FCS Training IPT

Briefing for

SEDRIS Technology Conference

presented by

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for

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Agenda

- Introduction
- FCS Embedded Training
- A Common Environment is Required
  - Background
  - FCS ORD Environmental Requirements
  - Data Model
  - Data Dictionary
- Summary

Embedded Training…..
a DoD plan ; an Army Commitment

"Build an Integrated Live, Virtual, and Constructive Training Environment. The ultimate goal is to develop a transformed training capability that provides accurate, timely, relevant, and affordable training and mission rehearsal in support of specific operational needs. Training must be a living process with the ability to adapt and respond quickly to the dynamic challenges of the national security environment. This will require the ability to identify potential crisis situations in real time; conduct course-of-action analyses; utilize continuously available networks for mission rehearsal, simulation and just-in-time training; and measure performance systematically to improve operational effectiveness."

Strategic Plan for Transforming DoD Training, 1 Mar 02

FCS Embedded Training

UA/FCS Training Concept

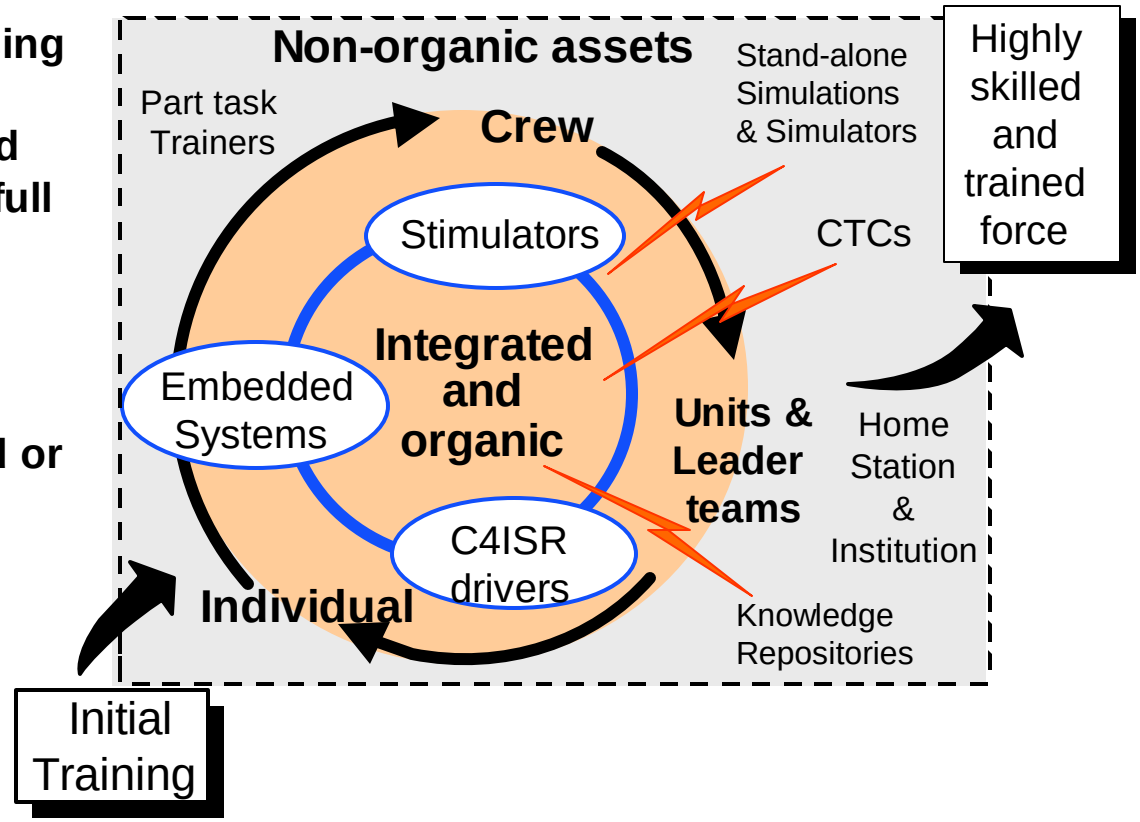
Training is THE factor in determining the victor.

- DSB Task Force on Training Superiority and Training Surprise

- **Expanded training availability using organic, integrated, embedded systems - Training, Operations, and Mission Planning/ Rehearsal – for full spectrum training including JIM**

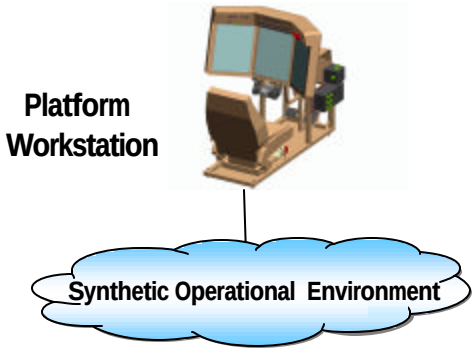
- **Full range of training task representation - individual, crew, collective, and leaders – embedded or 'reach' via C4ISR system**

- **Reduced training burden & cost resulting from product line design approach - maximum commonality between operational and training systems.**

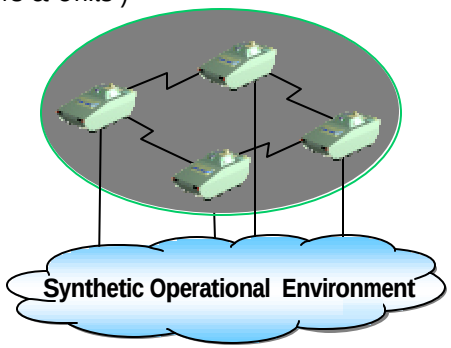


Training Systems Capabilities

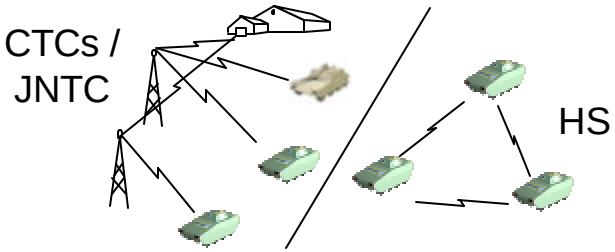
Embedded Task Training
(Crews & Soldier)



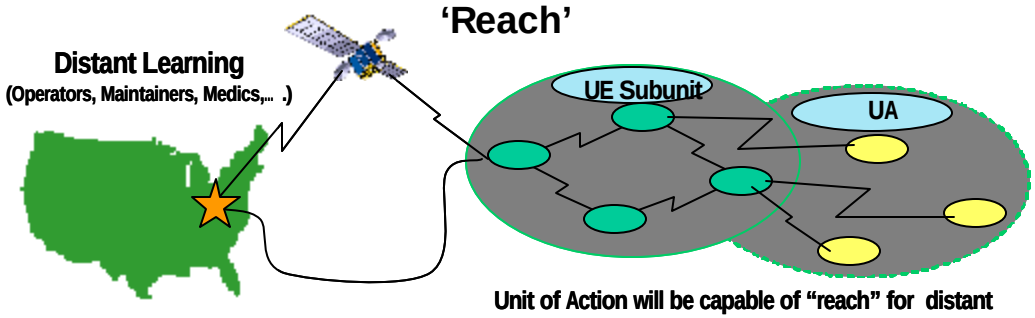
Distributed, Collective Training (Virtual & Constructive)
(Leaders & Units)



Distributed, Collective Training (Live)
(Embedded MILES & CTC Instrumentation Interface)



'Reach'



Unit of Action will be capable of "reach" for distant learning via C4ISR system

FCS ORD Training Requirements

Base ORD (Paragraph 4)	
1093	Networked "tiered" embedded Full Task Trainer
3341	Institutional Training Support
1253	Multi-echelon combined arms training capability
3783	Standalone TADSS
2840	Interoperability w/legacy & interim Syn Tng Env
1078	FTT - Soldier, Crew, Small Unit, Dism't Soldier
1089	Embedded TESS
3816	On-board repository of Training products
3817	AAR System
3818	Embedded Tng Mgt System (Interface w/C4ISR)
3819	Embedded Computer Generated Forces - OneSAF
3782	Training Support Packages (TSPs)
3784	Interoperability w/FCS networks & info systems
3786	Conform to FCS MANPRINT, MPT, & QQPRI
3785	Tng info network w/automated link to IETMS
ANNEX A - C4ISR	
2323	Battle Command sys spts tng & garrision ops
3156	Interface w/legacy,interim,OF (provides reach)
1139	Mission Planning and Rehearsal System
ANNEX D - Manned Systems	
1079	Out-the-Window (OTW) view - 3D
2862	Train with engine off
1097	Train without radio propogation
1084	Detachable PDA

ANNEX B - Leader Development	
3122	PME tng & knowledge repository 24/7 via C4ISR
3123	PME training focus-high stress Ldrshp dilemmas.
3125	Web-based emulation of the FCS Battle Cmd sys
3126	Interactive multimedia instruction pkgs for Ldr tng
3128	AC/RC capabilities and organizations courses
3130	Joint, Inter-Agency, & Multinational virtual tng
3136	Virtual campuses
3137	Capture Ldr responses and actions
3138	24/7 world wide reach to Training Institutions
3131	Battle Command SOPs and spt
3133	Opnl doctrine updated to account for LL'd.
ANNEX C - Soldier	
3478	"Requisite TADSS" for dismounted training
3211	Onboard storage of tng data, pers records & SOPs
ANNEX F - Sustainment	
2756	Full set of IETM for operators & Maintainers
3767	Desktop training
3768	Part Task Trainers (PTT)
2854	SCORM/AOM Compliant Courseware

Reflects 22 Jan '03 ORD

FCS ORD Training Requirements

Base ORD (Paragraph 4)	
1093	Networked "tiered" embedded Full Task Trainer
3341	Institutional Training Support
1253	Multi-echelon combined arms training capability
3783	Standalone TADSS (NRFTTs)
1078	FTT - Soldier, Crew, Small Unit, Dism't Soldier
1089	Embedded TESS (E-TESS)
3816	On-board repository of training products
3817	AAR System
3818	Embedded Tng Mgt System (Interface w/C4ISR)
3819	Embedded Computer Generated Forces (CGF)
3782	Training Support Packages (TSPs)
3784	Interoperability w/FCS networks & info systems
3786	Conform to FCS MANPRINT, MPT, & QQPRI
3785	Tng info network w/automated link to IETMS
ANNEX A - C4ISR	
2323	Cognitive Decision Aides must work in Tng mode
3156	Interface w/legacy,interim,OF (provides reach)
1016	Integrate w/Joint, secure Mission Planning sys
1139	C4ISR w/ Mission Planning and Rehearsal System
ANNEX D - Manned Systems	
1079	OTW (Out-the-Window view - 3D)
2862	Train with engine off
1097	Train without radio propogation
1084	Detachable PDA (CRIS)

ANNEX B - Leader Development	
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2854	SCORM / AOM Compliance

38 Training Requirements
in
14 Apr 03 JROC Approved FCS ORD

Objective Requirements

KPP-Critical Requirements

Training Requirements are spread across the FCS program

Training Products

- Mission & Task Analyses
- Embedded Training system
  - Driver Trainer
  - Weapons Trainer
  - RSTA Trainer
  - Battle Command Trainer

  } Each contains a progressive performance matrix (a la UCOFT)
- Stand-Alone Training Systems (reconfigurable) for those tasks which are unsafe, unaffordable or impractical for embedded training; expected primary support for institutions.
  - High fidelity
  - Desk-top

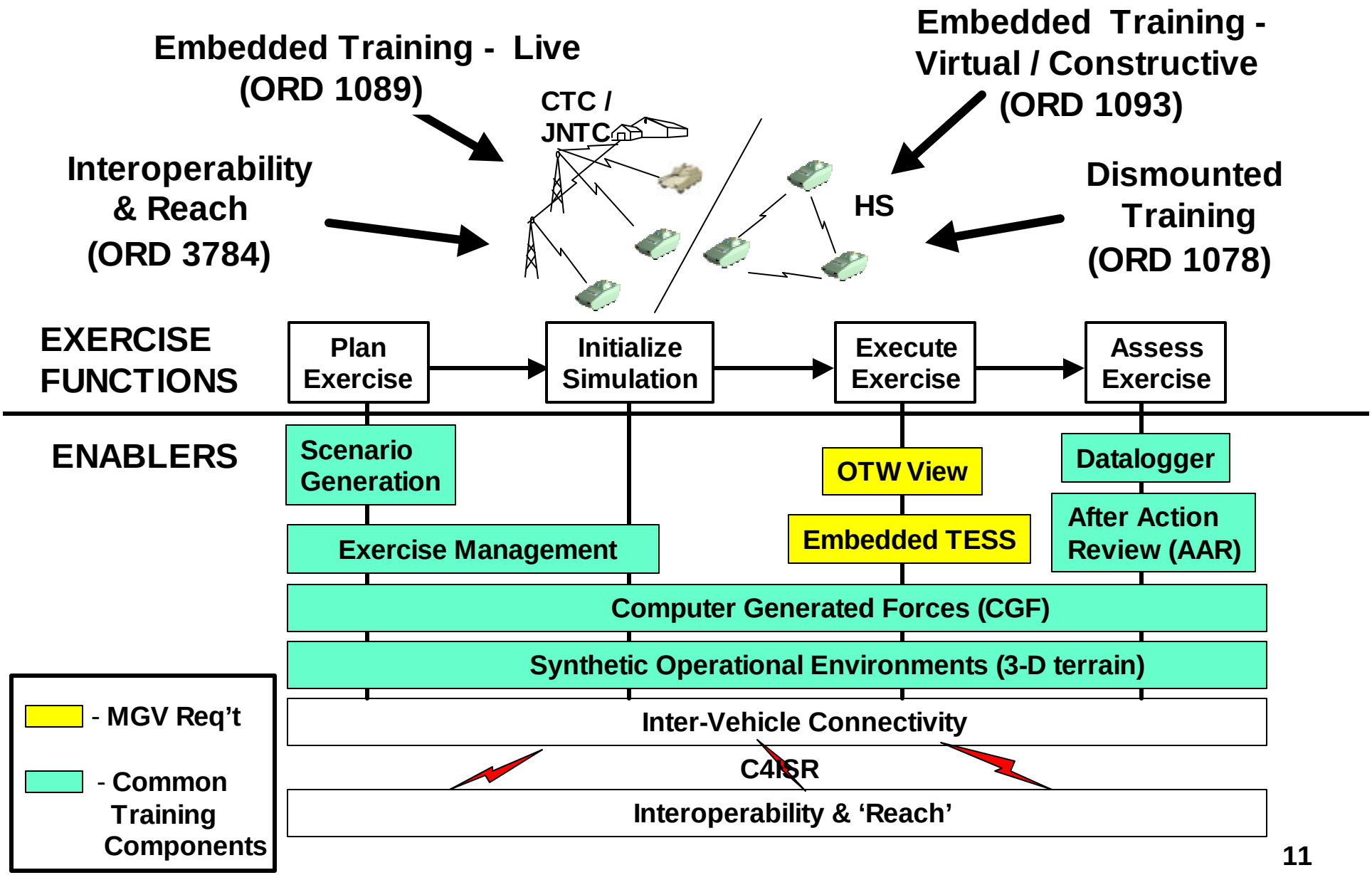
  } Each Stand-alone trainer reuses ET code
- Maintenance Trainers
- Training Support Packages (TSPs) – Individual & Collective
  - Level V IETMs
  - Simulation-based TSPs
  - Interactive Multimedia Instruction (IMI)

Training KPP

The FCS FoS must have an embedded individual and collective training capability that supports live, virtual and constructive training environments.

Rationale: Embedded full task and tactical engagement simulation systems provide leaders with a readily available system for training and assessing Combat Critical Skills of soldiers; and provide the capability to train and assess crew/sections, dismounted soldiers, and multi-echelon combined arms skills in operational environments.

Critical Enabling KPP Requirements



Dependencies and constraints

- Warrior Machine Interface (WMI)
- System of Systems Common Operation Environment (SoS COE) common services
- Vetronics – common vehicle bus, intra vehicle applications connection to switches, knobs, dials and controls.
- Use of System communication services (JTRS/ WIN-T) for distributed training applications and reach.
- Use of Manned Ground System integrated computer resources
- Use SoS IA and Security services

Acquisition Strategy

✍ Development IAW the FCS training architecture

✍ Separate CLIN for training in all procurement packages

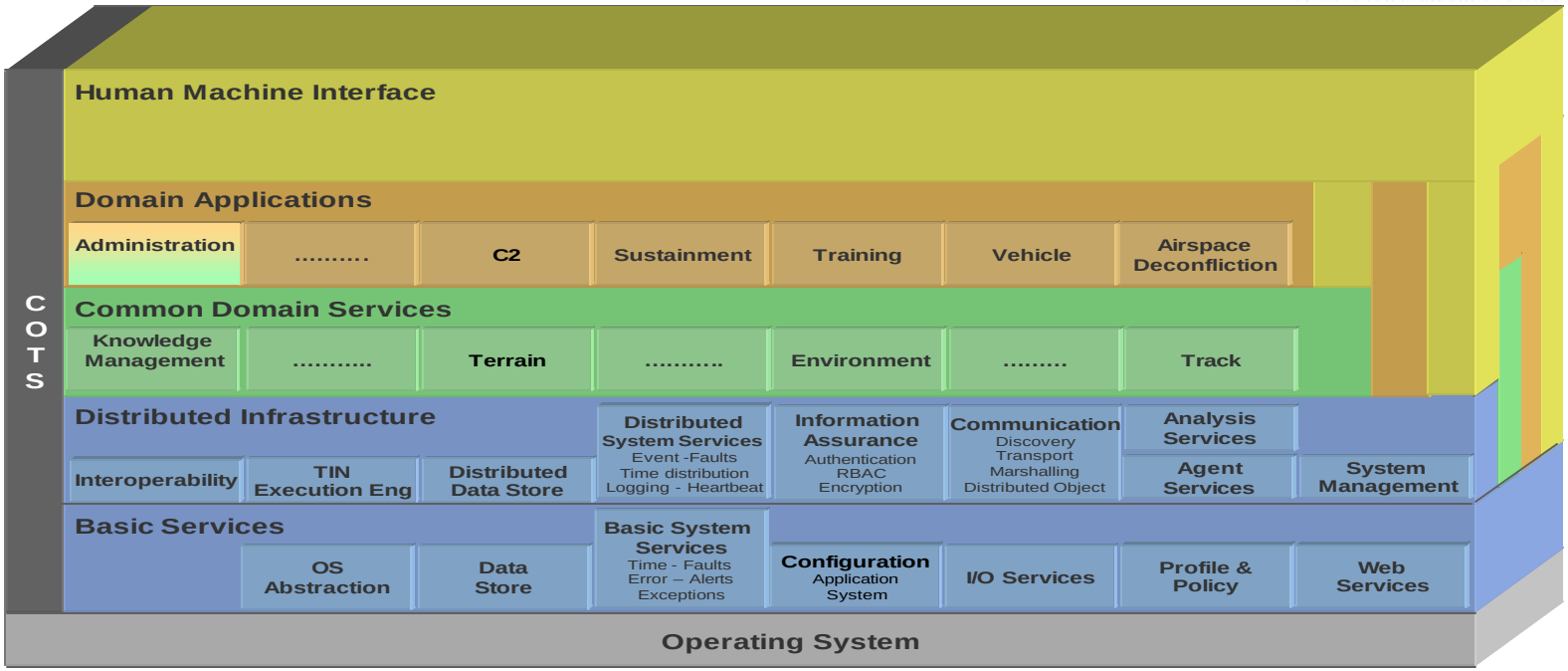
A Common Environment

Common Environment

- FCS ORD requires environmental data from all domains; terrain, atmosphere, ocean, and space (e.g. ORD #1020, 2392, and 2467)
- FCS ORD requires a common environmental representation (e.g. ORD #3131 and 1079)
- PM FCS through the C^4ISR IPT established the Terrain Working Group (TWG) to address these issues (May 2003)
- DCSOPS directed G-3 to address the USA geospatial issues (June 2003)

Common Environment

- The complete environment is also the view held by the SoSCOE
- 21 May 2003 brief presented "Build 0 Implementation Reference 1.4"
- It is understood that there are other "views of the cube" such as the architecture reference model view
- This view important because it shows need at implementation
- Terrain and environment are in the Common Domain Services



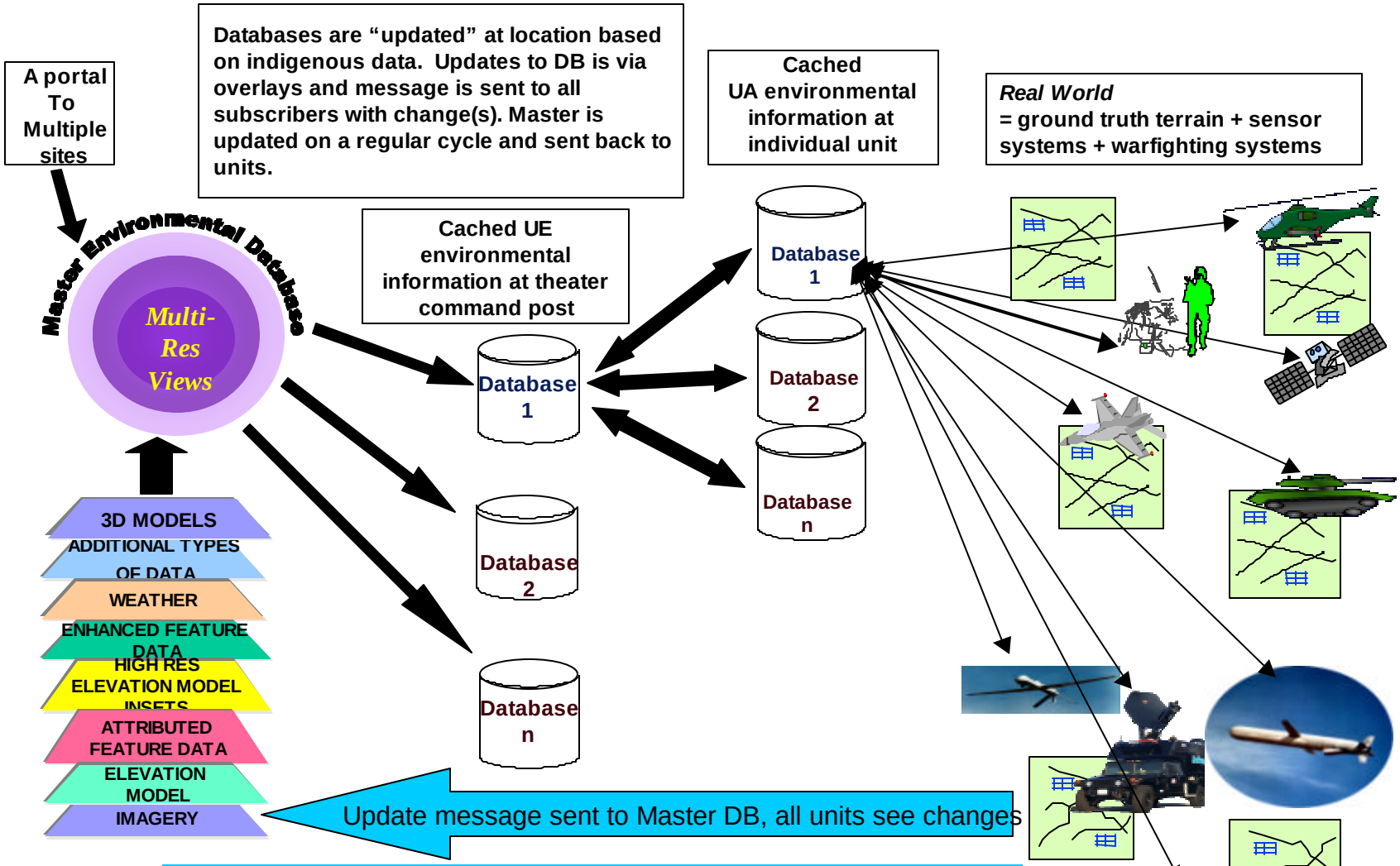
What is Next?

- We now know that we are required to have a common environment
- How is it defined?
  - The FCS approach (remember that FCS is an integration program and does not have development funds)
  - The Army G3 approach (this is where FCS will have to look for plugging technology gaps)
- This definition must align with the FCS ORD requirements

Effort by FCS TWG

- **Draft Original Charter of TWG**
  - **Conduct a trade study across FCS IPTs to investigate:**
    - **Data Model application, features, and attributes**
    - **Do a requirements analysis of at least the FCS applications of C/JMTK, OneSAF, and DTSS**
    - **Do an analysis of existing and potential terrain data sources and how FCS could implement a common terrain model**
- **TWG has five sub-teams to investigate:**
  - **Terrain database requirements**
  - **CONOPS**
  - **Logical data model**
  - **Data Element Dictionary**
  - **Terrain services APIs**
- **TWG initial findings included**
  - **Proposed data flow CONOPS**
  - **Identification of FCS ORD and SoS environmental requirements**
  - **Data model recommendation**
  - **Data dictionary recommendation**
  - **Proposed features attributes for FCS environment**
- **TWG expected to be chartered this month by FCS CCB to be responsible for geospatial/environment issues**

Notional FCS Environmental Data Flow



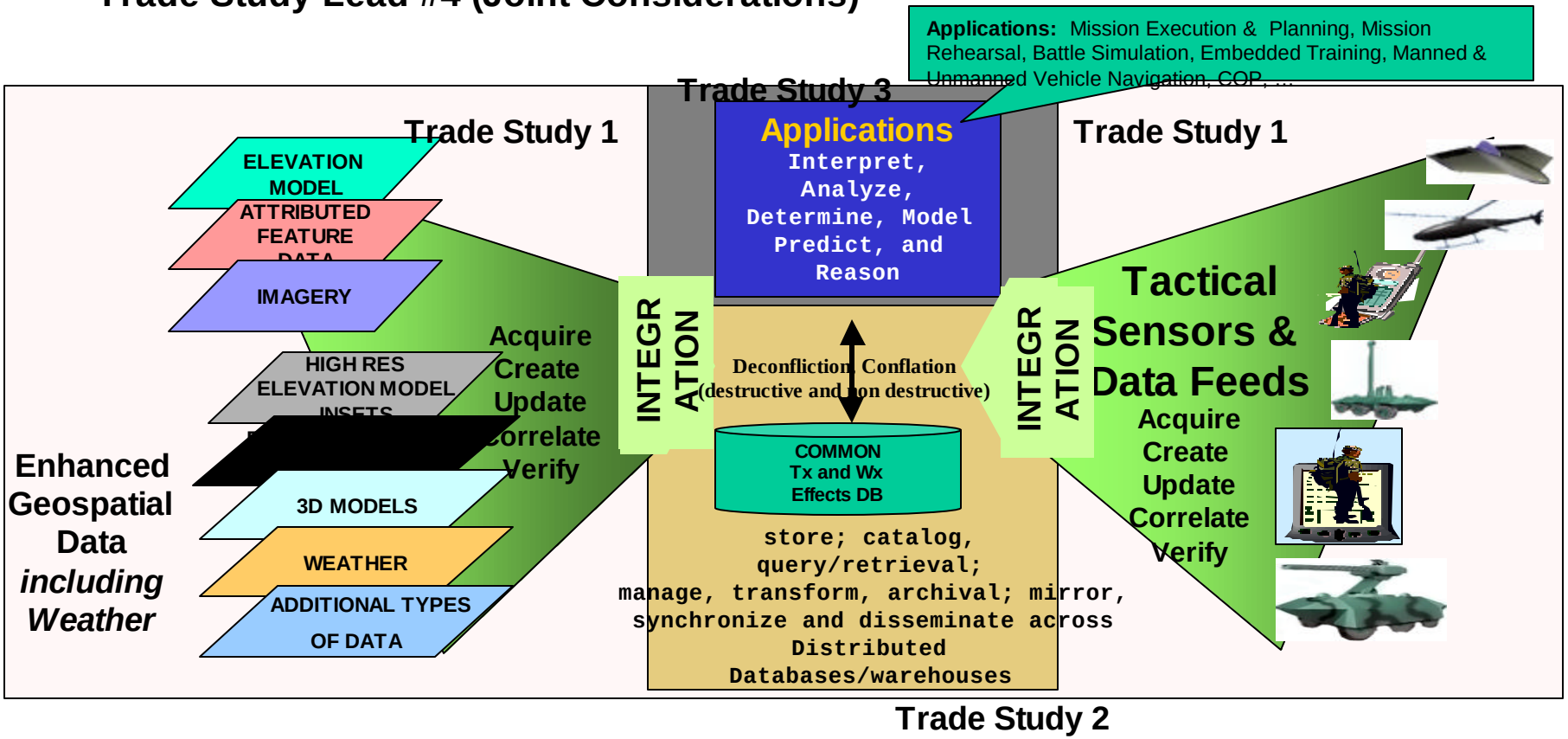
Current, coherent, resolution-appropriate environment data, available on demand, to warfighing echelons and warfighting consumer systems.

Efforts by Army G3 WG

- GDIMPWG Charter
  - Definition of an End To End Process (Horizontal and Vertical)
    - Recommend policy changes (AR 115-11, AR 5-11, etc)
    - Need to also address Doctrine and Architecture Issues and determine the need for CRD
  - Integration of all Army geospatial data users
  - Mission planning/mission rehearsal (MP/MR), training, command and control, embedded training, Intelligence, Surveillance, and Reconnaissance (ISR), etc.
  - Identification of funding requirements:
    - POM 06-11
    - Refine year of execution (FY04/05)

Efforts by Army G3 WG

- **GDIMPWG formed four Trade Studies to investigate:**
  - **Trade Study Lead #1 (Data Sources)**
  - **Trade Study Lead #2 (Data fusion, validation, warehousing)**
  - **Trade Study Lead #3 (Application tools and runtime environment)**
  - **Trade Study Lead #4 (Joint Considerations)**



FCS ORD Environmental Requirements

- 14 April 2003 FCS ORD was reviewed and environmental requirements were identified
- Approximately 420 were identified
- Not all 420 had actual ORD numbers
- Initial review did not distinguish between environmental database requirement and testing requirements
  - Need to know soil type for maneuver vs must be able to operate between –20 and +100 degrees
- Requirements stratified by four environment domains (terrain, atmosphere, ocean, space)

FCS ORD Environmental Requirements

- Below is an extraction from the spreadsheet
- Description column is the actual ORD words
- Geospatial requirement column is for the domain of the requirement
- Comments column is the rationale used
- Last two columns are whether we thought the requirement was an operational or test requirement, and if the requirement was an architecture, timing, or database requirement

ORD Section	ORD Paragraph #	Environmental Class Mapping	ORD Number	Description	Geospatial Requirement	Comments	Operational vs. T&E	Arch., Timing, or Database
Main	4.1.1.1.1.1	t	ORD 1020	FCS units must be capable of conducting distributed, simultaneous, multiple, and continuous fully integrated CA full spectrum operations, day and night, against any threat in a wide assortment of terrain and weather.	Terrain, Weather, Space (Solar and lunar illumination)	Development and testing SNE req. Also know the SNE.	t	d
Main	4.1.1.2.1.2	t	ORD 1016	The FCS information system must provide UAs down to the battalion nodes (Threshold) and all FCS manned systems (including the individual Soldier) (Objective) the ability to integrate into a Joint, secure, mission planning and rehearsal system from alert t	Terrain, atmosphere, ocean	SNE architecture req	o	a
Main	4.1.1.3.3.1	go	ORD 1036	The FCS FoS must enable dismounted Soldiers to conduct battle command and maneuver through subterranean complexes in support of squad and larger unit assault and clearing operations. (Threshold)	Terrain	Subterranean databases req for training, mission rehearsal/planning	o	d

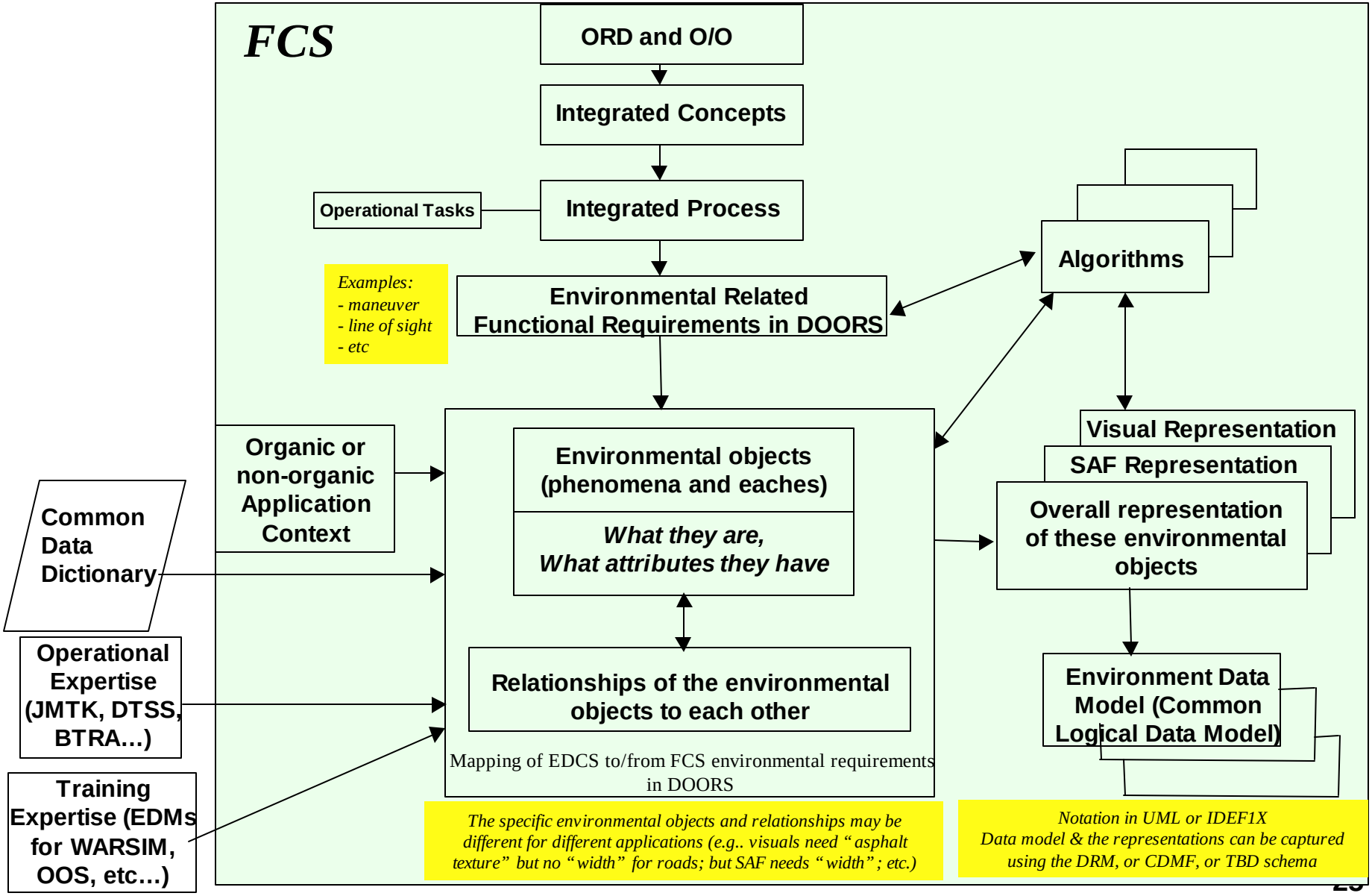
What is Needed?

- We now know that FCS requires a common environment
- We have identified key organizations to work the environment (FCS – integrates and G3 effort helps plug technology gaps)
- We now know what the requirements are as outlined in the FCS ORD
- What are the key pieces that must be accomplished now to set the stage for a common environment?
  - A common logical data model leading to a common physical data model for persistent storage of common environment content
  - A common data dictionary
  - Tools, especially to allow applications to read the common persisted format and convert to application-specific formats at runtime

FCS Environmental Data Model

- A common environment requires a common logical and physical data model
- Common data model is implied in several FCS ORD requirements such as #1064, 2467, 3131, 3153, and 3757
- One component of the data model is the environment
- Many systems have environmental data models and some were investigated for this effort
- Two ways of developing the environmental data model: via the ORD requirements and from similar systems
- Both ways have been considered for this effort
- Next slide will show process used in identifying environmental requirements

Data Modeling Process for FCS Environmental Representation



FCS Environment Data Dictionary

- A common environment needs a common logical and physical data model which in turn implies a common dictionary
- FCS needs a standard dictionary of environmental terms for the encoding and communication of qualitative and quantitative information
- FCS ORD does require a common environmental representation (e.g. ORD #3131 and 1079)
- Terms must be unambiguously defined
- Terms must have a precise definition that states the nature, properties, scope and quantities of each term

FCS Environment Data Dictionary

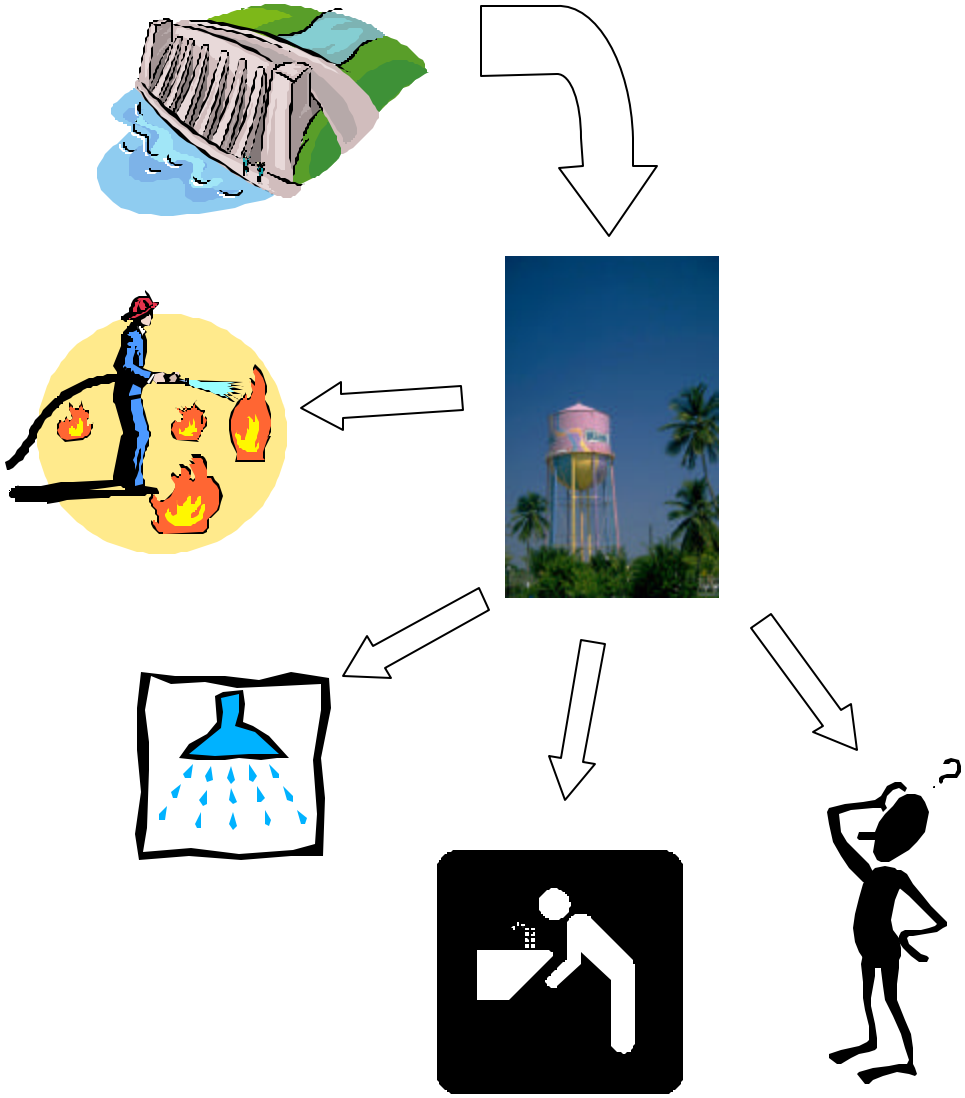
- **Several types of data must be found in the environmental data dictionary**
  - **vegetation (forests, trees, grass, etc.),**
  - **topography (mountains, valleys, islands, etc),**
  - **oceanographic phenomena and conditions (littoral regions with surf, wave information, salinity, turbidity, water body type, ice, and floor, etc),**
  - **hydrology (lakes, rivers, etc),**
  - **atmosphere and atmospheric conditions (rain rate, humidity, soil moisture effects, aerosol particles, etc),**
  - **space phenomena (solar activity, EMP, charged particles, effects on spacecraft and satellites, etc),**
  - **man-made objects (bridges, vehicles, buildings, interiors, the building material, etc)**

FCS Environment Data Dictionary

- Several candidate data dictionaries are available
- Some include:
  - Digital Geographic Information Exchange Standard (DIGEST): Part 4 of DIGEST is the Feature and Attribute Coding Catalogue (FACC), which is a coding schema for terrain-related features, attributes, and their values
  - Environmental Data Coding Specification (EDCS): An emerging international standard (ISO/IEC 18025) that supports the encoding and communication of information associated with all domains of the environment. The standard has an Application Program Interface (API) and nine separate dictionaries that specify the environmental concepts. EDCS takes advantage of FACC, IHO S-57, WMO, ICAO, and several other environmental dictionaries of concepts and terms
  - International Hydrographic Organization (IHO): The IHO S-57 is a standard for transfer of digital hydrological data. It has a dictionary, data model, and exchange format. It specializes in transfer of only hydrological data
  - Joint METOC Conceptual Data Model (JMCDM): The JMCDM has four sections for observational, derived, climatological, and astronomical data. It is an encyclopedia of meteorological, oceanographic, and space related features and is part of the US DOD Data Model (being replaced by the Joint METOC Broker Language (JMBL)
  - …

Tools

- FCS requires a common environment
- That means each individual FCS "system/application" has the same "feature" available to it
- That "feature" may be at different resolutions or displayed differently or used differently depending on the specific system needs at run-time
- What is required is a common source (persisted representation), but individual uses (run-time system format)
- Tools are needed to construct the common source, and tools are needed to make ready the common source for each individual use at run-time



Summary

- Embedded Training is the user's default option
- Embedded Training is a KPP for FCS
- Enabling technologies are sufficiently mature
- Procurement strategy is well defined and understood by LSI
- FCS also requires a common environment
- A common environment implies several common components

- **Integration is the challenge**