

Cross Command Collaboration Effort (3CE)



NDIA Conference

25 February 2009

Purpose and Topics

- **Purpose: Provide information on:**
 - **Cross Command Collaboration Effort (3CE) and provide lessons learned**
- **Topics:**
 - **Problem Statement**
 - **The 3CE Mission Statement and Intent**
 - **How Do We Function? ... The 3CE Process**
 - **ROI**
 - **Lessons Learned**
 - **Questions**

Purpose of 3CE

- **3CE objective per the MOU (4th Quarter 2003):**
 - Maximize the rapid availability of transformational technology to the field soldier by leveraging the synergy gained from integrating the activities of each of the three commands into a holistic cooperative effort.
- **DUSA OR Task to PM FCS MSMO:**
 - Ensure compatibility among the respective M&S capabilities of TRADOC, RDECOM, ATEC, and the FCS LSI in order to support concept exploration, systems integration, analysis, and acquisition of the FCS BCT SoS.
- **3CE purpose per the MOA (1st Quarter 2004):**
 - Develop cross-command Army M&S and data environments that will be used in Systems of System (SoS) design, development, integration, and test of FCS FoS components, systems, and prototypes within a realistic FCS BCT context.

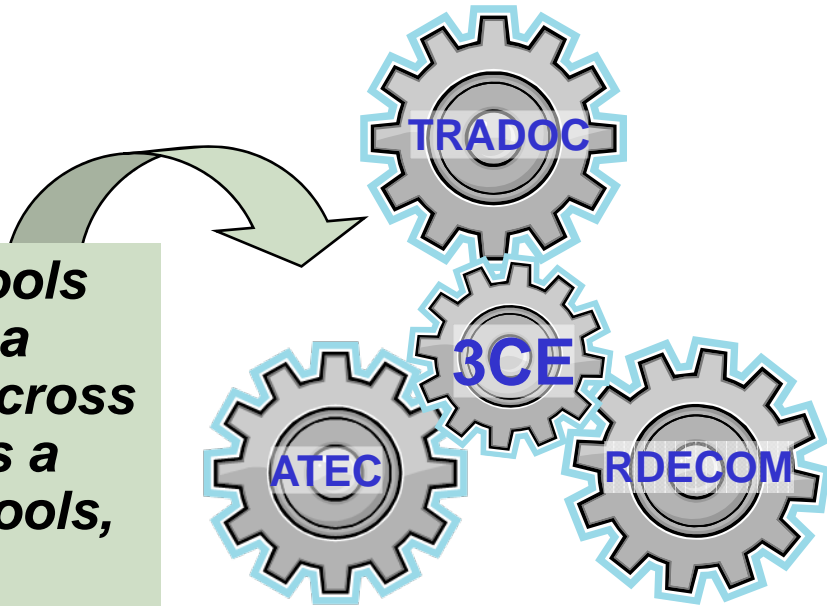
Problem Statement

Problem: The Army provides no resources to deliver integrated M&S Tools, Data or Processes across a program's lifecycle – that supports Science & Technology, Analysis, Experimentation, Test, and Training.



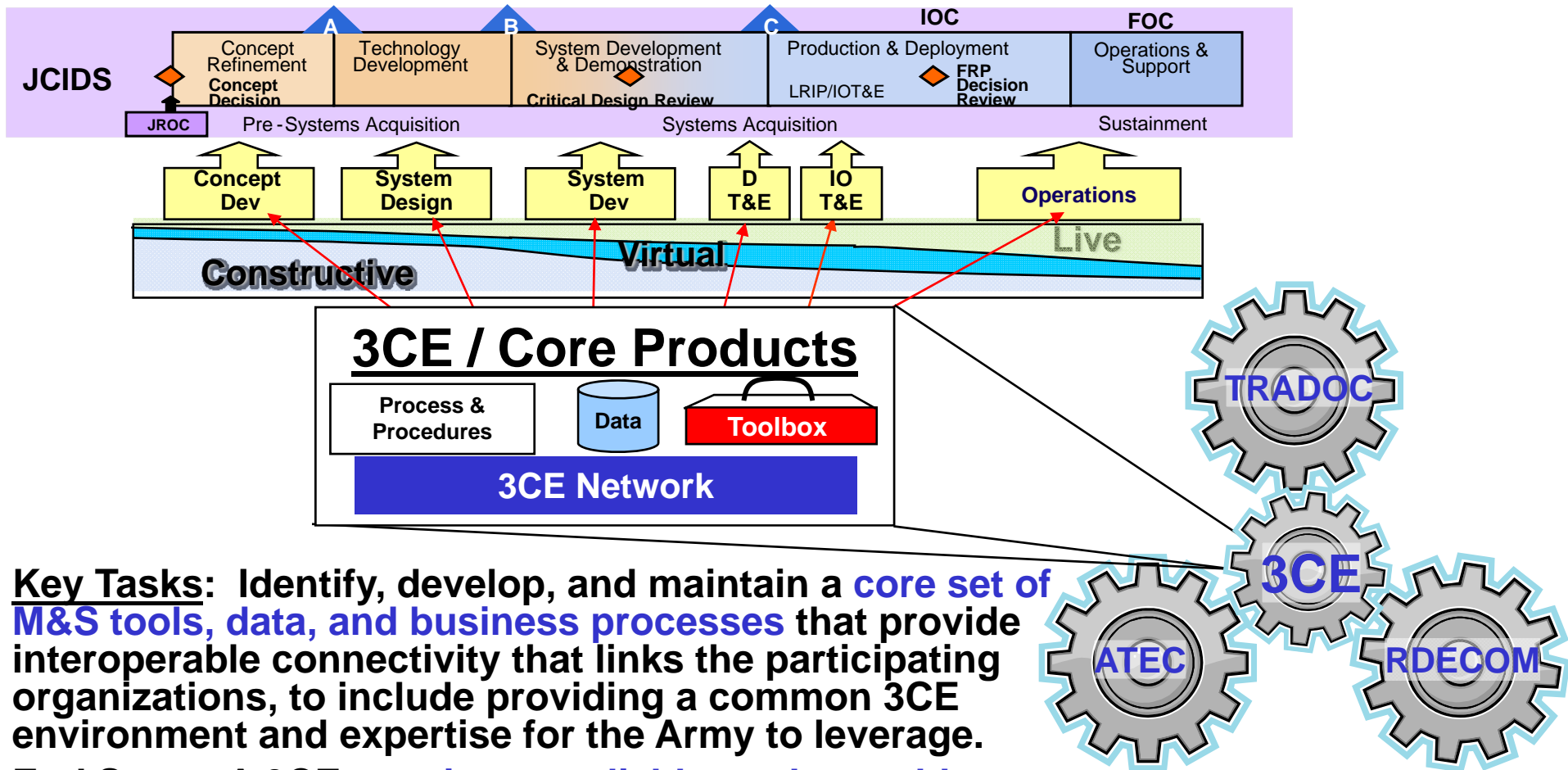
Result: increased cost, and time to execute DOTMLPF.

Solution: Provide an integrated M&S tools and data environment that “serves” a program's entire lifecycle. 3CE enables cross command collaboration, and provides a capability consisting of M&S common tools, data, and services.



3CE Mission – A Unique Capability

Mission: Develop a cross command Army M&S and data environment for design, development, integration, and testing of capabilities, systems, and prototypes.



Key Tasks: Identify, develop, and maintain a core set of M&S tools, data, and business processes that provide interoperable connectivity that links the participating organizations, to include providing a common 3CE environment and expertise for the Army to leverage.

End State: A 3CE consistent, reliable, and reusable environment that meets the common requirements of all three commands and Army PMs to conduct distributed DOTMLPF development.

What Makes 3CE Different?

Strategic Guidance

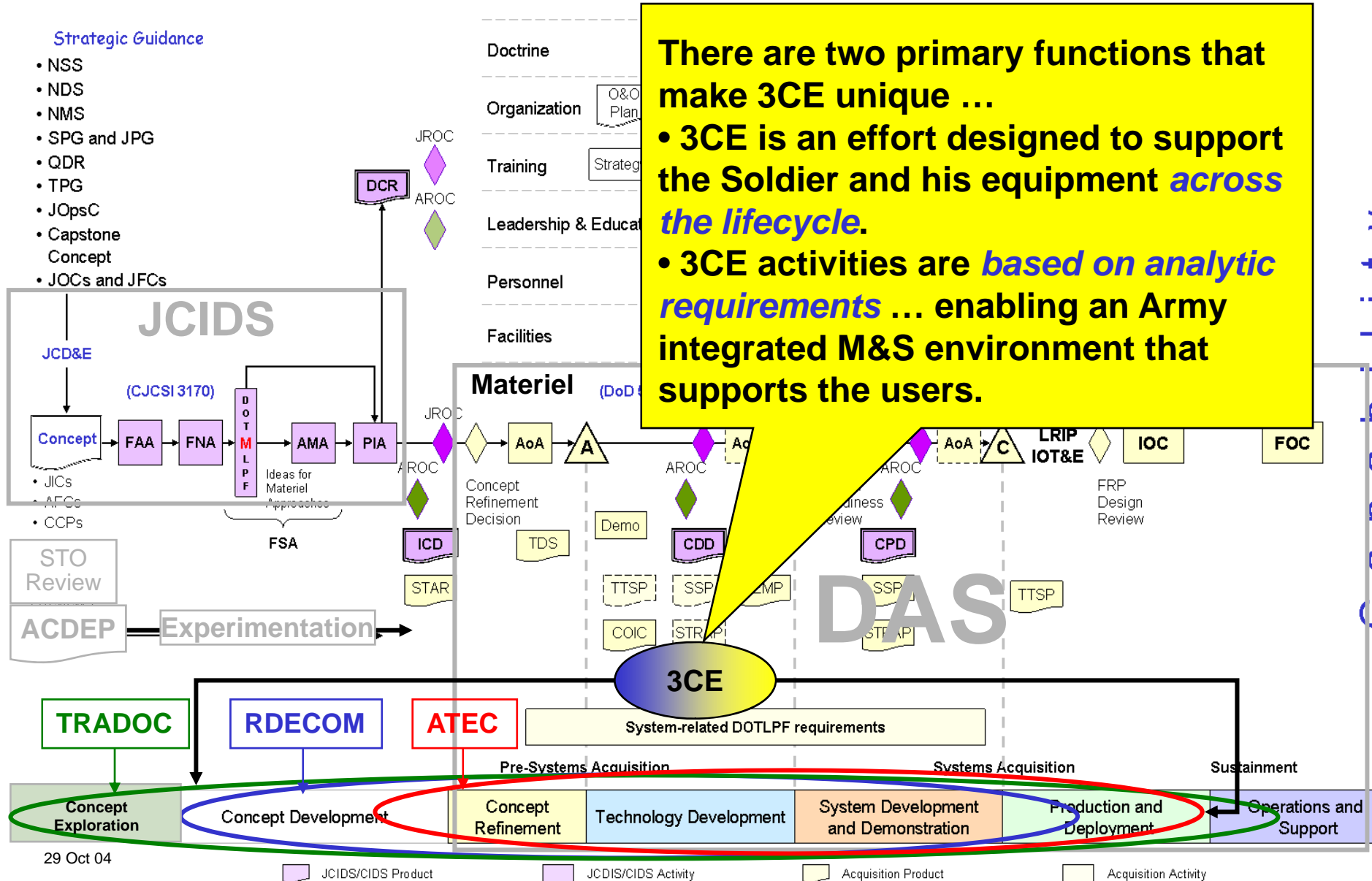
- NSS
- NDS
- NMS
- SPG and JPG
- QDR
- TPG
- JOpsC
- Capstone Concept
- JOCs and JFCs

- Doctrine
- Organization
- Training
- Leadership & Education
- Personnel
- Facilities

There are two primary functions that make 3CE unique ...

- 3CE is an effort designed to support the Soldier and his equipment *across the lifecycle*.
- 3CE activities are *based on analytic requirements* ... enabling an Army integrated M&S environment that supports the users.

Capability



29 Oct 04

TRADOC

RDECOM

ATEC

3CE

System-related DOTLPP requirements

Pre-Systems Acquisition

Systems Acquisition

Sustainment

Concept Exploration

Concept Development

Concept Refinement

Technology Development

System Development and Demonstration

Production and Deployment

Operations and Support

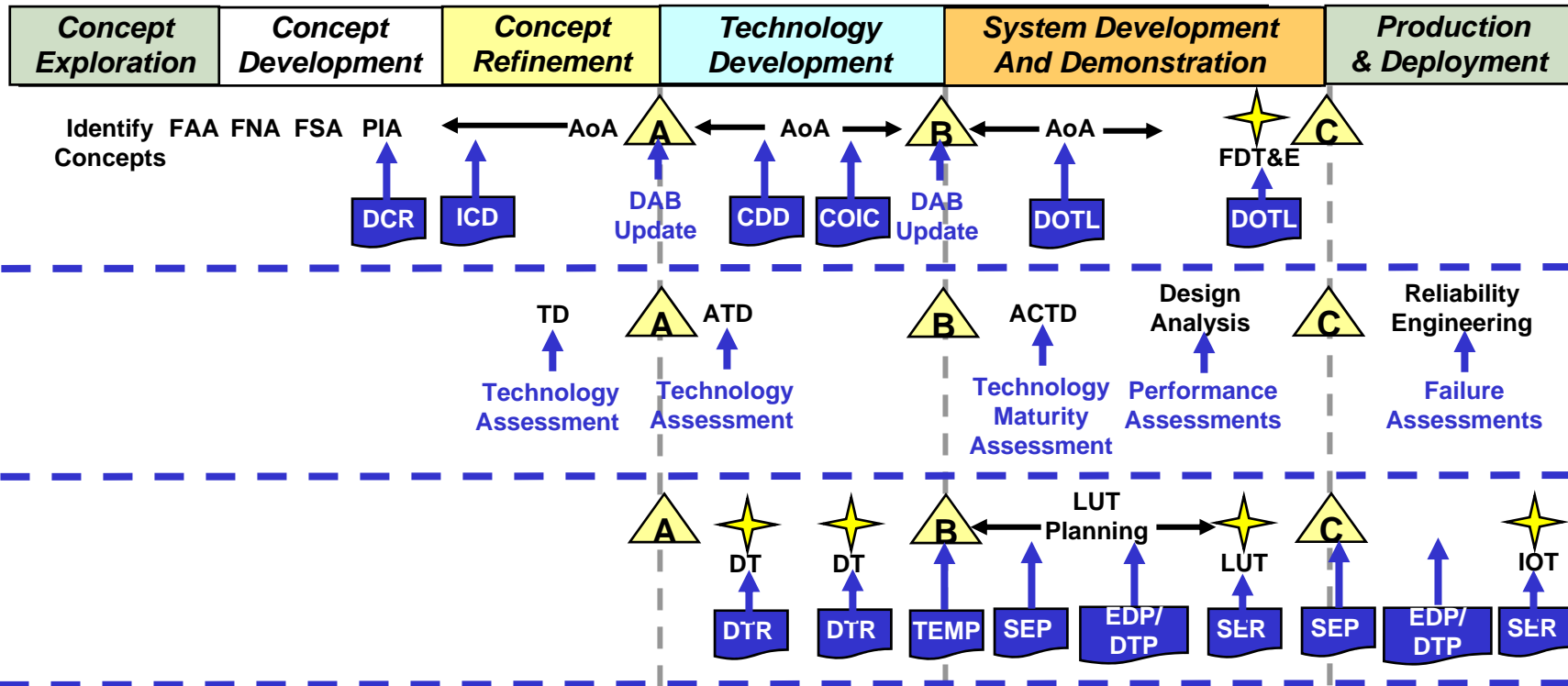
JCIDS/CIDS Product

JCIDS/CIDS Activity

Acquisition Product

Acquisition Activity

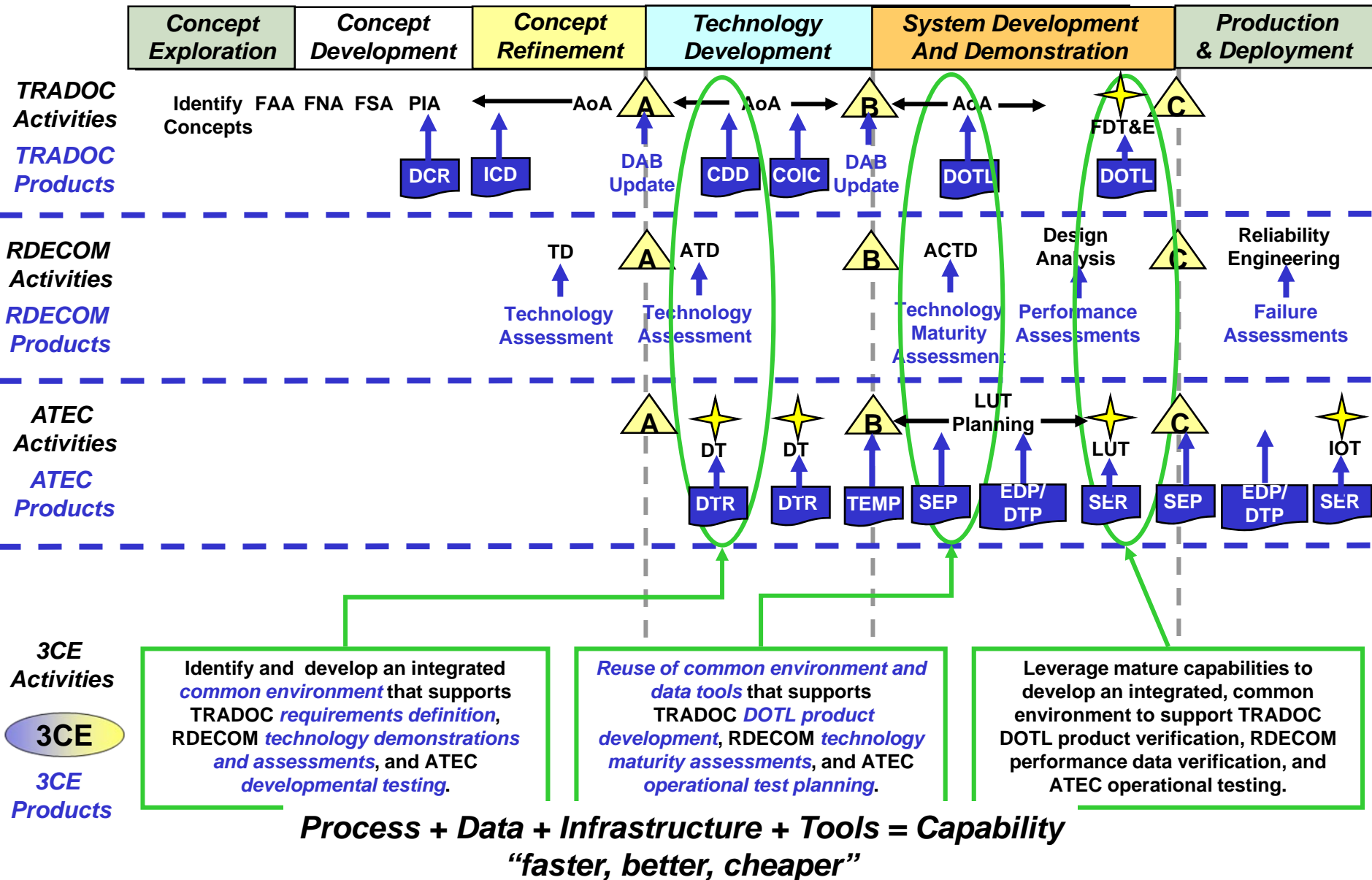
Current Army Process?



What's Missing

- Reliability and consistency of data – little or no reuse
- Lack of common M&S tools and data environment across life cycle
- No concurrent development of Training/Operational Tools/Devices
- Lack of feedback mechanism – most everything is thrown over the fence

The Solution



How do We Function? ... 3CE Overarching Process

The overarching process describes how 3CE will execute its mission...

Source of Requirements

FCS SSP, FACTS,
M&S Community,
PM/MAT DEV, DTE,
SIMEX, LUT, L-V-C,
etc...

- Research Requirements
- Command Requirements
- PM Requirements

User (3CE KR)

- Facilitate Event Planning
- Facilitate Event Execution
- Facilitate Accreditation & Certification
- Leverage 3CE Toolkit through the 3CE KR

- Event Requirements

Requirements:

- High Level
- Analytical Basis
- Across Commands

Capability Development and Integration

3CE Program Management

3CE TFA IPT

Analysis/Evaluation

- Identify Requirements
- Consolidate
- Archive
- Verify
- Prioritize
- Decompose
- Refine

Prioritized Requirements:
• Analytical
• Other

List of M&S
Capability Gaps

System Engineering

- Assess and define M&S Requirements
- Identify M&S Capability maturity levels and "gaps"
- Refine Capabilities Development Road Map
- Update Knowledge Repository

Prioritized List of M&S
Capability Gaps

Infrastructure, Integration, & Verification

- Validate and Verify Solutions
- Integrate M&S Solutions
- Configuration Manage Solutions
- Manage Current Capabilities

Solutions

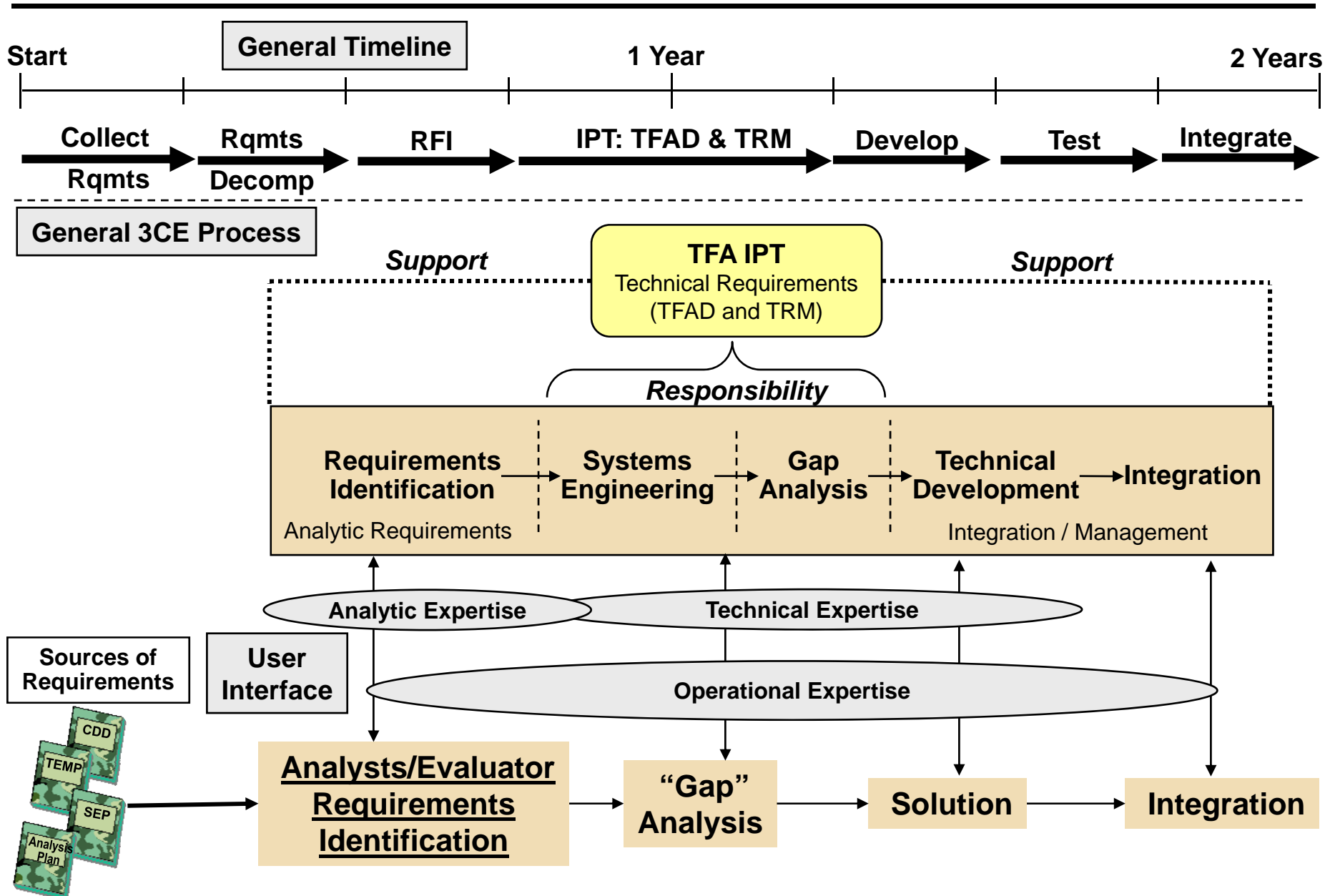
Technical Development

- Identify Current Capabilities
- Design M&S Solutions
- Develop M&S Solutions
- Develop Technical Solutions

- List of Configuration Managed M&S Solutions
- Technical Capabilities
- Business Processes
- Standards

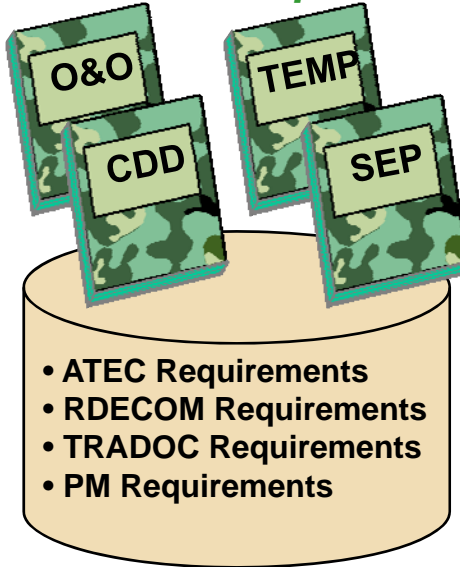
Legend
Inputs
Outputs
Process

3CE TFA IPT . . . A Component of the Process



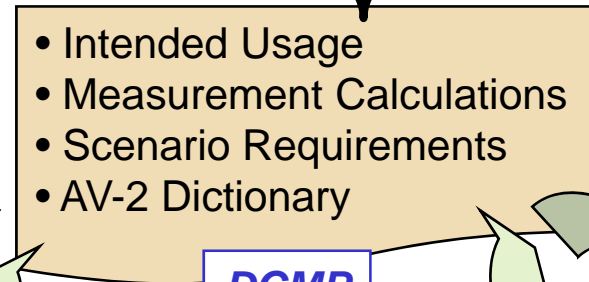
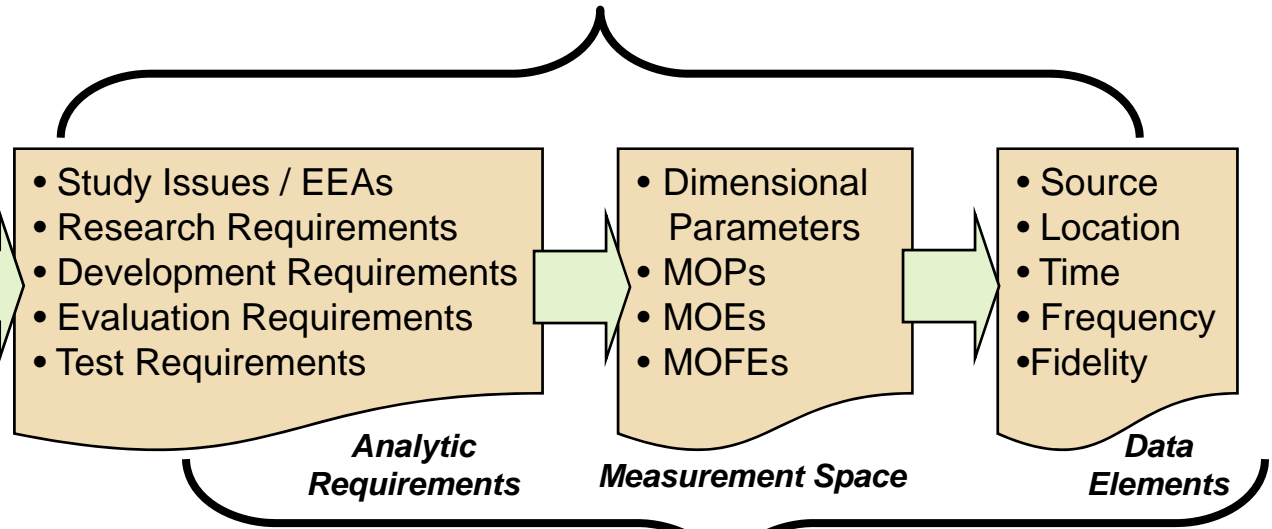
Analyst/Evaluator Requirement Decomposition

Authoritative Source Documents for A/E Requirements



Database of Prioritized A/E Requirements (DOORS)

Decomposition Process



Enable M&S capability gap determination.

Provide measures to Users



Refined requirements from user planning and execution.

Refined data element fidelity.

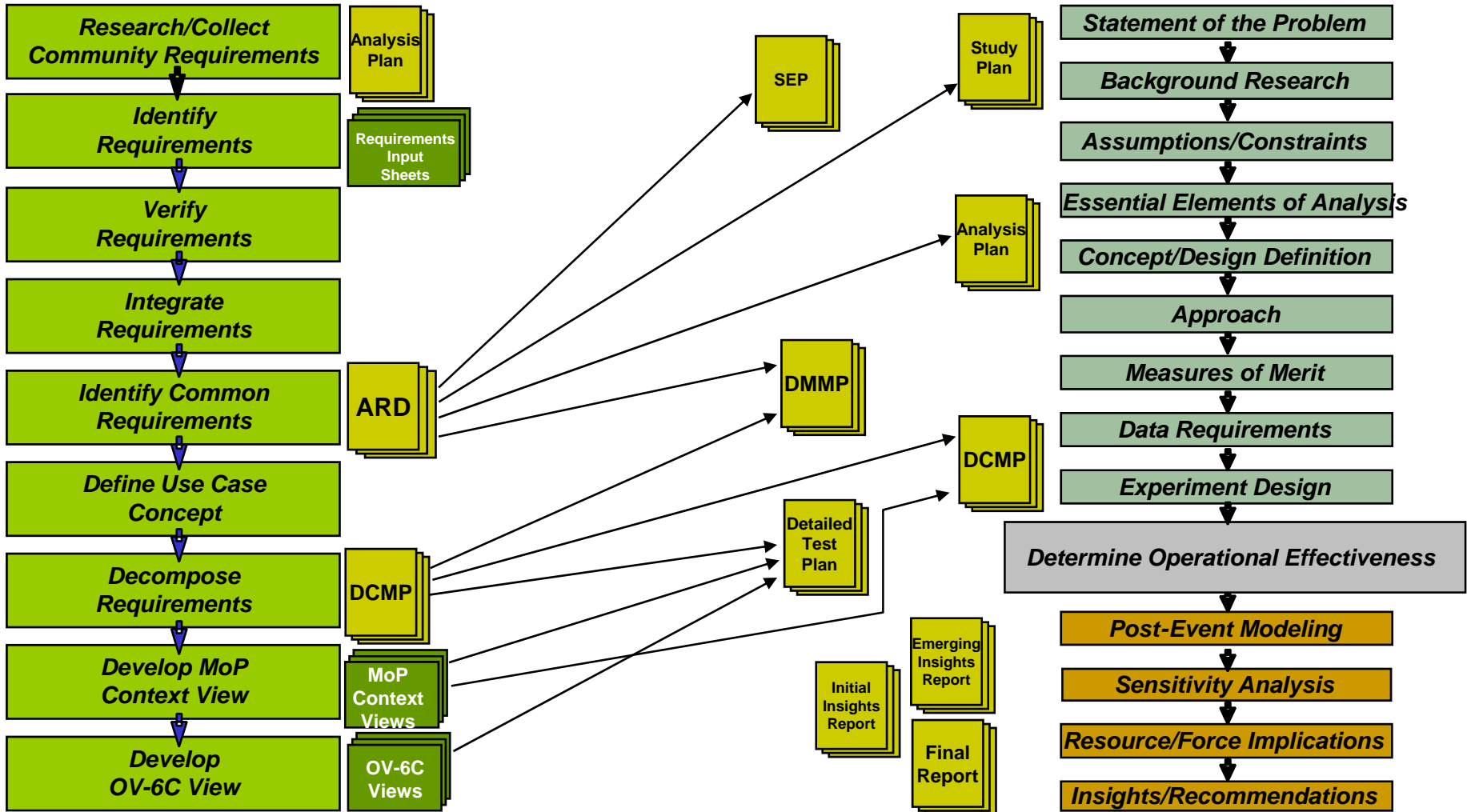


3CE Products ... Additional Uses

The functional decomposition of A/E requirements, as part of the 3CE requirements definition process, produces products that can be leveraged for additional uses.

3CE REQUIREMENTS DEFINITION PROCESS

ANALYSIS PROCESS STEPS



Accomplishments Through Tool Application

Common Solution

- **Moving commands towards adoption of OneSAF for use in experimentation, analysis and testing**
 - **Current and future uses**
 - **PM C4ISR OTM (RDECOM)**
 - **AAEF (TRADOC)**
 - **PM(FCS) SO1 (ARCIC, PM FCS LSI, ATEC)**
 - **Common Federation Object Model; BLCSE, OASIS adopted MATREX as the 3CE environments OM**
 - **Data exchange “contract” for interoperability. Significant reduction in time to buildup for event conduct**

Consolidation of effort on a smaller number of tools provides ...

- *reduced investment in fixing, maintaining, and reusing the common components;*
- *shared experiences, lessons learned, and unity of effort; and*
- *more stable components for reuse for entire US Army*

The 3CE Knowledge Repository ... A Proven Tool

The 3CE KR is *needed by multiple users* to enable mission execution ...

3CE Team Members (Internal Users)

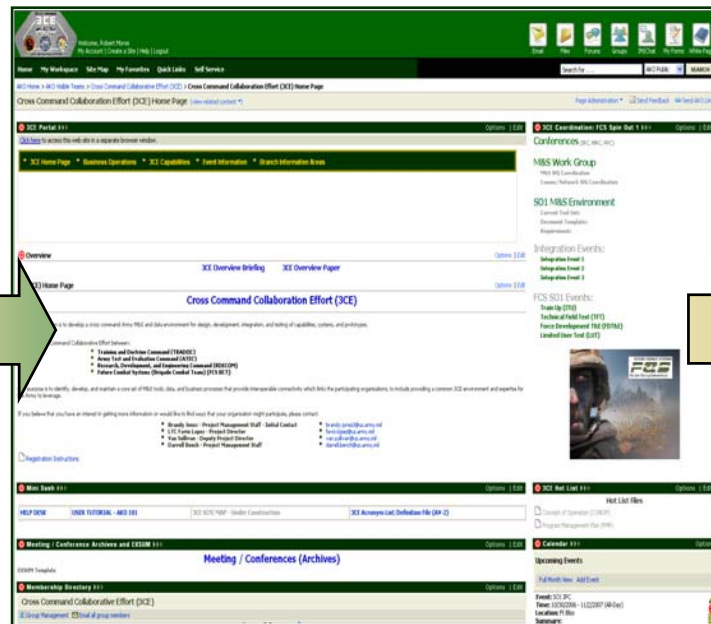
- Facilitate team member coordination
- Satisfy information repository needs
- Enable development, test, and integration activities relating to 3CE's mission and intent.
 - Enable collaboration
 - Enable document sharing
 - Establish processes and procedures

3CE Commands & PMs (External Users)

- Satisfy information needs
 - 3CE capabilities (tools, network)
 - 3CE processes
 - 3CE data
- Satisfy event coordination needs
 - Support the planning, execution, and reporting of events.
 - Facilitate cross command data visibility and accessibility

3CE maintains a KR of assets and capabilities:

- Subject matter experts.
- Tools (M&S, analytic, collaboration).
- Best-practice procedures and standards.
- Persistent and secure network.
- Authoritative data.



... its demand has a *proven reputation for enabling mission success* as evidenced through characterization activities and the SO1 test integration events.

Benefits Using AKO

First and foremost ... professional and responsive AKO help desk support!

- 3CE Knowledge Network provided at *no cost* to 3CE
- 3CE File space is *unlimited*
- AKO user authentication *maintained* by AKO
- Flexible AKO *security* setup, allowing site administrators to develop multiple security groups, each having different levels of security.
 - A 3CE member may belong to more than one security group
 - Security groups allow information access only to users “that need to know”
- Flexible *web page development* and implementation
 - 3CE users access information that is most current and valid (Discoverability)
 - Version control ensures that web links always uses the most current document
 - Easy web channel setup, using AKO’s predefined channels
- 3CE KR community site easily *customizable* to incorporate additional “Teams” that wish to collaborate with 3CE information
 - 3CE Characterization Event (SECA)
 - SO1 Working Groups

Army Organizations that leverage 3CE KR

Design, development and implementation best practices...

- **AKO Organizations that have leveraged 3CE KR documented design, development and implementation best practices**
 - FCS (BCT) CIO beta version
 - Army Modeling & Simulation Directorate (DAMO-MS)
 - [https://www.us.army.mil/suite/portal.do?\\$p=95](https://www.us.army.mil/suite/portal.do?$p=95)
 - AKO PMO request to reuse 3CE KR code for select organizational web pages (E.g. Green to Gold)
- **Demonstrations**
 - FCS Boeing/LSI
 - CBRND M&S IPT
 - HPC / DREN (to be scheduled)

Leveraging AKO Business Process Management (BPM)

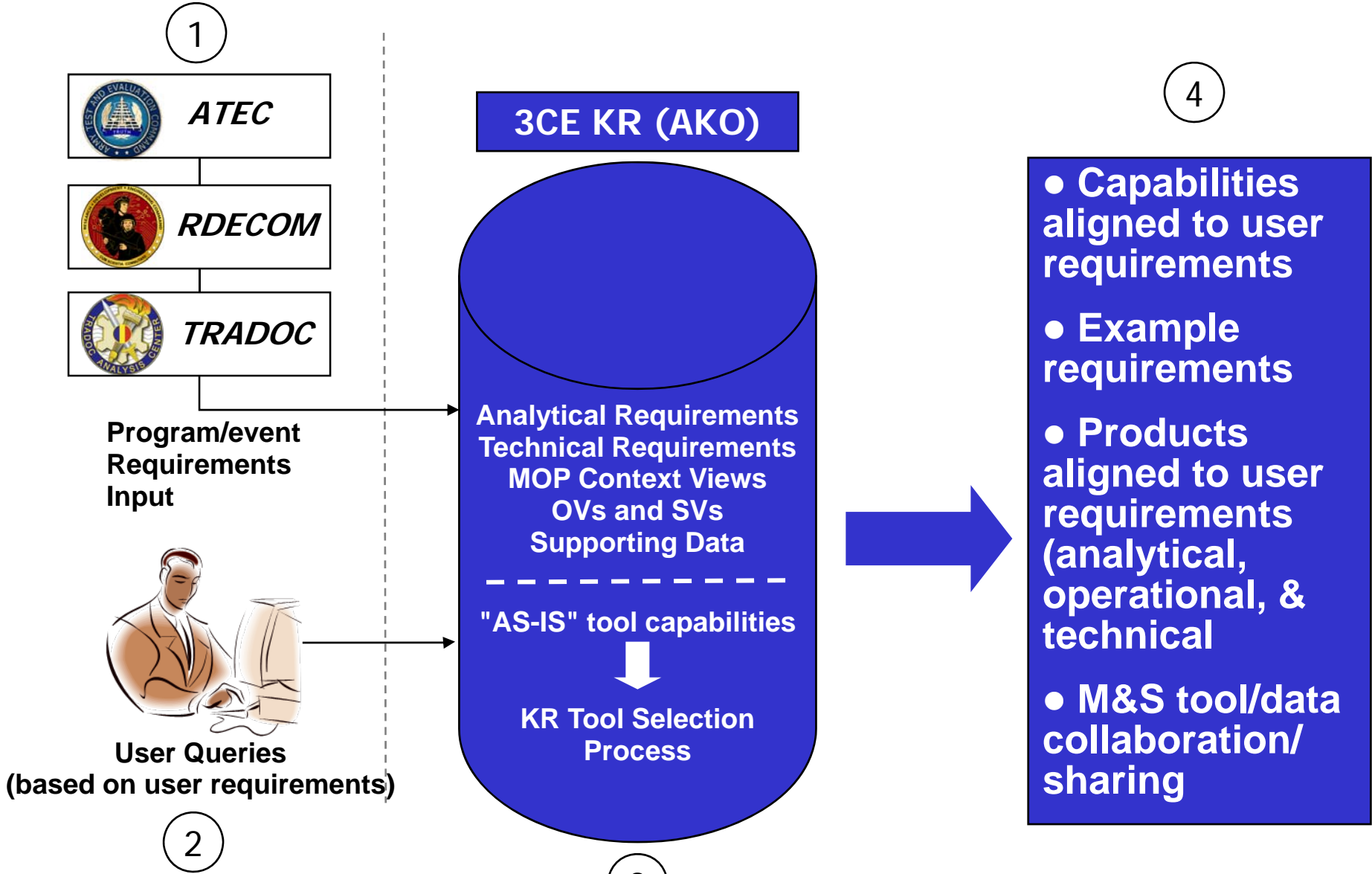
- **Approved AKO BPM beta user**

- **Phase 1 – 3CE internal processes. Solve human-centric process flows. Increase productivity and quality by reducing variations. Examples:**
 - **Document approval process**
 - **Configuration Item (CI) approval and KR posting processes**

- **Phase 2 - Build a BPM solution that leverages a Service Oriented Architecture (SOA) to integrated existing Army services (applications) into 3CE processes. Examples:**
 - **Metrics catalog**
 - **M&S Inventory**
 - **Capability Development & Integration (Metrics thru System Integration & Verification)**

AKO/DKO is a key enabler to making net-centric enterprise information and data sharing a reality...

Tool Selection Using the 3CE Knowledge Repository



3CE KR – Next Generation

- **Expand 3CE KR to enable new internal teams needed to support customer events**
- **Foster Army net-centric information and data sharing**
- **Incorporate BPM best practices**
 - **Create reusable models**
 - **Standardize 3CE internal processes**
 - **Model 3CE Capability Development & Integration processes**
 - **Incorporate Service Oriented Architecture (SOA) that may leverage existing Army services (applications)**

Enabler of Army net-centric enterprise information and data sharing...

3CE M&S Planning ... What We Learned

An integrated Army M&S strategy for future long-term investments does not exist ...

- Opportunities for cross command collaboration have been *undiscovered and unstated*, for the most part, and so *not leveraged*.
- *Command and Program of Record (PoR) planning tends to be localized and focused on near-term execution* ... long-term M&S planning activities are conducted at subordinate elements and none of the 3CE signatories has command level planning and execution activities.
 - ATEC Test Technologies Directorate (TTD) is responsible for command-wide M&S coordination, prioritization and funding.
 - ATEC OTC conducts a rigorous process and manages M&S activities through OASIS; ATEC DTC no longer manages its M&S through VPG.
 - RDECOM M&S IPT responsible for M&S *coordination*; MATREX is the only Command level M&S program.
 - TRADOC M&S planning for support to Joint and Army experimentation is an annual “bottoms-up” approach; ARCIC Simulation Division is initiating centralized planning.
 - PoRs independently develop their own M&S investment plans, and are unable to leverage a shared set of planning.
- *3CE enforced partnerships and meetings have led to increased cooperation* through established and evolving relationships and opportunities for information sharing ... institutionalizing these opportunities for communication and collaboration should be a priority of 3CE and the commands.
- *Funding has been a critical driver in hindering potential opportunities* for collaboration and sharing ... a limited effort and strong reluctance to create cross domain and cross command partnerships – afraid of losing funding.

3CE long-term planning efforts must continue to evolve business processes for active participation and communication to eliminate impediments that hinder progress ... 3CE must continue to foster an environment that promotes leveraged long-term planning.

Summary

As the integrator of an environment, 3CE focuses on common and consistent capabilities to enable cross command collaboration, synergy, and reusability ...

- Provides consistent representation through common tools and data IAW established standards and best practices.
- Provides the capability to leverage a single event for multiple purposes.
- Provides and develops environment capabilities that are traceable to user needs and design requirements.
- Enhances current M&S capabilities and reuse.
- Provides a leave behind capability to support future SoS acquisition programs.

... through the activities in support of SO1 integration, 3CE will have an instantiation of this capability to support future user activities across the Army.

- Provide a core federation with supporting functional, interoperability, event management, and data collection and analysis tools.
- Provide an accessible knowledge repository that provides the processes, procedures, standards, and expertise to leverage 3CE capabilities.
- Provide a persistent and secure network that enables collaboration and interoperability across the commands and the PM/LSI.

Back-up

Army Tools - Evaluated

Collaboration

- **Army Knowledge Online (AKO)**
 - Insert AKO Benefits slide here
- **Virtual Digital Library System (VDLS)**
- **BLCSE Portal (originally used)**
- **MATREX IDE**

M&S Inventory

- **Army Modeling and Simulation Resource Repository**

Army Model and Simulation Resource Repository (MSRR) Characterization

Model and Simulation Resource Repository (MSRR)

- **MSRR is an Army-maintained repository for Army model & simulation resources. The repository holds meta data (descriptions) about Army M&S resources**
- www.msrr.army.mil
- **User registration not required to search**
- **User registration is required to:**
 - **Submit/modify resources**
 - **Access metadata**
 - **Obtain data dictionary list of field names**

Model and Simulation Resource Repository (MSRR)

Searching the MSRR repository

- **M&S resource area provides a broad spectrum of metadata**
 - **Functional Area (C4ISR Network End-to-End M&S)**
 - **Baseline M&S**
 - **Accreditation**
 - **Interfaces (HLA, DIS, etc...)**
 - **Model Types (L,V,C)**
 - **Etc...**

Model and Simulation Resource Repository (MSRR)

How good is the information?

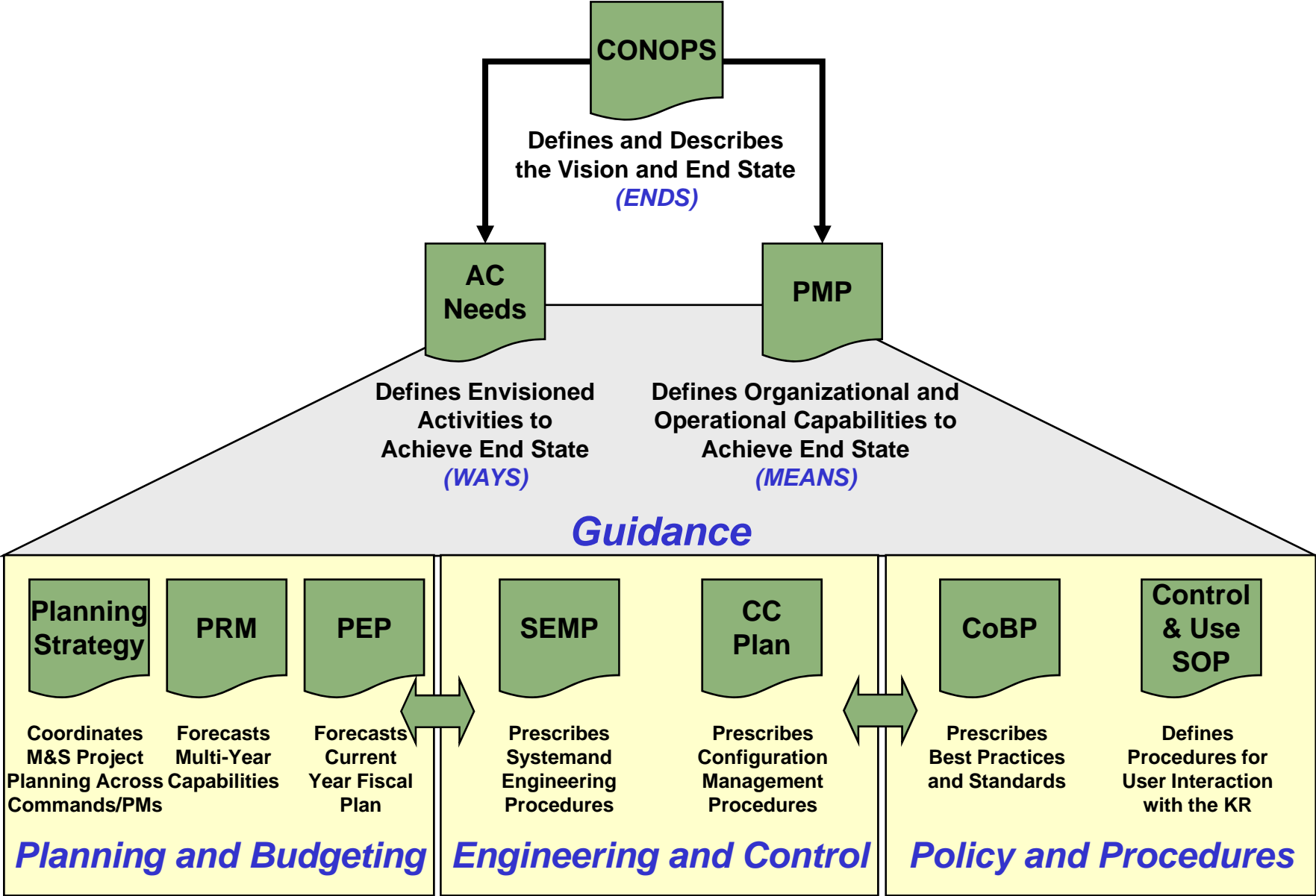
- **Provides broad summary descriptions of models and simulations**
- **Needs more technical metadata fields in order to adequately to filter searches**
- **Needs more stringent requirements for proponent to keep information up to date**

Model and Simulation Resource Repository (MSRR)

What 3CE M&S capabilities are missing from MSRR?

- **Start with 3CE / DTE-5 capability list and cross-reference to MSRR? (Coordinating with Harry Birch, Execution/User Branch)**
- **Collect from other sources (data repositories, and other command documents).**
 - **E.g. BLSCE M&S comparison sheets (by combat functionality) to LSI and DTE-5, based on following criteria**
 - **Have real-time run capability**
 - **Be able to federate in a distributed environment**
 - **Be able to import federation-specific data sets (classified)**
 - **E.g. ATEC models found in PIVOMS (Evaluator Tool)**

3CE Document Requirements



Army Tools - Evaluated

Collaboration

- **Army Knowledge Online (AKO)**
 - Insert AKO Benefits slide here
- **Virtual Digital Library System (VDLS)**
- **BLCSE Portal (originally used)**
- **MATREX IDE**

M&S Inventory

- **Army Modeling and Simulation Resource Repository**

Requirement Types

User Requirements

CDD/ORD Requirements

Ends

Verify that the material solution must be capable of detecting a minefield 90% of the time.

Mission Need

A/E Requirements

Analytic Requirements

Ways

- **MOE/MOP**
 - # of mines detected
 - % of mines detected
 - # systems destroyed
 - % of systems destroyed

Capability

M&S Requirements

Capability Requirements

Means

The test system shall simulate minefield detection and breaching.

Requirement

What “requirements” are we identifying?

3CE Network ... A Proven Capability

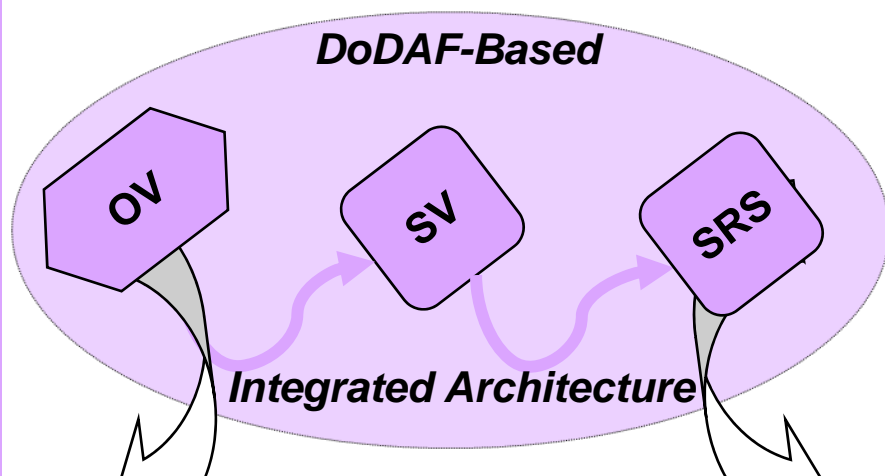
The 3CE network is a proven capability that has demonstrated success:

- Collaborative – facilitated SO1 planning and 3CE characterization activities
- Distributed – enabled distributed testing for 8 SO1 integration events
- Persistent – maintained greater than 99% availability
- Secure – accredited on the DREN and supported numerous events
- Extensible – linked BLCSE, ATIN, DVL, and SoSIL environments



Influencing Joint M&S Investment...Common Process

A **credible** systems engineering process for designing, developing, and integrating **common** LVC capabilities ...

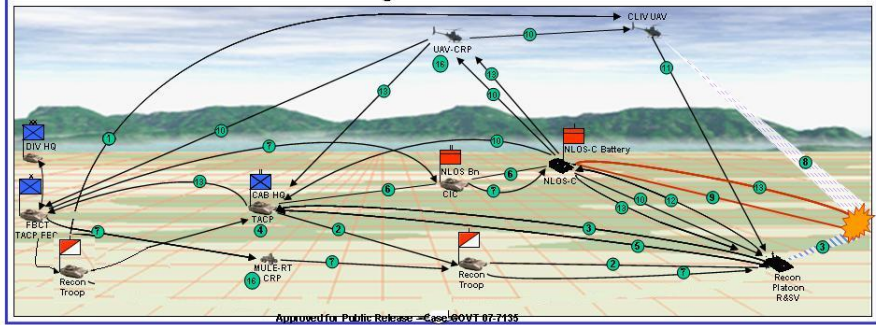


... enabling a **user-defined** LVC environment that supports FFID and AETF **training, testing, and experimentation needs.**

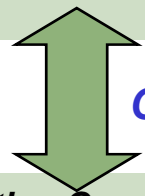
MoP: Connectivity Rate (30E-1417)

(Percentage of FBCT network nodes able to send/receive messages over time)

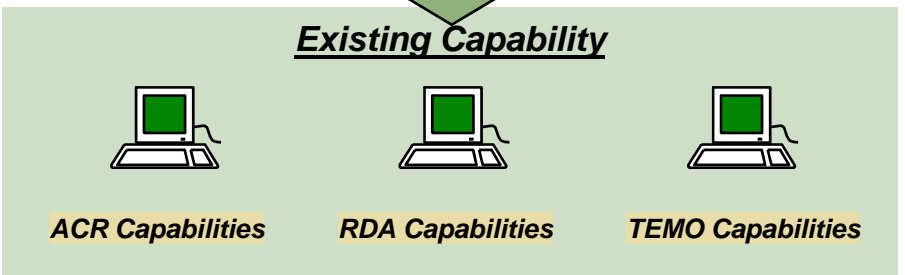
1. FBCT BICC requests that the █ CAB perform ISR mission █ (data), with special instructions to transmit a call for fire if enemy artillery is found, and tasks the █ UAV ISR overwatch..
 2. █ CAB TACP directs █ Platoon of Recon Troop via the Recon Troop HQ to perform ISR █ with special instructions to transmit a call for fire if enemy artillery is found.
 3. █ CAB Recon Platoon █ detects and identifies enemy █ platoon █ in a hide location. R&SV transmits a spot report █ (data) to █ CAB TACP.
- "etc."
16. A █ are available as communications relay platforms (CRP) to provide extended communications to the FBCT during this mission.



- ### System Requirement Specifications
- The system shall send JTMF message traffic to ABCS devices.
 - The system shall represent the effects of degraded communications.
 - The system shall compute traffic load by node.
 - ...



Gap Analysis



MoP: Connectivity Rate (3CE-1417)

(Percentage of FBCT network nodes able to send/receive messages over time)

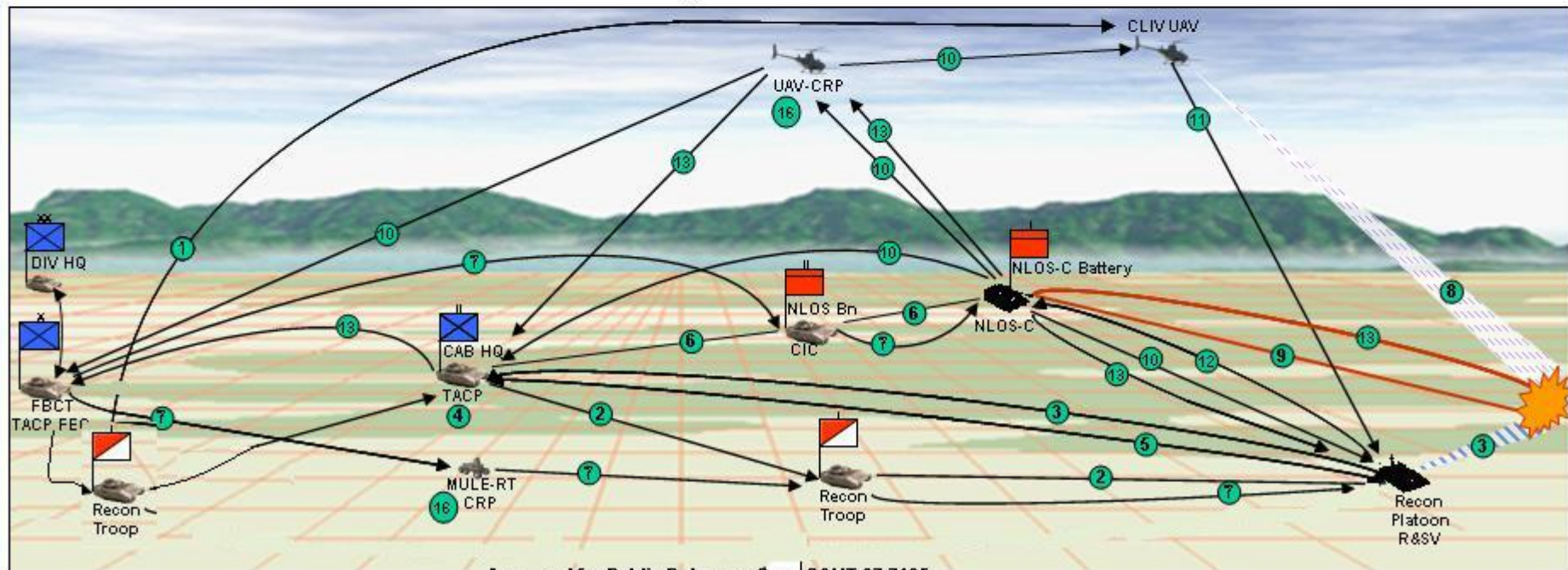
1. FBCT BICC requests that the [redacted] CAB perform ISR mission [redacted] (data), with special instructions to transmit a call for fire if enemy artillery is found, and tasks the [redacted] UAV ISR overwatch..

2. [redacted] CAB TACP directs [redacted] Platoon of Recon Troop via the Recon Troop HQ to perform ISR [redacted] with special instructions to transmit a call for fire if enemy artillery is found.

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“etc.”

16. A [redacted] are available as communications relay platforms (CRP) to provide extended communications to the FBCT during this mission.



MoP: Connectivity Rate (3CE-1417)

(Percentage of unit network nodes able to send/receive messages over time)

Data Elements

- 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 14, 15 - Total number of nodes able to send/receive in the unit network over time
- All - Total number of nodes in the unit network over time
- Connectivity standard (TRADOC SME)

Key Terms

1. A network is defined as an integrated system of systems (SOS) that includes the SOS common operating environment, battle command software, communications and computers, and intelligence, surveillance, and reconnaissance (ISR) systems. Two or more of these components usually reside on an FBCT platform. The interaction of all four components provides the unit with C4ISR capabilities that are greater than the sum of the parts of the SOS.
2. A node is defined as a location within the unit network where information is processed rather than simply transmitted. The node may be a primary node where information originates or terminates and is used, or an intermediate node that boosts and relays information between two or more primary nodes. Unit nodes do not include destroyed platforms or killed soldiers.
3. Connectivity is defined as a node in the unit network that is actually sending/receiving information with another node in the unit network.
4. Connectivity standard is defined as the minimum percentage of nodes in the unit network over time that are sending/receiving information.

Calculation

$$\left(\frac{\text{Total number of nodes in the unit network able to send/receive messages over time}}{\text{Total number of nodes in the unit network over time}} \right) \times 100$$

Operational Business Rules ... OV-6A

The number aligns to the sequence activity from the OV-6C.

The OV-6A is a set of operational business rules depicted in a “if” and “then” format based on potential actions/decisions for an identified sequence of activities (OV-6C) ...

OV-6A OPERATIONAL RULES MODEL FOR IPWS OV-6C VIEW IPWS.1

Operational rules are statements that define or constrain some aspect of the mission, or the architecture. They are intended to assert operational structure or to control or influence the mission thread. As the product evolves, the rules captured in OV-6a are operational (i.e., mission-oriented) not systems-oriented.

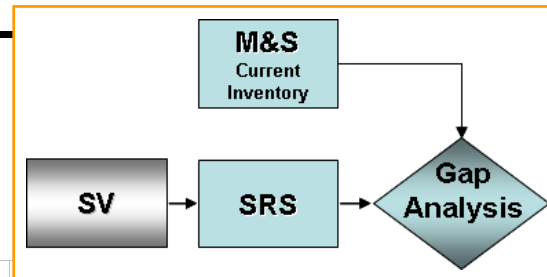
NUMBER	IF	THEN
1	The FBCT is deployed for operations	ISR assets will be deployed to provide networked early warning of threats
1a		an AN/TPQ-36 radar will be deployed and operational to protect against airborne threat activity
1b		a reconnaissance troop will be deployed and operational to seek out and detect ground threats
1b1		a reconnaissance platoon will be deployed and operational to extend the range of the reconnaissance troop
1c		a Class IV UAV will be deployed and operational to provide intelligence of other ISR assets and to detect and identify threats
2	Identifies a threat	a message will be transmitted by the troop reconnaissance troop R&SV
2a	The acquisition message is transmitted	a JTMR K02.09 target data format will be used
2b		transmission will be by voice
3	The R&SV receives an acquisition message	the RSV will transmit a SPOT report to the FBCT TACP FEC
3a	The SPOT report is transmitted	a JTMR K04.01 SPOT/SALUTE report message summary format will be used
3b		transmission will be by voice
4	The FBCT TACP FEC receives a message	the common operating picture (COP) will be provided
4a		the attack guidance matrix (AGM) will be available
4b		the AGM will be employed to assess the threat in the area
4c		the AGM will be employed to determine the appropriate response IAW the decision matrix

The “IF” statements represent activities that are transposed or evolved from the activities depicted on the OV-6C

The “THEN” statements represent resulting actions from the activities that are transposed or evolved from the dependency relationships of the activities depicted on the OV-6C

Gap Analysis Methodology

- SV – SRS (Narrative)
- SRS Narrative – SRS Requirements/Needs Matrix
- Development of M&S Current Inventory Matrix



CURRENT M&S INVENTORY TAXONOMY			
Cumulative By Command	COMMAND	ACRONYM	TITLE/NAME
ATEC			
1	1	ATEC	256
2	2	ATEC	ACCN
3	3	ATEC	AGTB
4	4	ATEC	DAUVS/TGEN
5	5	ATEC	CPDPS
6	6	ATEC	EG/CEGS
7	7	ATEC	CB Analyzer
8	8	ATEC	CBSNE
9	9	ATEC	DAS
10	10	ATEC	CVII
11	11	ATEC	DAUVS
12	12	ATEC	DCARS
13	13	ATEC	DTDAS
14	14	ATEC	DMFC
15	15	ATEC	DETES
16	16	ATEC	DIAS
17	17	ATEC	DMS3
18	18	ATEC	DSOM
19	19	ATEC	ECSM
20	20	ATEC	ETS
21	21	ATEC	EXCIS FSA
22	22	ATEC	4DWX
23	23	ATEC	GAVELAPS
24	24	ATEC	GAVELS
25	25	ATEC	Geo-Pairing

COMMUNICATIONS EFFECTS	
DEGRADATION	
Terrain Barriers and Obstacles	
Weather	
Obscurants	
Man-Made Structures	
Foliage	
Electromagnetic Environment (EME)	
Electronic Warfare (EA/IW)	
TRAFFIC	
Load	
	Application Traffic
	Overhead
	Network Convergence
	Systems Traffic (Data base replication)
	MWR: Recreation Traffic (email, home, etc)
WAVE FORM	
FCS	
	WNW
	SRW
	WIN-T
	WIN-T PoP
GIG	
	SATCOM
	Common Data Link (CDL)

M&S APPLICABLE TO 3CE	
COMMAND	Totals
ATEC	65
TRADOC	21
RDECOM	108
Misc	46
Overall	240

MSRR 3CE Reviews	
ATEC - Don Timian, Mike Bell	
RDECOM - Bob Leach	
TRADOC - MAJ Mike Ganuelas	
Misc - All Above	

SV: Systems View
SRS: System Requirements Specification