

11th International Command & Control Research & Technology Symposium
26-28 Sept 2006 Cambridge, United Kingdom

**Joint US and German
Simulation and C2 Information Systems Connectivity Experimentation Program
(SINCE)**

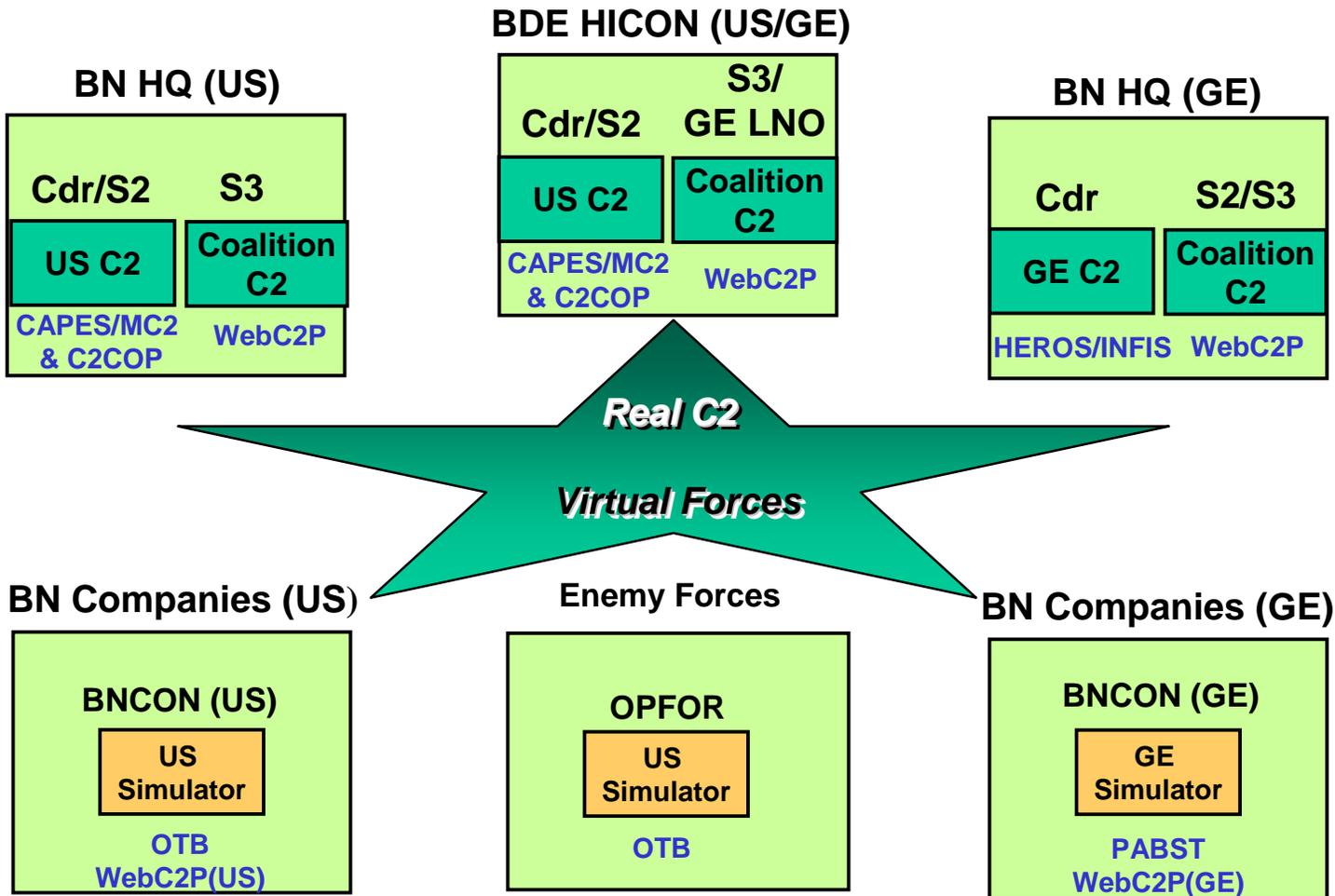


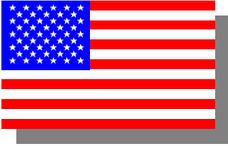
**Achievement of Cognitive Interoperability is Key for
Coalition Command and Control in the Networked Era**

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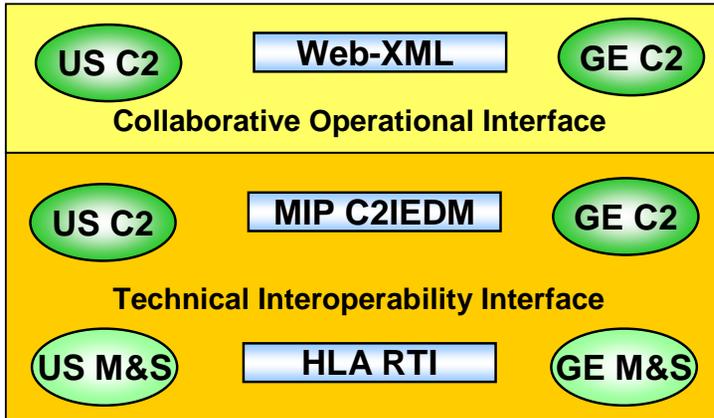


Experiment 1b - Conceptual Test Bed





SINCE Implementation Approach



Web-based C2 Collaboration Portal (WCP)

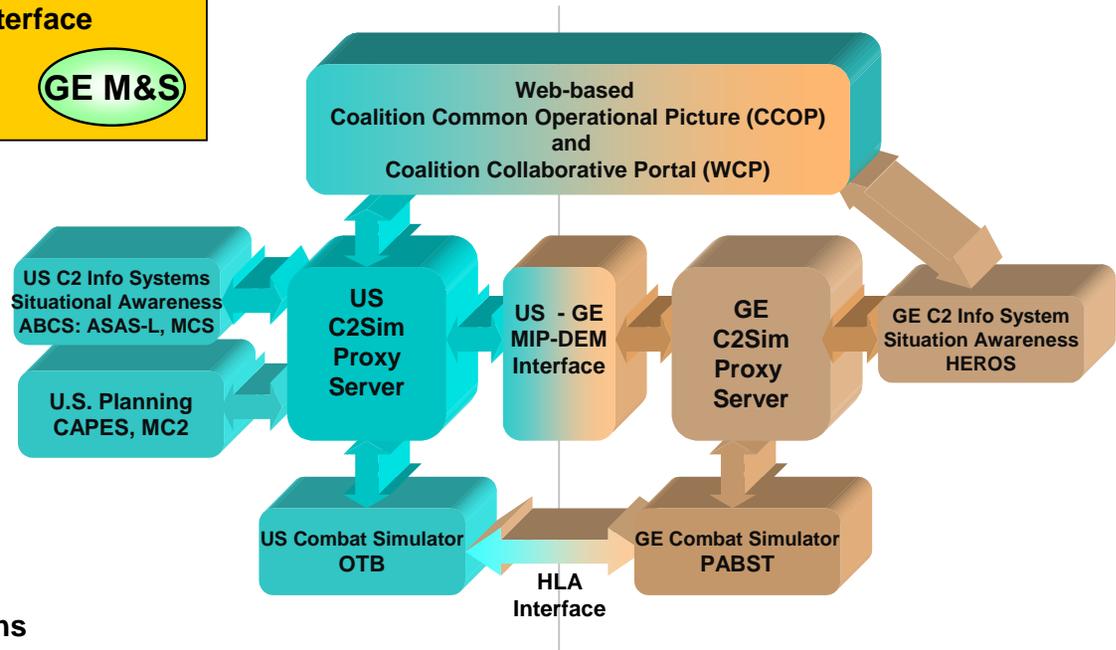
- Supports Display of Coalition Common Operating Picture (CCOP)
- Supports Graphical Collaboration on Coalition OPLAN/FRAGO development & mission management

Digitized OPORD/OPLAN

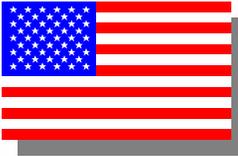
- Data Model & Representation
 - XML & Battle Management Language (BML) Structure
 - Used to map info between C2 and Simulation worlds
- Support Authoring software

C2Sim Proxy Server

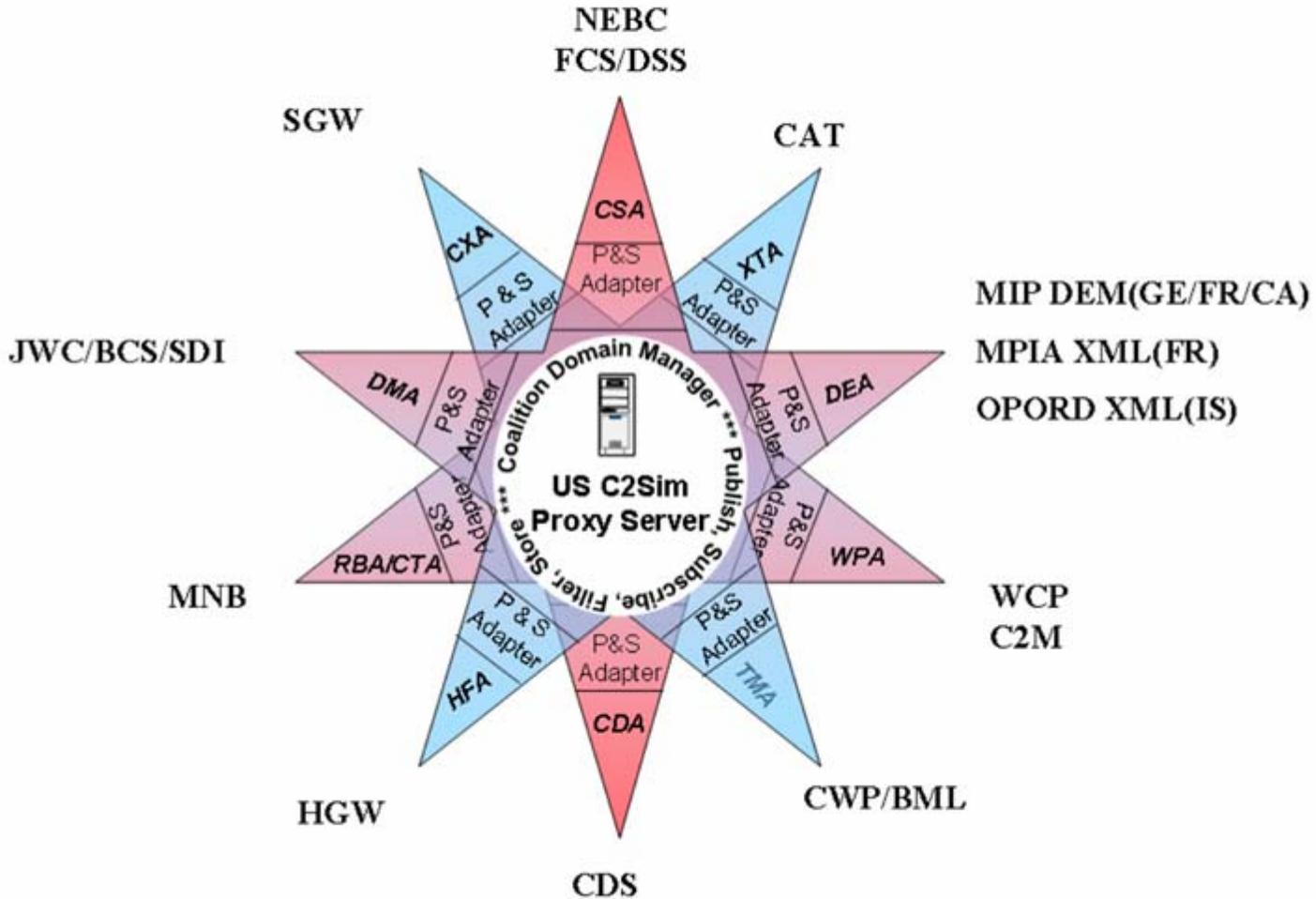
- Web-based Enterprise Services supporting Net-Centric Operations
- Enables Info Exchange between C2 and M & S systems

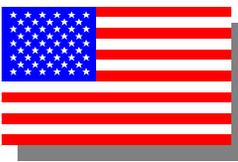


Experimentation Test Bed Implementation



US/Coalition/Internet-based Open System Architecture for SINCE Exp 2b





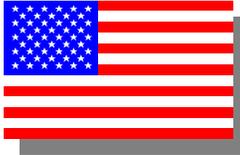
Typical OPORD Categories of Information



C2 Product Example: Operations Order (OPORD)

- **Header** (POC, Time, Location Distribution, References...)
- **Situation**
 - The Enemy Forces (Where are they? How strong are they?)
 - The Friendly Forces (Who are they? What kind of unit is it?)
- **Mission**
 - A clear concise, statement of what the unit should achieve.
- **Execution**
 - What is the Concept of Operation?
 - What tasks to perform with what priority, rules and constraints?
- **Service Support**
 - Where and when are logistics available? Logistics support priorities?
 - How?
- **Command and Signal**
 - How communications and C2 will be maintained?

Annexes

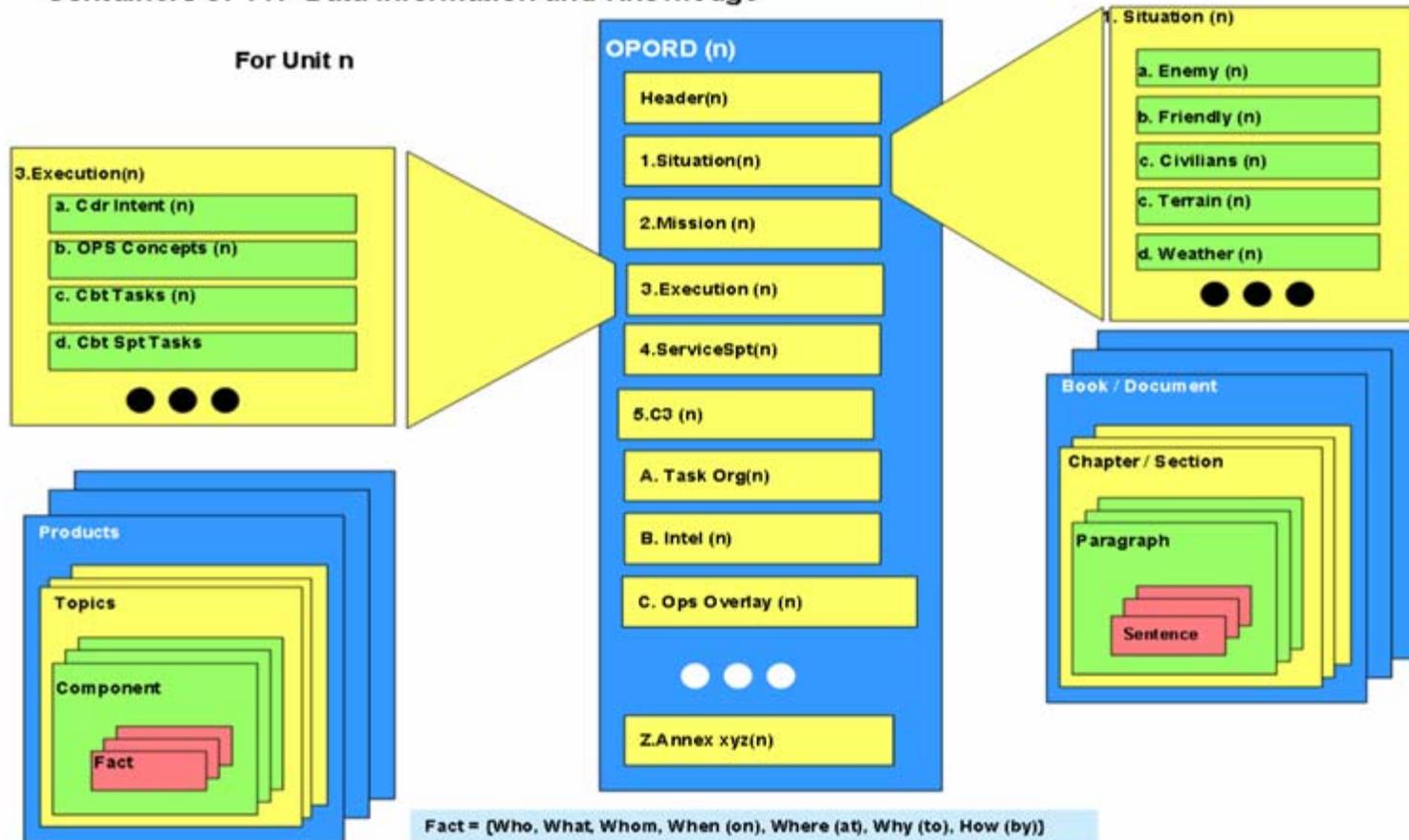


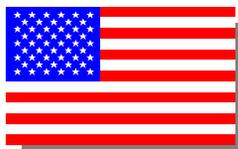
OPORD/OPLAN

Business Object Container View



C2 Products = {C2 Business Objects} = Orders / Reports / ... }
Containers of TTP Data Information and Knowledge





Digitized OPORD/OPLAN XML Schemas

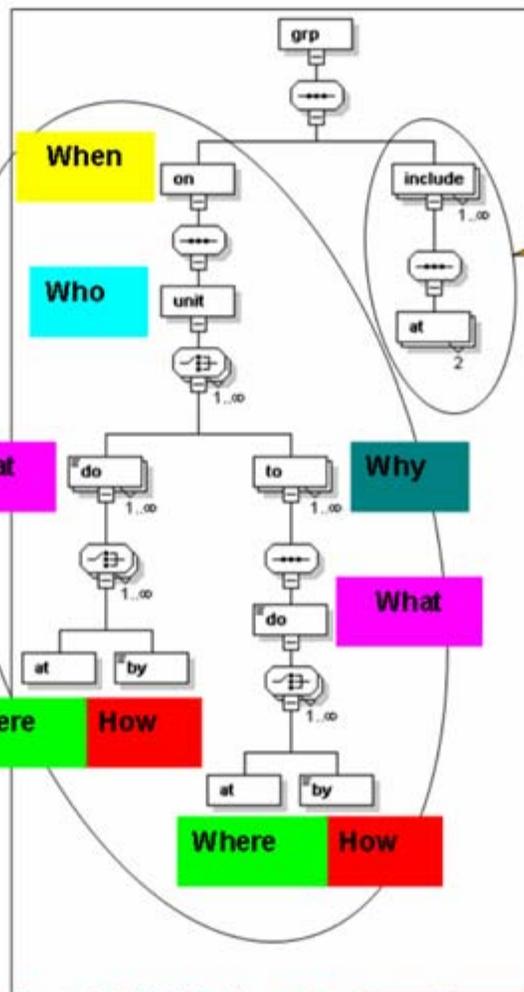
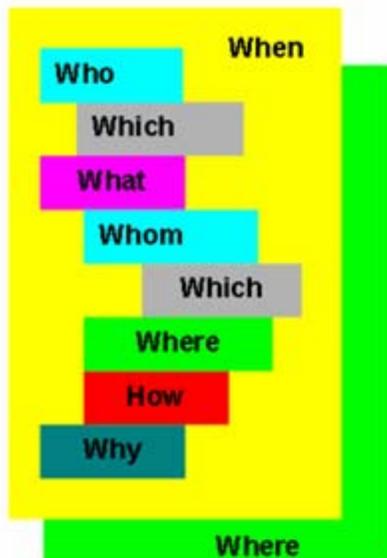


XML Schema for W6H Constructs

Main Construct

Supplemental Constructs

Color Schema



When → on
 Who → unit
 Which → asset
 What → do
 Whom → unit
 Where → at
 How → by
 Why → to



WCP Collaboration Drag and Drop Planning Interface



Typical Web C2 Portal Graphical Plan Build

Graphical Action Tasks

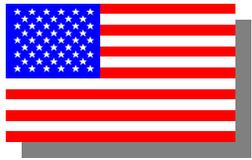
Deliberate Attack	Isolate
Feint Attack	Move
Hasty Attack	Occupy
Block	Reinforce
CATK	Secure
CATK-by-Fire	Seize
Fix	Support
Guard	Suppress

The screenshot displays a central map interface with several tactical graphics overlaid, including a 'DELIB' (Deliberate Attack) graphic. Surrounding the map are several interactive menus:

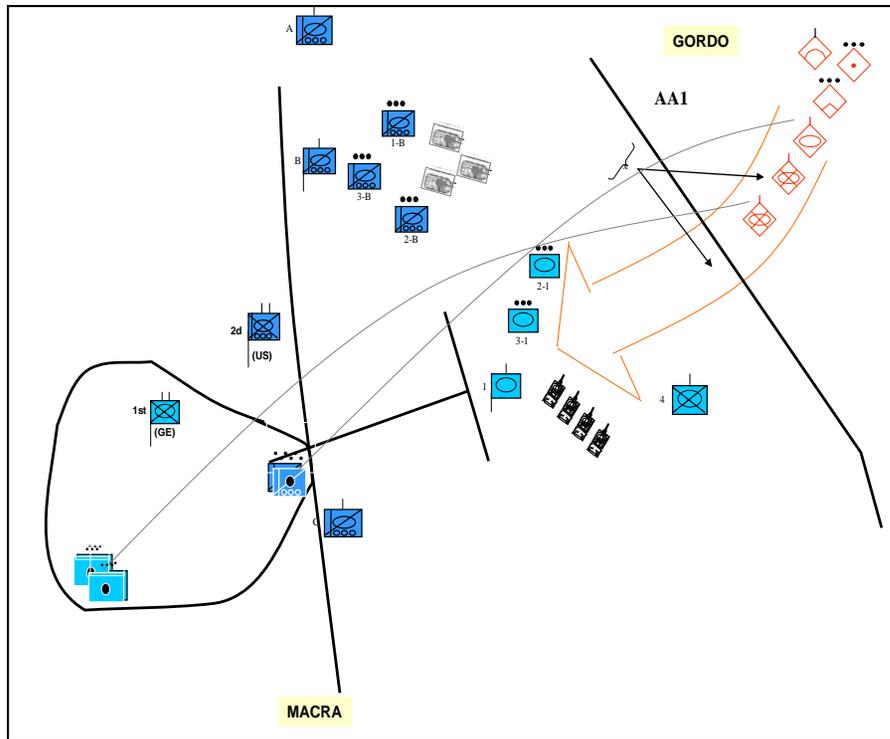
- Unit/Feature Property Menu:** A 'Properties' dialog box showing details for a unit (FUS21366407161), including location, name, and affiliation.
- Pop Up Menu:** A 'CONTROL FEATURE' dialog box for configuring a control feature, with fields for name, affiliation (set to 'FRIENDLY'), and size (set to 'SQUAD').
- Task/Action Menu:** A vertical menu with options: Hide, Aggregate, DeAggregate, Add Member, Add To Tracker, Task, and Action.
- BML Action Task View:** A detailed view of a task or action, showing a list of tactical graphics and their parameters.

Graphical Action Tasks

Recon	Withdraw	Screen



Creation of Operational Overlays



Sample OPORD (BN) Overlay

Action: Comments	Graphical Representation	Example
<p>Attack, deliberate: Use Axis of Advance (Main Attack) to represent the path for the unit to attack. The word 'delib' is added to denote such action.</p>		
<p>Attack, feint: Use Axis of Advance for feint to represent the path for the unit to attack.</p>		
<p>Attack, hasty: Use Axis of Advance (Main Attack) to represent the path for the unit to attack. The word 'hasty' is added to denote such action.</p>		
<p>Block: Defined in MIL-2525B.</p>		

WCP Action Tasks for Creating OPORD Overlay



Main WCP Control Areas



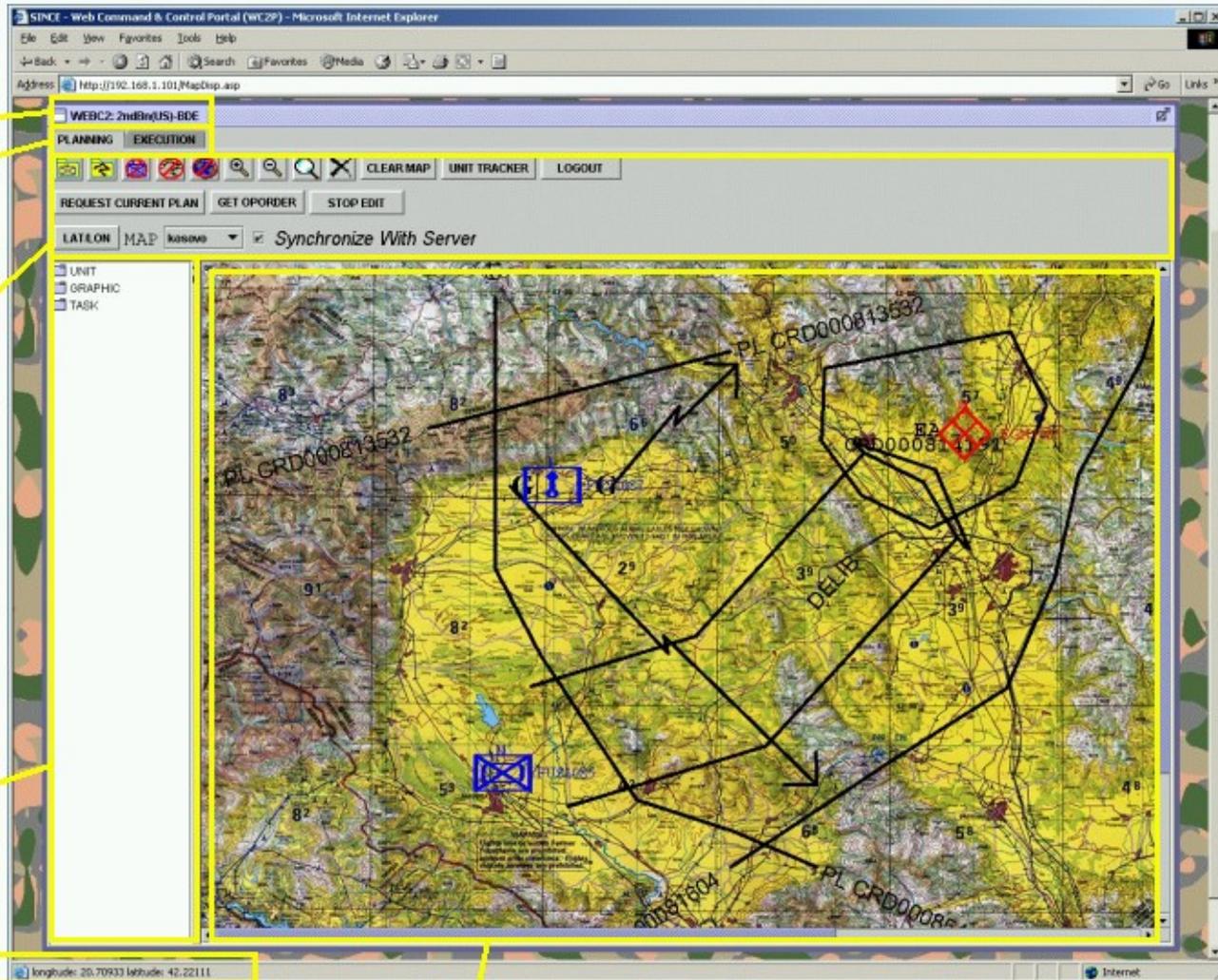
User Name
and
Session
Switch
between
mode

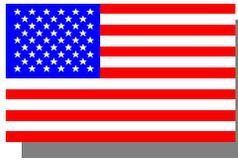
Toolbar

Object
Tree

Cursor Location on Map

Map Area





Viewing OPOrd and Current Situation



OPOrd Viewer

OP Order Viewer with Current Situation

ID	Name	Publisher
ORG000001	OPORD/Restore Peace01	1ST IN BN(GE)\1ST BCT
ORD0000	Restore Peace	1ST BCT(US)\1ST IN DIV
ORD0000	Restore Peace	1ST IN BN(GE)\1ST BCT

Detailed View of Selected OPOrd

OPOrDER	
ID	ORG000001
Name	OPORD/Restore Peace01
Publisher	1ST IN BN(GE)\1ST BCT
Use	execute
Status	init

- 0. Header
- 1a. Current Situation - Enemy
- 1b. Current Situation - Friend
- 1c. Current Situation - Environment
- 2. Mission
- 3. Execution
 - 3b. Battlefield Geometry
 - 3c. Tasks to CBT Units
 - 3d. Tasks to CS Units
- 3e. Coordination Instruction
 - A. Unit Task Organization
 - B. Intelligence

3c. Tasks to CBT Units

Phase IV - Redeployment -					
ID	Name	Affiliation	Role	Size	Task
FGE0001015	Mortar Co/1st IN Bn(GE)	GE	MORTAR	CO	
FGE0001012	2nd Co/1st IN Bn(GE)	GE	MECHT	CO	
FGE0001013	3rd Co/1st IN Bn(GE)	GE	MECHT	CO	Screening area east of GNJILANE
FGE0001013	3rd Co/1st IN Bn(GE)	GE	MECHT	CO	
FGE0001011	1st AR Co/1st IN Bn(GE)	GE	AR	CO	
FGE0001014	4th Co/1st IN Bn(GE)	GE	MECHT	CO	Screening area southeast of GNJILANE
FGE0001014	4th Co/1st IN Bn(GE)	GE	MECHT	CO	
FGE0001012	2nd Co/1st IN Bn(GE)	GE	MECHT	CO	Screening the area northeast of GNJILANE
FGE0001010	Bn HQ/1st IN Bn(GE)	GE	MECHT	CO	

3d. Tasks to CS Units

3e. Coordination Instruction

Product Effective On commander's critical information requirements (CCIR) OPOrd is effective upon receipt of mission. Arrival day is A-Day

priority intelligence requirements (PIR) b. Where are GSFF operating bases and headquarters in KAZAR? (LTVOI is D-4). c. Where will the GSFF attempt to interdict IBCT movement into KAZAR? (LTVOI is D-4). d. Where are the known locations of minefields and obstacles? (LTVOI is D-4).

Unit Action Task assignment View

Unit ID	FGE0001014		
Unit Name	4th Co/1st IN Bn(GE)		
Task ID	FGE0001014.152.D.13		
Task Type	task		
Task Name	SCREEN		
Task Description	Screening area southeast of GNJILANE		
Target Unit	ID	Role	Affiliation
Location	ID	Type	Name
	FGE0001014.152.C.13		FGE0001014.152.C.13
			=20040721 150000E

Unit ID	FGE0001014		
Unit Name	4th Co/1st IN Bn(GE)		
Task ID	FGE0001014.152.D.9		
Task Type	task		
Task Name	MOVE		
Task Description			
Target Unit	ID	Role	Affiliation
Location	ID	Type	Name
	FGE0001014.152.C.9		FGE0001014.152.C.9
			=20040721 020000E

Unit Task Breakdown View

Unit Action Task assignment View

Sim Sys
meets
C2IS

Collaborative
Planning
Decisions

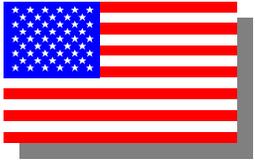
Experiment Overview



MEETING THE COALITION C2 CHALLENGE

- ✓ Common Battlefield Management Language (*BML*)
- ✓ Enhances visual communication through standard graphics and symbols promoting common understanding
- ✓ Standardizes combat and SOSO tasks
- ✓ Facilitates combined doctrine development and understanding
- ✓ Integrated electronic battle book and online library enables informed decision making and accurate planning
- ✓ Considers capabilities, restrictions and caveats in current operations and in the collaborative planning process
- ✓ Remote CCOP input enables shared vision
- ✓ Mission notebook enables rapid OPORD dissemination and examination with annex/appendix linkage (*FAST FIND*)
- ✓ Considers coalition intelligence sharing restrictions
- ✓ *C2-MATE*—a fully integrated staff assessment & performance tool for exercises (OC/Ts) and actual operations (Commanders) AARs





SINCE Scenario

"A snapshot of the real world"



Challenge of Coalition C2

- Language
- Force Structure
- Equipment
- Training
- Professionalism
- Military "Culture Clash"
- National Caveats
- Intelligence Sharing
- C2 Systems

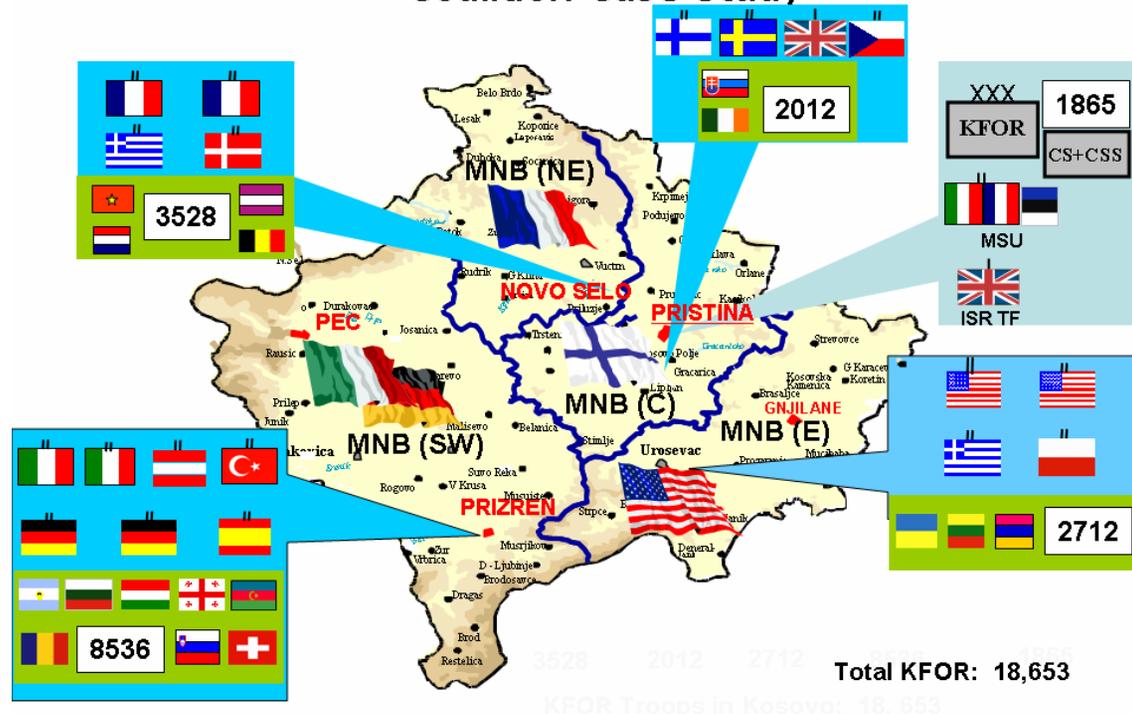
Collaborative Planning

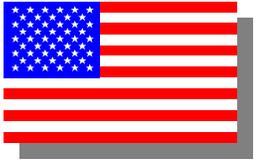
MDMP

Execution Monitoring

COP

Multi-National Military Operations Coalition Case Study





SINCE Experiment 2 Scenario Enhancements



Summary:

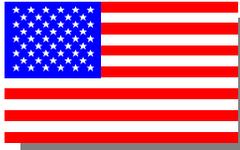
- ✓ Expanded experiment scope with integration of 12 Maneuver Battalions (FR)
- ✓ Applied division level graphics—boundaries, PLs, MSR and units with *C2D's WCP, GITI's Verona and IST's Mission Notebook*
- ✓ Organized Provisional XN RSTA SQD (I, CA, FR)
- ✓ Task organized TFs for march serials, sequence and route deconfliction
- ✓ Organized DE battalion into XN tank, mechanized and Stryker (US) TF
- ✓ Planned DS FA Paladin “maneuver boxes” for 1 BCT (XN) fire support
- ✓ Integrated RSTA (XN)CO/PLT with each TF for route recon and security
- ✓ Developed free text into SPOTREPS for off site injects through *Drexel's SWAT: RSTA, MINEFIELD, MEDEVAC...*
- ✓ Attached US Engineer Company from BSB to US TF during movement
- ✓ Provided multi-echelon commanders guidance through *OSU's CSLANT*
- ✓ Filtered US STRAT INTEL for FRAGO 1 Intel build through *CERDEC's CDS*
- ✓ Executed performance measurement through *Aptima's C2-MATE*-- data collection, self reporting and system fault isolation—for rolling After Action Review



Conceptual Planned SINCE Experiment 2b Activities



17 -21 July, 2006.					24 - 28 July, 2006.					31 July - 3 Aug, 2006.			
Test					Experiment					Demonstrate			
Technical Validation			User V&A/Training		Operational Experimentation					Integrated Demonstration			
D1(17) Mon	D2(18) Tue	D(3)19 Wed	D4(20) Thu	D5(21) Fri	D8(24) Mon	D9(25) Tue	D10(26) Wed	D11(27) Thu	D12(29) Fri	D15(31) Mon.	D16(1) Tue.	D17(2) Wed	D18(3) Thu
Arrival	Connectivity Testing	Federation Testing	M&S Update all data Bases Database tests w/ technicians	M&S Crawl-through screenplay Walk-through screenplay	screenplay	Update System Configurations	screenplay	Vignettes 1 - 3	Integrated, Ad Hoc Vignettes	Demo Testing	VIP Day 1!	VIP Day 2?	Tear Down
			M&S Operator Training	M&S Run-through Script Ad hoc run	screenplay	screenplay	Plan for Ad hoc						
			Bn Update all data bases Database tests w/ technicians	Crawl-through screenplay Walk-through screenplay	screenplay	Update System Configurations	Ad hoc						
Setup	Bn Operator & technician Training	Bn Operator & technician Training	Bn Operator & technician Training	Run-through screenplay Ad hoc run	screenplay	screenplay	Plan for Ad hoc	Vignettes 4 - 5	Hot Wash	AAR PMG	AAR PMG	AAR PMG	Departure
	Bde Operator & technician Training	Bde Operator & technician Training	Bde Update all data Bases Database tests w/ technicians	Crawl-through screenplay Walk-through screenplay	screenplay	Update System Configurations	Ad hoc			AAR OWG	AAR OWG	AAR OWG	
	M&S Operator Training	M&S Operator Training	Bde Operator & technician Training	Run-through screenplay Ad hoc run	screenplay	screenplay	Plan for Ad hoc			AAR TWG	AAR TWG	AAR TWG	
Setup, Testing and Training					Screenplay / Ad hoc Missions/Tasks					Demonstrate, Baseline Critique			
Brigade(C2)		Battalion(C2)		Company(M&S)									



Systems Playing in Experiment



**US Joint Web
COP C2 Sys**



US FBCB2 C2 Sys



**US CAPES-MC2
Planning Sys**



**US C2Mate
AAR Sys**



**Four US
SWAT Remote
Tablet WCP**



**Eleven US Web C2
Collaboration (WCP) Portals**



**US Cross Security
Domain Services**



**US Verona
Info Mgt Sys**



**US Battle Cmd
Server**



**US C2Sim
Proxy Server**



US HLA Gateway



**Three US OTB
Combat Sim. Sys**



DE HEROS C2 Sys



DE FAUST C2 Sys



**DE C2-Sim
Proxy Server**



**DE PABST
Simulator**



**DE SIRA
Simulator**



CA Battle View C2 Sys



FR SIC-F C2 Sys



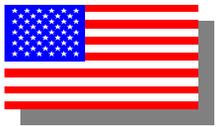
**FR APLET Plan
Support Sys**



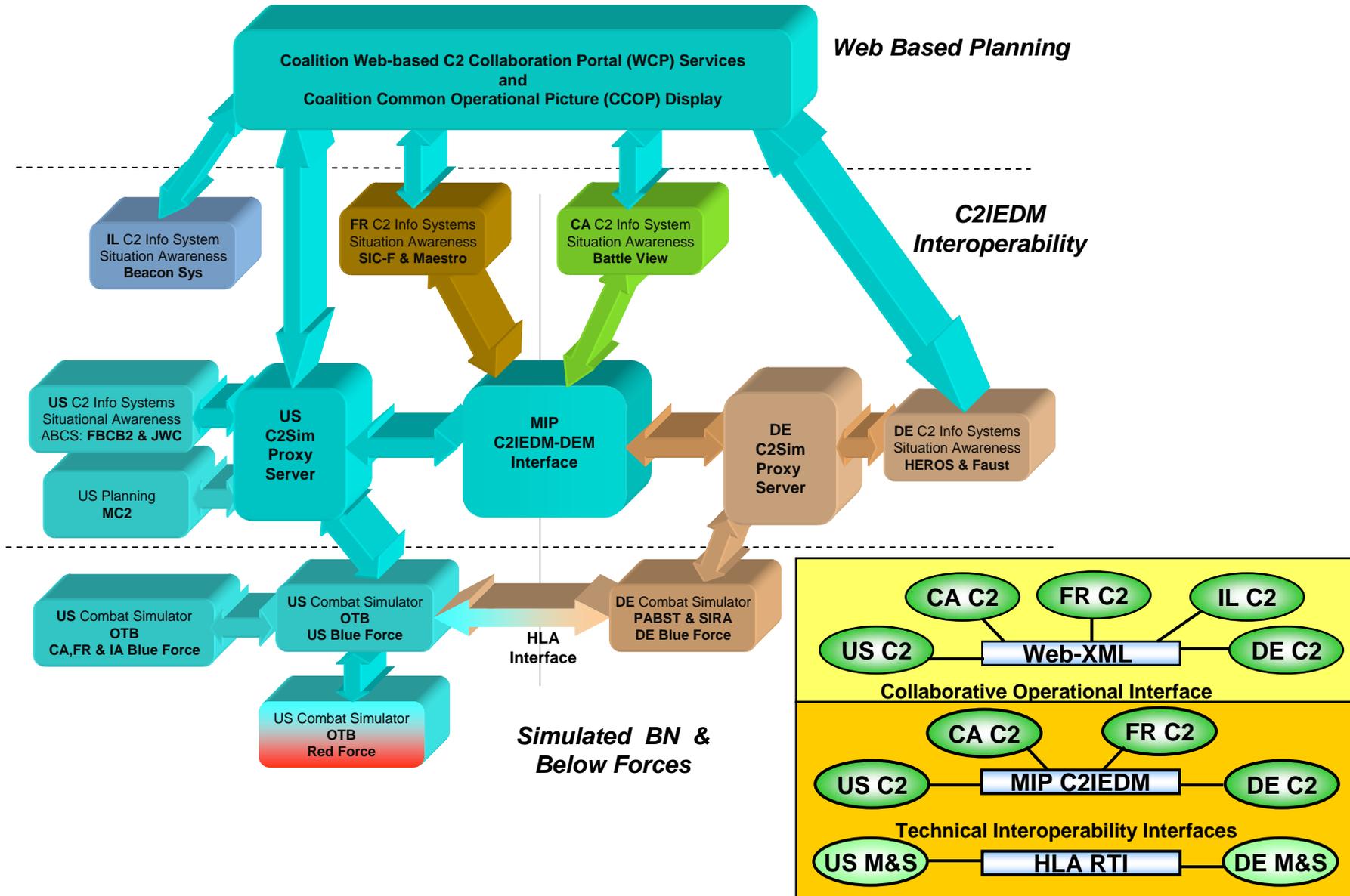
FR Maestro C2 Sys

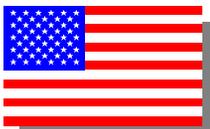


IL Beacon C2 Sys



Five Nation SINCE Experiment 2b Architecture Implementation





Integrated Demo of New Technologies



Web-based C2 Collaboration Portal (WCP) Services

- Real-time Coalition COP Display Generation Services
- Drag & Drop Action-Task Graphical Plan Overlay Generation Services

Digitized Mission Notebook XML/BML OPORD Authoring Services

- Supports Authoring Additional elements of OPORD/OPLAN
- Auto linked with Drag-Drop Action Graphical Planning Services

C-SLANT OPLAN Annotation & Animation Services

- Pop-up Commander's annotations on Action Task Overlays
- Animation of Action Overlays to illustrate Commander's Vision

Collaborative Unit Action Task Workflow Tool and Scheduling Services

- Supports display Unit Action Tasks Assignments in Temporal Execution Workflow Structure
- Changes & subtasks Linked back into WCP Digitized OPORD/OPLAN XML

C2 Mate

- Automated After-Action Reporting Tool
- Performance Assessment

Cross Security Domain Services (CSDS)

- Rule-based, Automated Information Security Screening services
- Automatically screens and controls flow of national SA information passed to coalition C2IEDM SA database
- CSDS is being designed to meet and go through NSA Security Accreditation

Secure Wireless Agent Technology (SWAT)

- Intelligent Agent based Tablet/PDAs
- Compressed WCP XML Communications

VERONA

- Agent oriented Collaborative Information Management Services

ONESAF-OTB HLA Gateway

- Real-time Interface between C2 and Simulation Systems
- Supports simulation driven real-time Mission Rehearsal and Training activities

The Coalition Domain Manager (CDM) Module

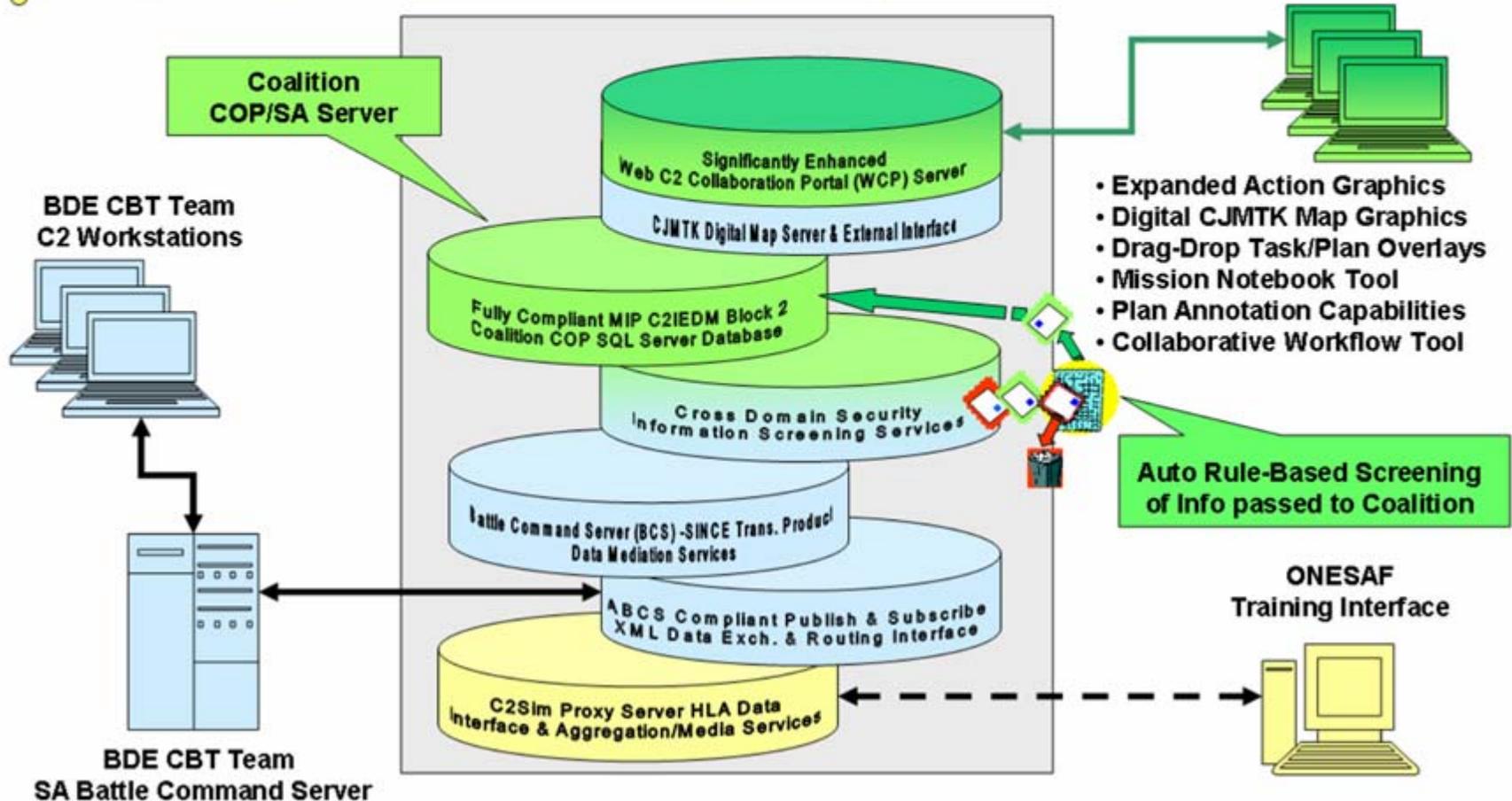
- Automatically manages information distribution and mediation services required to move information between PASS, C2IEDM and WCP OPORD/OPLAN XML interfaces, etc.

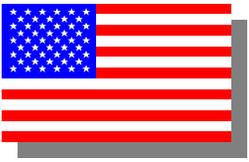


SINCE Transition Product



**US SINCE WCP& C2Sim Proxy Server
Redesigned to Work on Common Server Platform**





Conclusions & Preliminary Results



- **“SINCE Experiment was a success”**
- **A Flexible, Scalable, Extensible M&S driven experimental environment is critical to technology assessment for potential transition**
 - **2 Echelons (1 Bde, 3 Bn) for C2 Cells**
 - **3 Echelons for Live & Constructive M&S (Co, Plt, Platform entities)**
 - **13 Officers at C2 Cells (CPTs, MAJs, and LTCs) from 5 Armies**
 - **8 Multinational ‘Systems of Record’, 12 R&D prototypes**
 - **50+ PCs, 10 Interconnected Networks**
 - **13+ Information Standards**
- **Information Sharing Portal technologies were well received as Key to Multinational Force C2**
 - **Collaborative Planning and Execution Monitoring using standard graphics and symbols for common understanding and shared vision.**
- **Live simulation essential to provide ad-hoc free-play stimulation injects complementing highly structured constructive simulations”**