisis as a sequence of memos describing relevant events and outcomes of the participant's actions on previous memos.

independent verification and validation. The conduct of verification and validation of a model or simulation by individuals or agencies that did not develop the model or simulation.

inductive modeling. Finding the rule with the cause and the effect. Inductive modeling combines ideas from many other technologies - including simulations, data modeling, expert systems and object-oriented modeling - to apply artificial intelligence to very complex systems such as data networking environments. Inductive techniques include system identification and parameter estimation.

inertial tracker. Self contained sensors that measure the rate of change in an object's orientation. They may also measure the rate of change of an object's translation velocity.

information. 1. Any communication or reception of knowledge such as facts, data, or opinions, including numerical, graphic, or narrative forms, whether oral or maintained in any medium, including computerized databases, paper, microform, or magnetic tape. 2. Any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual forms.

information assurance. Measures that protect and defend information and information systems by ensuring their availability, integrity, authentication, confidentiality, and nonrepudiation. This includes providing for restoration of information systems by incorporating protection, detection, and reaction capabilities.

information enterprise. The DoD information resources, assets, and processes required to achieve an information advantage and share information across the Department of Defense and with mission partners. It includes: (a) The information itself and the Department's management over the information life cycle; (b) the processes, including risk management, associated with

managing information to accomplish the DoD mission and functions, (c) activities related to designing, building, populating, acquiring, managing, operating, protecting, and defending the information enterprise; and (d) Related information resources such as personnel, funds, equipment, and IT, including national security systems.

information environment. The aggregate of individuals, organizations, or systems that collect, process, disseminate, or act on information.

information model. A model that represents the processes, entities, information flows, and elements of an organization and all relationships between these factors.

information operations. The integrated employment of the core capabilities of electronic warfare, computer network operations, psychological operations, military deception, and operations security, in concert with specified supporting and related capabilities, to influence, disrupt, corrupt or usurp adversarial human and automated decision making while protecting our own.

information system. 1. The organized collection, processing, maintenance, transmission, and dissemination of information in accordance with defined procedures, whether automated or manual. 2. Any equipment, or interconnected system or subsystem of equipment, that is used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of data or information, and includes computers and computer networks, ancillary equipment, software, firmware and similar procedures, services (including support services) and related resources. Notwithstanding the above, the term information technology does not include any equipment that is acquired by a federal contractor incidental to a federal contract. The term information systems is used synonymously with IT (to include National Security Systems).

information technology. 1. The branch of technology devoted to: a. The study and application of data and the processing thereof; i.e., the automatic acquisition, storage, manipulation (including transformation), management, movement, control, display, switching, interchange, transmission or reception of data and b. The development and use of the hardware, software, firmware, and procedures associated with this processing. 2. Any equipment or interconnected system or subsystem of equipment, used in the automatic acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission, or reception of data or information by the executive agency, if the equipment is used by the executive agency directly or is used by a contractor under a contract with the executive agency that requires the use of that equipment; or of that equipment to a significant extent in the performance of a service or the furnishing of a product. Information technology includes computers, ancillary equipment, software, firmware and similar procedures, services (including support services), and related resources; but does not include any equipment acquired by a Federal contractor incidental to a Federal contract.

information warfare. Actions taken to achieve information superiority by affecting adversary information, information-based processes, information systems, and computer-based networks, while defending one's own information, information-based processes, information systems, and computer-based networks.

infrastructure. An underlying base or foundation; the basic facilities, equipment, and installations needed for the functioning of a system.

initial condition. The values assumed by the variables in a system, model, or simulation at the beginning of some specified duration of time. Contrast with: boundary condition; final condition.

initial state. The values assumed by the state variables of a system, component, or simulation at the beginning of some specified duration of time. Contrast with: final state.

input/output trace. Typically a time line associated with each major actor in a scenario. The systems involved are listed across the top of the diagram with the time lines running vertically down the page under each of the systems. The progression of time moves from top to bottom in an input/output trace.

instantiation. To represent an abstraction by a concrete instance (e.g., in object oriented programming the creation of a new object (or instance) of a class is called instantiation).

instructional simulation. A simulation intended to provide a simulation equivalent of a real or hypothesized stimulus that could occur in the synthetic environment for the purpose of training.

Integrated Definition 0 (IDEF0) & Integrated Definition 1x (IDEF1x) (Entity Relationship diagrams). Functional modeling language(s) sponsored by the Air Force capable of capturing various organizational enterprise operations/functions (IDEF0), and related information requirements (IDEF1x), such as key elements of an invoice.

intellectual property. 1. Property that can be protected under federal law, including copyrightable works, ideas, discoveries, and inventions. Such property would include novels, sound recordings, a new type of mousetrap, or a cure for a disease. 2. Any product of someone's intellect that has commercial value, especially copyrighted material, patents, and trademarks.

intelligent agent. A software entity that carries out a set of operations on behalf of a user with some degree of independence or autonomy, and in so doing, employs knowledge or representation of the user's goals or desires.

interaction. An explicit action taken by a federate that may have some effect or impact on another federate within a federation execution.

interactive graphics. System that can make and manipulate computer generated images not only of concrete, "real world" objects but also of abstract, synthetic objects, such as mathematical surfaces in 4D, and of data that have no inherent geometry, such as survey results.

interaction parameters. The information associated with an interaction that a federate potentially affected by the interaction may receive to calculate the effects of that interaction on its current state.

interactive model. A model that requires human participation.

interactive speed. Attribute of a virtual reality system that reacts "in time" according to actions taken by a user. Such a system must be fast enough to allow a user to perform a task at hand satisfactorily with no perceived delay.

interface specification. Set of structures and/or classes including properties, methods, and/or events which serve to provide a well-defined agreement for which applications (M&S software and adjunct tools), federations, components and/or services can connect and communicate.

internal schema. An internal schema describes data as it is physically stored and includes all aspects of the environment in which the data is to reside.

Internet protocol. A standard protocol designed for use in interconnected systems of packet-switched computer communication networks. The Internet protocol provides for transmitting blocks of data called datagrams from sources to destinations, where sources and destinations are hosts identified by fixed-length addresses. The Internet protocol also provides for fragmentation and reassembly of long datagrams, if necessary, for transmission through small-packet networks.

Internet Protocol version 6 (IPv6). IP version 6 (IPv6) is a new version of the Internet Protocol, designed as the successor to IP version 4 (IPv4). IPv6 increases the IP address size from 32 bits to 128 bits, to support more levels of addressing hierarchy, a much greater number of addressable nodes, and simpler auto-configuration of addresses. The scalability of multicast routing is improved by adding a "scope" field to multicast addresses. And a new type of address called an "anycast address" is defined, used to send a packet to any one of a group of nodes.

interoperability. 1. Interactions between two or more systems affected by allowing information to be exchanged and used by the receiving system. There is an implied level common understanding that is shared between sender and receiver. See: M&S interoperability. 2. The capability, promoted but not guaranteed by joint conformance with a given set of standards, that enables heterogeneous equipment, generally built by various vendors, to work together in a network environment. 3. The ability of a federate to provide services to and/or accept services from other federates and to use the services so exchanged to enable the federates to operate effectively together. 4. The ability to operate in synergy in the execution of assigned tasks. 5. The condition achieved among communications-electronics systems or items of communications-electronics equipment when information or services can be exchanged directly and satisfactorily between them and/or their users. The degree of interoperability should be defined when referring to specific cases. 6. Interoperability exists when different systems exhibit the "same" behavior (performance) when stimulated by a set of standard procedures. The term "same", above, should be framed for a given task or class, be within a specified tolerance or number of anomalies, and with a predefined number of statistically measurable trials. Standard procedures should be layered and decomposed to include but not limited to areas such as update rate, terrain database, models, etc.

interpolation. Estimation of a value based on an established set of collected data within a given data range.

interval-oriented simulation. A continuous simulation in which simulated time is advanced in increments of a size suitable to make implementation possible on a digital system.

irregular warfare. A violent struggle among state and non-state actors for legitimacy and influence over the relevant population(s). Irregular warfare favors indirect and asymmetric approaches, though it may employ the full range of military and other capacities, in order to erode an adversary's power, influence, and will.

J

Joint Capability Technology Demonstration. A demonstration of the military utility of a significant new technology and an assessment to clearly establish its operational utility and system integrity.

joint modeling and simulation. Representations of joint and Service forces, capabilities, equipment, materiel, and services used by the joint community or by two, or more, Military Services.

Joint Training Enterprise Network. The persistent global network connecting live training sites and ranges, constructive models and simulations, virtual simulators, and experimentation sites.

K

kinesthesia. Is the perception of movement or strain from within the muscle, tendons and joints of the body.

knowledge. The rules, environment, etc. that form the structure humans use to process and relate to information, or the information a computer system must have to behave in an apparently intelligent manner.

knowledge-based system. A system in which the domain knowledge is explicit and separate from the system's operational instructions/information.

L

lag. Delay between the measurement of a position and orientation by a tracking apparatus and the report or output of this information to an output device (i.e., scene generator, force feedback apparatus) requiring the orientation or position values.

lag variable. In a discrete simulation, a variable that is an output of one period and an input for some future period; in an analog simulation, a variable that is a function of an output variable and that is used as input to the simulation to provide a time delay response or feedback.

large volume display. Graphics displays that allow several users located in close proximity to simultaneously view a stereo or monoscopic image of the virtual world.

Lambert conformal conic map projection. A conformal map projection of the so-called conical type, on which all geographic meridians are represented by straight lines which meet in a common point outside the limits of the map, and the geographic parallels are represented by a series of arcs of circles having this common point for a center. Meridians and parallels intersect at right angles, and angles on the Earth are correctly represented on the projection. This projection may have one standard parallel along which the scale is held exact; or there may be two such standard parallels, both maintaining exact scale. At any point on the map, the scale is the same in every direction. It changes along the meridians and is constant along each parallel. Where there are two standard parallels, the scale between those parallels is too small; beyond them, too large.

latency. 1. The time delay between action and result. 2. The time interval required by a simulation to respond to a stimulus in excess of the time interval required for the corresponding real world or standard event. 3. The time interval required for a device to begin output of data after presented with a stimulus or stimuli (i.e., input of data, occurrence of an event). 4. The time required for a device to begin physical output of a desired piece of data once processing is complete. 5. The time interval required for a simulation to begin its response to a stimulus after it has been presented with a stimulus or stimuli (e.g., input of data, occurrence of an event).

latency (network). Refers to time delay between any two simulators, from submitting a message from the sending simulation to receiving this message by the recipient simulation.

layered protocol architecture. The communication task is broken up into subtasks, each of which is implemented separately and arranged in a vertical stack. Each layer in the stack performs a related subset of the functions required to communicate with another system. It relies on the next lower layer to perform more primitive functions and to conceal the details of those functions. In provides services to the next higher layer. Ideally, layers should be defined so that changes in one layer do not require change in the other layers.

lead variable. In a discrete simulation, a variable that is an output of one period and that predicts what the output of some future period will be; in an analog simulation, a variable that is a function of an output variable and that is used as input to the simulation to provide advanced time response or feedback.

learning management system. Software that automates learning event administration through a set of services that launches learning content, keeps track of learner progress, determines the

order (sequence) that learning objects are to be delivered, and reports student progress through a learning experience.

learning theories. Explanations regarding human learning processes; how to-be-learned material is perceived, cognitively encoded in short-and long-term memory and retrieved independently or as part of other activities (i.e., decision making, problem solving, etc.).

light emitting diode. Photoelectric emitting device used as a light signal.

linear object. A synthetic environment object that is geometrically anchored to the terrain with one point and has a segment size and orientation.

linear programming. Optimization problems in which the object function and the constraints are all linear.

live entity. A perceptible object that can appear in the virtual battlespace but is unaware and non-responsive (either by intent, lack of capability or circumstance) to the actions of virtual entities. See: field instrumentation.

Live Fire Test & Evaluation. A test that involves the firing of actual munitions at targets to examine user casualty, vulnerability and/or lethality issues, and the evaluation of the results of such tests.

live simulation. Live simulation involves real people operating real systems. Military training events using real equipment are live simulations. They are considered simulations because they are not conducted against a live enemy.

live, virtual, and constructive simulation. A broadly used taxonomy describing a mixture of live simulation, virtual simulation, and constructive simulation. Note that live, virtual, and constructive simulations always includes a real or synthetic person in the simulation as contrasted with a science based simulation which models a phenomenon or process only.

local area network. A class of data network that provides high data rate interconnection between network nodes in close physical proximity.

local scene illumination. Treats the interaction between objects and light sources in isolation, neglecting the interdependences between objects.

local time. Time valid for only a component of a system.

logical data model. A model of the data stores and flows of the organization derived from a conceptual business model.

logical time. 1. A federate's current point on the High Level Architecture time axis. Federates making use of the management services follow restrictions on what time stamps can be sent in timestamp order messages (relative to their logical time) to ensure that federates receiving those messages receive them in timestamp order. 2. Measured by ticks of a clock embedded in a model.

logical verification. The identification of a set of assumptions and interactions for which the M&S correctly produces the intended results. Logical Verification determines the

appropriateness of the M&S for a particular application and ensures that all assumptions and algorithms are consistent with the conceptual M&S.

long-haul network. A communications network of devices that are separated by substantial geographical distance. A long-haul network could be any of numerous networks available commercially or through the Government that can accommodate the requirements of the Distributed Interactive Simulation or other virtual battlefield for long-distance network services. Synonym: wide area network.

lookahead. Lookahead is a nonnegative value that establishes a lower value on the timestamps that can be sent in timestamp order messages by time-regulating joined federates. Each time regulating joined federate must provide a lookahead value when becoming time-regulating.

loosely coupled. A condition that exists when simulation entities are not involved in very close interaction such that every action of an entity does not need to be immediately accounted for by the other entities. Two tanks moving over terrain five miles apart from each other is an example of a loosely coupled situation.

M

machine simulation. A simulation that is executed on a machine. See: computer simulation.

magnetic tracker. A noncontact position measurement device that uses a magnetic field produced by a stationary transmitter to determine the real time position of a moving receiver element.

magnetron. A semi-conducting device in which the flow of electrons is controlled by an externally applied magnetic field.

main program. A program that invokes the timing routine to determine the next event and then transfers control to corresponding event routine to update the system state appropriately. The main program may also check for termination and invoke the report generator when the simulation is over.

management game. A simulation game in which participants seek to achieve a specified management objective given pre-established resources and constraints; for example, a simulation in which participants make decisions designed to maximize profit in a given business situation and a computer determines the results of those decisions. See: war game.

management object model. A group of predefined High Level Architecture constructs (object and interaction classes) that provide the following: a) Access to federation execution operating information, b) Insight into the operations of joined federates and the runtime infrastructure, and c) Control of the functioning of the runtime infrastructure, the federation execution, and the individual joined federates.

Markov chain. A discrete Markov process. See: Markov chain model.

Markov chain model. A discrete, stochastic model in which the probability that the model is in a given state at a certain time depends only on the value of the immediately preceding state. See: semi-Markov model.

Markov process. A stochastic process that assumes that in a series of random events, the probability for occurrence of each event depends only on the immediately preceding outcome. See: semi-Markov process.

mass storage. Refers to any device that can store large amounts of data and retrieve it at some later time, even after system power-down. Mass storage devices are usually categorized in terms of being either on-line storage or off-line storage.

master scenario events list. A chronological list that supplements the exercise scenario with event synopses; expected participant responses; capabilities, tasks, and objectives to be addressed; and responsible personnel. It includes specific scenario events (or injects) that prompt players to implement the plans, policies, and procedures that require testing during the exercise, as identified in the capabilities-based planning process. It also records the methods that will be used to provide the injects (i.e., phone call, facsimile, radio call, e-mail).

master simulation datalink. Acts as the master air battle gamekeeper, presents the appropriate stimuli to the internally networked battle management, command, control, communications,

computers and intelligence and weapon system simulators, records data collection events, and allows the neutral force to monitor the scenario and status of equipment. The host computers, array processors, disk and tape drives, terminals, displays, and software included in the master simulation datalink also support data processing functions of scenario development, data collection, data reduction, data analysis, and replay.

mathematical model. A mathematical model is a symbolic model whose properties are expressed in mathematical symbols and relationships. Mathematical models are commonly used to quantify results, solve problems and predict behavior.

measure of effectiveness. 1. A qualitative or quantitative measure of the performance of a model or simulation or a characteristic that indicates the degree to which it performs the task or meets an operational objective or requirement under specified conditions. 2. A qualitative or quantitative measure of aggregate performance or a characteristic of a model, simulation or system that indicates the degree to which it performs the task or meets an operational objective or requirement under specified conditions. 3. Measure of how the system/individual performs its functions in a given environment. Used to evaluate whether alternative approaches meet functional objectives and mission needs. Examples of such measures include loss exchange results, face effectiveness contributions, and tons delivered per day. 4. Variable that describes how well a system carries out a task or set of tasks within a specific context. A measure of effectiveness is measured outside the system for a defined environment and state of the context variables.

measure of outcome. Metric that defines how operational requirements contribute to end results at higher levels, such as campaign or national strategic outcomes.

measure of performance. Measure of how the system/individual performs its functions in a given environment (e.g., number of targets detected, reaction time, number of targets nominated, susceptibility of deception, task completion time). It is closely related to inherent parameters (physical and structural) but measures attributes of system behavior. See: measure of effectiveness.

mechanical tracker. Consists of a serial or parallel kinematic structure composed of links interconnected using sensorized joints for determining the spatial position and orientation of a target object.

mediated reality. Includes adding virtual objects to visual reality but also includes the ability to take away, alter, deliberately diminish, and significantly alter the perception of visual reality.

mental model. 1. Abstraction of thought. 2. An explanation of someone's thought process about how something works in the real world.

Mercator map projection. A conformal map projection of the cylindrical type. The Equator is represented by a straight line true to scale; the geographic meridians are represented by parallel straight lines perpendicular to the line representing the Equator; they are spaced according to their distance apart at the Equator. The geographic parallels are represented by a second system of straight lines perpendicular to the family of lines representing the meridians and therefore parallel with the Equator. Conformality is achieved by mathematical analysis, the spacing of the parallels being increased with increasing distance from the Equator to conform with the

expanding scale along the parallels resulting from the meridians being represented by parallel lines. Also called equatorial cylindrical orthomorphic map projection.

message. Format and semantics of data, also known as protocol data units, that are exchanged between simulation applications and simulation management. The protocol data units provide information concerning simulated entity states, the type of entity interactions that take place in a exercise, and data for management and control of a exercise.

metadata. Searchable information describing the characteristics of data; data or information about data; or descriptive information about an object's data, data activities, systems, and holdings. For example, metadata for a model or simulation will include keywords and/or a description of the capabilities along with developer and user information. 2. Data about data; specification of the content, meaning, structure, and use of the data. 3. Information describing the characteristics of data; data or information about data; descriptive information about an organization's data, data activities, systems, and holdings. 4. Searchable data that describes the function and use of an artifact. If the artifact is a model, rather than data, sometimes called a metamodel. 5. Structured, encoded data that describe characteristics of information-bearing entities to aid in the identification, discovery, assessment, and management of the described entities.

metadata catalog. A system that contains the instances of metadata associated with individual data assets. Typically, a metadata catalog is a software application that uses a database to store and search records (or cards) that describe such items as documents, images, and videos. Search portals and applications would use metadata catalogs to locate the data assets that are relevant to their query.

meta-knowledge. Knowledge about knowledge. Knowledge about the use and control of domain knowledge in an expert or knowledge-based system. Knowledge about how the system operates or reasons.

metamodel. A model of a model. Metamodels are abstractions of the M&S being developed that use functional decomposition to show relationships, paths of data and algorithms, ordering, and interactions between model components and subcomponents. Metamodels allow the software engineers who are developing the model to abstract details to a level that subject matter experts can validate.

methodology. The system of principles, practices, and procedures, applied to a specific branch of knowledge.

metric. A measure of the extent or degree to which a product possesses and exhibits a certain quality, property, or attribute.

metric(s). A process or algorithm that may involve statistical sampling, mathematical computations, and rule-based inferencing. Metrics provide the capability to detect and report defects within a sample.

middleware. Software that connects or integrates other software modules or components, typically providing a set of communications or interaction functions that may be invoked by the linked modules.

minimize. (communication) A condition wherein normal message and telephone traffic is drastically reduced in order that messages connected with an actual or simulated emergency shall not be delayed.

mission space. The environment of entities, actions, and interactions comprising the set of interrelated processes used by individuals and/organizations to accomplish assigned tasks.

mock-up. A full-sized model, but not necessarily functional, built accurately to scale, used chiefly for study, testing, or display. See: physical model.

model. A physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. See: structural model; analytical model.

model concept. Information (and amount) required to develop a model.

model entity. A model entity represents a real world object in a simulation.

model specification. Precise specification for a specific model which, if implemented properly, will produce anticipatable results, i.e., dead reckoning or coordinate conversion. Compare to: modeling method (which is less specific, typically larger in scope).

modeling. 1. Application of a standard, rigorous, structured methodology to create and validate a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. 2. Representation of an event and/or things that is real (a case study) or contrived (a use-case). It can be a representation of an actual system. It can be something used in lieu of the real system to better understand a certain aspect about that system. To produce a model you must abstract from reality a description of a vibrant system. The model can depict the system at some point of abstraction or at multiple levels of abstraction with the goal of representing the system in a reliable fashion (i.e., mathematical). 3. The process concerns itself with the extraction of knowledge from the physical plant to be simulated, organizing that knowledge appropriately, and representing it in some unambiguous fashion.

modeling and simulation (M&S). 1. The discipline that comprises the development and/or use of models and simulations. 2. The use of models, including emulators, prototypes, simulators, and stimulators, either statically or over time, to develop data as a basis for making managerial or technical decisions. The terms "modeling" and "simulation" are often used interchangeably.

M&S accreditation. The official certification that a model or simulation is acceptable for use for a specific purpose.

M&S asset. M&S tools, data, and services, including models and simulations, and data assets.

M&S Coordination Agent. A DoD Component designated by USD(AT&L) to coordinate prescribed aspects of DoD M&S for a designated M&S area. A DoD M&S Coordination Agent is not a Modeling and Simulation Executive Agent.

Modeling and Simulation Coordination Office (M&S CO). A USD(AT&L) organization that performs key M&S Enterprise-level coordination functions necessary to encourage cooperation, synergism, and cost-effectiveness among the M&S activities of the DoD Components.

M&S data. Data used to develop models or simulations, data used as input to models and simulations, and data produced by models and simulations.

M&S developer. The agency that actually develops an M&S or the agency that is overseeing the M&S development by a contractor or Federally Funded Research and Development Corporation.

Modeling and Simulation Executive Agent (MSEA). A DoD Component designated by USD (AT&L) to coordinate all aspects of DoD M&S for a designated M&S area. These MSEAs are transitioning to M&S Coordination Agents. There are five such MSEA's. Air Force for Air and Space Environment. Navy for Ocean Environment; National Geospatial-Intelligence Agency for Terrain Environment (now under the authority, direction and control of Under Secretary of Defense for intelligence (USD(I)); Defense Intelligence Agency for Threat Forces and Intelligence Processes (now under the authority, direction and control of USD(I)); and Assistant to the Secretary of Defense for Nuclear and Chemical and Biological Defense Programs (ATSD(NCB)) for Chemical, Biological, Radiation, and Nuclear Defense M&S.

M&S event. An interaction between M&S infrastructure elements that is associated with a particular point in time that results in something happening or changing. M&S Events include tests, analysis, research and design, training, experiments, M&S infrastructure interactions, and internal model interactions.

M&S infrastructure. An underlying base or foundation; the basic facilities, equipment, installations and services needed for the functioning of a system. An M&S infrastructure would consist of M&S systems and applications, communications, networks, architectures, standards and protocols, information resource repositories, etc.

Modeling and Simulation Integrated Process Team (M&S IPT). A DoD sub-committee of the M&S Steering Committee (M&S SC) that makes recommendations and performs functions for the M&S SC.

M&S interoperability. 1. The ability of a model or simulation to provide services to, and accept services from, other models and simulations, and to use the services so exchanged to enable them to operate effectively together. 2. The ability of a federate to provide services to and/or accept services from other federates and to use the services so exchanged to enable the federates to operate effectively together.

M&S Master Plan. A plan published under the authority of the appropriate DOD Component or functional area lead that establishes time-phased objectives and responsibilities aligned with the DOD master plan and targeted at the needs of the DOD Component or functional area.

M&S proponent. The DoD component organization that has primary responsibility to initiate development and life-cycle management of the reference version of one or more models and/or simulations.

M&S reuse. 1. The use of M&S resources, (i.e., models, simulations, databases, algorithms, tools) for purposes beyond those for which they were originally developed. Reuse can occur within an organization or in different organizations, or in different application areas. 2. The process of building, assembling, or executing M&S systems and applications from existing components.

M&S Services. An activity that enhances the ability to effectively and efficiently use M&S to accomplish a mission.

Modeling and Simulation Steering Committee (M&S SC). An executive-level DoD committee that advises and assists the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) in all matters pertaining to M&S.

Modeling and Simulation Strategic Vision. A high-level document describing the strategic vision and goals for the DoD M&S Enterprise.

M&S Tools. Software that implements a model or simulation or an adjunct tool, i.e., software and/or hardware that is either used to provide part of a simulation environment (e.g., to manage the execution of the environment) or to transform and manage data used by or produced by a model or simulation. Adjunct tools are differentiated from simulation software in that they do not provide a virtual or constructive representation as part of a simulation environment.

M&S user. M&S User is the term used to represent the organization, group, or person responsible for the overall application. The M&S user needs to solve a problem or make a decision and wants to use modeling or simulation to do so. The M&S user defines the requirements, establishes the criteria by which model or simulation fitness will be assessed, determines what method or methods to use, makes the accreditation decision, and ultimately accepts the results.

modeling method. Set of organizing principles, fundamental concepts, and common algorithms and data structures for a class of models, i.e., discrete event simulation or finite element modeling. Category of models with a common basis or modeling technique, i.e., Lanchester equations, finite state machines.

model-test-model. An integrated approach to using models and simulations in support of pretest analysis and planning; conducting the actual test and collecting data; and post-test analysis of test results along with further validation of the models using the test data.

modifier. A word that helps define and render a name unique within the database, which is not the prime or class word.

modular semi-automated forces. A class of computer generated forces utilizing a modular software structure in which model components have well-defined and documented interfaces allowing run-time reconfiguration of model behavior to develop generalized, and more sophisticated, representations of reactive behaviors and missions.

monoscopic image depth cues. Are those that can be seen in a single static view of a scene, as in photographs and paintings.

Monte Carlo. A simulation in which random statistical sampling techniques are employed such that the result determines estimates for unknown values.

Monte Carlo algorithm. a randomized algorithm whose running time is deterministic, but whose output may be incorrect with a certain (typically small) probability.

Monte Carlo method. a class of computational algorithms that rely on repeated random sampling to compute their results. Monte Carlo methods are often used in simulating physical and mathematical systems. These methods are most suited to calculation by a computer and tend to be used when it is infeasible to compute an exact result with a deterministic algorithm. This method is also used to complement the theoretical derivations.

motion depth cues. Come from the parallax created by changing relative position between the head and the object being observed (one or both may be in motion).

multicast. A transmission mode in which a single message is sent to selected multiple (but not necessarily all) network destinations; i.e., one-to-many. Contrast with: broadcast, unicast.

multisensory input/output. The use of more than one sensory mechanism (visual, aural, tactile, etc.) to interact with a computer-generated environment.

multi-resolution modeling. Represents aspects of the real world at more than one level of detail.

multi-state objects. Mission space entities that express a changing state (in attribution and visual display) as the simulation progresses (e.g., damage to structures, changes in vegetation, damage system representations such as vehicles, tanks, etc.).

multi-step methods. Used for the numerical solution of ordinary differential equations. Conceptually, a numerical method starts from an initial point and then takes a short step forward in time to find the next solution point. Multistep methods attempt to gain efficiency by keeping and using the information from previous steps rather than discarding it. Consequently, multistep methods refer to several previous points and derivative values.

N

nadir. The point on the celestial sphere directly beneath the observer and directly opposite the zenith.

narrative model. A symbolic model the properties of which are expressed in words; for example, a written specification for a computer system. Synonym: verbal descriptive model. Contrast with: graphical model; mathematical model; software model; tabular model.

National Military Command System. The priority component of the Global Command and Control System designed to support the President, Secretary of Defense, and Joint Chiefs of Staff in the exercise of their responsibilities.

National Simulation Center. A team of trainers and technicians who link training developers to the acquisition community to set the conditions for training. The National Simulation Center is the capability developer for Army Constructive training simulations; Army Gaming and the Live, Virtual, Constructive-Integrating Architecture, documenting and developing requirements for these capabilities to ensure they meet the needs of the Warfighter. In addition to these capability development activities, the National Simulation Center supports joint, corps, division and brigade warfighter exercises, mission readiness exercises and experiments.

natural model. A model that represents a system by another system that already exists in the real world; for example, a model that uses one body of water to represent another.

nearest neighbor. A method of image re-sampling that uses the pixel location nearest to the re-sampled pixel.

net centric operations. seeks to translate an information advantage, enabled in part by information technology, into a competitive advantage through the robust networking of well informed geographically dispersed forces. This networking, combined with changes in technology, organization, processes, and people, may allow new forms of organizational behavior.

network. An arrangement of nodes and interconnecting branches.

network byte order. The internet-standard ordering of the bytes corresponding to numeric values.

network communication services. The capability provided to electronically transmit modeling and simulation data between networked computational nodes in a manner that meets requirements for transmission latency, multi-cast addressing and security needed to support the creation and operation of distributed time and space coherent synthetic environments.

network filter. A system to selectively accept or reject data received from the network.

network latency. Also known as network delay, is the amount of time required to transfer a bit of data from one point to another.

network management. The collection of administrative structures, policies, and procedures that collectively provide for the management of the organization and operation of the network as a whole. See: network manager.

network manager. The person or organization responsible for maintaining, monitoring and scheduling the operation of the portion of a network used for a distributed simulation and whose responsibilities for the network terminates at the gateways and who is not responsible for the simulation hosts or a local area network. See: network management.

network node. A specific network address. See: node. Contrast with: processing node.

network theory. The study of networks used to model processes such as communications, computer performance, routing problems, and project management.

networked virtual environment. A software system in which multiple users interact with each other in real-time, even though those users may be located around the world. Typically each user accesses his or her own computer workstation or console, using it to provide a user interface to the content of a virtual environment.

neural networks. Also known as a parallel distributed processing network, is a computing paradigm that is loosely modeled after cortical structures of the brain and consists of interconnected processing elements called nodes or neurons that work together to produce an output function.

node. 1. A general term denoting either a switching element in a network or a host computer attached to a network. See: processing node; network node. 2. A single entity that is represented in a mathematical model; for example, in a model of a nuclear reactor, a water pump or section of pipe. 3. A location in a mobility system where a movement requirement is originated, processed for onward movement, or terminated. 4. In communications and computer systems, the physical location that provides terminating, switching, and gateway access services to support information exchange.

non-absorbing state. In a Markov chain model, a state that can be left once it is entered.

non-governmental organization. A private, self-governing, not-for-profit organization dedicated to alleviating human suffering; and/or promoting education, health care, economic development, environmental protection, human rights, and conflict resolution; and/or encouraging establishment of democratic institutions and civil society.

non-standard cell. A cell that is not compliant with the Distributed Interactive Simulation message and database standards. Non-standard cells require a Cell Adapter Unit in order to join a Distributed Interactive Simulation exercise.

non-standard data element. Any data element that exists in a system or application program and does not conform to the conventions, procedures, or guidelines established by the organization.

normative model. A model that makes use of a familiar situation to represent a less familiar one; for example, a model that depicts the human cardiovascular system by using a mechanical pump, rubber hoses, and water.

notional data. Speculative or theoretical data rather than actual data.

numerical model. 1. A mathematical model in which a set of mathematical operations is reduced to a form suitable for solution by simpler methods such as numerical analysis or automation; for

example, a model in which a single equation representing a nation's economy is replaced by a large set of simple averages based on empirical observations of inflation rate, unemployment rate, gross national product, and other indicators. 2. A model whose properties are expressed by numbers.

O

object-based. A software design methodology adhering to only some of the properties of object-oriented software. See: object-oriented.

object management. Registers and unregisters local participant objects within each federate; discovers remote participant objects; exchanges object state and interaction events.

object model. 1. A specification of the objects intrinsic to a given system, including a description of the object characteristics (attributes) and a description of the static and dynamic relationships that exist between objects. 2. A system specification defined primarily by class characteristics and relationships. The High Level Architecture idea of an object model is similar in many ways, but not identical, to the common idea of an object model in object-oriented literature.

object model framework. The rules and terminology used to describe High Level Architecture object models.

object-oriented. 1. Pertaining to, or characteristic of, a computer program consisting of (a) many relatively small, simple programs (subroutines), and (b) one monitor program, the function of which is to coordinate the exchange of data among the subroutines. Note: Subroutines designed under this concept may be stored in object libraries, and used by other computer programmers with similar functional requirements. 2. Pertaining to, or characteristic of, data to be processed by object-oriented programs. See: object-based.

object-oriented language. A computer programming language that best suits an object-oriented description of software and that provides the capability to implement classes and objects, to directly support data abstraction and classes, and to provide additional support for inheritance as a means of expressing hierarchies of classes.

object-oriented programming. A method of implementation in which programs are organized as cooperative collections of objects, each of which represents an instance of some class, and whose classes are members of class hierarchies as defined by the inheritance mechanism.

observation frame. Specifies how to simulate the system with inputs: what variables to measure and how to observe the variables over a time base.

occlusion. The vision effect of closer objects overlapping or obstructing more distant ones, providing visual clues to judge how close objects are from the viewer.

octet. A sequence of eight bits, usually operated upon as a unit.

octet ordering. The order of transmission of data is resolved at the octet level.

off-line storage devices. Off-line storage devices generally are used for data backup and archival applications, using media-like magnetic tapes or removable hard or floppy disks.

on-line storage devices. On-line storage devices provide more immediate retrieval of data than off-line storage devices and usually refer to non-removable magnetic or optical hard disk drives.

open architecture. Architecture in which the hardware and software interfaces are sufficiently well defined that additional resources can be added to the system with little or no adjustment.

Open Modeling and Simulation Architecture (OpenMSA). A layered architecture that focuses on the technology of scalable parallel and distributed computing, with an emphasis on M&S. The OpenMSA also addresses interoperability with existing Live Virtual and Constructive (LVC) standards such as HLA, DIS, TENA, and XML-based web services such as the Simple Object Access Protocol and Web Service Definition Language.

open standard. Standards that are widely used, consensus based, published and maintained by recognized industry standards organizations.

open system. A system in which the components and their composition are specified in a non-proprietary environment, enabling competing organizations to use these standard components to build competitive systems. There are three perspectives on open systems: 1. *Portability*: the degree to which a system component can be used in various environments, 2. *Interoperability*: the ability of individual components to exchange information, and 3. *Integration*: the consistency of the various human-machine interfaces between an individual and all hardware and software in the system.

Open System Architecture for Modeling and Simulation (OSAMS). Contained within the OpenMSA and focuses on the programming constructs and interoperability methodologies for developing composable plug-and-play model components. OSAMS provides a Service Oriented Architecture philosophy within an application executing in parallel on multicore computers.

operational environment. A composite of the conditions, circumstances, and influences that affect the employment of military forces and the decisions of the unit commander. Frequently characterized as permissive, semi-permissive, or non-permissive.

Operational Test and Evaluation. The field test, under realistic operational conditions, of any item (or key component) of weapons, equipment, or munitions for the purpose of determining the operational effectiveness and operational suitability of the weapons, equipment, or munitions for operational use, including combat, by typical military users, and the evaluation of the results of such test.

optical see through. Work by placing optical combiners in front of the user's eyes. These combiners are partially transmissive, so that the user can look directly through them to see the real world. The combiners are also partially reflective, so that the user sees virtual images projected on the combiners from head mounted displays.

optimistic event simulation. Implies that a process clock may run ahead of incoming activities, resulting in errors in chronology (time warp).

optimistic synchronization. A mechanism that uses a recovery mechanism to erase the effects of out-of-order event processing. This is in contrast to conservative synchronization. The Time Warp protocol is an example of an optimistic synchronization mechanism. Messages sent by an optimistic federate that could later be canceled.

orthogonal. Pertaining to or composed of right angles. Variables which are orthogonal are mutually independent mathematically. This includes the notion of "independence" or "ease of transformation," as used in regard to matrices in multivariate analysis.

orthographic map projection. A perspective azimuthal projection in which the projecting lines, emanating from a point at infinity, are perpendicular to a tangent plane. This projection is used chiefly in navigational astronomy for interconverting coordinates of the celestial equator and horizon systems. Also called orthogonal map projection.

outcome-oriented simulation. A simulation in which the end result is considered more important than the process by which it is obtained; for example, a simulation of a radar system that uses methods far different from those used by the actual radar, but whose output is the same. Contrast with: process-oriented simulation.

output validation. The process of determining the extent to which the output (outcome distributions for the M&S and/or sub-models) represents the significant and salient features of distributions or real-world systems, events, and scenarios.

ownership management. Used by joined federates and the runtime infrastructure to transfer ownership of instance attributes among joined federates. The ability to transfer ownership of instance attributes among joined federates is required to support the cooperative modeling of a given object instance across a federation.

P

parallax. The vision effect of having two eyes viewing the same scene from slightly different positions that creates a sense of depth. Computer-generated environments, one for each eye, artificially create the parallax effect.

parallel computing. The simultaneous execution of the same task (split up and specially adapted) on multiple processors in order to obtain results faster.

parallel simulation. A solution for large-scale queuing network models. Synchronization is required to run a parallel simulation because the produced results are expected to be the same as those produced by sequential simulation.

parallel processing. Multiple processes running on multiple processors simultaneously.

parametric model. A model using parametric equations that may be based on numerical model outputs or fits to semi-empirical data to succinctly describe a particular process, feature, or effect.

period. The time interval between successive events in a discrete simulation.

persistent. Enduring availability for re-use of M&S components after the completion of a specific event.

personal graphics display. A graphics display that outputs a virtual scene to be viewed by a single user.

petri net. 1. An abstract, formal model of information flow, showing static and dynamic properties of a system. 2. It graphically depicts the structure of a distributed system as a directed bipartite graph with annotations.

physical architecture. The identification and arrangement of the physical components of a system into an orderly framework that describes the physical structure, the technical functions, design features and technical attributes that can be achieved by each component and by the system within specified constraints.

physical data model. A representation of the technologically independent information requirements in a physical environment of hardware, software, and network configurations representing them in the constraints of an existing physical environment.

physical immersion. Is accomplished by presenting a virtual world to users based on their location and orientation and providing synthetic stimuli to one or more of their senses in response to their position and actions.

physical model. 1. A model whose physical characteristics resemble the physical characteristics of the system being modeled; for example, a plastic or wooden replica of an airplane. A mock-up. See: mock up; iconic model; scale model. Contrast with: symbolic model. 2. Representation of an entity in three-dimensional space and can be divided into full-scale mock-up, subscale mock-up, breadboard, and electronic mock-up.

physical security. 1. In communications security, the component that results from all physical measures necessary to safeguard classified equipment, material, and documents from access thereto or observation thereof by unauthorized persons. 2. That part of security concerned with physical measures designed to Safeguard personnel; to prevent unauthorized access to equipment, installations, material, and documents; and to safeguard them against espionage, sabotage, damage, and theft.

physical time. Measured by ticks of a physical clocks.

physics-based modeling. Mathematical models in which the equations that constitute the model are those used in physics to describe or define physical phenomenon being modeled.

pitch. Rotation around the Y axis, in a right hand system where Y is perpendicular to the plane of symmetry (for most entities).

pixel. A "picture element," refers to the smallest visual unit a computer display.

platform. 1. A generic term used to describe a level of representation equating to vehicles, aircraft, missiles, ships, fixed sites, etc., in the hierarchy of representation possibilities. 2. The part of the virtual reality system where the participant is situated; a platform can be designed to mimic a real world device found in the virtual world or simply provide a generic place to sit or stand.

polygon. A flat planar figure with multiple sides, the basic building block of virtual worlds. Humans perceive the equivalent of 80 million polygons at more than 30 frames per second in normal vision.

Political, Military, Economic, Social, Information and Infrastructure. The process of categorizing and understanding the interactions among various aspects of a region's infrastructure and dynamics as a part of developing operational and tactical plans.

point object. A synthetic environment object that is geometrically anchored to the terrain with a single point.

position tracking. Informs the virtual reality system where the users are located within a virtual reality space. In position sensing systems, three factors interact with each other (besides cost): 1. Accuracy/precision and speed of the reported sensor position, 2. Interfering media (i.e., metals opaque objects), and 3. Encumbrance (wires, mechanical linkages).

precision. The quality of the operation by which the result is obtained and can be repeated.

predictive model. A model in which the values of future states can be predicted or are hypothesized; for example, a model that predicts weather patterns based on the current value of temperature, humidity, wind speed, and so on at various locations.

prescriptive model. A model used to convey the required behavior or properties of a proposed system; for example, a scale model or written specification used to convey to a computer supplier the physical and performance characteristics of a computer system. Contrast with: descriptive model.

presence. Short for sense of presence, as in being mentally immersed.

prime word. A word included in the name of a data entity that represents the logical data grouping (in the logical data model) to which it belongs.

probabilistic model. See: stochastic model.

processes. Processes affect entities. Attrition, communications, and movement are examples of processes. Processes have a level of detail by which they are described.

process improvement modeling. Defines and documents the current ("as is") and desired future ("to be") processes and information requirements of a functional activity. Two types of process improvement models are: activity model and data model.

process model. 1. A model of the processes performed by a system; for example, a model that represents the software development process as a sequence of phases. Contrast with: structural model. 2. Model that defines the functional decomposition of the system function and the flow of inputs and outputs for those functions. 3. Process models are designed to replicate steps in a process or system. All processes models allow users to define their processes, workflows or system dynamics. Other common processes that are modeled are information flow through a system and the manufacturing of parts using an assembly line.

process-oriented simulation. A simulation in which the process is considered more important than the outcome; for example, a model of a radar system in which the objective is to replicate exactly the radar's operation, and duplication of its results is a lesser concern. Contrast with: outcome-oriented simulation.

processing node. The hardware and software processing resources devoted to one or more simulation entities. See: node. Contrast with: network node.

prop. A physical object used as an interface to a virtual world; prop may be embodied by a virtual object and might have physical controllers mounted on it.

proprietary. A technological design or architecture whose configuration is unavailable to the public and may not be duplicated without permission from the designer or architect.

proprietary standard. A standard that is exclusively owned by an individual or organization, the use of which generally would require a license and/or fee.

proprioception. Means stimulation from within the body.

proprioceptive sensor. Subcutaneous sensors that respond to stimuli produced inside the body.

protocol. A set of rules and formats (semantic and syntactic) that determine the communication behavior of simulation applications.

protocol data unit. A unit of data that is passed on a network between simulation applications. For example, Distributed Interactive Simulation.

protocol entity. An object that exchanges information with other entities in a network via protocol data units in accordance with an established protocol. A key attribute of a protocol

entity is its state. State transitions occur in a given protocol entity in accordance with the established protocol as the result of: Protocol data units received from other protocol entities; and occurrence of an external event (i.e., expiration of a time-out counter). See: protocol data unit.

protocol suite. A defined set of complementary protocols within the communication architecture profile.

prototype. 1. A preliminary type, form, or instance of a system that serves as a model for later stages or for the final, complete version of the system. 3. Physical model of the system that ignores certain aspects of the system, glosses over the aspects and is fairly representative of a third segment of aspects of the system. The prototype can range from a subscale model of the system to a paper display (storyboard) of the user interface of the system.

pseudocode. A description of control and/or data structures in a natural language with no rigid rules of syntax.

publish and subscribe. An asynchronous messaging paradigm that allows loose coupling between publishers (senders) and subscribers (receivers). Publishers are the agents that send information to a central component, while subscribers express their interest in receiving messages. A broker or dispatcher is the central component of a publish / subscribe system and is responsible for recording all subscriptions, matching publications against subscriptions, and notifying the corresponding subscribers.

Q

qualitative. Factors that typical represent structural assumptions that are not naturally quantified.

qualitative data. A non-numeric description of a person, place, thing, event, activity, or concept.

qualitative model. A model that provides symbolic, textual, or graphic answers. Symbolic models are based on logic or set theory. Textual models are based in verbal descriptions. Graphical qualitative models use either elements of mathematical graph theory or simply artistic graphics to represent a hierarchical structure, the flow of items or data through a system's functions, or the dynamic interaction of the systems components.

quality assurance. The policies, procedures and systematic actions established in an enterprise for the purpose of providing and maintaining some degree of confidence in data integrity and accuracy throughout the life cycle of the data. The planned systematic activities necessary to ensure that a component, module, or system conforms to established technical requirements.

quality of service. Refers to the properties of a network that contribute to the degree of satisfaction that users perceive, relative to the network's performance. Four service categories are typically included under this term: capacity, or data rate; latency, or delay; jitter, and traffic loss.

quantitative. Factors naturally assume numerical values.

quantitative data. Numerical expressions that use numbers, upon which mathematical operations can be performed.

quantitative model. Model that provides answers that are numerical; these models can be either analytic, simulation or judgmental models.

Quaternion method. A four parameter method used for defining orientation of an aircraft or other object. This method is an alternative to the Euler Angle method, as it avoids singularities that occur when the pitch attitude reaches 90 degrees.

queue. A set of zero or more entities waiting to be serviced by a service facility.

queuing model. A model consisting of service facilities and entities waiting in queues to be served; for example, a model depicting teller windows and customers at a bank. See: queuing theory.

queuing network model. A model in which a process is described as a network in which each node represents a service facility rendering a given type of service and a queue for holding entities waiting to be served; for example, a model depicting a network of shipping routes and docking facilities at which ships must form queues in order to unload their cargo. See: queuing theory.

queuing theory. The study of queues and the performance of systems that service entities that are organized into queues. See: queuing model; queuing network model.

R

random. Pertaining to a process or variable whose outcome or value depends on chance or on a process that simulates chance, often with the implication that all possible outcomes or values have an equal probability of occurrence; for example, the outcome of flipping a coin or executing a computer-programmed random number generator.

random event. An event occurring without a recognizable pattern.

range or field of view. The amount of area covered by the sensor or solid angle represented by a display or graphics system.

raster. The raster structure has a simple format of rows and columns of pixels. Raster condenses all information about that pixel to a finite set of values. This pixel value generalizes a portion of reality, simplifying the data and storage formats and the processing time.

raster form. A vector to raster ratio of about 1:50. While raster files are bigger than vector files for a specified area of earth, the vector files typically takes longer for data access and display. Another significant difference is accuracy. Vector product accuracy obviously doesn't consider pixel size.

real battlefield. See: real world.

real-time. 1. Simulated time advances at the same rate as actual time. Contrast with: fast time; slow time. 2. An event or data transfer in which, unless accomplished within an allotted amount of time, the accomplishment of the action has either no value or diminishing value. 3. In modeling and simulation, simulated time advances at the same rate as actual time; for example, running the simulation for one second results in the model advancing time by one second. Contrast with: fast time; slow time.

real-time clock. Is responsible for the synchronization of real time and simulated time. The real-time clock is programmed to send a trigger impulse once every *h* time units of real time. Where *h* is the current step size of the integration algorithm, and the simulation program is equipped with a busy waiting mechanism that is launched as soon as all the computations associated with the current step have been completed and that checks for arrival of the next trigger signal. The new step will not begin until the trigger signal has been received.

real-time service. A service that satisfies-timing constraints imposed by the service user. The timing constraints are user specific and should be such that the user will not be adversely affected by delays within the constraints.

real-time system. A system that computes its results as quickly as they are needed by a real-world system. Such a system responds quickly enough that there is no perceptible delay to the human observer. In general use, the term is often perverted to mean within the patience and tolerance of a human user.

real-world. The set of real or hypothetical causes and effects that simulation technology attempts to replicate. When used in a military context, the term is synonymous with real battlefield to include air, land, and sea combat. Synonym: real battlefield.

real-world time. The actual time in the real world, expressed as Universal Coordinated Time.

reality engine. Any computer system specifically designed to generate virtual reality worlds.

reference. Part of a tracking system considered fixed with respect to the motion of a target.

reference frame (or frame of reference). A conceptual framework rigidly connected to a set of axes to measure the position or motion of a point. For example, the earth can be used as a geocentric frame of reference, which can express quantitatively the location of a point relative to the earth.

reference version. The most recent version of a model or simulation that has been released by, and under configuration management of an approving authority.

referent. A codified body of knowledge about a thing being simulated.

reflected object. An object that is represented but not explicitly modeled in a simulation. The reflecting simulation accepts changes in state of the reflected object as they are produced by some other federation member and provided to it by the runtime infrastructure.

regime. The interaction domain of entities.

registration. Alignment of coordinate systems or phenomenological agreement between environment models.

regression testing. Retesting a portion of the system after a change has been made to ensure that new problems were not introduced.

relative timestamp. A relative timestamp is used when simulation application clocks are not synchronized. Each simulation application keeps time beginning with an arbitrary starting point. The time indicated by the timestamp is then relative to the simulation application issuing the PDU.

reliability model. A model used to estimate, measure, or predict the reliability of a system; for example, a model of a computer system, used to estimate the total down time that will be experienced.

reliable service. 1. A communication service in which the received data is guaranteed to be exactly as transmitted. 2. A communication service in which the number and type of errors that the user finds in the data are acceptable for the application. Reliable communication may require specific mechanisms in order to achieve the user's requirements: detection and notification; or error detection and correction from protocol data unit errors, such as bit errors, duplicated protocol data units, missing protocol data units, or out-of-sequence protocol data units.

reliable transport. As relates to message delivery, the property that sent messages (or other data) are guaranteed to be delivered to the recipient. As an example, The Transmission Control Protocol (TCP) is one of the core protocols of the Internet protocol suite. TCP provides reliable, in-order delivery of a stream of bytes, making it suitable for applications like file transfer and e-mail. In contrast, the internet protocol (and other network protocols) also allows use of

unreliable transport (or best effort transport) such as the User Datagram Protocol which does not guarantee reliability or ordering in the way that TCP does.

remote entity approximation. The process of extrapolating or interpolating any state of an entity based on its last known state. This includes dead reckoning and smoothing. Synonym: dead reckoning.

repeatability. Ability to accurately recreate responses under identical stimuli.

report generator. A subprogram that computes estimates (from the statistical counters) of the desired measures of performance and produces a report when the simulation ends.

repository. A computer system used to store digital library collections and disseminate them to users.

representation. Models of the entity or phenomenon associated and its effects. Representations using algorithms and data that have been developed or approved by a source having accurate technical knowledge are often considered authoritative.

representational resource. Knowledge about the real world (raw materials) used to develop a model, simulation, or federation. Representational resources fall into one of three categories: 1. *Functional Description of the Mission Space (FDMS)*: An operator's view of the entities, actions, relationships, interactions and environmental factors associated with a mission. Mission spaces may include any aspect of the real world, to include military operations, medical treatment, manufacturing, electrical power distribution, etc. 2. *Characteristics and Performance Descriptions (C&PD)*: An expert's identification of the entity's nature, which are comprised of attribute definitions, algorithms and data limits. 3. *Scenario-specific Data*: The particular information used by a given model, simulation or federation execution so that it may provide its representations in the context of a set of real world circumstances. Scenario-specific data include terrain databases, order of battle, weather, plans and other state data.

requirement. 1. An established need justifying the timely allocation of resources to achieve a capability to accomplish approved military objectives, missions, or tasks. 2. Determined by the M&S proponent in cooperation with the intended application sponsor and documented for its intended use complete with scope, features of the M&S and the data needed.

resolution. 1. The degree of detail and precision used in the representation of real world aspects in a model or simulation. 2. For raster applications, resolution is the number or pixels per unit distance. 3. (Joint Chiefs of Staff) A measurement of the smallest detail which can be distinguished by a sensor system under specific condition. 4. The minimum distance between two adjacent features, or the minimum size of a feature which can be detected by a remote sensory system. 5. Smallest resolvable change in position and orientation. A measure of resolution is the standard deviation of the underlying distribution of measurements around the mean of a measured position or orientation.

retraction. An action performed by a federate to unschedule a previously scheduled message. Message retraction may be visible to the federate to whom the scheduled message was to be delivered. Retraction is widely used in classic event-oriented discrete event simulations to model behaviors such as preemption and interrupts.

reuse. 1. The practice of using again, in whole or part, existing M&S tools, data, or services. 2. Reuse encompasses the policy, practices, and the supporting technology that foster the effective reuse of M&S resources to include requirements, conceptual models, software architecture, designs, algorithms, software components, models, simulations, and data.

re-usability. The degree to which a software module or other work product can be used in more than one computing program or software system.

right-hand rule. Positive rotation is clockwise when viewed toward the positive direction along the axis of rotation.

roll. Rotation around the X axis.

runtime infrastructure. 1. The general-purpose distributed operating system software that provides the common interface services during the runtime of an High Level Architecture federation. 2. The software that provides common interface services during a High Level Architecture federation execution for synchronization and data exchange.

S

sample rate. The frequency at which the sensor samples the stimulus.

saturation. The maximum amount of stimulus the sensor can respond to.

scalability. The ability of a distributed simulation to maintain time and spatial consistency as the number of entities and accompanying interactions increase.

scale model. A physical model that resembles a given system, with only a change in scale; for example, a replica of an airplane one tenth the size of the actual airplane.

scan conversion algorithm. Computes the coordinates of the pixels that lie on or near an ideal, infinitely thin straight line imposed on a 2D raster grid.

scenario. 1. Description of an exercise (including initial conditions). It is part of the session database that configures the units and platforms and places them in specific locations with specific missions. 2. An initial set of conditions and timeline of significant events imposed on trainees or systems to achieve exercise objectives.

scene graph. A hierarchical organization of objects (visible or not) in the virtual world (or universe), together with the view to that world.

Sharable Content Object Reference Model (SCORM). The SCORM is a collection of specifications that defines a web-based learning Content Aggregation Model, Run-time Environment, and Sequencing and Navigation protocol for reusable content objects. At its simplest, it is a model that references a set of interrelated technical specifications and guidelines designed to meet the Department of Defense's high-level requirements for distributed learning content.

schema. Descriptive representation of data and/or data requirements that describe conceptual, internal, or external views of information/data needs.

scope. The range of real or imagined world objects or conditions represented by a particular model, simulation or simulation exercise.

seamless. Normally referring to integrating or merging two simulations or their component parts. Perfectly consistent. Transparent.

SECRET Internet Protocol Router Network (SIPRNET). The worldwide SECRET-level packet switch network that uses high-speed internet protocol routers and high-capacity Defense Information Systems Network circuitry.

security forces. Duly constituted military, paramilitary, police, and constabulary forces of a state.

segment. A portion of a session that is contiguous in simulation time and in wall clock time (sidereal time).

selector. A portion of an address identifying a particular entity at an address (i.e., a session selector identifies a user of the session service residing at a particular session address).

semi-automated forces. Simulation of friendly, enemy and neutral platforms on the virtual battlefield in which the individual platform simulation is operated by computer simulation of the platform crew and command hierarchy. The term "semi-automated" implies that the automation is controlled and monitored by a human who injects command-level decision making into the automated command process. See: computer-generated forces.

semi-Markov model. A Markov chain model in which the length of time spent in each state is randomly distributed. See: Markov chain model.

semi-Markov process. A Markov process in which the duration of each event is randomly distributed. See: Markov process.

session. A portion of an exercise that is contiguous in wall-clock (sidereal) time and that is initialized by a session database.

sidereal time. Time based upon the rotation of the Earth relative to the vernal equinox.

simuland. The system being simulated by a simulation.

simulated mission space. A general term that describes the synthetic depiction of the real (or projected) world provided by a model, simulation, or federation.

simulated time. Time as represented within a simulation. Synonym: virtual time. See: fast time; real time; slow time.

simulation. A method for implementing a model over time.

simulation application. The executing software on a host computer that models all or part of the representation of one or more simulation entities. The simulation application represents, or simulates, real-world phenomena for the purpose of training, analysis, or experimentation. Examples include manned vehicle (virtual) simulators, computer-generated forces (constructive), environment simulators, and computer interfaces between a Distributed Interactive Simulation network and real (live) equipment.

simulation clock. A counter used to accumulate simulated time.

simulation entity (in Distributed Interactive Simulation (DIS)). An element of the synthetic environment that is created and controlled by a simulation application through the exchange of DIS protocol data units (e.g., tanks, submarines, carriers, fighter aircraft, missiles, bridges). It is possible that a simulation application may be controlling more than one simulation entity.

simulation environment. Consists of the operational environment surrounding the simulation entities including terrain, atmospheric, bathyspheric and cultural information.

simulation exercise. An exercise that consists of one or more interacting simulation applications. Simulations participating in the same simulation exercise share a common identifying number called the exercise identifier. These simulations should also utilize correlated representations of the synthetic environment in which they operate.

simulation fidelity. 1. The similarity, both physical and functional, between the simulation and that which it simulates. 2. A measure of the realism of a simulation. (3) The degree to which the

representation within a simulation is similar to a real world object, feature, or condition in a measurable or perceivable manner.

simulation game. A simulation in which the participants seek to achieve some agreed upon objective within an established set of rules. For example, a management game, a war game. Synonym: gaming simulation.

simulation language. A programming language that is specialized to the implementation of simulation programs. Such languages are usually classified as either discrete event simulation languages or continuous simulation languages.

simulation management. A mechanism that provides centralized control of the simulation exercise. Functions of simulation management include but are not limited to: start, restart, maintenance, shutdown of the exercise, and collection/distribution of certain types of data.

simulation manager. See: exercise manager.

simulation object model. 1. A specification of the types of information that an individual federate could provide to High Level Architecture (HLA) federations as well as the information that an individual federate can receive from other federates in HLA federations. The standard format in which simulation object models are expressed facilitates determination of the suitability of federates for participation in a federation. 2. Describes salient characteristics of a federate to aid in its reuse and other activities focused on the details of its internal operation.

simulation operation. The art and science of applying live, virtual and constructive simulation technologies in support of military operations, training and acquisition activities which include, testing, experimentation and analysis.

simulation process. The imitative representation of the actions of platform(s), munitions(s), and life form(s) by computer program(s) in accordance with a mathematical model and the generation of associated battlefield entities. May be fully automated or partially automated. In the latter case, the human-in-the-loop injects command-level decisions into the process and is not intended to be a "trainee."

simulation support entity. Processing modules used to support, control, or monitor the simulation environment, but which do not actually exist on the battlefield. This includes battlefield viewing devices for controllers or exercise observers such as the stealth vehicle, the plan view display, after action review systems, and simulation control systems.

simulation time. The reference time (e.g., UTC) within a simulation exercise. This time established ahead of time by the simulation management function and is common to all participants in a particular exercise.

simulator. A device, computer program, or system that performs simulation.

simulator entity. Computational device for generating behavior of the model.

single point-of-entry. The individual organization(s) responsible for entering data values for a data element.

sliver. A polygonal area so thin that its interior does not contain a distinct span for each scan line.

slow time. The duration of activities within a simulation in which simulated time advances slower than actual time. Contrast with: fast time; real time.

smoothing. Interpolation of the previous state of an entity (location, velocity, etc.) to the current state, creating a continuous transition between two successive entity state updates.

social network modeling. Used to understand the connections among people whether they are political leaders, specific groups, and/or cliques in organizations. It also allows for an explanation of a flow of information, or the spread of contagion, or the identification of outliers, or individuals who are isolated from the group.

socket. A software representation of the endpoint to a communication channel.

software in-the-loop simulation. Simulation and simulators that employ one or more elements of operational software within the simulation/simulator system.

software reuse. See: reuse.

Soldier Visualization Station. The Soldier Visualization Station (SVS) features real-time 3-D graphics and directional audio. SVS supports representation of urban environments including multilevel buildings, adjustable fields of view and viewing distances, multiple movement modes, adjustable lighting and visibility modes, tethering options, wireframe mode, etc. The software is DIS compliant, HLA compliant, Semi-Automated Forces compliant and supports WAV audio files.

sound display. Computer interfaces that provide synthetic sound feedback to users interacting with the virtual world.

source system entity. The real or artificial source of data.

span. The scale of the domain that is global, theater, regional, local, or individual. Description of the span is often subjective.

stability. Constancy of purpose; steadfastness; reliable; dependable.

stability operations. An overarching term encompassing various military missions, tasks, and activities conducted outside the United States in coordination with other instruments of national power to maintain or reestablish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief.

stabilized-variable model. A model in which some of the variables are held constant and the others are allowed to vary; for example, a model of a controlled climate in which humidity is held constant and temperature is allowed to vary.

standard. 1. A rule, principle, or measurement established by authority, custom, or general consent as a representation or example. 2. A document that establishes uniform engineering or technical criteria, methods, processes and practices.

standardization. 1. The process by which the DoD achieves the closest practicable cooperation among the Services and Defense agencies for the most efficient use of research, development, and production resources, and agrees to adopt on the broadest possible basis the use of: a. common or compatible operational, administrative, and logistic procedures; b. common or compatible technical procedures and criteria; c. common, compatible, or interchangeable supplies, components, weapons, or equipment; and, d. common or compatible tactical doctrine with corresponding organizational compatibility. 2. The process of developing and agreeing on (by consensus or decision) uniform engineering criteria for products, processes, practices, and methods for achieving compatibility, interoperability, interchangeability, or commonality of materiel.

state. 1. The internal status of a simulation entity; i.e., fuel level, number of rounds remaining, location of craters, etc. 2. A condition or mode of existence that a system, component, or simulation may be in; for example, the preflight state of an aircraft navigation program or the input state of given channel. 3. The values assumed at a given instant by the variables that define the characteristics of a system, component, or simulation. Synonym: system state. See: final state; initial state; steady state.

state transition. A change from one state to another in a system, component, or simulation.

state variable. A variable that defines one of the characteristics of a system, component, or simulation. The values of all such variables define the state of the system, component, or simulation.

static model. A model of a system in which there is no change; for example, a scale model of a bridge, studied for its appearance rather than for its performance under varying loads.

static simulation model. Representation of a system at a particular time, or one that may be used to represent a system in which time simply plays no role.

static variables. Variables that do not change over the course of an experiment.

statistical counters. Variables used for storing statistical information about system performance.

statistics. Any function of the observations of a random variable which does not depend on unknown parameters.

steady state. A situation in which a model, process, or device exhibits stable behavior independent of time.

stealth viewer. A component that provides the capabilities for visually observing a simulation exercise without participating in the simulation exercise interaction.

steradian. The unit of measure of a solid angle.

Stereoscopic Image Depth Cue. Is derived from the parallax between the different images received by the retina in each eye (binocular disparity). The Stereoscopic Image Depth Cue depends on parallax, which is the apparent displacement of objects viewed from different locations.

stimulate. To provide input to a real system in order to observe or evaluate the system's response.

stimulation. The use of simulations to provide an external stimulus to a real system or subsystem. An example is the use of a simulation representing the radar return from a target to drive (stimulate) the radar of a missile system within a hardware/software-in-the-loop simulation.

stimulator. A hardware device that injects or radiates signals into the sensor system(s) of operational equipment to imitate the effects of platforms, munitions, and environment that are not physically present.

stochastic. Pertaining to a process, model, or variable whose outcome, result, or value depends on chance. Contrast with: deterministic.

stochastic model. A model in which the results are determined by using one or more random variables to represent uncertainty about a process or in which a given input will produce an output according to some statistical distribution; for example, a model that estimates the total dollars spent at each of the checkout stations in a supermarket, based on probable number of customers and probable purchase amount of each customer. Synonym: probabilistic model. See: Markov chain model. Contrast with: deterministic model.

stochastic process. Any process dealing with events that develop over time or cannot be described precisely, except in terms of probability theory.

stochastic simulation model. A model that has at least some random input components.

stochastic system. A system that contains a certain amount of randomness in its transitions from one state to another.

structural metadata. Metadata that documents the internal characteristics of an artifact. May include name, description, data constraints, and tag relationships. The High Level Architecture (HLA) object model template standard is an example of structural metadata, where the data described is an HLA object model; an HLA object model is itself structural metadata with respect to a specific run-time set of objects and their attribute values. Makes the artifact understandable.

structural model. A representation of the physical or logical structure of a system; for example, a representation of a computer network as a set of boxes connected by communication lines. See: model. Contrast with: process model.

structural validation. The process of determining that the M&S assumptions, algorithms, and architecture provide an accurate representation of the composition of the real world as it pertains to the intended use of the M&S.

subject area. 1. A major, high-level classification of data. 2. A group of entity types that pertain directly to a function or major topic of interest to the enterprise.

symbolic model. A model whose properties are expressed in symbols. Examples include graphical models, mathematical models, narrative models, software models, and tabular models. Contrast with: physical model.

symbology. A graphic representation of concepts or physical objects.

synchronization. 1. The timing requirements of a data element, or between and/or among data elements. 2. The arrangement of military actions in time, space, and purpose to produce maximum relative combat power at a decisive place and time. 3. In the intelligence context, application of intelligence sources and methods in concert with the operation plan to ensure intelligence requirements are answered in time to influence the decisions they support.

synthetic battlefield. One type of synthetic environment.

synthetic environment. 1. The integrated set of data elements that define the environment within which a given simulation application operates. The data elements include information about the initial and subsequent states of the terrain including cultural features, and atmospheric and oceanographic environments throughout an exercise. The data elements include databases of externally observable information about instantiable entities, and are adequately correlated for the type of exercise to be performed. 2. Internetted simulations that represent activities at a high level of realism from simulations of theaters of war to factories and manufacturing processes. These environments may be created within a single computer or over a distributed network connected by local and wide area networks and augmented by realistic special effects and accurate behavioral models. They allow visualization of and immersion into the environment being simulated. 3. A computer-based representation of the real world (including the natural environment, e.g. atmosphere, space, ocean, and terrain), usually a current or future battlespace, within which any combination of players may interact. The players may be computer models, simulations, people or real instrumented equipment.

system. A collection of components organized to accomplish a specific function or set of functions.

system architecture. A representation of a system in which there is a mapping of functionality onto hardware and software components, a mapping of the software architecture onto the hardware architecture, and human interaction with these components.

system dynamics. An approach to understanding the behavior of complex systems over time. It deals with internal feedback loops and time delays that affect the behavior of the entire system. What makes using system dynamics different from other approaches to studying complex systems is the use of feedback loops and stocks and flows. These elements help describe how even seemingly simple systems can display nonlinearity. The basis of the method is the recognition that the structure of any system is often just as important in determining its behavior as the individual components themselves.

system model. A representation of a real system; the body of information about a system gathered for the purpose of studying the system.

Systems Modeling Language. Systems Modeling Language (SysML) is a general purpose modeling language for systems engineering applications. It is a dialect of Unified Modeling Language (UML) and supports the specification, analysis, design, verification, and validation of a broad range of systems and systems of systems.

system state. The collection of state variables necessary to describe the system at a particular time.

systems of systems. A set or arrangement of systems that results when independent and useful systems are integrated into a larger system that delivers unique capabilities.

T

T-1. Data communications service that supports 1.544 megabits per second operation.

T-2. Data communications service that supports 45 megabits per second operation.

tabular model. A symbolic model whose properties are expressed in tabular form; for example, a truth table that represents a Boolean logic "OR" function. Contrast with: graphical model; mathematical model; narrative model; software model.

taction. Is the sense of touch that comes from sensitive nerve sensors at the surface of the skin.

target. Feature (i.e., object, landmark, human feature) to be localized by the tracking process.

taxonomy. A classification system. Provides the basis for organizing objects for identification, retrieval and research purposes.

technical data. Scientific or technical information recorded in any form or medium (e.g., manuals and drawings). Computer programs, related software, financial data and other information related to contract administration are not technical data where documentation of computer programs and related software are.

technical infrastructure. The internal framework that must be built to implement an operational service.

telecommunications. Any transmission; emission; reception of signs, signals, writings, images, sounds; or information of any nature by wire, radio, visual, or other electromagnetic systems.

telepresence. The ability to directly interact (often via computer mediation) with a physically real, remote environment from the first person point of view; there are no restrictions on the location of the remote environment, and there are no restrictions on the size of the device used to carry out the user's commands at the remote location.

tempest. An unclassified term referring to technical investigations for compromising emanations from electrically operated information processing equipment; these investigations are conducted in support of emanations and emissions security.

Test and Evaluation. The act of generating empirical data during the research, development or sustainment of systems, and the creation of information through analysis that is useful to technical personnel and decision makers for reducing design and acquisition risks. The process by which systems are measured against requirements and specifications, and the results analyzed so as to gauge progress and provide feedback.

Test and Training Enabling Architecture. The Test and Training Enabling Architecture (TENA) is designed to bring affordable interoperability to US live simulation test and training ranges and their customers. The TENA program was established in 2002 for developing the foundation that will allow DoD ranges, labs and facilities to be interoperable by 2010. TENA integrates testing, training, simulation, and a high-performance computing technology, distributed across many facilities, and ties them together with a common architecture.

texturing. A technique performed in the rasterizing stage of the graphics pipeline in order to modify the object model's surface properties such as color, specular reflection, or pixel normals.

tightly coupled. A condition that exists when simulation entities are involved in very close interaction such that every action of an entity must be immediately accounted for by the other entities in real-time.

time. The measurable aspect of duration. Time makes use of scales based upon the occurrence of periodic events. These are: the day, depending on the rotation of the Earth; the month, depending on the revolution of the Moon around the Earth; and the year, depending upon the revolution of the Earth around the Sun. Time is expressed as a length on a duration scale measured from an index on that scale. For example: 4 p.m. local mean solar time means that 4 mean solar hours have elapsed since the mean Sun was on the meridian of the observer.

time-dependent event. An event that occurs at a predetermined point in time or after a predetermined period of time has elapsed. See: conditional event.

time management. 1. A collection of High Level Architecture (HLA) services that support controlled message ordering and delivery to the cooperating joined federates within a federation execution in a way that is consistent with federation requirements. 2. Maintains a common sense of time among all federates, either based on real time clock or based on an event based clock.

time redundancy. Use of extra processing when time is available to perform the same computation multiple times with a single hardware and software combination and then compare the results.

time-slice simulation. A discrete simulation that is terminated after a specific amount of time has elapsed; for example, a model depicting the year-by-year forces affecting a volcanic eruption over a period of 100,000 years. Synonym: time-interval simulation. See: critical event simulation.

time stamp (of an event). A time stamp is used to indicate the time at which the data contained in the protocol data unit were generated. For simulations using absolute timestamps, this time is the exact UTC. For simulations using relative timestamps, this time is the time that the simulation application assumes the event or state occurred in the synthetic environment relative to its own host clock. By example this timestamp can be specified using a 32-bit unsigned integer representing units of time passed since the beginning of the current hour. The least significant bit indicates whether the timestamp is absolute or relative.

timestamp order. An ordering of messages provided by a runtime infrastructure for joined federates making use of time management services and messages containing time stamps. Messages having different time stamps are said to be delivered in timestamp order if for any two messages M1 and M2 (time stamped with T1 and T2, respectively) that are delivered to a single joined federate where T1 < T2, then M1 is acted upon before M2.

time step models. Dynamic models in which time is advanced by a fixed or independently determined amount to a new point in time, and the states or status of some or all resources are updated as of that new point in time. Typically these time steps are of constant size, but they need not be.

time variable. A variable whose value represents simulated time or the state of the simulation clock.

Topographic Map of the United States. The recommended designation for the topographic map of the United States prepared of the quadrangle areas in atlas sheet form, chiefly by the U.S. Geological Survey. This map portrays all basic information about location, elevation, and extent of physical and cultural features that are required for preliminary economic and engineering studies and for incorporation in maps prepared for special purposes.

touch feedback. Conveys real-time information on contact surface geometry, virtual object surface roughness, slippage, and temperature. It does not actively resist the user's contact motion and does not stop the user from moving through virtual surfaces.

tracked munition. 1. A munition for which position data is required over time. By necessity, a tracked munition becomes a simulation entity during its flight; its flight path is represented, therefore, by Entity State Protocol Data Units. 2. A munition for which tracking data is required. A tracked munition's flight path is represented by Entity State Protocol Data Units.

tracker. The special-purpose hardware used in VR to measure the real-time change in a 3D object position and orientation.

tracker accuracy. Represents the difference between the object's actual 3D position and that reported by tracker measurements.

tracker drift. The steady increase in tracker error with time.

tracker jitter. Represents the change in tracker output over time when the tracked object is stationary.

traditional warfare. A form of warfare between the regulated militaries of states, or alliances of states, in which the objective is to defeat an adversary's armed forces, destroy an adversary's war-making capacity, or seize or retain territory in order to force a change in an adversary's government or policies.

transmission security. The component of communications security that results from all measures designed to protect transmissions from interception and exploitation by means other than cryptanalysis.

transmit management. The control of the transmission rate to match the transmission media. The transmission rate is selected to reduce total network traffic.

transverse Mercator map projection. A conformal cylindrical map projection, being in principle equivalent to the regular Mercator map projection turned (transverse) 90° in azimuth. In this projection, the central meridian is represented by a straight line, corresponding to the line which represents the Equator on the regular Mercator map projection. Neither the geographic meridians (except the central meridian) nor the geodetic parallels (except the Equator) are represented by straight lines. Also called Inverse cylindrical orthomorphic map projection; Inverse Mercator map projection; transverse cylindrical orthomorphic map projection.

trial. Represents a single instance of an experiment to be performed as part of a human factor study.

Turing test. An informal validation method well suited for validating models of human behavior first proposed as a means to evaluate the intelligence of a computer system.

typing. The enforcement of the software class of an object, such that objects of different types may not be interchanged, or may be interchanged only in restricted ways.

U

ultrasound tracker. A noncontact position measurement device that uses an ultrasonic signal produced by a stationary transmitter to determine the real-time position of a movable receiver element.

unbundling. The process of unpacking a set of protocol data units into multiple separate protocol data units. Contrast with: bundling.

unconventional warfare. A broad spectrum of military and paramilitary operations, normally of long duration, predominantly conducted through, with, or by indigenous or surrogate forces who are organized, trained, equipped, supported, and directed in varying degrees by an external source. It includes, but is not limited to, guerrilla warfare, subversion, sabotage, intelligence activities, and unconventional assisted recovery.

unicast. A transmission mode in which a single message is sent to a single network destination; i.e., one-to-one.

Unified Modeling Language (UML). A general purpose, standardized specification (modeling) language for object modeling that includes a graphical notation used to create an abstract model of a system.

unit. A basis of measurement.

unit conversion. A system of converting measurement from one basis to another; for example, English/metric, knots/feet per second, etc.

Universal Space Rectangular Coordinate System. A right-handed orthogonal coordinate system with its origin at the center of the Earth, positive x-axis in the equatorial plane and passing through the zero degree meridian, positive y-axis in the equatorial plane and passing through the ninety degree east meridian, and positive z-axis passing through the North Pole.

universal time. A measure of time that conforms, within a close approximation, to the mean diurnal rotation of the Earth and serves as the basis of civil time-keeping. Universal time (UT1) is determined from observations of the stars, radio sources, and also from ranging observations of the Moon and artificial Earth satellites. The scale determined directly from such observations is designated Universal Time Observed (UTO); it is slightly dependent on the place of observation. When UTO is corrected for the shift in longitude of the observing station caused by polar motion, the time scale UT1 is obtained. When an accuracy better than one second is not required, Universal Time can be used to mean Coordinated Universal Time (UTC). Also called "Zulu Time". See: Greenwich Mean Time.

universal transverse Mercator (UTM). A military grid system based on the transverse Mercator projection, applied to maps of the Earth's surface extending to 84°N and 80°S latitudes.

update rate. Maximum frequency of report of position, orientation, or other regularly occurring event.

user. The organization that accredits and uses the results or products from a specific application of a model or simulation.

V

validation. 1. The process of determining the degree to which a model or simulation and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model. 2. The process of evaluating a model, simulation, or federation of models and simulations throughout the development and execution process to determine how well it satisfies the acceptability criteria within the context of the referent. 3. Data validation is the documented assessment of data by subject area experts and its comparison to known or best-estimate values. Data producer validation is that documented assessment within stated criteria and assumptions. Data user validation is that documented assessment of data as appropriate for use in an intended M&S. 4. Distributed simulation validation is the process of determining the degree to which a distributed simulation is an accurate representation of the real world from the perspective of its intended use(s) as defined by the requirements. 5. Face validation is the process of determining whether a model or simulation based on performance seems reasonable to people knowledgeable about the system under study. The process does not review software code or logic, but rather reviews the inputs and outputs to assure that they appear realistic or representative. 6. Model/simulation validation is the process of determining the degree to which a model is an accurate representation of the real world from the perspective of the intended use(s) of the model.

validity. 1. The quality of maintained data that is found on an adequate system of classification (e.g., data model) that is rigorous enough to compel acceptance for a specific use. 2. The quality of being inferred, deduced or calculated correctly enough to suit a specific application.

variable. A quantity or data item whose value can change. See: dependent variable; independent variable; state variable. Contrast with: constant.

variance reduction. Procedure used to increase the precision of the estimates that can be obtained for a given number of iterations.

vector. The vector structure, in contrast to the single pixel value of raster features, describes features objectively and subjectively in great detail. Vector features are points, lines, or areas defined by polygons. The vector structure is more flexible because at any magnification it preserves feature content and retains maximum digitized positional accuracy. Vector is not a simple data structure like raster; it requires sophisticated data manipulation software at an additional significant storage cost.

verification. 1. The process of determining that a model or simulation implementation accurately represents the developer's conceptual description and specification. 2. The process of determining that a model or simulation implementation and its associated data accurately represent the developer’s conceptual description and specifications. 3. The process of evaluating a model, simulation, or federation of models and simulations and its intermediate products to determine whether the products from a given development phase satisfy the conditions imposed at the start of that phase and, ultimately, determining that an implementation of a model, simulation, or federation of models and simulations correctly and completely represents the developer’s conceptual description and specifications. 4. Data verification is the use of techniques and procedures to ensure that data meets specified constraints defined by data standards and business rules. Data producer verification is the use of techniques and procedures

to ensure that data meets constraints defined by data standards and business rules derived from process and data modeling. Data user verification is the use of techniques and procedures to ensure that data meets user specified constraints defined by data standards and business rules derived from process and data modeling and to ensure that data are transformed and formatted properly. 5. Distributed simulation verification is the process of determining that an implementation of a distributed simulation accurately represents the developer's conceptual description and specifications. 6. Model/simulation verification is the process of determining that a model implementation accurately represents the developer's conceptual description and specifications.

verification agent. 1. The person or organization designated to perform verification of a model, simulation, or federation of models and/or simulations and the associated data. 2. The organization designated by the M&S sponsor to perform verification of a model, simulation, or federation of M&S.

verification and validation agent. The person or organization designated to perform the verification, validation, or both, of a model, simulation, or federation of models and simulations, and their associated data.

verification and validation proponent. The agency responsible for ensuring verification and validation is performed on a specific model or simulation.

Verification, Validation & Accreditation (VV&A). Verification is the process of determining that a model implementation and its associated data accurately represent the developer's conceptual description and specifications. Validation is the process of determining the degree to which a model and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model. Accreditation is the official certification that a model, simulation, or federation of models and simulations and its associated data are fit for a specific purpose. The VV&A area encompasses three main components: the thing to be simulated, i.e., the real world referent; the simulation model; and a bounding principle, i.e., the accuracy required for the intended use.

video game. A virtual experience carefully designed to be entertaining (among other things).

video see through. Work by combining a closed-view head mounted display with one or two head-mounted video cameras. The video cameras provide the user's view of the real world. Video from these cameras is combined with the graphic images created by the scene generator, blending the real and virtual.

vignette. A self-contained portion of a scenario.

virtual. Refers to the essence or effect of something, not the fact.

virtual battlespace. The illusion resulting from simulating the actual battlespace.

virtual images. Visual, auditory, and tactile stimuli that are transmitted to the sensory end organs so they appear to originate from within the three-dimensional space surrounding the user.

virtual network. The interconnection of Distributed Interactive Simulation cells by any communications means that provide the necessary network services to conduct an exercise.

virtual prototype. A model or simulation of a system placed in a synthetic environment, and used to investigate and evaluate requirements, concepts, system design, testing, production, and sustainment of the system throughout its life cycle.

virtual reality. The effect created by generating an environment that does not exist in the real world. Usually, a stereoscopic display and computer-generated three-dimensional environment gives the immersion effect. The environment is interactive, allowing the participant to look and navigate about the environment, enhancing the immersion effect. Virtual environment and virtual world are synonyms for virtual reality.

virtual simulation. A simulation involving real people operating simulated systems. Virtual simulations inject human-in-the-loop in a central role by exercising motor control skills (i.e., flying an airplane), decision skills (i.e., committing fire control resources to action), or communication skills (i.e., as members of a C4I team).

virtual time. See: simulated time.

virtual training domain. A simulator-based training environment that trains real people using virtual simulators that physically replicate the working environments of real mission systems operating within realistically simulated operational battlespace environments and scenarios.

virtual world. 1. An imaginary space often manifested through a medium. 2. A description of a collection of objects in a space and the rules and relationships governing those objects.

visualization. The formation of an artificial image that cannot be seen otherwise.

visualization pipeline. Process of creating visual representation from simulation data. The pipeline describes a step-wise process involving four phases, namely: 1. *Data analysis*: preparation of raw simulation data for visualization (i.e., by applying a smoothing filter or interpolating missing values). This step is computer centered, with little or no user interaction. 2. *Filtering*: Selection of data portions to be visualized, this step is usually user-centered. 3. *Mapping or transformation*: Focus data are mapped to geometric primitives (i.e., points, lines) and their attributes (color, position, size). This is the most critical step for achieving effective visual representation. 4. *Rendering*: Geometric data are transformed into visuals (i.e., pixel-based image in 2D, or a 3D model.

visual stealth. A component that provides the capabilities for visually observing a simulation exercise without participating in the simulation exercise interaction.

W, X, Y, & Z

warfare simulation. A model of warfare or any part of warfare for any purpose (such as analysis or training).

war game. A simulation game in which participants seek to achieve a specified military objective given preestablished resources and constraints; for example, a simulation in which participants make battlefield decisions and a computer determines the results of those decisions. Synonym: constructive simulation; higher order model. See: management game.

wargaming. Simulating, by whatever means, a military operation involving two or more opposing forces, using rules, data and procedures designed to depict an actual or assumed live situation.

web mapping service. Produces maps of spatially referenced data dynamically from geographic information.

white box model. A model whose internal implementation is known and fully visible; for example, a model of a computerized change-return mechanism in a vending machine, in the form of a diagram of the circuits and gears that make the change. Synonym: glass box model. Contrast with: black box model.

white box testing. Inner workings of the module are examined as part of the testing to ensure proper functioning.

wide area network. A communications network designed to support interactions across large geographic areas.

world coordinate system. The right-handed geocentric Cartesian system. The shape of the world is described by the World Geodetic System 1984 standard. The origin of the world coordinate system is the centroid of the earth. The axes of this system are labeled X, Y, and Z, with: the positive X-axis passing through the Prime Meridian at the Equator; the positive Y-axis passing through 90 degrees East longitude at the Equator; and the positive Z-axis passing through the North Pole.

World Geodetic System 1984 (WGS 84). A geocentric coordinate system which describes a basic frame of reference and geometric figure for the Earth, and which models the Earth from a geometric, geodetic, and gravitational standpoint. The WGS 84 coordinate system origin and axes also serve as the x, y, and z axes of the WGS 84 ellipsoid, the z axis being the rotational axis.

world view. The view each simulation entity maintains of the simulated world from its own vantage point, based on the results of its own simulation and its processing of event messages received from all external entities. For computer generated forces and for manned simulators or real vehicles, the world view is the perceptions of the participating humans.

XTERM. A terminal emulator that functions as a standard terminal for X Window System. It allows the user to work with multiple programs simultaneously, each in a separate window.

X Window System. Called X for short, is a network-based graphics window system that was developed at MIT in 1984.

yaw. Rotation around the Z axis.

yoked variable. One of two or more variables that are dependent on each other in such a manner that a change in one automatically causes a change in the others.

Z-buffer. The management of image depth coordinates in three-dimensional (3-D) graphics, usually done in hardware, sometimes in software. Also known as depth buffering.