
PROGRAM EXECUTIVE OFFICE
PEO C3S
NETWORKING THE BATTLESPACE
COMMAND CONTROL COMMUNICATIONS SYSTEMS

Report Documentation Page

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Abstract

Subject Terms

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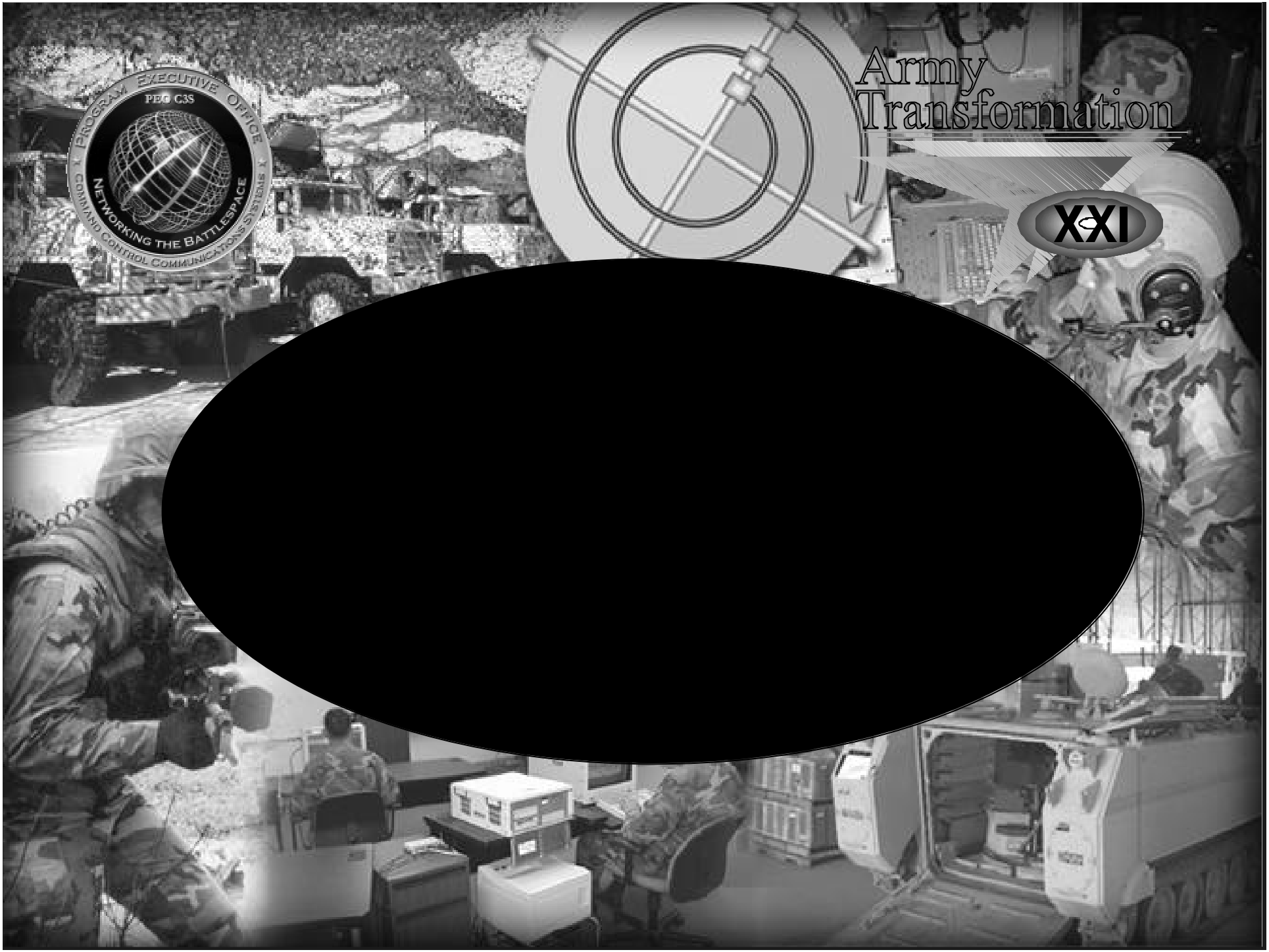
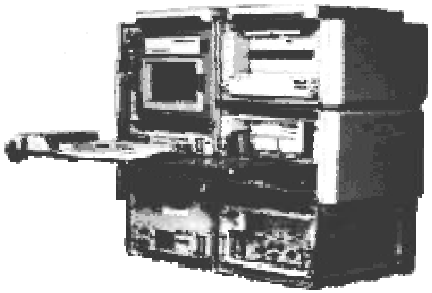
Classification of Abstract unclassified	**Limitation of Abstract** UU

Number of Pages
58

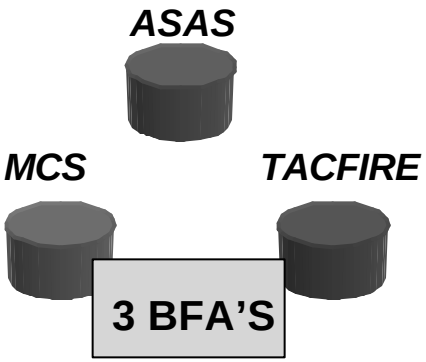

PROGRAM EXECUTIVE OFFICE
PEO C3S
COMMAND CONTROL COMMUNICATIONS SYSTEMS
NETWORKING THE BATTLESPACE
Army
Transformation
XXI

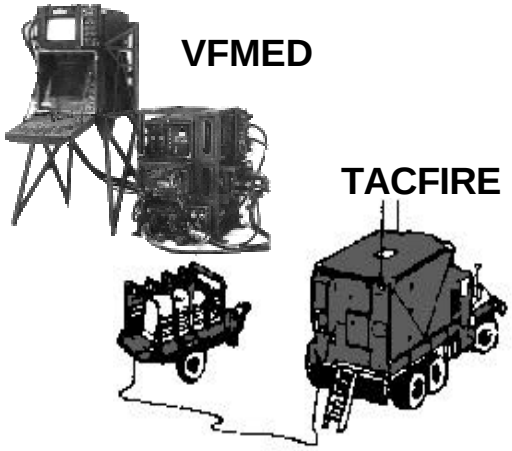
Army Battle Command

circa 1989...



MCS Version 9





- Independent Systems - *No Horizontal Integration or Data Exchange*
- *Unique HW & SW - Stovepipe* Requirements
- Independent Development - *Unsynchronized Fielding*
- Separate Communications Intranets With Little Interaction
- Point to Point - *Analog* Traffic

AN/TSC-85

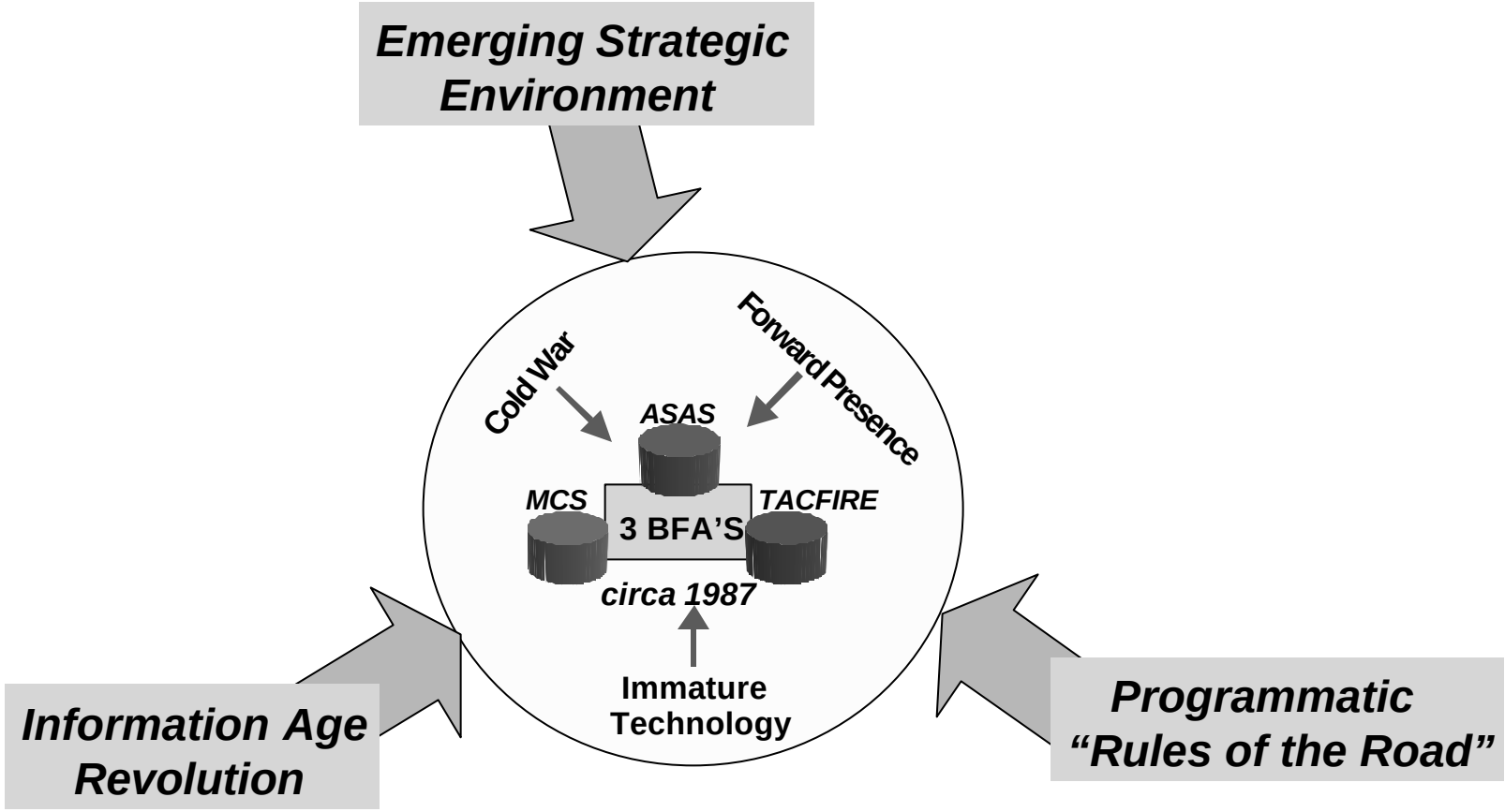
These systems:

- Reflected contemporary "state of the art" technology
- Were built in response to a geopolitical environment dominated by a bipolar, superpower rivalry
- Supported a forward deployed, robust force

but served that force well

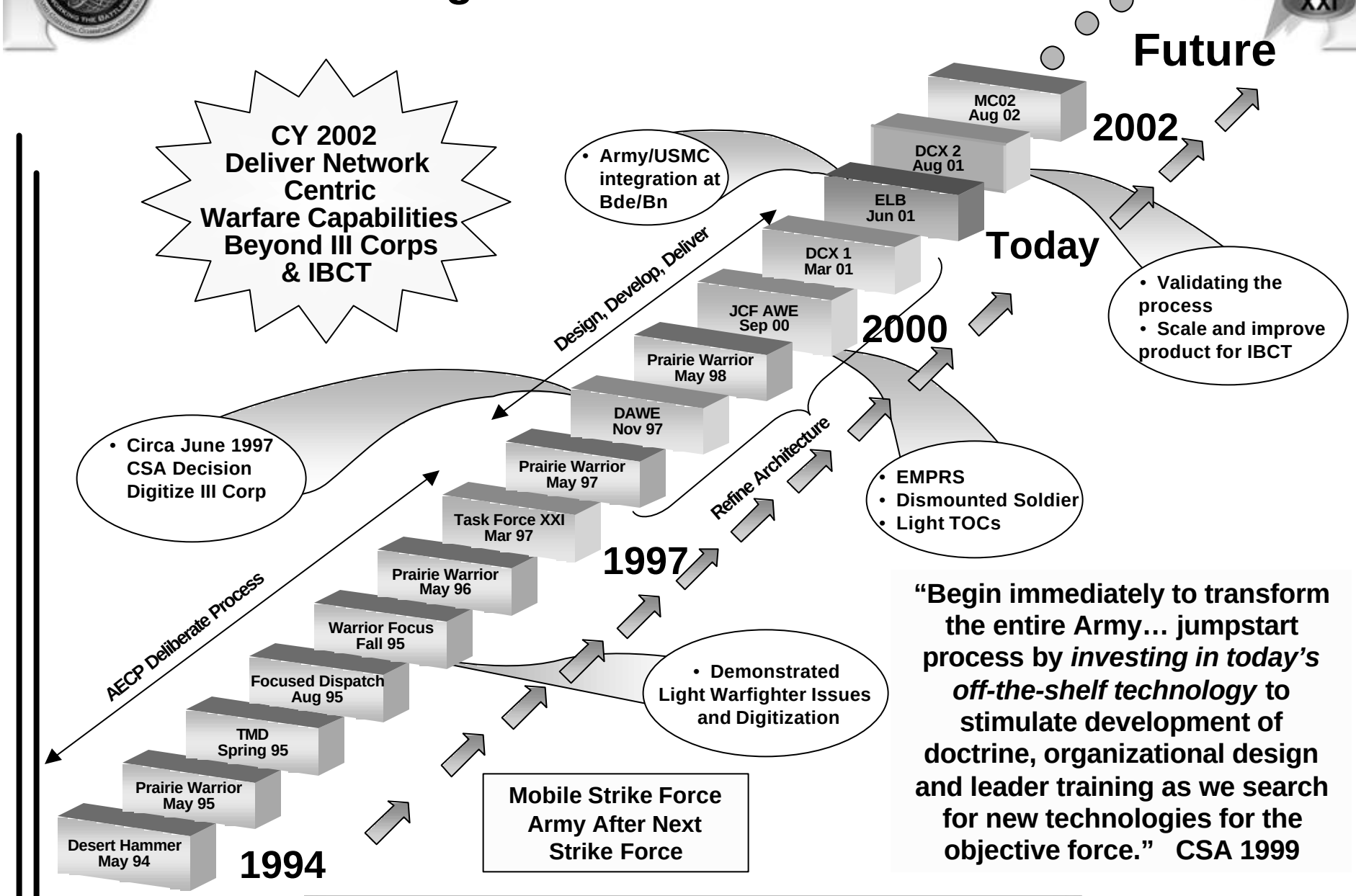
ASAS VAX 750R being removed from shelter *circa 1989*

But "New Forces" emerged...



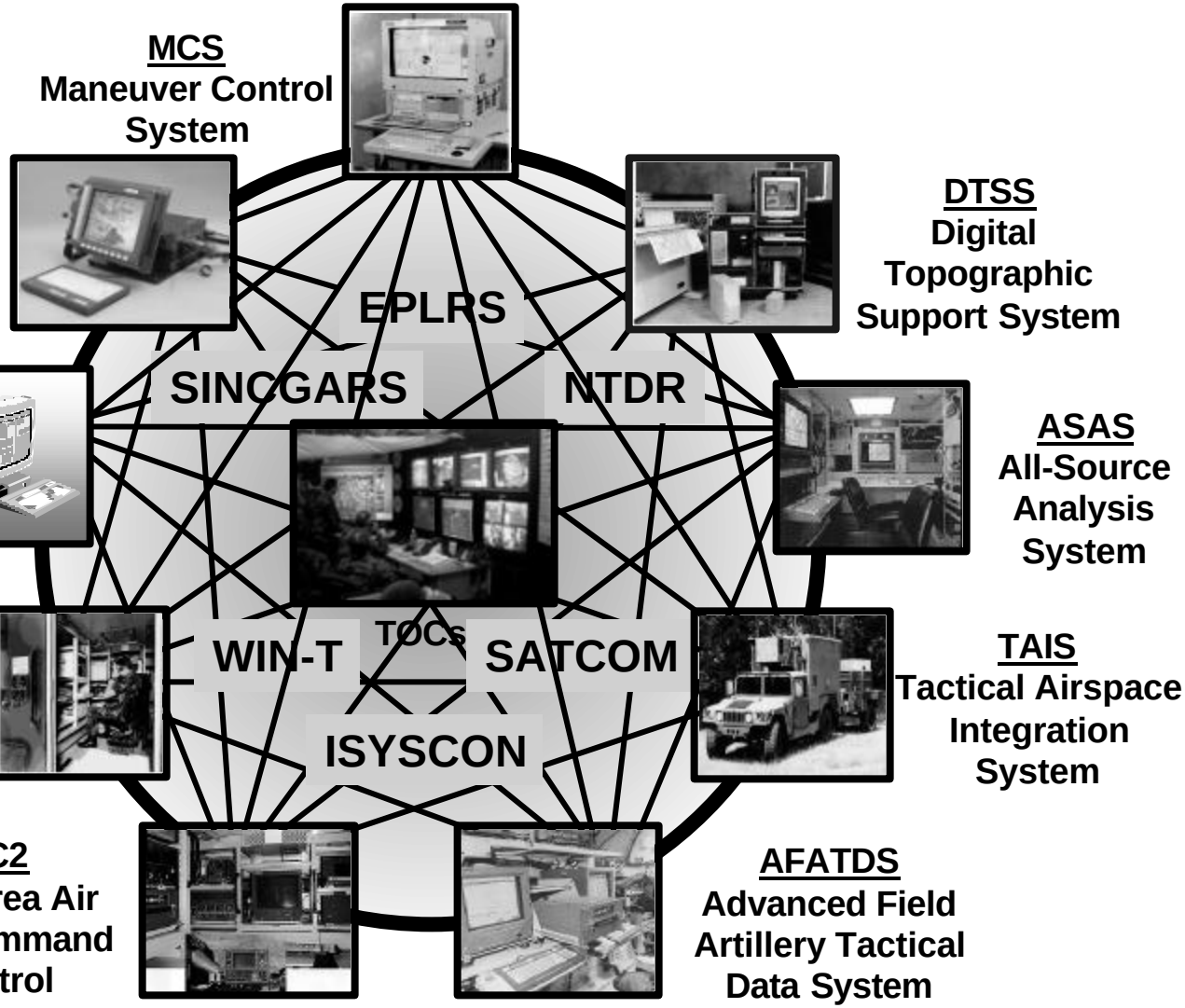
"These forces… exert tremendous new pressure on the … environment, superseding the old forces as the focus of planning." ***Unleashing the Killer App***

Continuing on the Road to Transformation



"Begin immediately to transform the entire Army… jumpstart process by *investing in today's off-the-shelf technology* to stimulate development of doctrine, organizational design and leader training as we search for new technologies for the objective force." CSA 1999

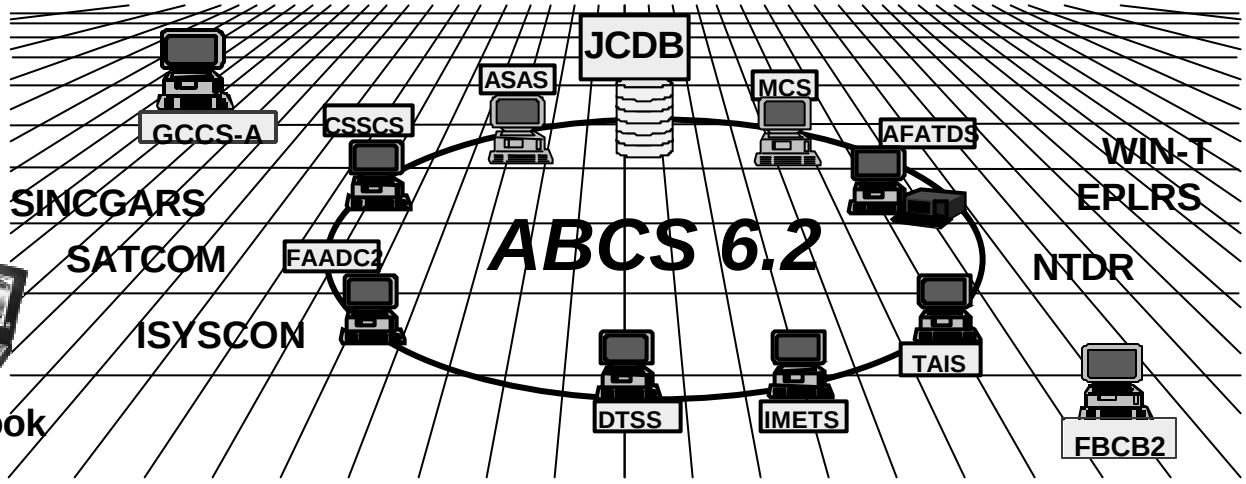
THE ARMY BATTLE COMMAND SYSTEM



ABCS circa 2001...

VCU

Notebook



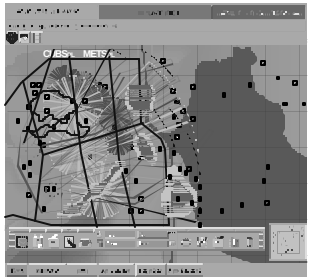
SMART-T

- *Common* look and feel - *Common* hardware - *Common* infrastructure
- ***Common tactical picture*** with *integrated*, interactive overlays, common map application & commander-imposed filters
- ***One linked internet*** enabled by commercial gateways
- Interoperable collaboration tools
- Database to database exchanges
- *Level 6 DII COE compliance*
- Lift reduction of 120 tons
- 20k Watt power reduction

A2C2S Configuration

… essentially a major overhaul of the software infrastructure….

DUSA (OR) Independent review of the Army's Digitization Program Sept 2000

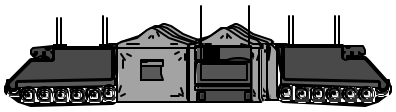


Common Tactical Picture

"Army Battle Command" Developmental Timeline

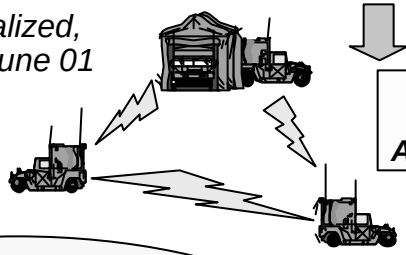
ABCS 6.2
Current

ABCS 7.0
Apr '03



ABCS 8.0
Oct '01 ***Oct '04***

ABCS 7.0 design finalized, goes on contract in June 01



ABCS 9.0
Apr '03 ***Apr '06***

ABCS 10.0
Oct '04 ***Oct '07***

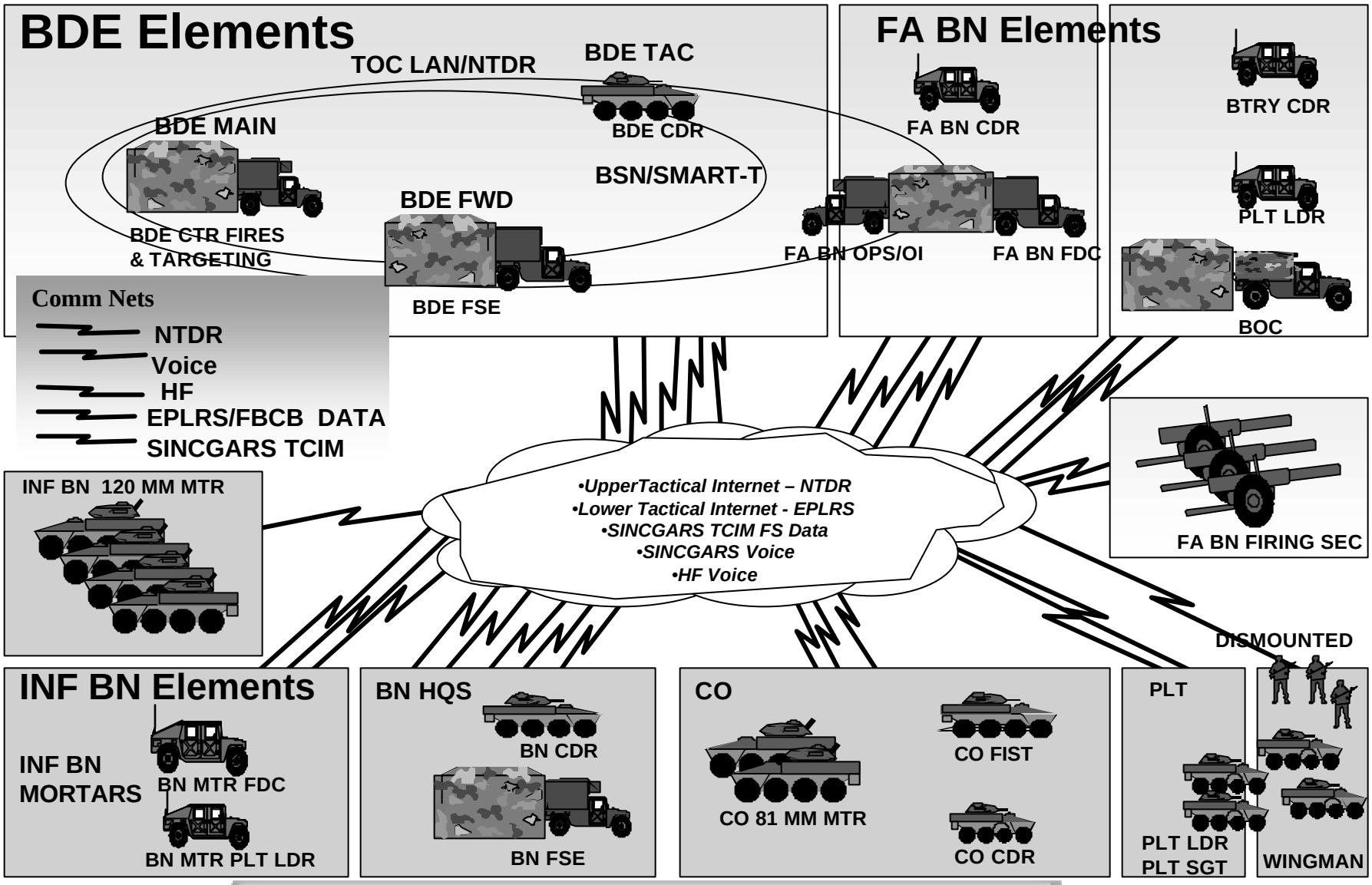
A suite of common software that can be tailored to satisfy Warfighter specific requirements at any level of the architecture, based upon the commander's assessment of his information management requirements to establish Force Level Control based on METT-TC

Objective Force Battle Command System
Apr '06 ***Apr '09***

ABCS Common Services ORD TRADOC 18 April 01

Objective Force comms support provided by WIN-T

Fire Support Architecture



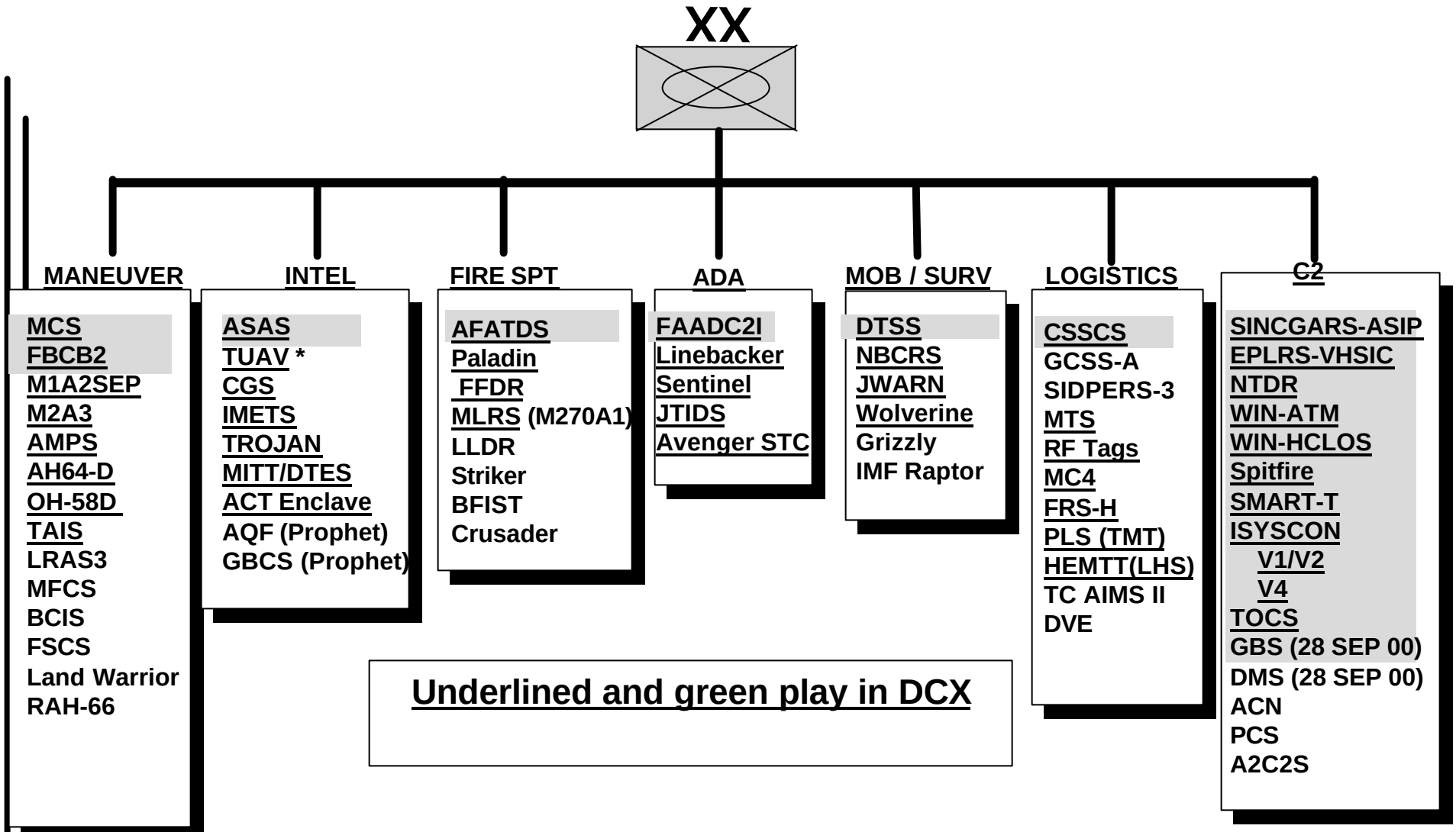
Meeting the Future Expectations of the Warfighter

As suggested by the TRADOC Objective Force Maneuver Unit of Action Operational and Organizational Concept

A C2 system that enables/provides

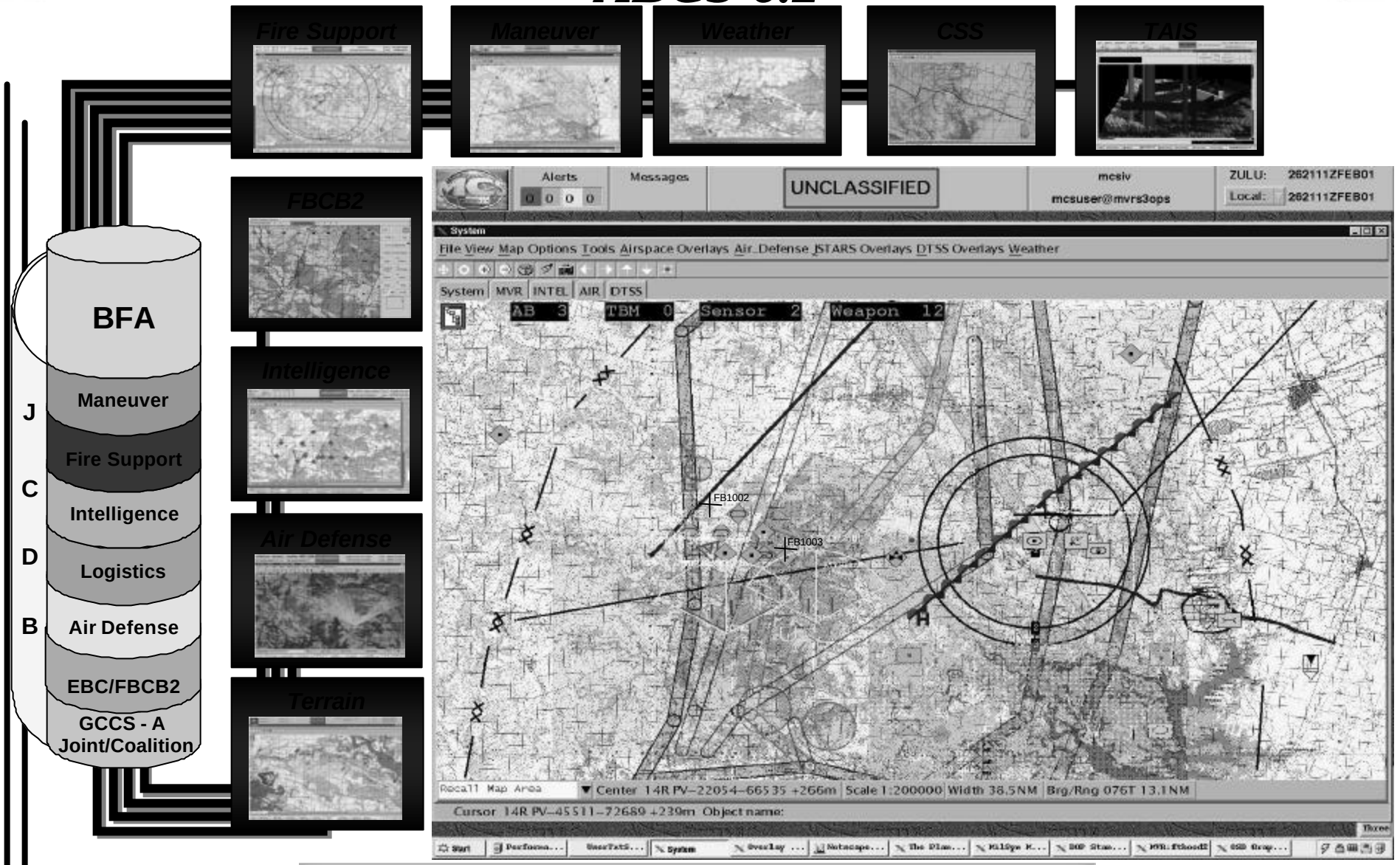
- ***Interoperability*** **with** ***legacy, joint and coalition*** **systems**
- **Planning and rehearsal from alert through employment**
- **Continuous assessment and dynamic synchronization during execution**
- **Distributed databases, tailorable to mission needs, that support a** ***common operational picture***
- **Multi-echelon collaborative planning**
- **Self synchronization of peer units**
- ***Beyond line-of-sight communications*** **- in depth**
- **Distributed,** ***mobile TOCs*** **- virtual staffing**
- **Tailorable, interactive,** ***dynamic displays*** **with intuitive interfaces**
- **Access to any relevant information in the** ***Global Information Gird***
- ***Network assurance*** **with low probability of detection and/or exploitation**
- **Real time terrain visualization**

DCX Systems List



Creating Common Tactical Picture

ABCS 6.2



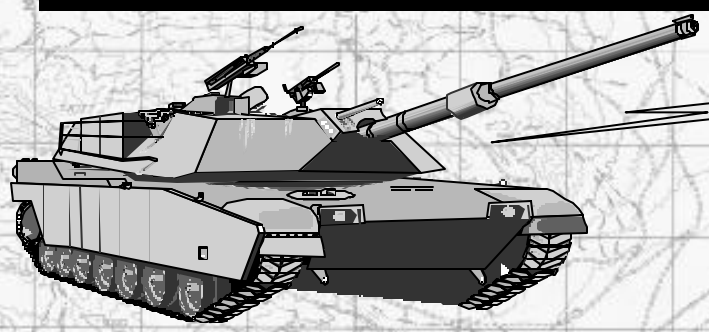
Enablers: FBCB2 and the Network

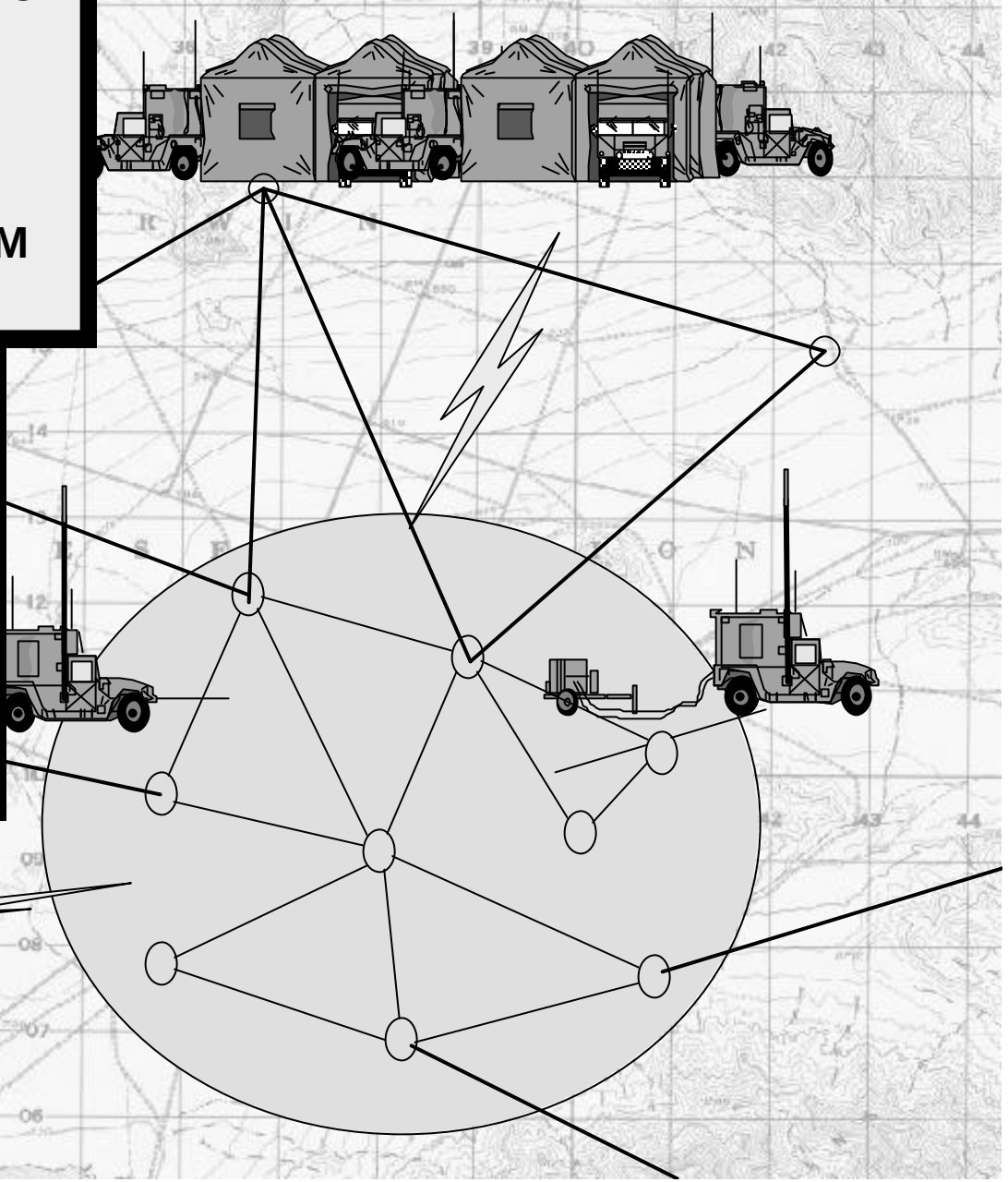
"Scenario"

- Units moved beyond FM Voice range
- Passing of digital traffic and Situational Awareness of friendly forces continued over networked system
- Maintained "command" beyond FM voice range with FBCB2

Spoiling Attack –

- A platoon leader was given a mission to conduct Spoiling Attack.
- Without a prepared plan, platoon used current information on FBCB2 to identify routes which offered maximum cover and concealment. Platoon obtained excellent fire positions with superior line of site.
- Enemy caught off guard and completely destroyed.



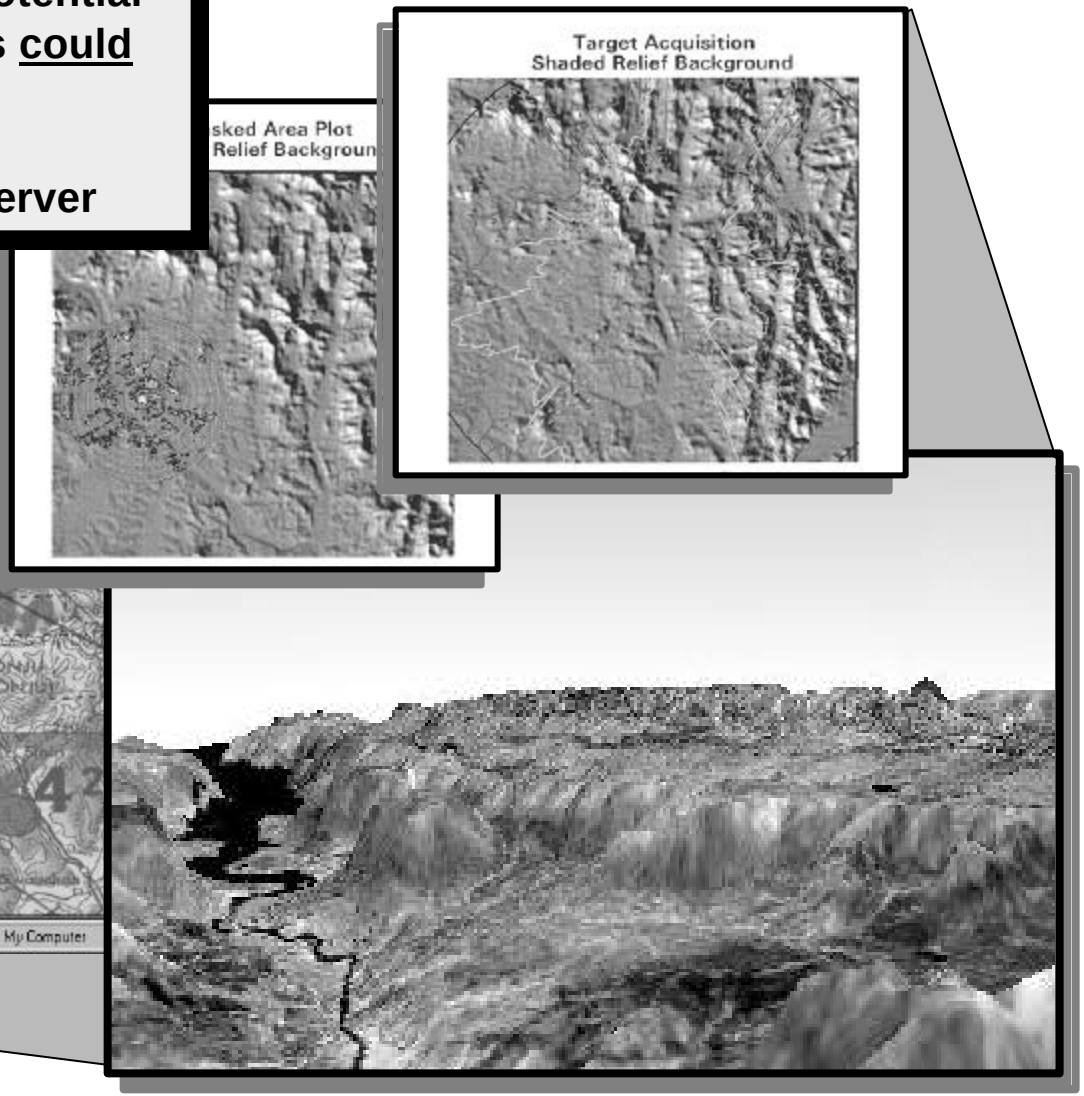


Enabler: AFATDS & DTSS Synergy "Finds" Enemy Observers

"Scenario"

- Counterbattery radars detected incoming artillery- displayed on AFATDS
- DTAC Staff used DTSS to Identify potential OP locations from were enemy FO's could observe fires
- UAV Confirmed enemy elements
- Blue Artillery Destroyed enemy observer

Counterbattery



DTSS Views

[illegible] Issues from DCX-1

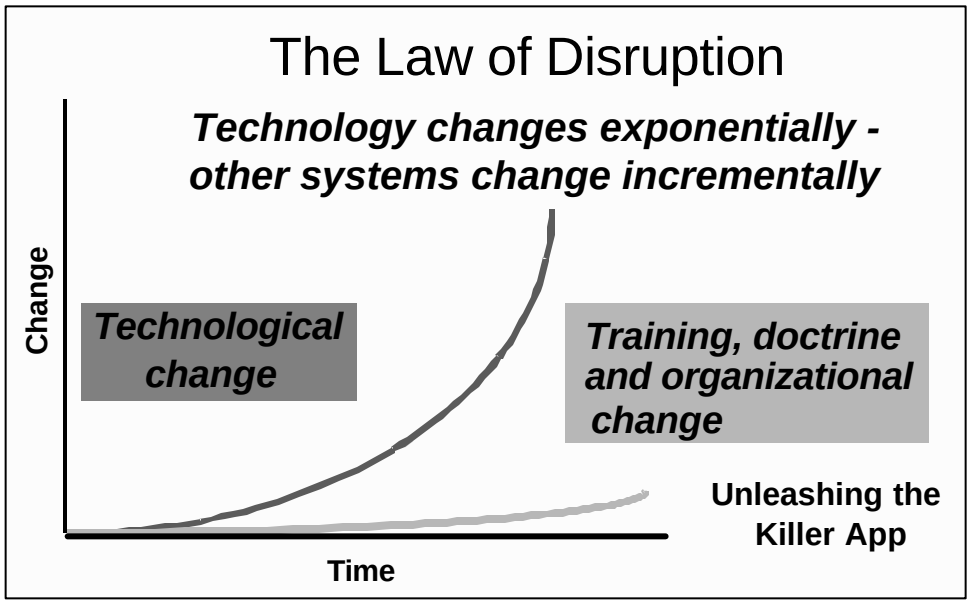
1. Improve Red SA distribution/presentation - refining tools, providing resources to IntelCen to support TTP development and training
2. Enhance network performance and robustness
   - Ensure that TOC-TOC radio network (NTDR) can scale to 4 brigade division
   - Improve C2 message completion rate
3. Implement architecture modifications, to address:
   - Need for additiona[illegible]
   - Need for DMS serv[illegible]
4. [illegible] of ABCS when contributing to/participating in [illegible]
5. Improve graphics/overlay exchange between systems, especially MCS & FBCB2
6. Fix Digital LOGSTAT reports and interface between FBCB2 and CSSCS
7. [illegible] network startup simplification

[illegible] systems

Summary
….. Change must be Holistic

"The real power of digitization will not be realized until those manual processes are replaced with new ones that reflect the addition of digitized systems through all echelons." **DUSA (OR) Independent Review of the Army's Digitization Program Sept 2000**

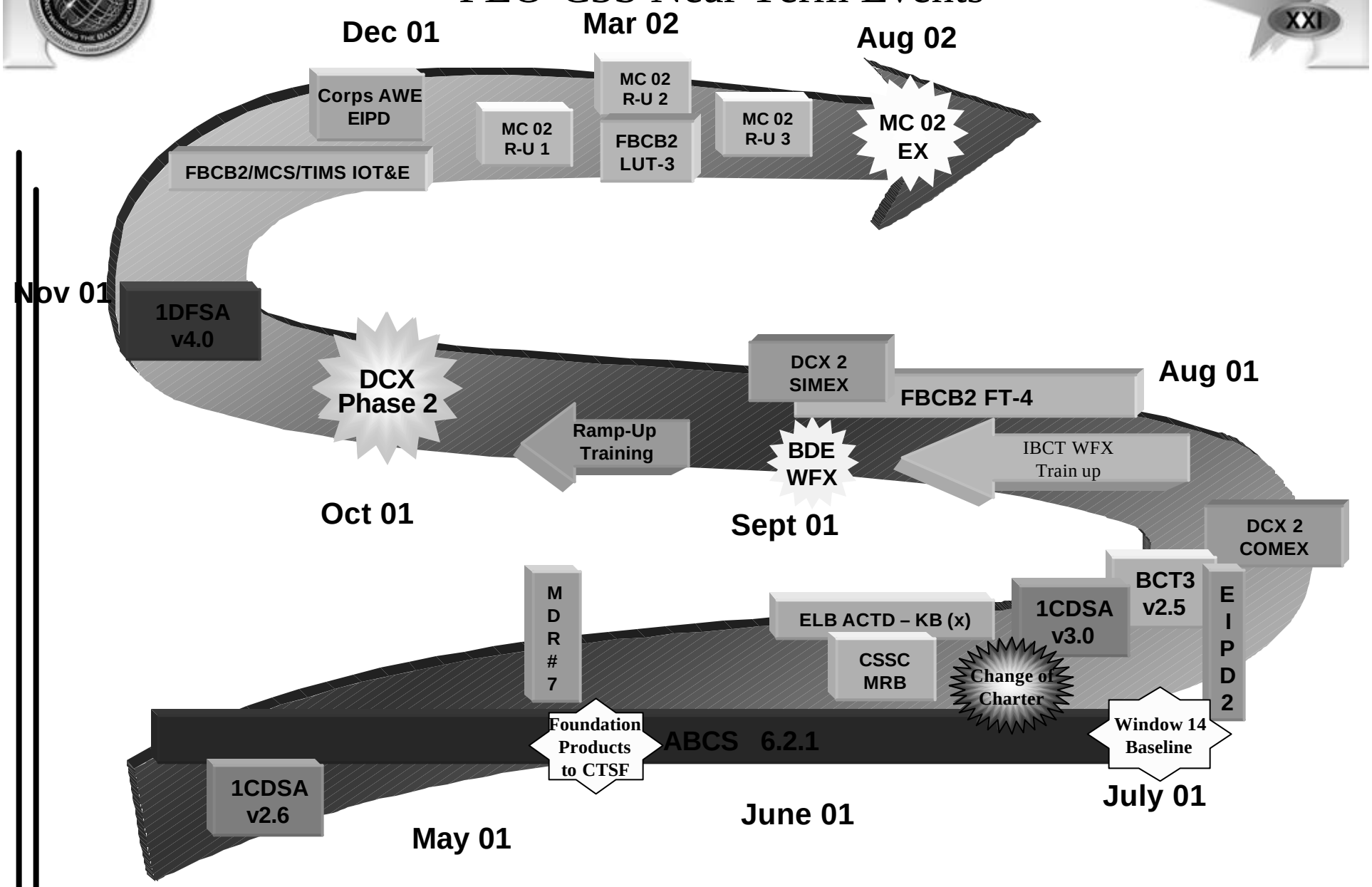
"… technology misapplied within an organization only guarantees failure"
Lifting the Fog of War



There must be a "dynamic convergence of the technological forces with the organizational and contextual forces."
ARI Newsletter Summer 99

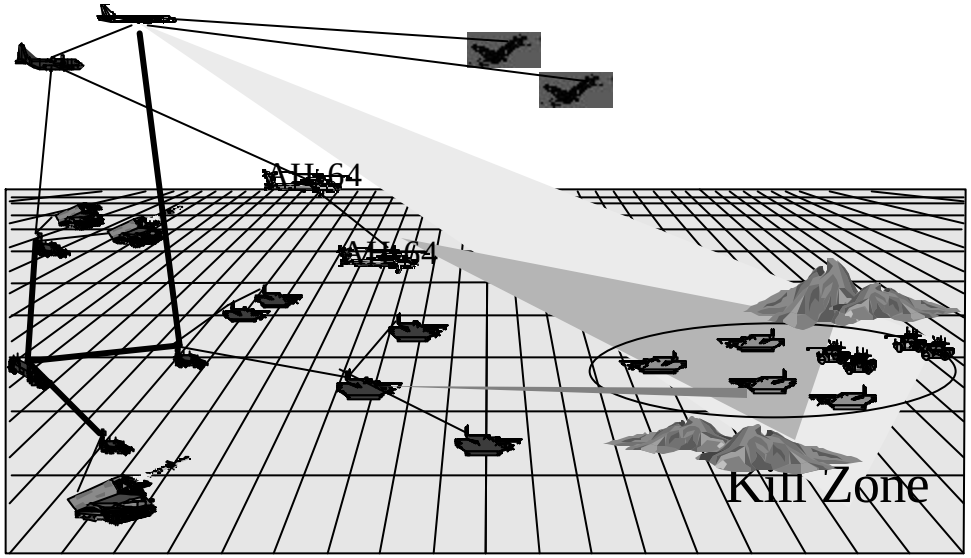
"Big changes in military capabilities took place when new weapons or other military equipment came into use along side equally pronounced shifts in tactics, doctrine and military organizations" **Lifting the Fog of War**

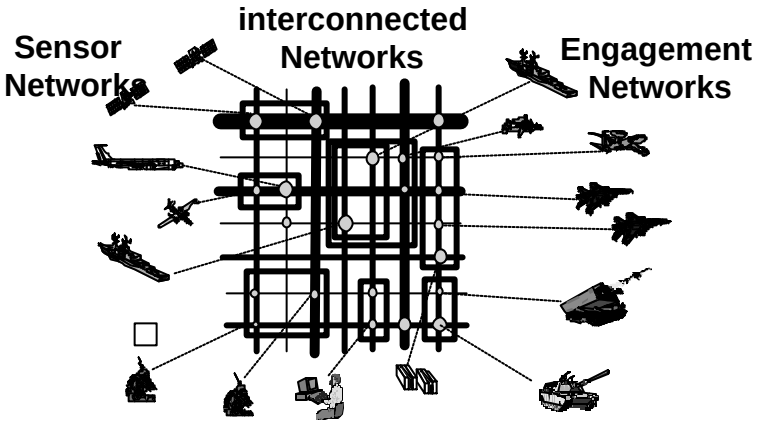
PEO-C3S Near Term Events

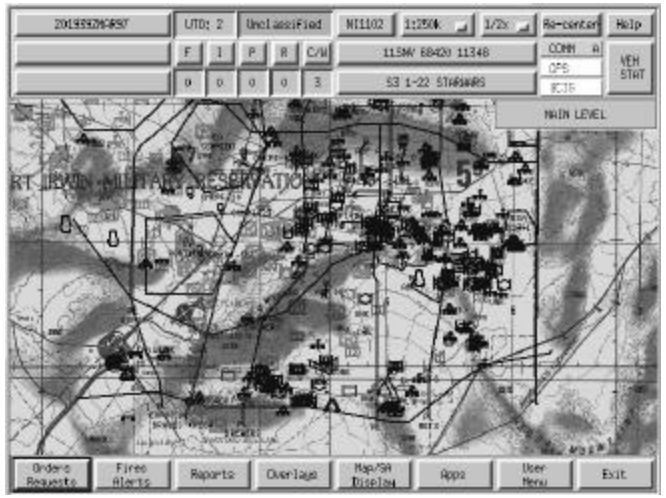


Army Digitization Backup

Army Digitization
Substituting Information for Forces







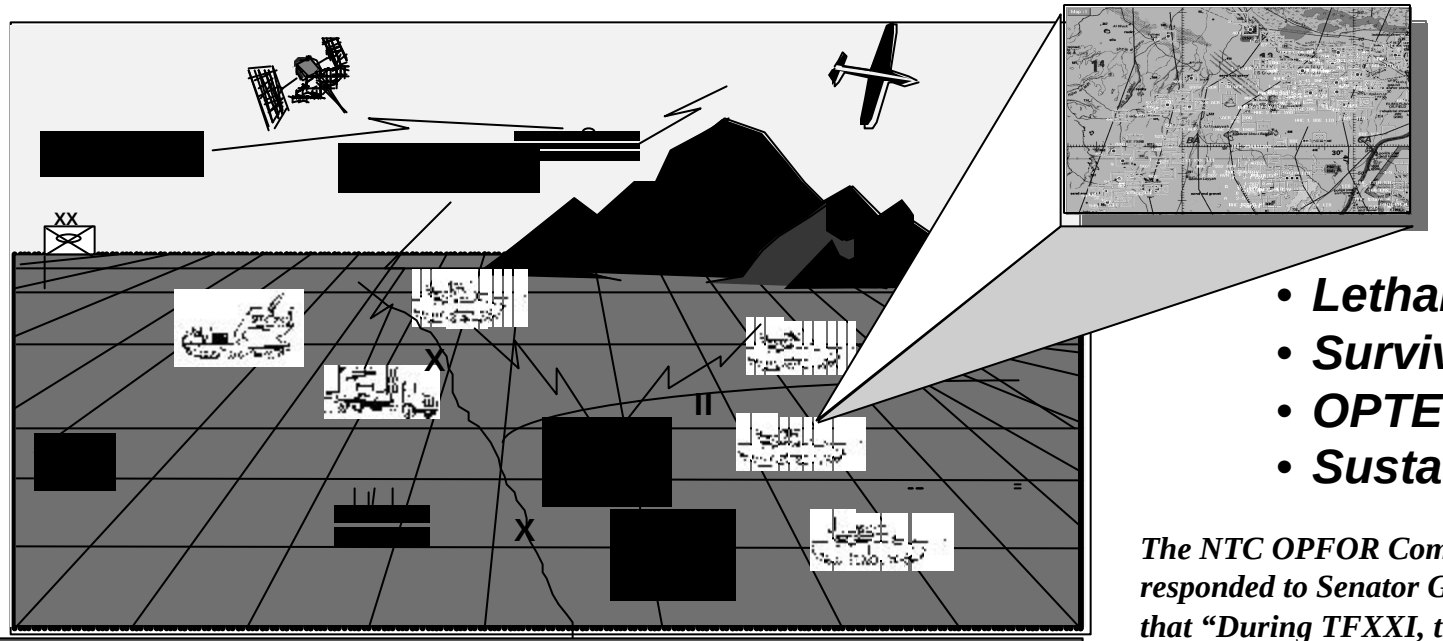
Increased Battlespace Awareness

- **Where Am I?**
- **Where Are My Buddies?**
- **Where Is the Enemy?**

What is Battlefield Digitization?

A Top Level View

Digitizing the Battlefield is the application of <u>information technologies</u> to acquire, exchange, and employ timely information throughout the battlespace, tailored to the needs of each decider (commander), shooter, and supporter. . . allowing each to maintain a clear and accurate vision of common battlespace necessary to support both planning and execution.[1]



From Strategic Base assets to the Tactical Level within the Army and within Joint/Combined operations

- ***Lethality***
- ***Survivability***
- ***OPTEMPO***
- ***Sustainability***

The NTC OPFOR Commander responded to Senator Glen in June 1997 that "During TFXXI, the digitized Brigade at the National Training Center successfully controlled three times the terrain - at a higher OPTEMPO than other non-digitized Brigades."

1. Reference: Special Task Force 2 on Battlefield Digitization

Self Forming, Self Healing Network

Pre- Legacy

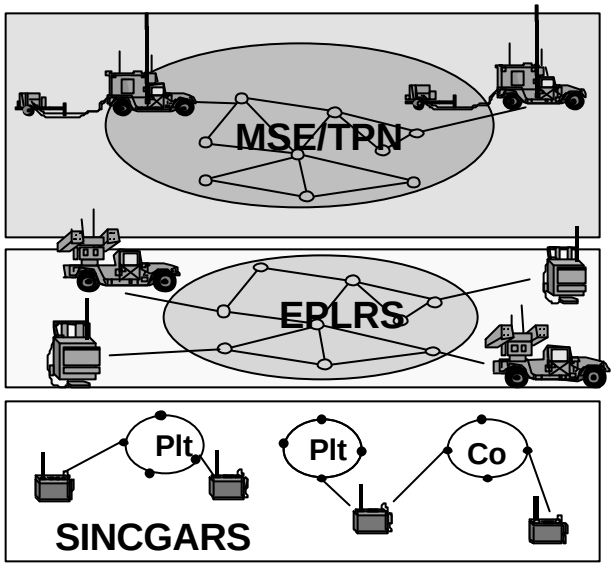
TTC-39

Deterministic Routing

pre-planned, pre-defined, fixed path routes

Self Forming, Self Healing

Legacy



Three separate internets and networks with little interaction
Required manual relay of information

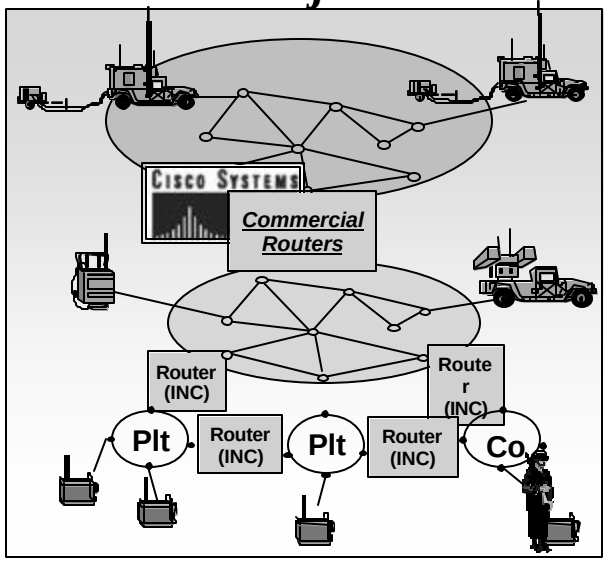
MSE

Flood-search Routing

by message, flood network to define best path

Transformation

IBCT and Objective Force



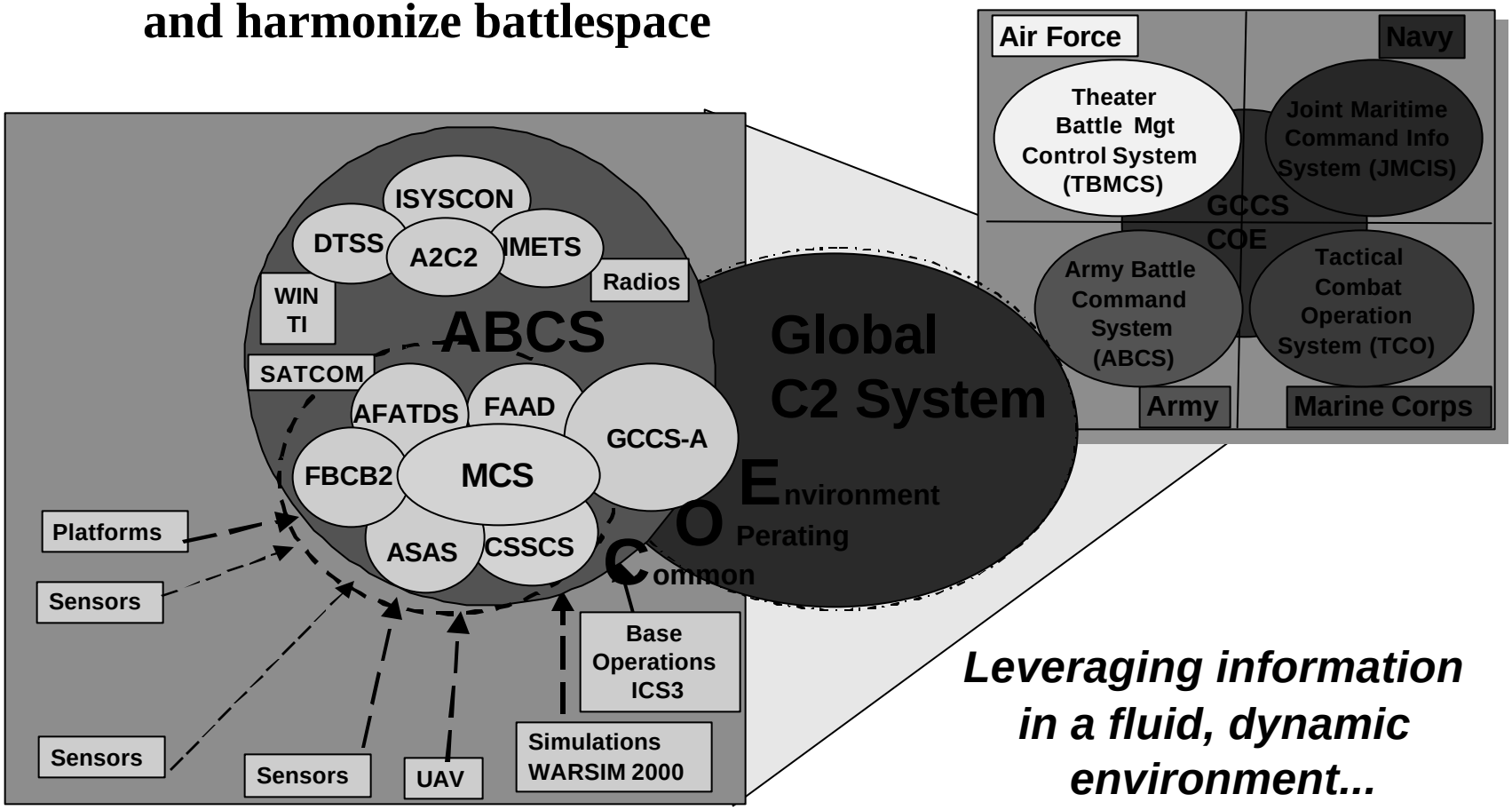
ONE seamless, pervasive intranet commercial router based
SINCGARS - upgraded "data capabilities"
EPLRS - throughput increased
MSE - Commercial ATM capable

IP - Optimal Path Routing

assured delivery, self-routing, multi-path

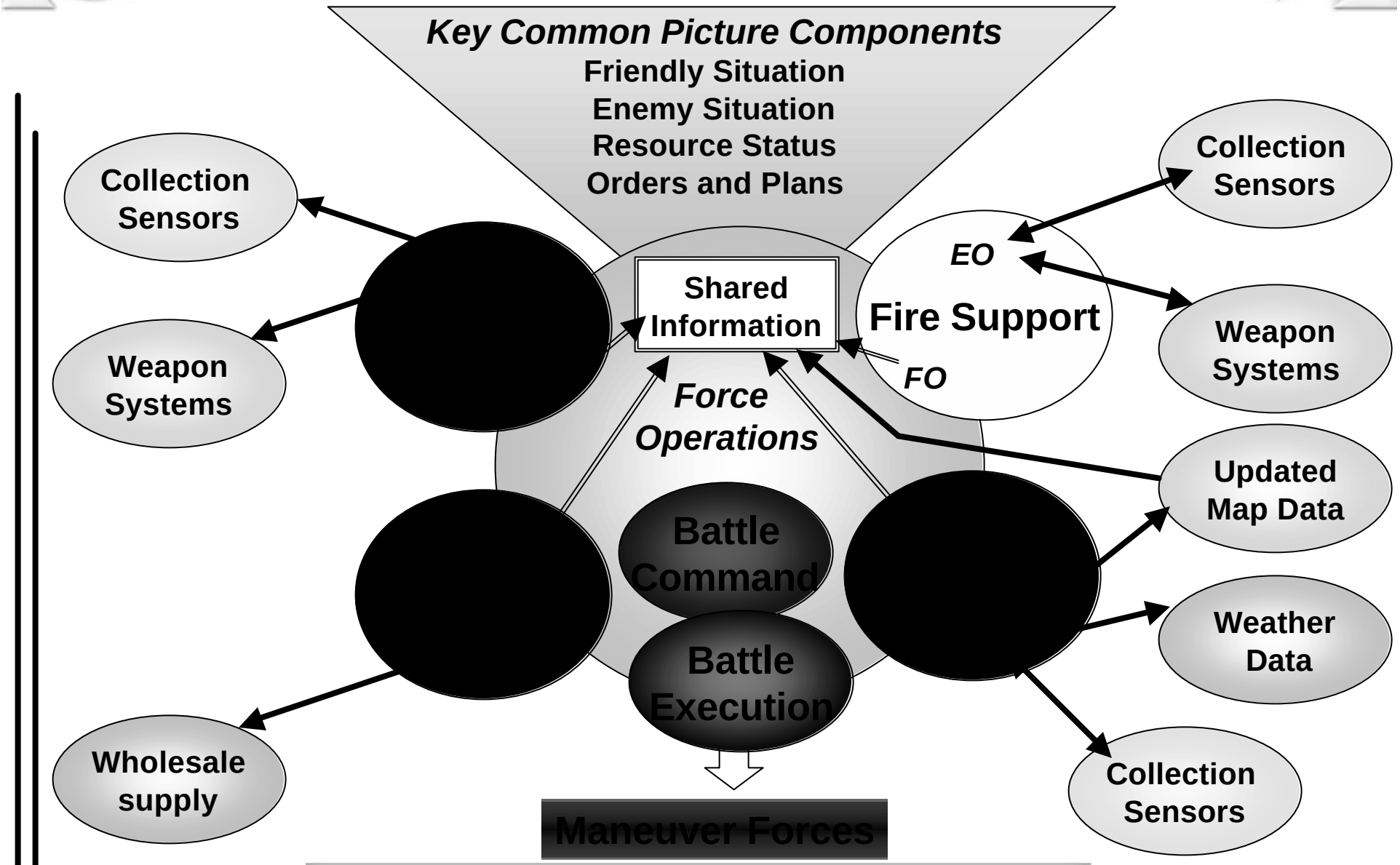
ABCS -- the Big Picture

- **Commander-centered**
- **Will allow the commander to clearly see and harmonize battlespace**

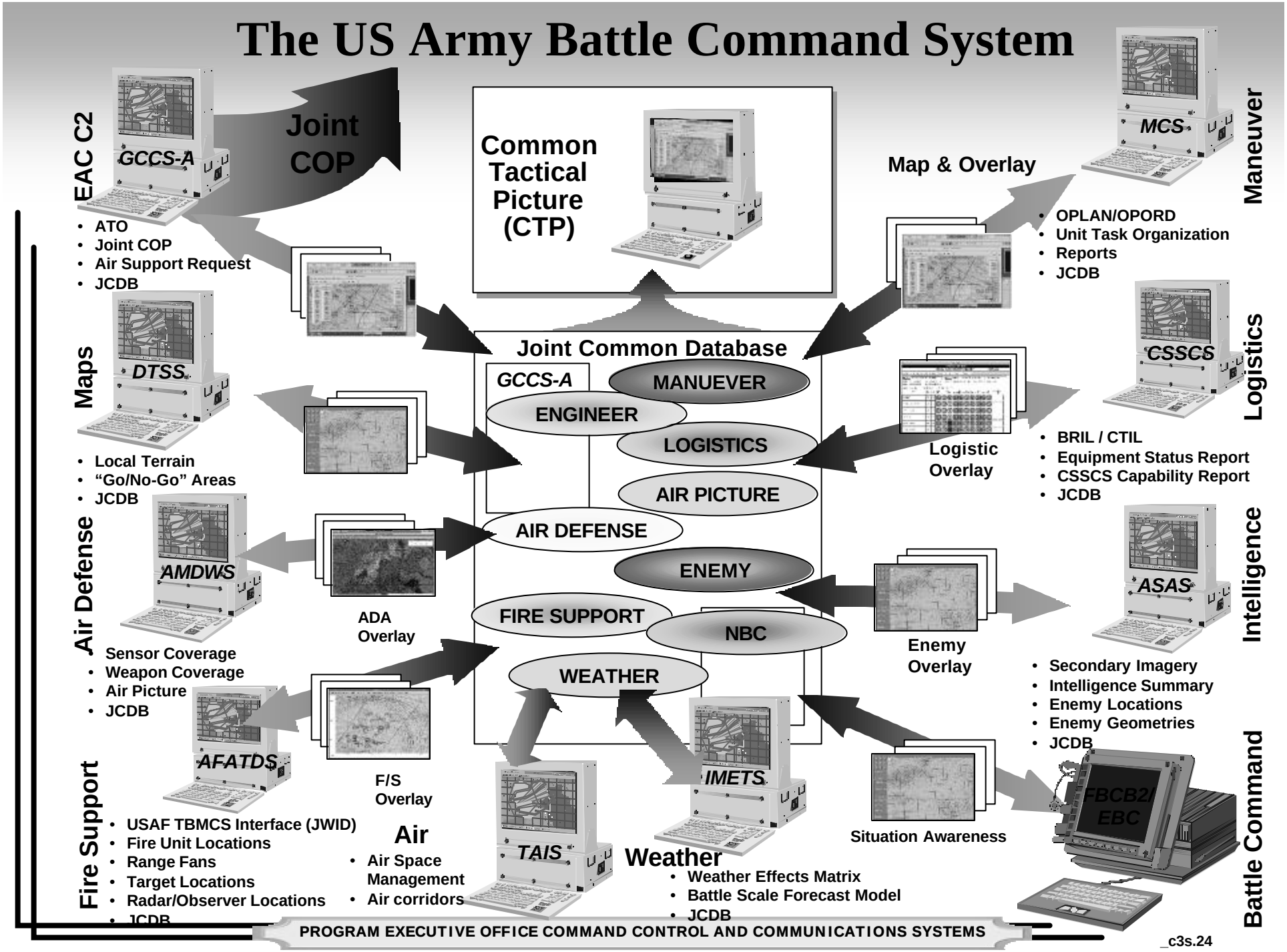


Leveraging information in a fluid, dynamic environment...

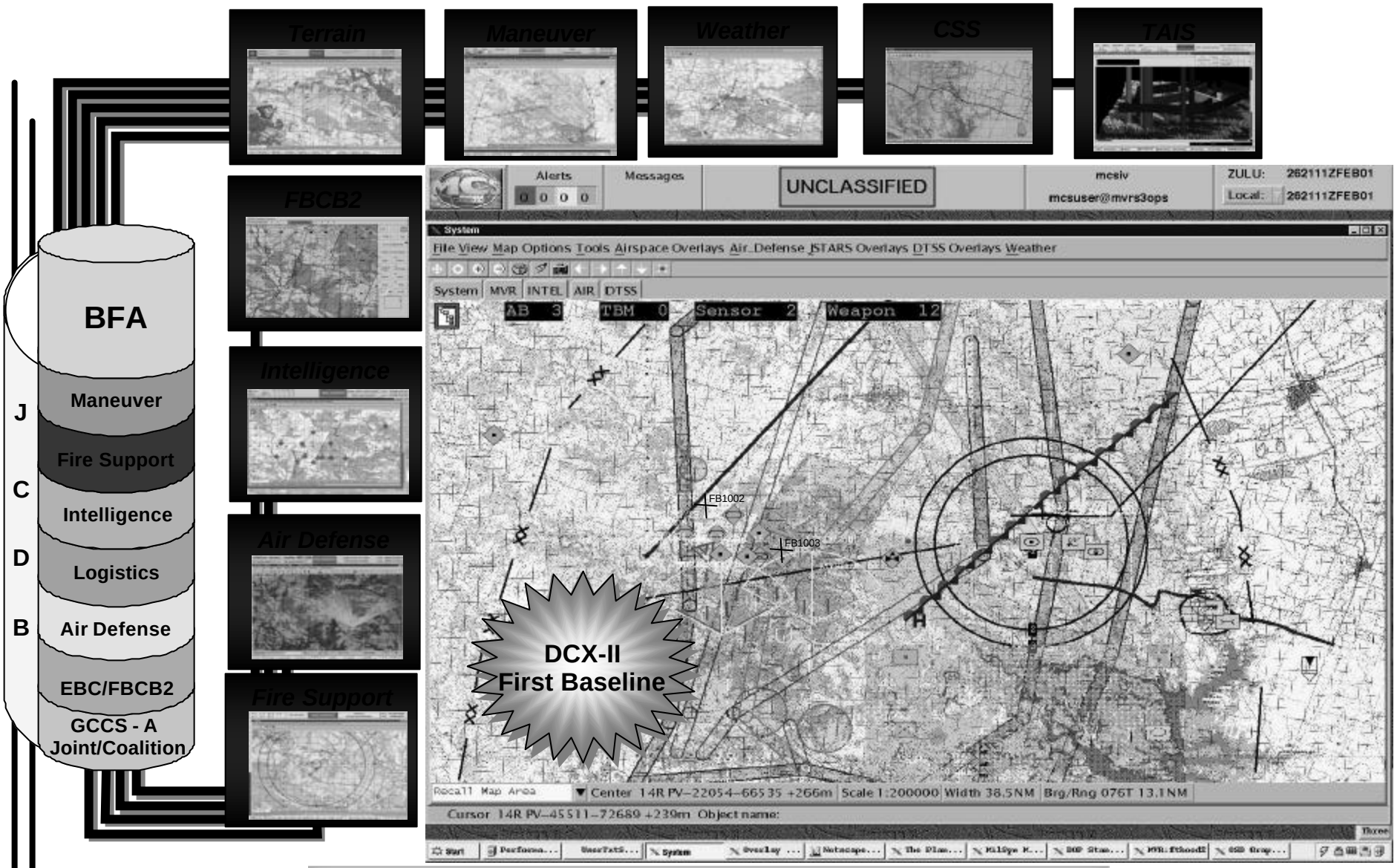
Engagement Operations and Force Operations



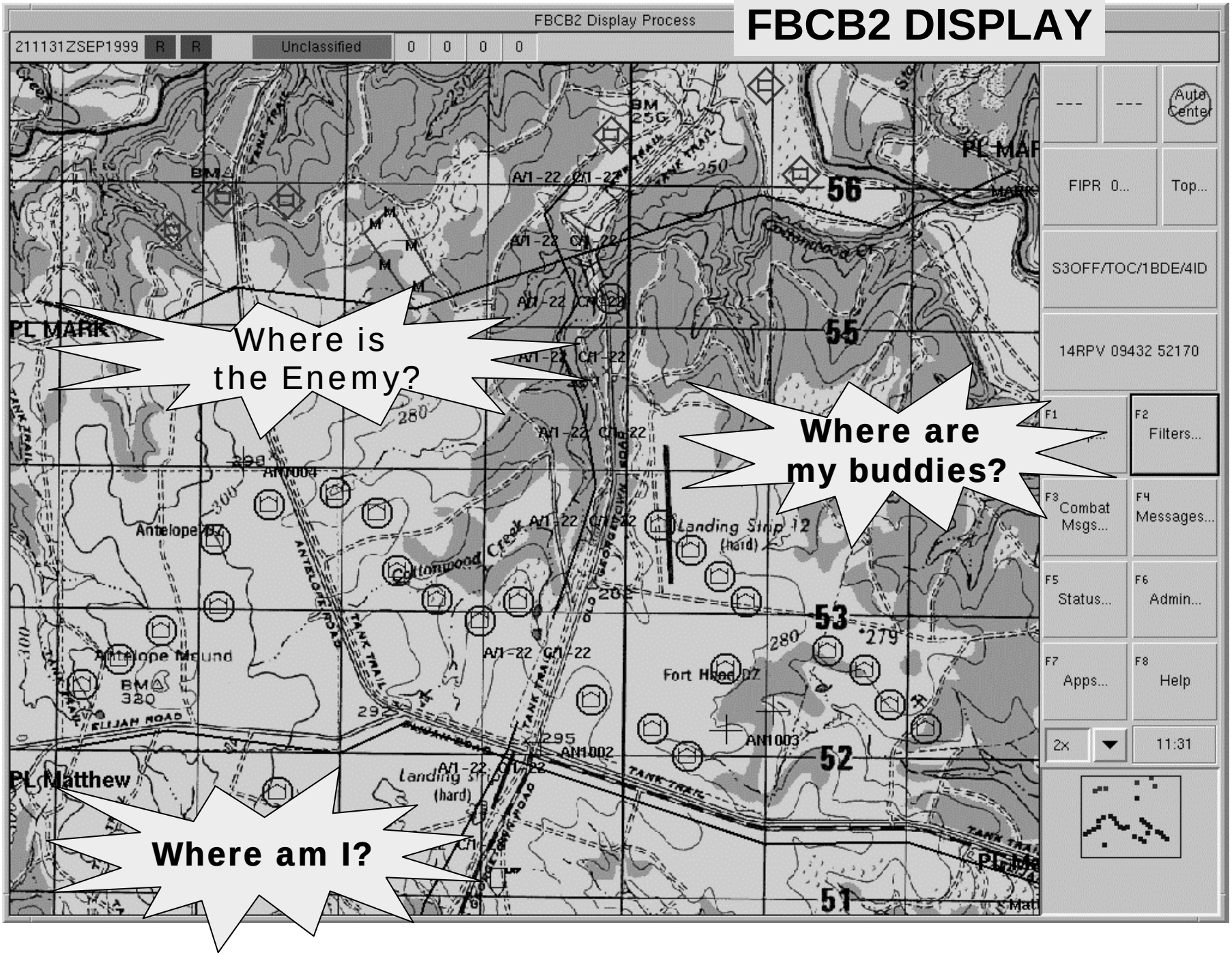
The US Army Battle Command System



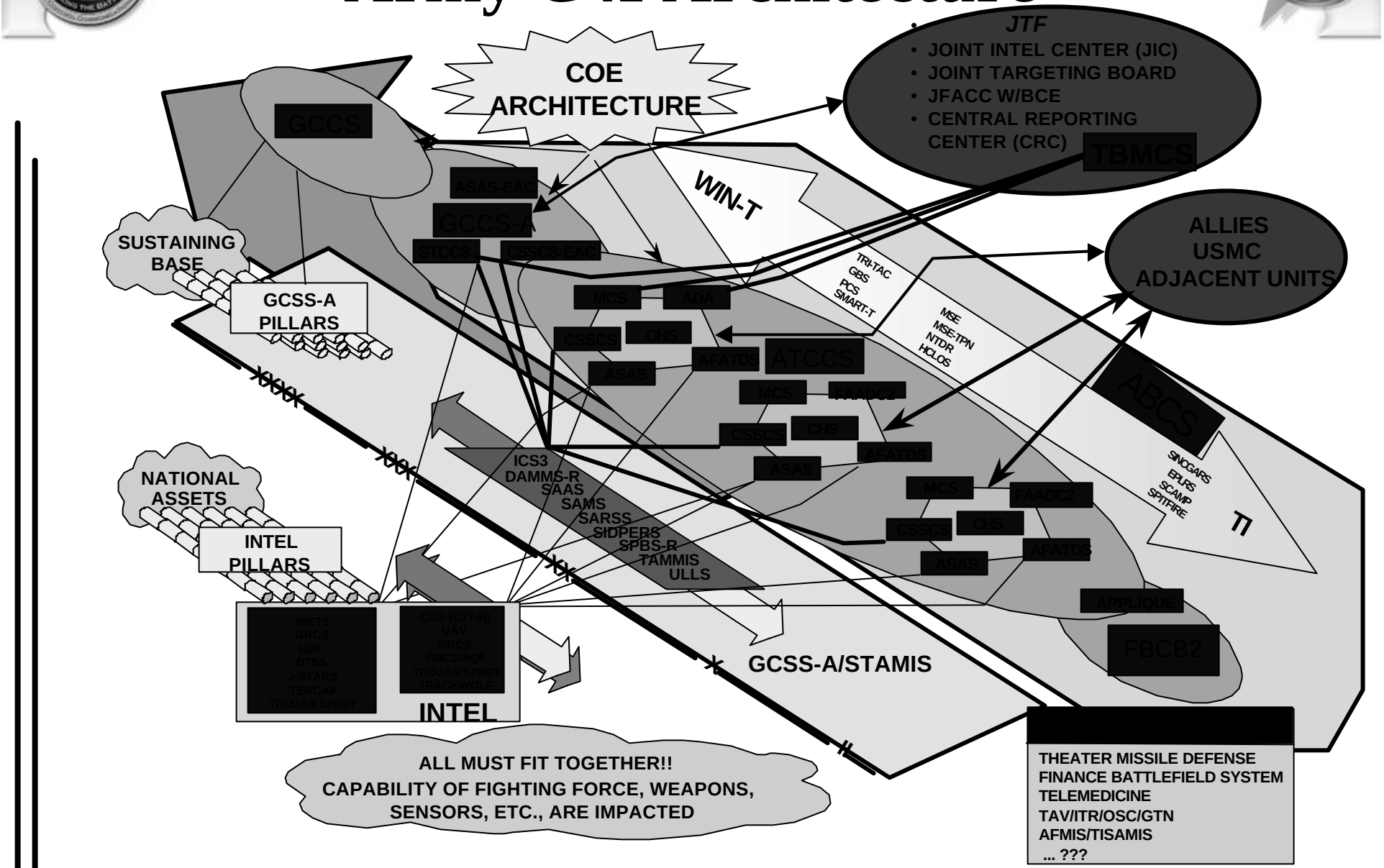
Creating Common Tactical Picture
ABCS 6.2 at DCX-I



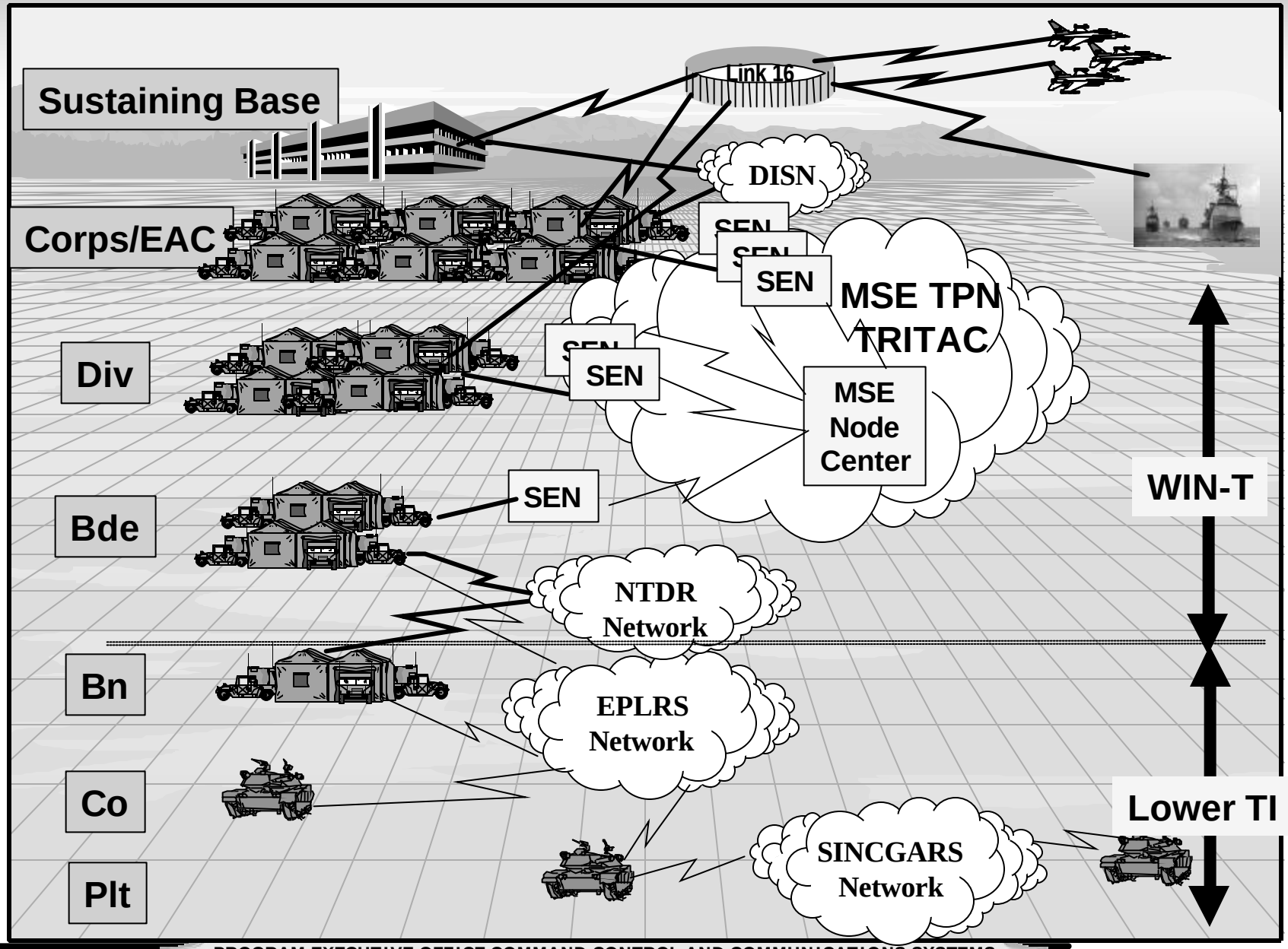
FBCB2 DISPLAY



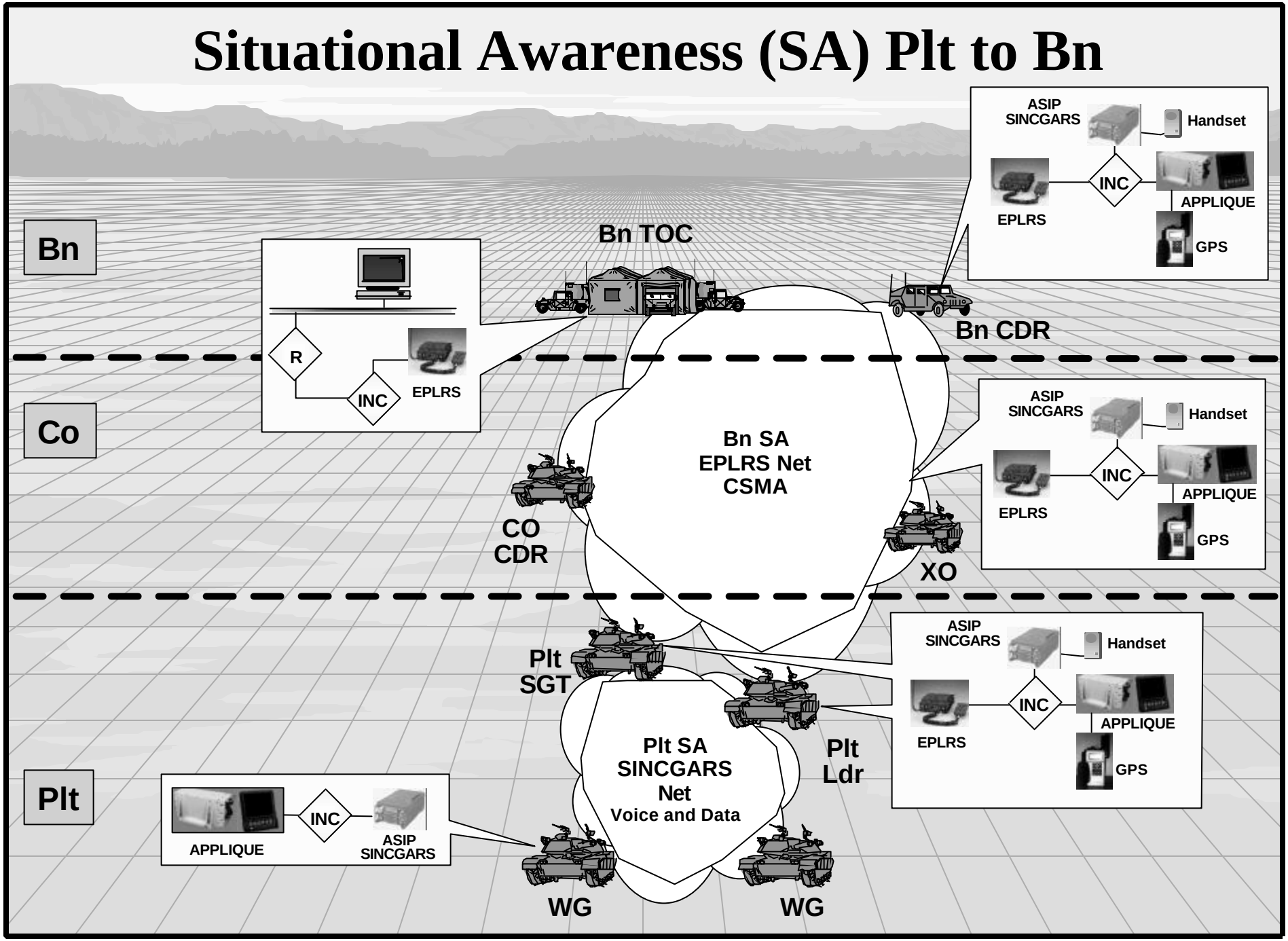
Army C4I Architecture



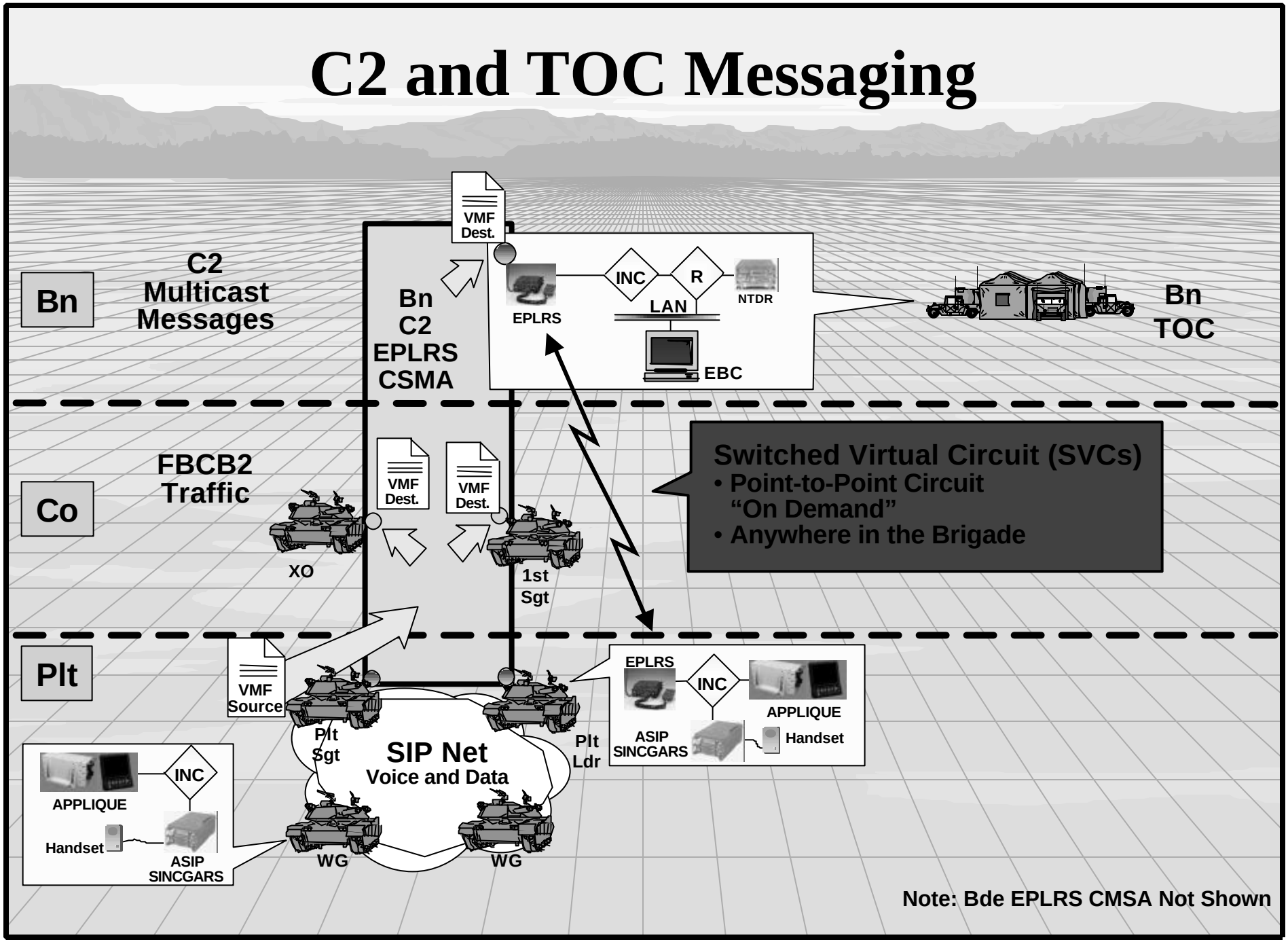
Battlefield Communications Overview



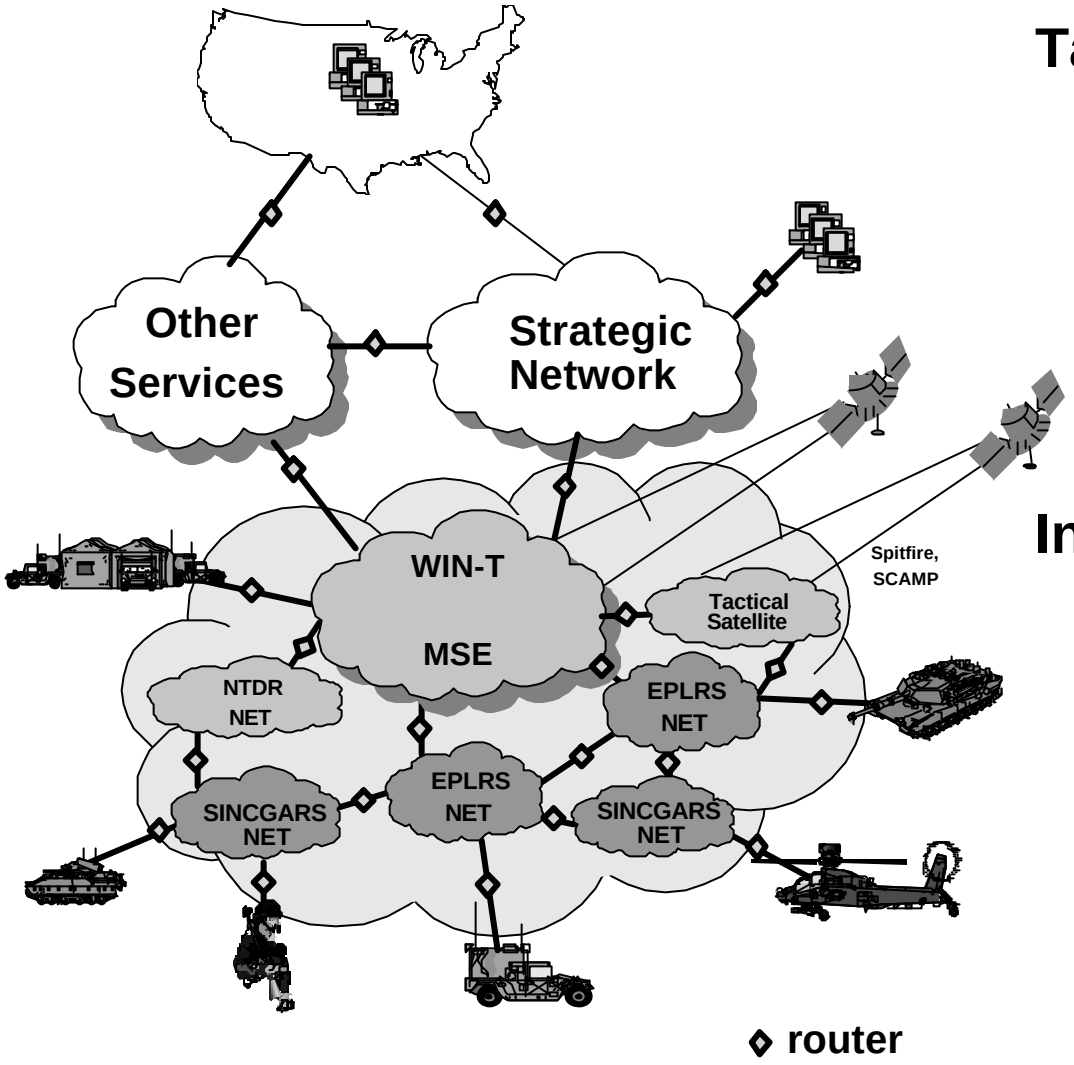
Situational Awareness (SA) Plt to Bn



C2 and TOC Messaging



Tactical Internet



Tactical

- Communications infrastructure at Corps and below
- Extends the architecture adopted by DISA and the Army at strategic levels

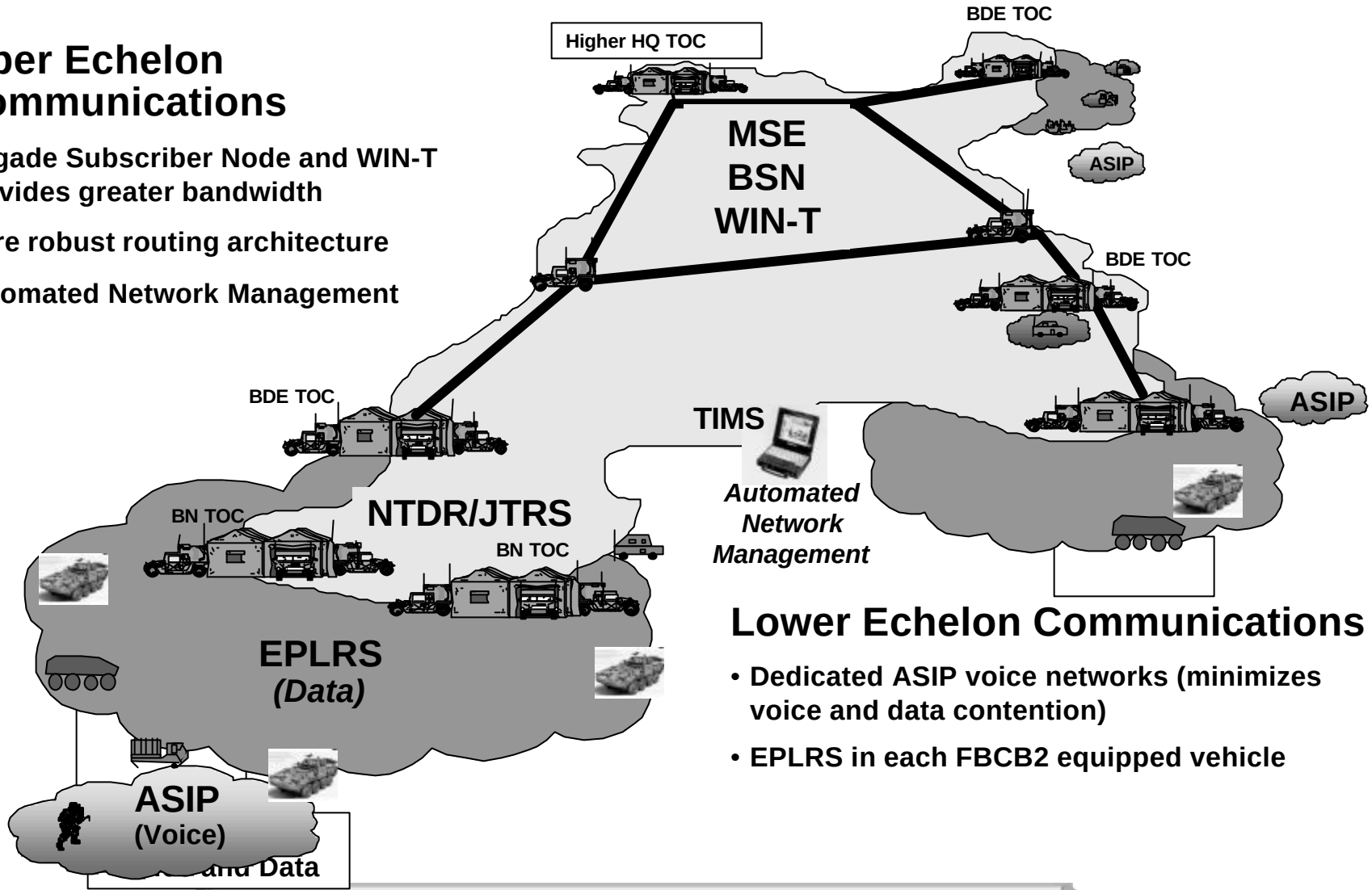
Internet-based

- Based on the standards and architecture used in the Internet
- Internet Protocol (IP) suite
- Router-based architecture
- De facto commercial network standards and products

Terrestrial Communications
(Transformation)

Upper Echelon Communications

- Brigade Subscriber Node and WIN-T provides greater bandwidth
- More robust routing architecture
- Automated Network Management

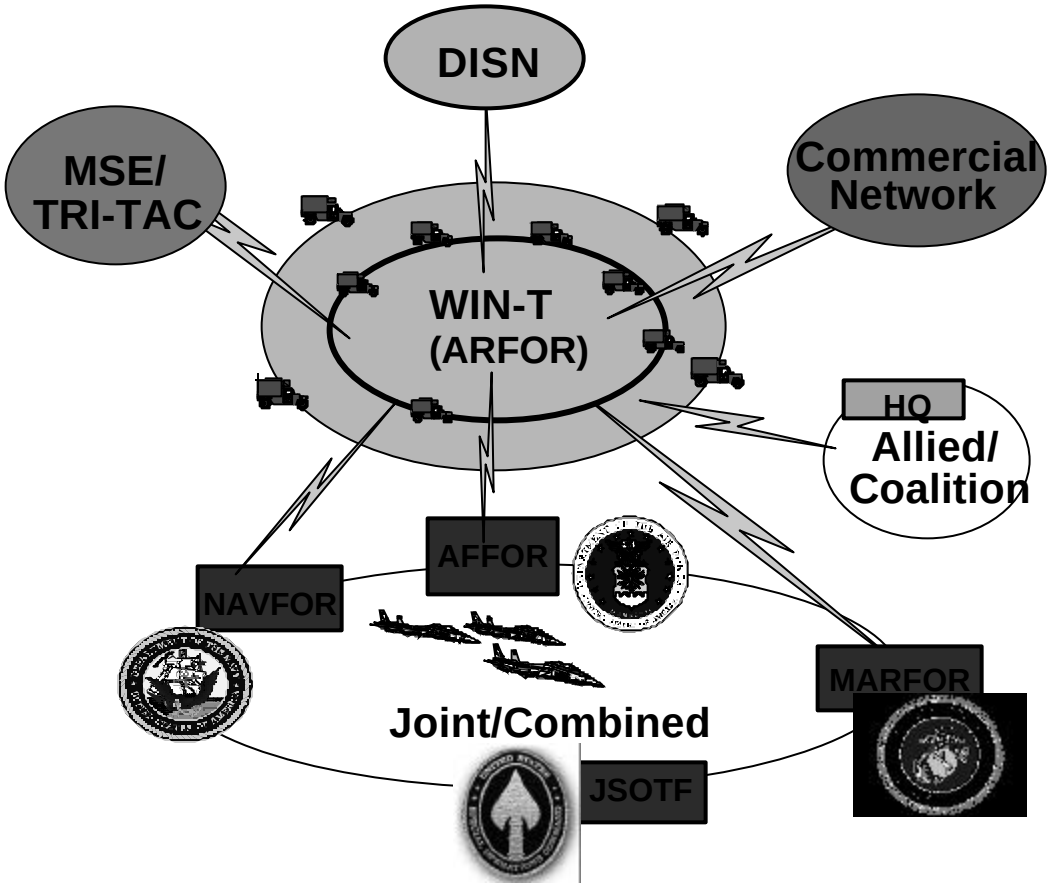


Lower Echelon Communications

- Dedicated ASIP voice networks (minimizes voice and data contention)
- EPLRS in each FBCB2 equipped vehicle

WIN-Tactical

"Transforming the Army"



…. an Army "Intranet" that provides mobile, secure, survivable, seamless multimedia connectivity between all elements within the battlespace

- **JTA Compliant**
- **Fully Interoperable with legacy, tactical, strategic, sustaining base, Joint, Allied and commercial networks**
- **Supports voice, data, and video at multiple security levels**
- **Provides coverage over extended battlespace**
  - **Division – 120 x 200 km**
  - **Brigade – 40 x 100 km**
  - **Battalion – 20 x 50 km**
- **Mobile platforms capable of providing network access at brigade and battalion level, to include operations on the move, on the pause and at the halt**
- **Equipment is capable of roll-on, roll-off operations on all transport aircraft**

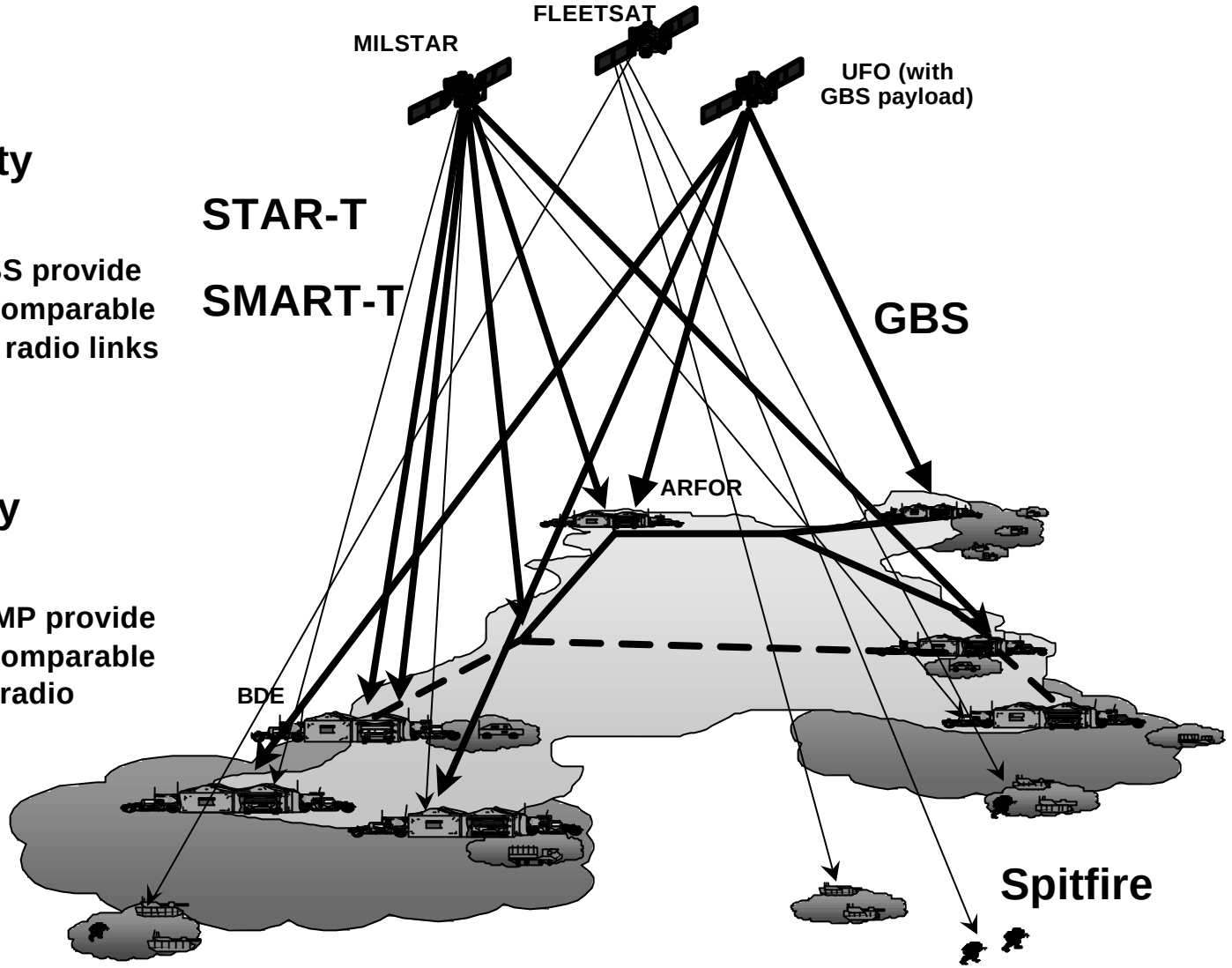
Satellite Communications

High-Capacity SATCOM

SMART-T and GBS provide link throughput comparable to upper echelon radio links

Low Capacity SATCOM

Spitfire and SCAMP provide link throughput comparable to lower echelon radio nets/links



DCX Backup

Division Capstone Exercise I

"Bottom Line Up Front"

DCXI – Demonstrated the first "Network Centric" Army Battlefield

(1) Blue Forces had a decided advantage over the world class OPFOR -

- **Synchronized**
- **Faster**
- **Night Capable**
- **Integrated with CAS (F-16 & A-10)**
- **Leveraged JSTARS MTI (to AH-64D)**

(2) Materiel Developer must make improvements prior to DXCII

- **Graphics - MCS to FBCB2**
- **Network Robustness**
- **FBCB2/EBC Stability - Bradleys & Abrams**

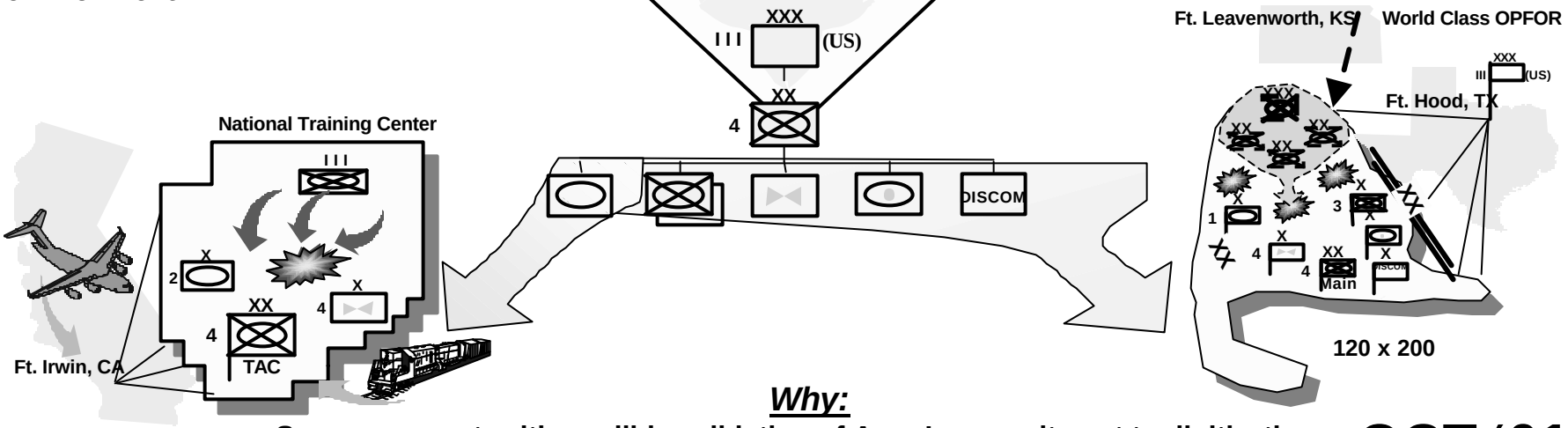
Division Capstone Exercise

What:

Demonstrate First Digitized Division in 01
Demonstrate relevance of Heavy Force in NMS
Demonstrate C2 systems functionality in a realistic environment

DEMONSTRATE
4th Infantry Division's go-to-war capability under realistic and demanding force projection scenario.

The Threat Environment: Adaptive
- **Technical Insertions**
- **Some digitization**
- **Powerful across the spectrum**
- **Asymmetric Capable**
- **Robust combined arms units**
- **Tactically Flexible**
- **Well trained**
- **"Lives in the Box"**



MAR '01

Why:

- **Secure support, with credible validation of Army's commitment to digitization**
- **Refine division O&O / design**
- **Answer previous/existing criticisms**
- **Provide comparative understanding of new force**
- **Demonstrate potential training methods of the future**
- **Demonstrate force effectiveness of FBCB2**

OCT '01

DCX-1 Overarching Objectives

- The Purpose of the Division capstone Exercise (Phase 1) was to demonstrate and assess the 4th ID's Mechanized Heavy and Aviation Brigades' ability to contribute decisively to III Corps' land campaign counteroffensive capability.

7 objectives for the DCX

1. Replicate a tough, demanding operational environment that will train the Mechanized Heavy and Aviation Brigades in their go to war METL.

2. Assess the effectiveness of Battle Command enhancements at each echelon of the Brigades' formations

3. Assess the Brigades' force effectiveness across the Battlefield Functional Areas

4. Assess the Brigades' ability to employ information as a decisive element of combat power

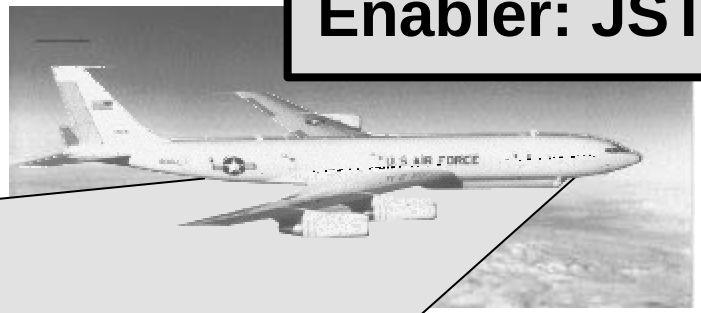
5. Determine the contribution of ABCS to the Brigades' warfighting effectiveness

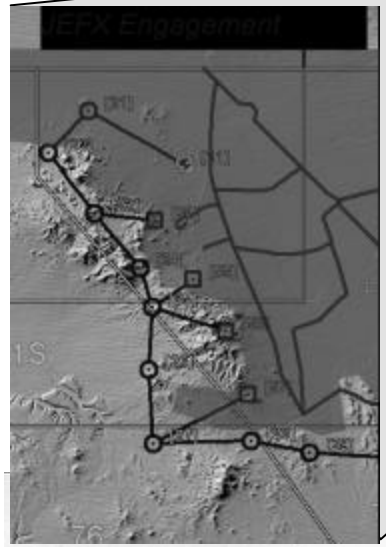
6. Determine DTLOMS refinements required for the brigade and below formations

7. Protect the force during all phases of the exercise

Enabler: JSTARS MTI to AH-64D

JSTARS





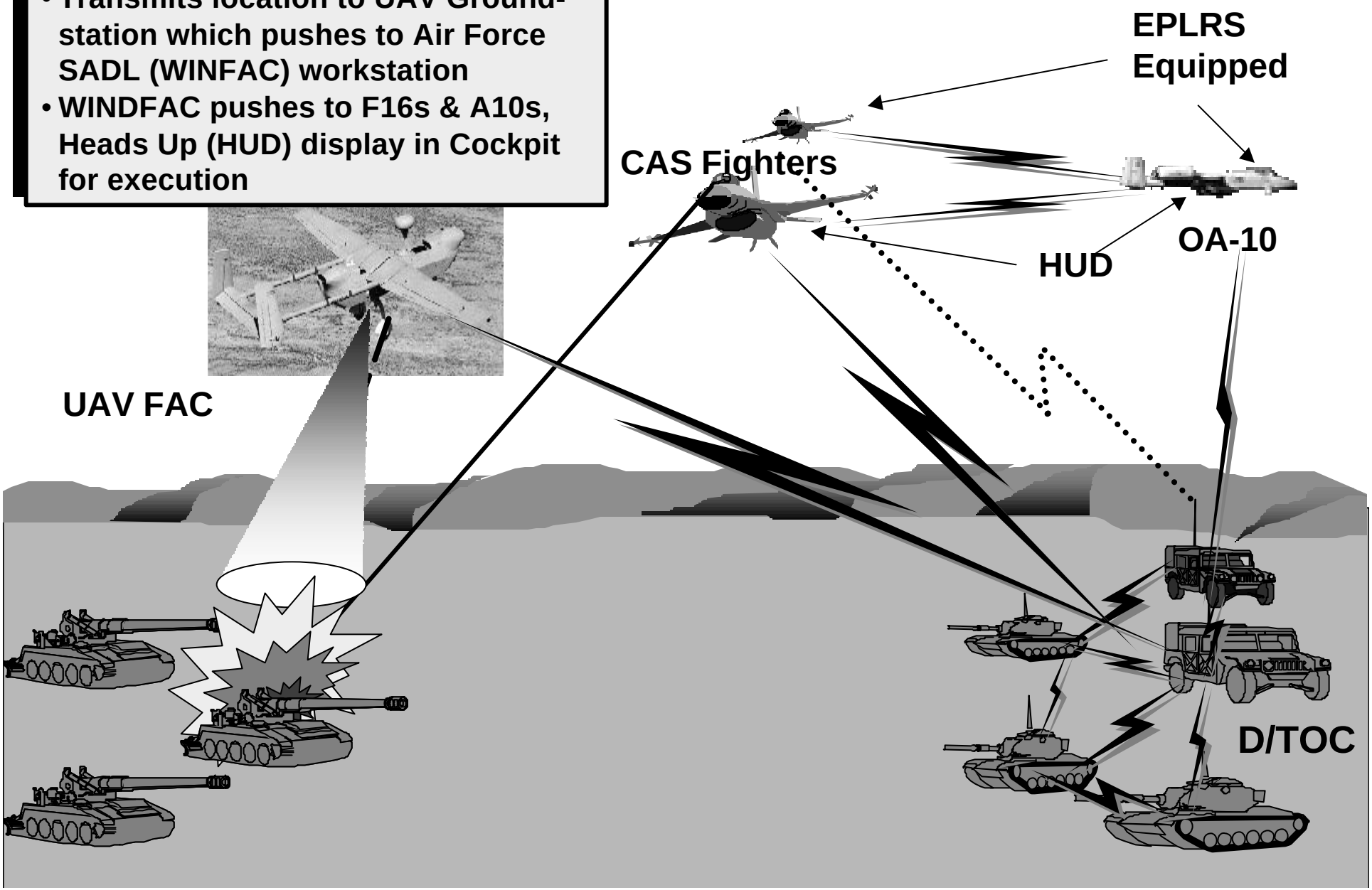
- ★ JSTARS collects MTI
- ★ JSTARS passes MTI to AH-64D
- ★ MTI appears on AH 64D display

Longbow Display

"Scenario"

- UAV identifies targets
- Transmits location to UAV Ground-station which pushes to Air Force SADL (WINFAC) workstation
- WINDFAC pushes to F16s & A10s, Heads Up (HUD) display in Cockpit for execution

Enabler: F-16 & A-10s Link to UAV & CGS



Enabler: FBCB2

"Scenario"

Spoiling Attack –

- **A platoon leader was given a mission to conduct Spoiling Attack.**
- **Without a prepared plan, platoon used current information on FBCB2 to identify routes which offered maximum cover and concealment. Platoon obtain excellent fire positions with superior line of site.**
- **Enemy caught off guard and completely destroyed.**

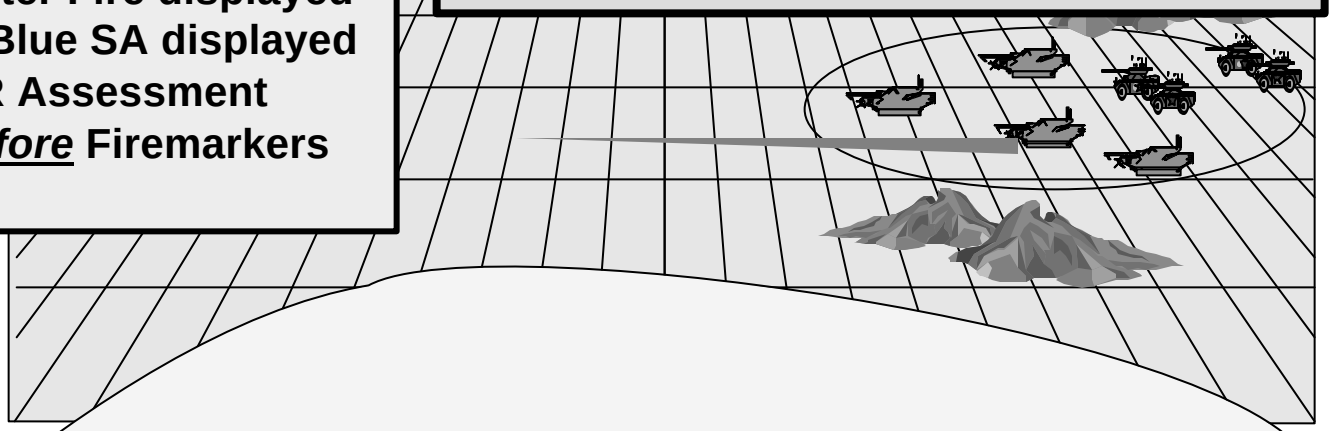
FBCB2
Force XXI Battle Command - Brigade and Below

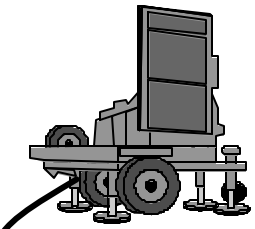
"Scenario"

On AFATDS-

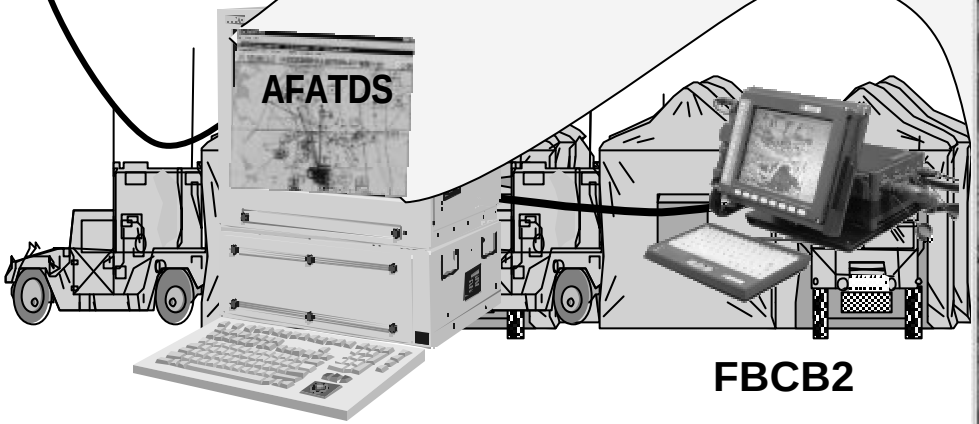
- **Red – Enemy Fires displayed**
- **Blue – Friendly Counter Fire displayed**
- **FBCB2 – Generated Blue SA displayed**
- **Div. Eng/Divarty CDR Assessment**
- **Located FASCAM *before* Firemarkers emplaced**

Enabler: Networking Fires, Firefinder and FBCB2 Generated SA

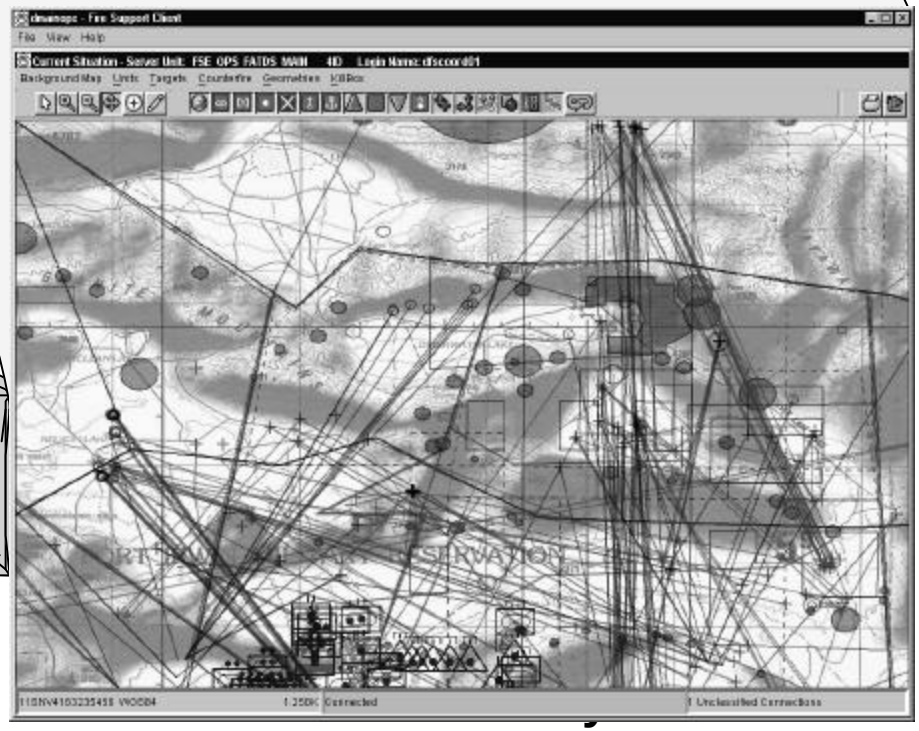




Firefinder



FBCB2



Summary

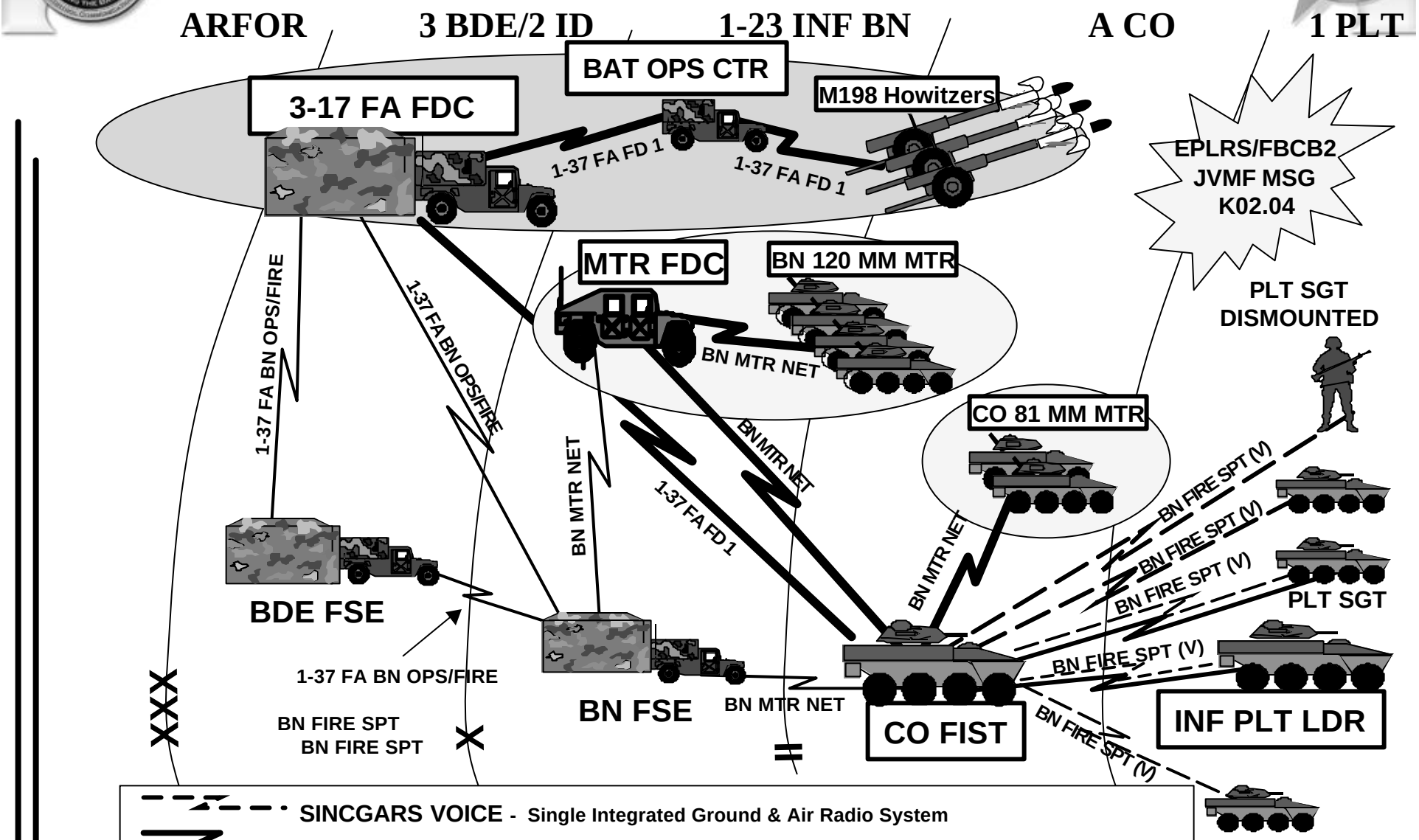
At the Technical and Material level we are on a roadmap to carry the Army through the "Current Force" to the "Objective Force"

<u>We are Networking the Battlefield!!!!!</u>

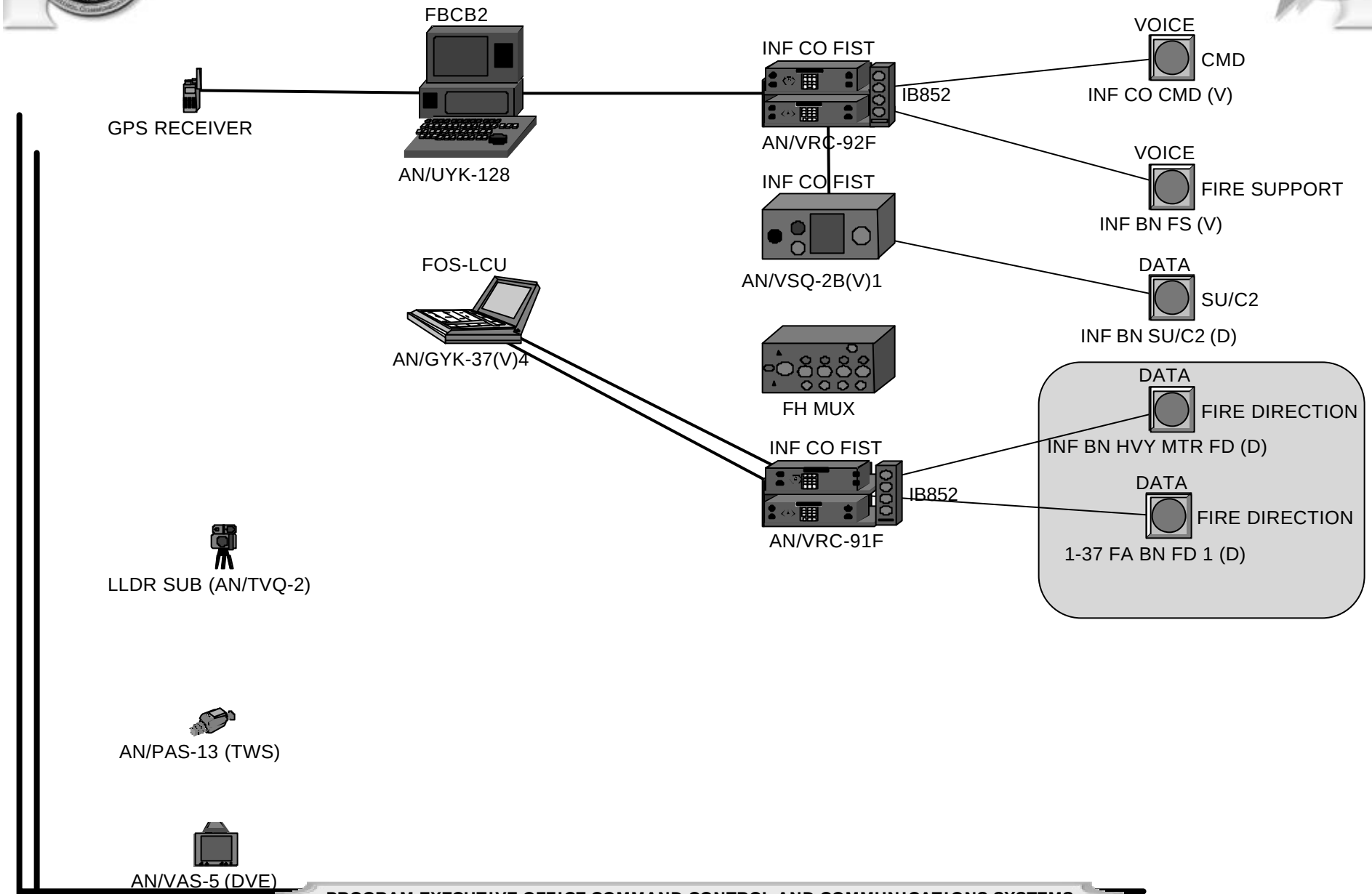
Next STOP DCX II

Fire Support Backup

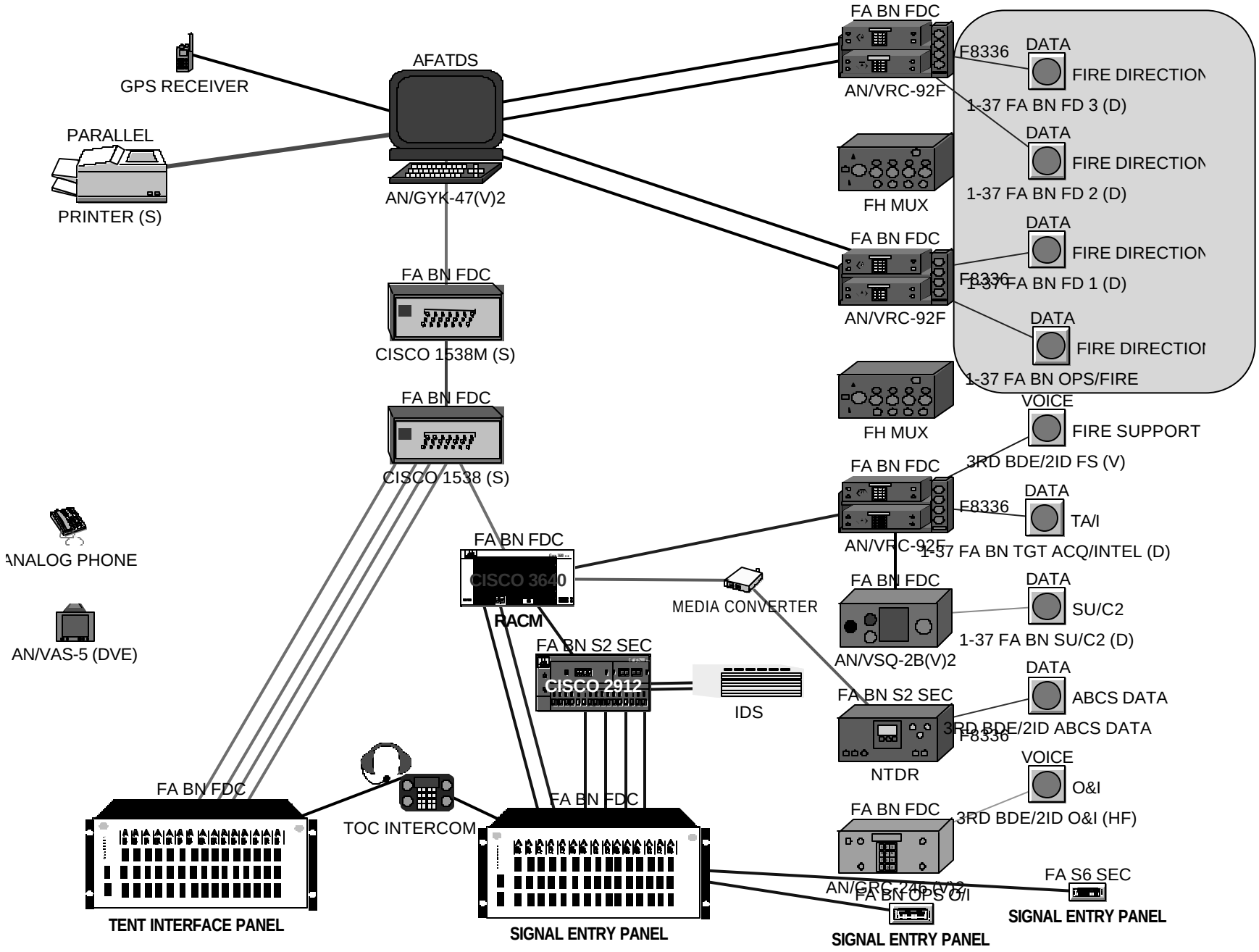
Fire Support Architecture (Data)



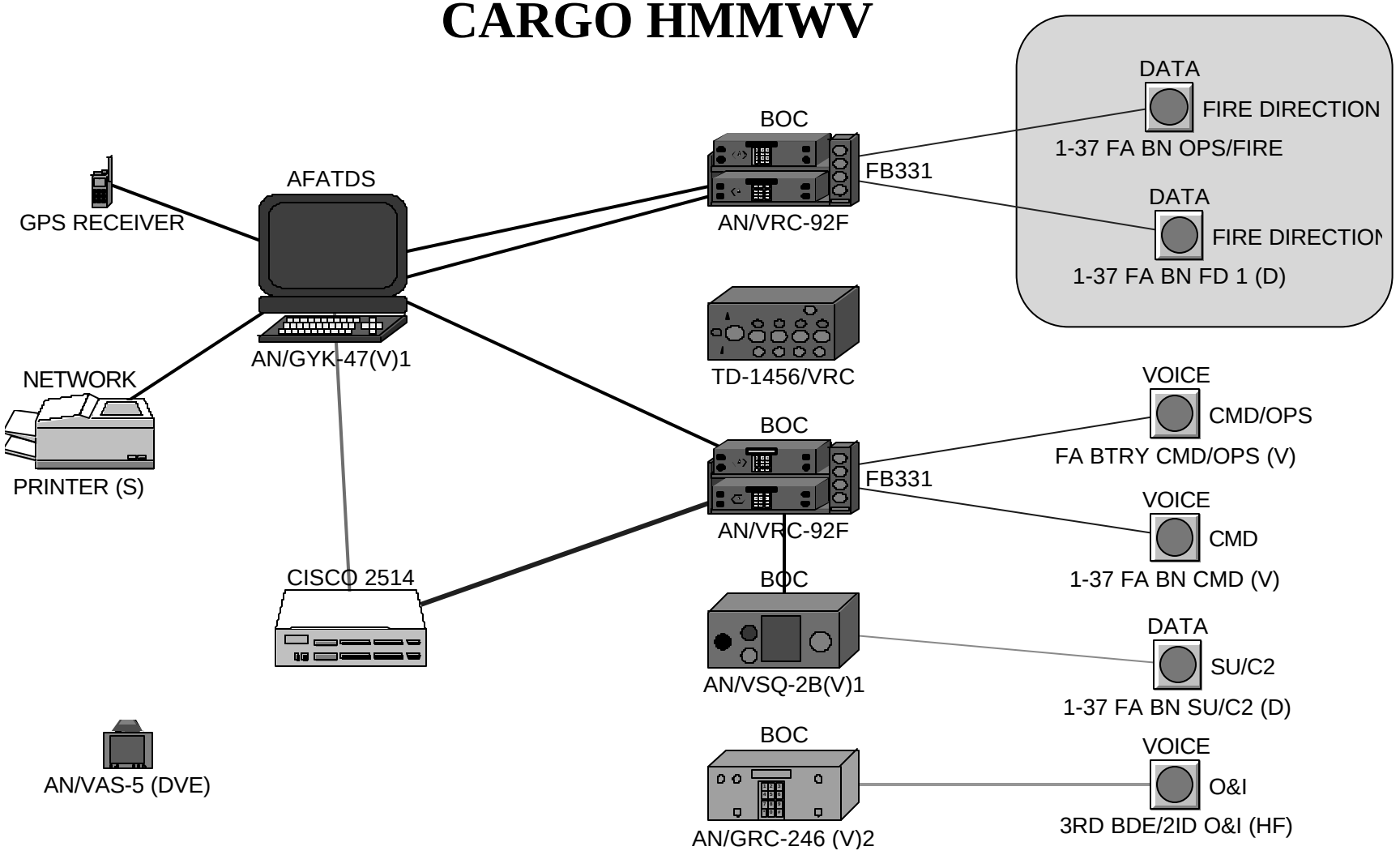
INF CO FIST - IAV



1-37 FA BN FDC – SICPS SHELTER

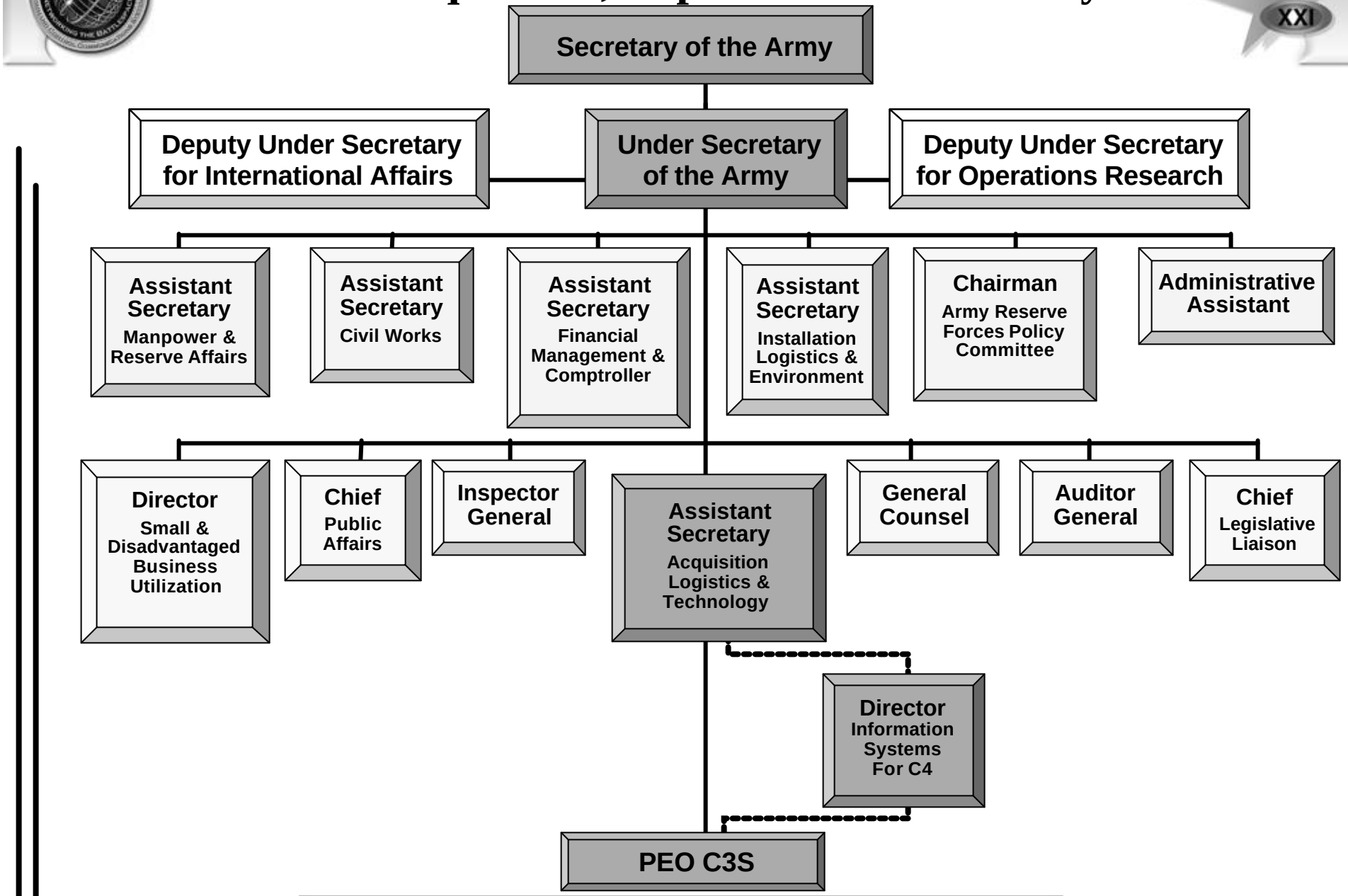


BATTERY OPERATIONS CENTER (BOC)
A/1-37 FA BN,
CARGO HMMWV



Other Backup

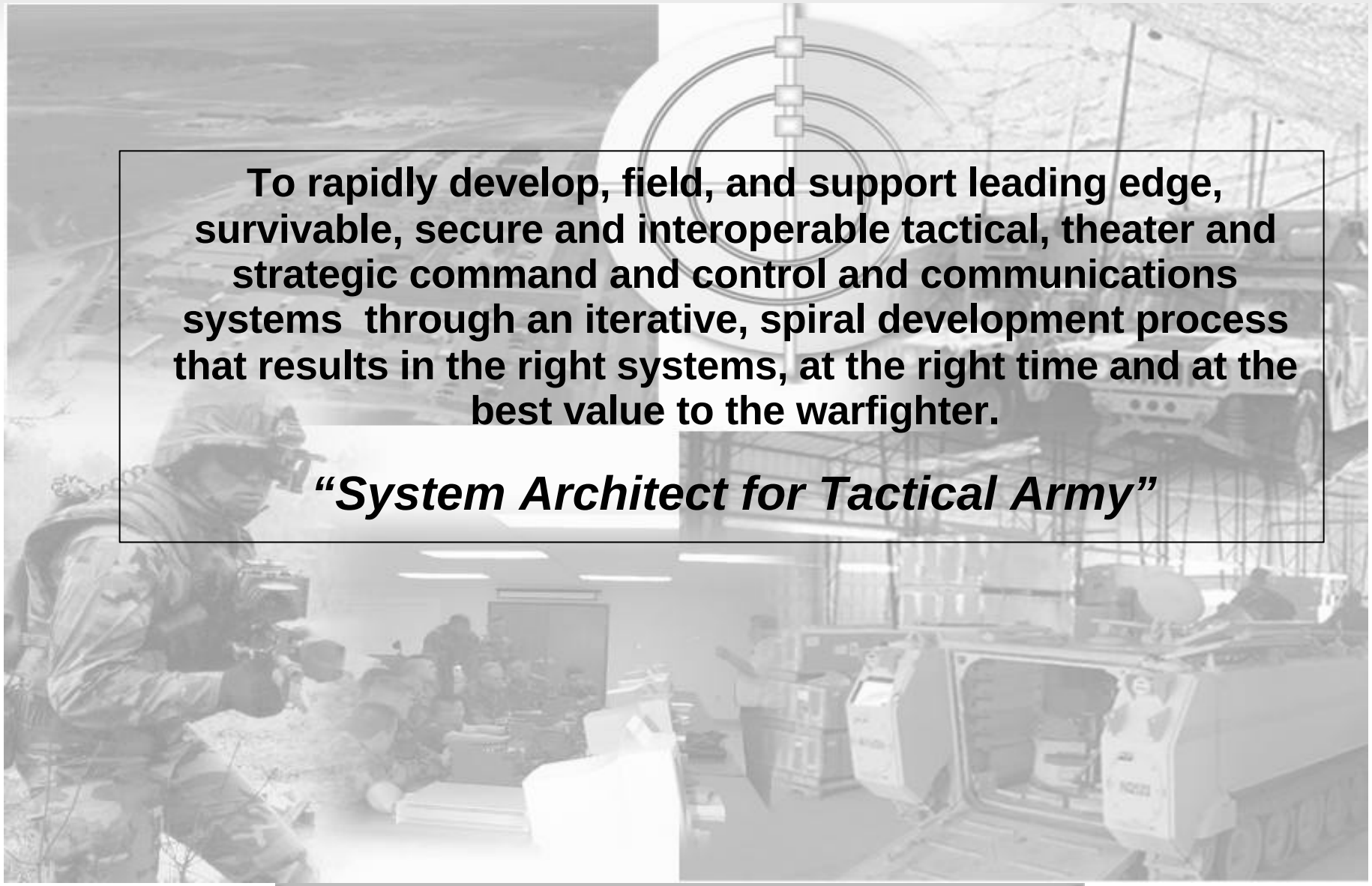
Headquarters, Department of the Army



PEO C3S Vision Statement

To be the Army's *change agent* for achieving battlespace supremacy through *information superiority* and *knowledge dominance*. The PEO is the *premier provider* to the warfighter of leap-ahead capabilities by seamlessly integrating rapid technology advancements into the Joint and Combined Command Control, Communications, Computers and Intelligence (C4I) system through a *robust architectural framework* and an evolutionary, *spiral development process*.

PEO C3S Mission Statement



To rapidly develop, field, and support leading edge, survivable, secure and interoperable tactical, theater and strategic command and control and communications systems through an iterative, spiral development process that results in the right systems, at the right time and at the best value to the warfighter.

"System Architect for Tactical Army"

Acronym Definitions

Acronym	Definition
A2C2	Army Airspace Command and Control
A2C2S	Army Airborne Command & Control System
ABCS	Army Battle Command System
ACN	Airborne Communications Network
ACTD	Advanced Concept Technology Demonstration
ACUS Mod	Area Common User System Modernization
ADA	Air Defense Artillery
AFATDS	Advanced Field Artillery Tactical Data System
AKMS	Army Key Management System
AMDCCS	Air and Missile Defense Command and Control System
AMDPCS	Air and Missile Defense Planning and Control System
AMDWS	Air and Missile Defense Work Station
AMPS	Aviation Mission Planning System
AOE	Army of Excellence
ARFOR	Army Forces
ARI	? Newsletter
ASAS	All Source Analysis System
ATC	Army Test Center
ATCCS	Army Tactical Command and Control System
ATEC	Army Test and Evaluation Center
ATM	Asynchronous Transfer Mode
ATO	Air Tasking Order
AWE	Advanced Warfighter Experiment
BCS	Battery Computer System
BCT	Brigade Combat Team
BDE or Bde	Brigade
BFA	Battlefield Functional Area
BFIST	Bradley Fire Support Team
BN or Bn	Battalion
BPV	Battle Planning and Visualization
BSN	Brigade Subscriber Node
C2	Command and Control
C3I	Command, Control, Communications and Intelligence
C3S	Command, Control and Communications Systems

Acronym Definitions *(Cont)*

Acronym	Definition
C4I	Command, Control, Communications, Computers, and Intelligence
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance and Reconnaissance
CBS	Corps Battle Simulator
CCU	Compact Computer Unit
CECOM	US Army Communications-Electronics Command
CGS	Common Ground System
CHIMS	Combat Intelligence/Human Intelligence Information Management System
CHS	Common Hardware System
CI/HUMINT	Combat Intelligence/Human Intelligence
CMP	Common Message Processor
CO or Co	Company
COE	Common Operating Environment
COP	Common Operating Picture
CTIS	Combat Terrain Information System
CTP	Common Tactical Picture
CSEL	Combat Survivor Evader Locator
CSA	U.S. Army Chief of Staff
CSS	Combat Service Support
CSSCS	Combat Service Support Command and Control System
CTSF	Central Technical Support Facility
DAWE	Division AWE
DCX	Division Capstone Exercise
DII	Defense Information Infrastructure
DIICOE	DII Common Operating Environment
DISN	Defense Information System Network
DIVARTY	Division Artillery
DIVENG	Division Engineers
DMS	Defense Message System
DSA	Deputy for Systems Acquisition
DTAC	Division Tactical Command Post
DTSS	Digital Topographic Support System
DUSA ()R)	?
EAC	Echelons Above Corps
EBC	Embedded Battle Command
EHF	Extremely High Frequency
ELB	Extended Littoral Battlespace
EPG	Electronic Proving Ground
EPLRS	Enhanced Position Location Reporting System

Acronym Definitions *(Cont)*

Acronym	Definition
FAADC2	Forward Area Air Defense Command and Control
FATDS	Field Artillery Tactical Data Systems
FBCB2	Force XXI Battle Command Brigade and Below
FED	Forward Entry Device
FHMUX	Frequency Hopping Multiplexer
FM	Frequency Modulation
FO	Forward Observer
FOS	Forward Observer System
FSAC	Fire Support Ada Conversion
FSE	Fire Support Element
GB	Gigabyte
GBS	Global Broadcast Service
GCCS-A	Global Command and Control System – Army
GCSS-A	Global Combat Service Support - Army
HCLOS	High Capacity Line of Sight Radio
HCU	High Capacity Unit
HTU	Handheld Terminal Unit
HW	Hardware
IBCT	Initial Brigade Combat Team or Interim Brigade Combat Team
ICS	? - Base Operations
IFSAS	Initial Fire Support Automated System
IMETS	Integrated Meteorological System
INC	Interface Network Card
IP	Internet Protocol
ISYSCON	Integrated System Control
ITRT	Individual Tactical Reporting Tool
JANUS/STORM	Joint Army Navy Uniform Simulation/Simulation, Testing, Operations and Rehearsal Model
JCF AWE	Joint Contingency Force AWE
JCDB	Joint Common Database
JRTC	Joint Readiness Training Center
JTA	Joint Technical Architecture
JTIDS	Joint Tactical Information Distribution System
JTRS	Joint Tactical Radio System
JVMF	Joint Variable Message Format
KM or km or Km	Kilometer

Acronym Definitions *(Cont)*

Acronym	Definition
LAN	Local Area Network
LCU	Lightweight Computer Unit
LDR	Low Data Rate
LFED	Lightweight Forward Entry Device
LNO	Liaison Office
LOGSTAT	Logistics Status
MARFOR	Marine Forces
MB	Megabyte
MBC	Mortar Ballistic Computer
MC02	Millennium Challenge 2002
MCE	Maneuver Commander's Environment
MCS	Maneuver Control System
METT-TC	?
MFCS	Mortar Fire Control System
MHz	MegaHertz
MI ACT	Military Intelligence Analysis and Control Team
MIDS	Multifunction Information Distribution System
MILSATCOM	Military Satellite Communications Systems
MSE	Mobile Subscriber Equipment
MTS	Movement Tracking System

Acronym	Definition
NAVFOR	Navy Forces
NBC	Nuclear, Biological & Chemical
NCU	Notebook Computer Unit
NSC	National Simulation Center
NTC	National Training Center
NTDR	Near Term Digital Radio
PCS	Personal Communications System
PEO	Program Executive Officer
PD	Project Director
PLT	Platoon
PM	Project Manager
OP	Observation Post
OPFOR	Opposing Forces
OPLAN	Operations Plan
OPORD	Operations Order
OPTEMPO	Operations Tempo
R&D	Research and Development
ROK	Republic of Korea
S&T	Science and Technology
SA	Situational Awareness
SATCOM	Satellite Communications

Acronym Definitions *(Cont)*

Acronym	Definition
SCAMP	Single Channel Anti-jam Manportable Terminal
SCOTT	Single Channel Objective Tactical Terminal
SECOMP	Secure Enroute Communications Package
SEN	Small Extension Node
SICPS	Standard Integrated Command Post System
SINCGARS	Single Channel Ground and Airborne Radio System
SMART-T	Secure Mobile Anti-jam Reliable Tactical Terminal
SOTM	Satellite On The Move
STAR-T	Super High Frequency Tri-band Advanced Range Extension Terminal
STRICOM	Simulation, Training and Instrumentation Command
SVR	Server
SW	Software
TACFIRE	Tactical Fire Direction System
TAIS	Tactical Airspace Integration System
TIDAT	?
TCU	Tactical Computer Unit
THSDN	Tactical High Speed Data Network
TI MGR	Tactical Internet Manager
TIMS	Tactical Internet Manager System
TMD	? An exercise
TPN	Tactical Packet Network
TOC	Tactical Operations Center
TRAC	TRADOC Analysis Center
TRADOC	US Army Training and Doctrine Command
TRCS	Tactical Radio Systems
TRITAC	Tri-Service Tactical Communications System
TTP	Training, Tactics, and Procedures
TUAV	Tactical UAV
USAF	United States Air Force
UAV	Unmanned Aerial Vehicle
USMC	United States Marine Corps
USN	United States Navy
VCU	Versatile Computer Unit
VF MED	?
WARSIM	Warfighters Simulation 2000
WIN-T	Warfighter Information Network – Tactical or Warfighter Information Network – Terrestrial
WSMR	White Sands Missile Range