**Introduction**

- Initializing any software-based system can be a challenge... initializing thousands is a BIG challenge!

- ACSIS—(US) Army C4ISR* and Simulation Initialization System—a successful working prototype of an Initialization Capability (IC) Repository and Tool Set

- **Emphasis:** A *Prototype* ...enormous challenges lie ahead

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*C4ISR: Command, Control, Communications, Computers, Intelligence, Surveillance, Reconnaissance

– *only the Americans could make an abbreviation like this!*
A Bit of IC History
“Those who cannot remember the past…”

- US Army “grew up” in digital systems from the bottom up—platoons and companies
  - Initialization “grew up” with platoons and companies
  - Based on a very-low-bandwidth network placed much of the information exchange burden on the database

- Initialization process was very slow to mature—highly complicated, manual and labor intensive, and error prone

- Numerous problems with accuracy and completeness of data, such as:
  - Different Entity Names in different data sources
  - No common data content (FBCB2 DB does not include all upper TI hosts—therefore FBCB2 cannot communicate with them; these hosts lose multicast group memberships upon UTR)

- Impacts of data problems on operations included:
  - Two “copies” of a unit shown on map displays…not always in same location
  - Lack of common identifiers prevented communication between units and between systems

- Not Timely

- Not Scalable

- Reliant on Contractors to perform IC tasks at Sustaining Base

Designed for Companies and Battalions…
Pressed into service for Corps and Theaters
The Four Challenges of IC

- **Data Synchronization** (between ‘Authoritative’ sources)
  - US Army alone is a challenge
  - Joint and multilateral will be a bigger challenge!

- **Data Standardization** (between Systems) and **Repository**
  - A *C4ISR* and a *Simulation* challenge
  - Once again, multilateral operations increase the challenge

- **Tool** Development and Maintenance
  - Hundreds if not thousands of C4ISR and Sim systems exist
  - We can currently initialize a few

- **Transition to Warfighter**—
  - *ACESIS* is an engineers’ tool
  - *Warfighter* must initialize his systems as task org and status changes
  - ‘10,000 km screwdriver’ will not work

*If data is not interoperable, systems are not interoperable*
Data Synchronization
Examples in US Department of Defense

• What makes a source ‘Authoritative’?
  • US examples: ASORTS—GSORTS—USAFMSA—SB 700-20—OCE Systems Architecture…
  • Fielded products: JMUL—FBCB2 DBs—JSID—I MEF—I I MEF—Other Unit ABs---…
  • Synchronization of release dates is a problem
    • Example: GSORTS updates daily…USAFMSA on six-month cycle…OCE SA is built from USAFMSA (MTOE)...and they contain many of the same fields (in different formats, of course)
    • Synchronization is logical and easy—for one record
    • But most sources typically release 40,000+ records!

• Data Sources—The Case of the Missing Key:
  • Example—US DoD GSORTS Basic Identity Data Element (BIDE): Entry is UIC plus--

<table>
<thead>
<tr>
<th>SECUR</th>
<th>--</th>
<th>COAFF</th>
<th>UDC</th>
<th>ANAME</th>
<th>UTC</th>
<th>ULC</th>
</tr>
</thead>
<tbody>
<tr>
<td>MJCOM</td>
<td>MONOR</td>
<td>MAJOR</td>
<td>REVAL</td>
<td>LNAME</td>
<td>SCLAS</td>
<td>TPSN</td>
</tr>
</tbody>
</table>

How can we handle this problem?
ACSIS Authoritative Data Source
Update Process (AADSUP)...a Work in Progress!

- Downloads from sources to a work database for analysis.
- Procedures and functions produce a team – or squad-level – organization from the MTOE.
- Tool associates equipment and personnel with units.
- Provides the Unit Order of Battle Tool with connectivity to the ACSIS and USAFMSA Oracle databases.

- **Compares existing ACSIS data against new data identifying fields as same, added, changed or moved.**
- Allows modifications to the ACSIS database.
- **Generates the SQL needed to make modifications to the ACSIS database and updates the ACSIS database.**
Data Standardization and The Repository

- Data Standardization: **C2IEDM is a good start!!**
  - Not detailed enough for system initialization, but a good start
  - Some examples of the current initialization problem (US Army systems):
    - Echelon Code versus Mission Code
    - Mission Specialty Code versus Role Code
    - ULP O-R Name versus FBCB2 Host Description (55 characters) versus ABCS Host Description (30 Characters) versus ‘ABCS 4.3’ Host Description (20 Characters) versus Machine Name (7 or 8 Characters, depending on BFA)
    - Often an interoperability issue (example: Variable Message Format (VMF) requires Unit Reference Number (URN) or name—not both)...always a cost issue
  - Database keys and message fields: More challenges!
    - Name (“Long_name”? “AName”? “PLAD”?)
    - Descriptive? Readable? Standardized? See the following example
    - **EID or EWID—very promising!**
    - Lack of a Key Means Both Interoperability and Cost Issues
### Data Standardization: Example Identifiers

<table>
<thead>
<tr>
<th>UNIT_NAME</th>
<th>URN</th>
<th>PLAT_DESCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>15SIGBDE / TRADOC</td>
<td>8000001</td>
<td>MED1-15SIGBDE-TRADOC</td>
</tr>
<tr>
<td>TRADOC</td>
<td>8000024</td>
<td>CGSC2-TRADOC</td>
</tr>
<tr>
<td>30REG / TRADOC</td>
<td>8000026</td>
<td>FA8-30REG-TRADOC</td>
</tr>
<tr>
<td>1AVNBDE / TRADOC</td>
<td>8000029</td>
<td>AVN7-1AVNBDE-TRADOC</td>
</tr>
<tr>
<td>59ORDBDE / TRADOC</td>
<td>8000031</td>
<td>OMMS2-59ORDBDE-TRADOC</td>
</tr>
<tr>
<td>TRADOC</td>
<td>8000033</td>
<td>CH1-TRADOC</td>
</tr>
<tr>
<td>3 / A / 1BN / 1BDE / TRADOC</td>
<td>8000037</td>
<td>PSG-3-A-1BN-1BDE-TRADOC</td>
</tr>
<tr>
<td>RTRP / 1BDE / TRADOC</td>
<td>8000075</td>
<td>CP-RTRP-1BDE-TRADOC</td>
</tr>
<tr>
<td>FORSCOM</td>
<td>8000041</td>
<td>NTC12-FORSCOM</td>
</tr>
<tr>
<td>FBCB2</td>
<td>8000054</td>
<td>FBCB2CMD5-FBCB2</td>
</tr>
<tr>
<td>FBCB2</td>
<td>8000055</td>
<td>FBCB2OPS1-FBCB2</td>
</tr>
<tr>
<td>TEST / FBCB2</td>
<td>8000056</td>
<td>FBCB2CGOHEL2-TEST-FBCB2</td>
</tr>
<tr>
<td>TEST / FBCB2</td>
<td>8000057</td>
<td>FBCB2GSHEL1-TEST-FBCB2</td>
</tr>
<tr>
<td>FBCB2</td>
<td>8000060</td>
<td>FBCB2DEMO1-FBCB2</td>
</tr>
<tr>
<td>HNTSVL</td>
<td>8000019</td>
<td>FBCB2SCTHEL4-HNTSVL</td>
</tr>
<tr>
<td>HNTSVL</td>
<td>8000020</td>
<td>FBCB2COBRA1-HNTSVL</td>
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<tr>
<td>HNTSVL</td>
<td>8000075</td>
<td>FBCB2STALLIONS-HNTSVL</td>
</tr>
<tr>
<td>HNTSVL</td>
<td>8000078</td>
<td>FBCB2JSTARS3-HNTSVL</td>
</tr>
<tr>
<td>TOBY</td>
<td>8000079</td>
<td>RAYTEST6-RAYTHEON</td>
</tr>
<tr>
<td>RAYTHEON</td>
<td>8000079</td>
<td>RAYTEST6-RAYTHEON</td>
</tr>
<tr>
<td>NGMS</td>
<td>80000730</td>
<td>NGSSTEST5-NGMS</td>
</tr>
</tbody>
</table>

**What are these?**
- Symbol?
- Echelon?

**What are these units?**
- UIC?
- SRC?
- ...

**MCG Assignments?**
- AVN MCG?

**What are these?**
- Symbol?
- Echelon?

**21 Entries…**
50++ RFIs
Data Standardization and The Repository

...Now write the code to automate that!
Data Standardization and The Repository

“…and (n?)ever the twain shall meet.”

- Repository and Data Sharing
  - A Joint and a Multilateral challenge
    - ACSIS currently accommodates US Army and Marines
    - Other US Services: ??? MIP members: ???
  - C4ISR and Simulation challenge
    - Similar technically (Org, Notional_Org tables in data model)
    - Very different organizationally (different acquisition and combat developments organizations)
  - Scope of repository is TBD
    - ACSIS supports network, organizations (down to billet level), personnel at the summary level (name, rank, MOS, billet)
    - Hence: Issue is not data model--but data maintenance
Armv C4ISR and Simulation Initialization System (ACSIS)

Authoritative Data Sources

- MTOE
- GSORTS
- LOGSA
- OCE (FIO) SA

DMSO's ACSIS Authoritative Data Source Update Process (AADS-UP):
- Provides and updates organization, UOB, and MTOE data to the ACSIS DB from DoD authoritative data sources.

ACSIS Tool Suite:
- Builds operational and exercise-specific Unit Task Organizations (UTO).
- Extracts ACSIS data and generates additional network configuration and addressing data.
- Identifies and fixes data integrity problems.
- Produces accurate and synchronized C4ISR and Simulation Initialization data products from a single data set based on a particular mission-specific UTO.

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September 16, 2004
Current ACSIS Schematic

Authoritative Data Sources
- MTOE
- GSORTS
- LOGSA
- OCE SA
- AADS-UP
- ACSIS DB
  - ASSIGN ORG-EIDs AND URNs

ACISIS Framework
- ACSIS Tool
  - BUILD MISSION-SPECIFIC UTO
  - GENERATE NETWORK DATA
- Partial StartEx Files
  - EXPORT CBS/RTM
  - CBS/RTM Extract
  - EXPORT FireSIM
  - FireSIM Extract
  - EXPORT Janus
    - Janus Extract
  - EXPORT EADSIM
    - EADSIM Extract
  - EXPORT AMDWS
    - .UNL Extract
  - EXPORT ASAS
    - .UNL Extract
  - EXPORT GCCS-A
    - GSORTS Extract
  - EXPORT MCS (XML)
  - BCS3 Extract

Scenario Generation Tools
- Complete StartEx Files
  - ADD/ MODIFY
    - CBS/RTM StartEx
    - FireSIM StartEx
    - Janus StartEx
    - EADSIM StartEx

Complete StartEx Files
- Additional StartEx Data
- Scenario Generation Tools
- Complete StartEx Files

TIMS (FBCB2/TOC Planner Tools)
- C2R Planner Tool

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ACSID Data Model: Overview
ACSI5 Data Model: ‘Platforms’ and Group Associations

BC_GROUP
- BC_ID (FK)
- UTO_INDEX (FK)
- UTO_VERSION (FK)
- BC_NAME
- NET_ID (FK)
- BC_ROLE_CD (FK)

MC_GROUP
- UTO_INDEX (FK)
- UTO_VERSION (FK)
- MC_ID (FK)
- ORG_EID_P (FK)
- ORG_EID_S (FK)
- MC_NAME
- IP_ADDRESS
- BC_ID (FK)
- ROLE_CD (FK)

BC_GROUP_MEMBER
- BC_ID (FK)
- URN (FK)
- UTO_INDEX (FK)
- UTO_VERSION (FK)
- LOCAL_NET_IND
- INTERFACE_ID (FK)

MC_GROUP_MEMBER
- MC_ID (FK)
- URN (FK)
- UTO_INDEX (FK)
- UTO_VERSION (FK)
- INTERFACE_ID (FK)

PLATFORM_ROLE
- URN (FK)
- UTO_INDEX (FK)
- UTO_VERSION (FK)
- NORTHRUP_ID
- HOST_DESCRIPTION
- IP_ADDR
- ROLE_CD (FK)
- ORG_EID_P (FK)
- ORG_EID_S (FK)
- VERSION (FK)
- SUBNET_ID (FK)
- PLATFORM_ID (FK)
- BFA
- MIL_47001_VERSION
- VMF_BODY
- USMTF_BODY
- EQUIPMENT_ID (FK)
- EPLRS_RSID
- ECH_PARENT

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ACIS Data Model: Materiel and Materiel Holdings

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ACSIS Data Model: Personnel and Personnel Holdings

ACSIS Implementation Data Model:

Organization-Personnel

- OCC_SPEC_CD
  - OCC_SPEC_CD
  - LABEL
  - LABEL_TEXT

- SKILL_LVL_CD
  - SKILL_LVL_CD
  - LABEL
  - LABEL_TEXT

- PERT_CAT_CD
  - PERT_CAT_CD
  - LABEL
  - LABEL_TEXT

- PER_TYPE
  - PER_TYP_INDEX
    - SKILL_LVL_CD
      - SKILL_LVL_CD
      - LABEL
      - LABEL_TEXT
    - OCC_SPEC_CD
      - OCC_SPEC_CD
      - LABEL
      - LABEL_TEXT
    - PERT_CAT_CD
      - PERT_CAT_CD
      - LABEL
      - LABEL_TEXT
    - RANK_CD
      - RANK_CD
      - LABEL
      - LABEL_TEXT

- UTO
  - UTO_INDEX
  - UTO_VERSION
    - UTO_CONFIG_CD
      - UTO_INDEX
      - UTO_NAME
      - UTO_TYPE
      - DATE_ADDED
      - TRAINING
      - UTO_OWNER
      - BASELINE_ID
  - UTO_OWNER
    - BASELINE_ID

- PERTYP_HLDNG_QTY
  - PER_TYP_INDEX
    - SKILL_LVL_CD
      - SKILL_LVL_CD
      - LABEL
      - LABEL_TEXT
    - OCC_SPEC_CD
      - OCC_SPEC_CD
      - LABEL
      - LABEL_TEXT
    - PERT_CAT_CD
      - PERT_CAT_CD
      - LABEL
      - LABEL_TEXT
    - RANK_CD
      - RANK_CD
      - LABEL
      - LABEL_TEXT

- POST
  - POST_TYP_INDEX
    - ORG_EID_P
      - ORG_EID_P
      - RANK_CD
    - ORG_EID_S
      - ORG_EID_S
    - POST_TYP_CD
      - POST_TYP_CD
      - RANK_CD
      - POST_TYP_CD

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ACSIS Data Model: Networks and Comms (1)
ACSI\$ Data Model: Networks and Comms (2)
Tool Development and Maintenance

• Hundreds if not thousands of C4ISR and Sim systems exist
  • We can currently initialize a few

• Key: Standard API set, PM initializes “his” system

• But: What about network initialization of common resources?
  • Multicast groups; IP addresses; netmasks; frequencies
  • C2IEDM does not address these things!
  • One example in US Army:
    • FBCB2 (an application) assigns IPs, populates subnets, radio nets
    • TIMS (another application) assigns members to subnets
  • Advantage: Subject Matter Expertise → functionality and efficiency in product
  • Disadvantage: More complexity—at the interface and in the data model
  • Recommendation: Use tools to initialize network parameters—then build application databases
The Four Challenges of IC
“One look at the battlefield saves thousands of hours of staff work”

• Provide a Tool for the Warfighter—
  • ACSIS is an engineers’ tool, centrally administered

• Warfighter must Initialize his systems as task organization and status change

• Possible: Network-based access to initialization repository and tools
  • The issue (of course)—immediacy versus currency
  • The question: ‘From where’ does the soldier initialize?
    • We thought: Brigade (UA)...but note (for example) new US division Satellite Communications Hub-and-Spoke Architecture

• Another question: Bandwidth demand versus tailored DB replication
  • Current Experience Helps—‘prototype’ DB replication

• Yet another question: Product and service delivery (again, bandwidth)
  • Service and product location protocols remain TBD (SOAP is one example in use by US)
Where This is Going:
IC Core Framework (ICCF)

Network Centric Data Management Center (NDMC)

IC Tool Suite

Unit IC Data Repository

Data Dissemination

Planning & Training Tools

Data Generation

Sustaining Base

Deployment
Advantages: A Single Integrated Initialization Database

- Synchronizes and Quality Checks Data--
  - To Established Standards
  - From a Number of different Authoritative Data Sources (ADS).
  - Feeds Back to ADS on Accuracy and Adequacy of Data Based on Warfighter’s Needs.

- Relational Database with Standard--
  - Data element constraints,
  - Semantics and syntax,
  - Naming conventions
  - Business rules
  ...to enforce data integrity across both C4ISR and simulation domains.

- Coordinates with Authoritative Data Sources
  - Assigns primary keys such as ORG_EIDs, URNs,
  - Assigns other materiel, personnel, and network identification, configuration and addressing data.
  ...So primary keys are not duplicated and confusion is reduced or eliminated

- Establishes Triggers and Stored Procedures as the Application Program Interfaces (APIs) for IC Tools
  - Helps maintain data integrity across domains
    Programmer only worries about the call and its parameters
  ...not the details of implementation.

Understandable – Trusted – Interoperable – Accessible - Responsive
The Path Forward…

“IC” May Need Better-Defined Scope:

- Terrain database
- Unit Task Organization (UTO)
- C2 & Support Relationships
- Entity Identification - weapon systems, vehicles, personnel, sensors, equipment
- Entity position/location and orientation
- OPORDs, Annexes, overlays, matrixes
- Communications structures, nodes, networks
-URNs, IP addresses, frequencies, aliases
- Unit specific TTPs, Tactical SOPs
- Man-made obstacles and fighting positions
- Entity/Unit logistical status
- Enemy information
- Weather conditions

Key:
In ACSIS
In Data Model, not Populated
Not in ACSIS
In Conclusion…

- ACSIS is a **Good Start**:  
  - Strong Data Model  
  - Good Initial Tool Set

- ACSIS is a **First Step**:  
  - Initializes a few of many systems  
  - Data Standardization Will be a Growing Challenge

- Many Lessons Have been Learned

- **Tremendous Challenges Lie Ahead** …especially in the Multilateral arena

- For More Information:  
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