ATCCIS Replication Mechanism (ARM)

Fundamental Concepts

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Advanced Systems Management Group

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ATCCIS Replication Mechanism

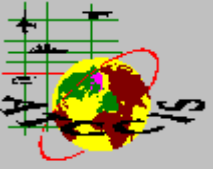
- Introduction
- ATCCIS Background
- The ATCCIS Data Model
- The ARM Specification
- Using an ARM over Tactical Networks
- Discussion

ATCCIS Background

- **ATCCIS Objectives**
  - 16 NATO nations
  - Level 5 Interoperability between C2ISs
  - Software/Hardware/Vendor-independent Solution
  - Two Main Products: Data Model and ARM Specification
- **MIP (Multilateral Interoperability Programme)**
  - Goal: To Field an Interoperability Solution
  - Adopted ATCCIS Products
  - Merged with ATCCIS in 2002
- **Exercises and Demonstrations**
  - 1997: Prove Benefits of the ATCCIS Data Model
  - 1999: Selective Replication using ARM Specification
  - 2001: MIP Limited Operational Test

Standardize on data...Not technology

ATCCIS & OSI Layers



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OSI-Layers

- 7 - Application Layer
- 6 - Presentation Layer
- 5 - Session Layer
- 4 - Transport Layer
- 3 - Network Layer
- 2 - Data Link Layer
- 1 - Physical Layer

- C2 Applications
- C2 Databases
- *ATCCIS Data Model*
- *ATCCIS Replication Mechanism*
- *Transfer Facility*

National Issue

ATCCIS

ATCCIS Data Model: LC2IEDM

National Issue

ATCCIS

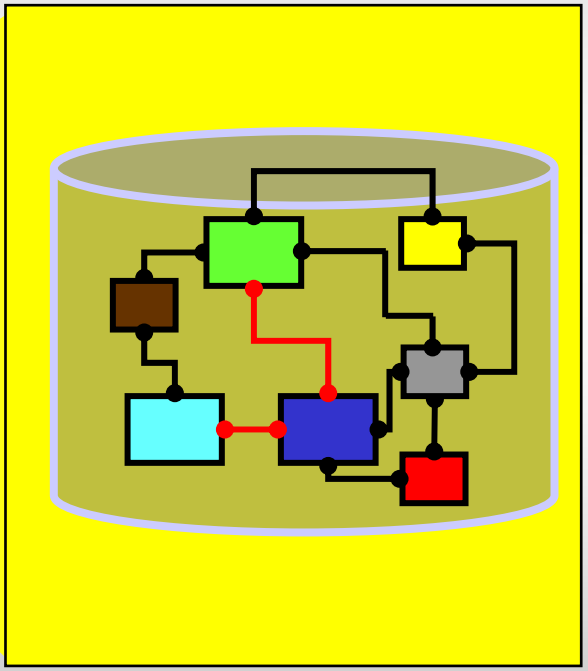
C2 Applications

C2 Databases

ATCCIS Data Model

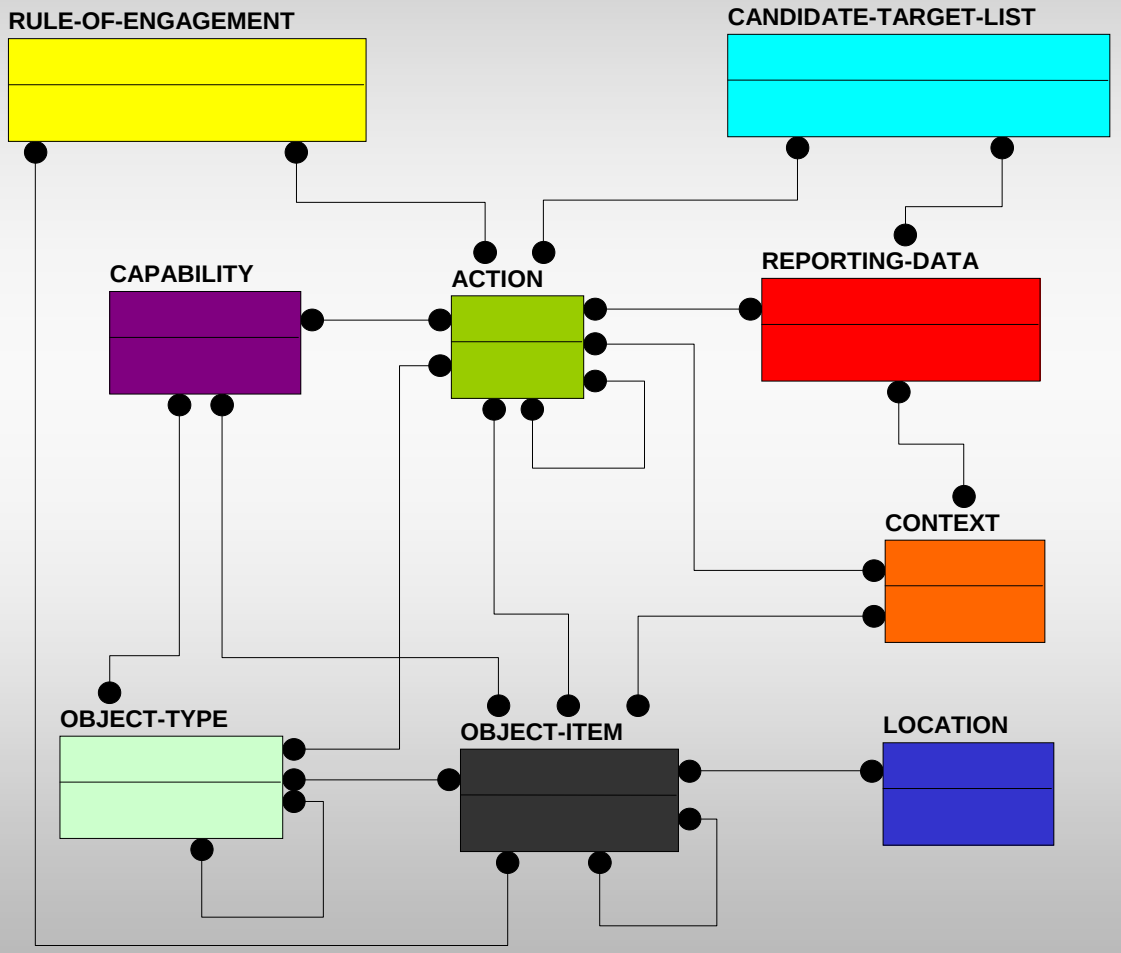
ATCCIS Replication Mechanism

Transfer Facility

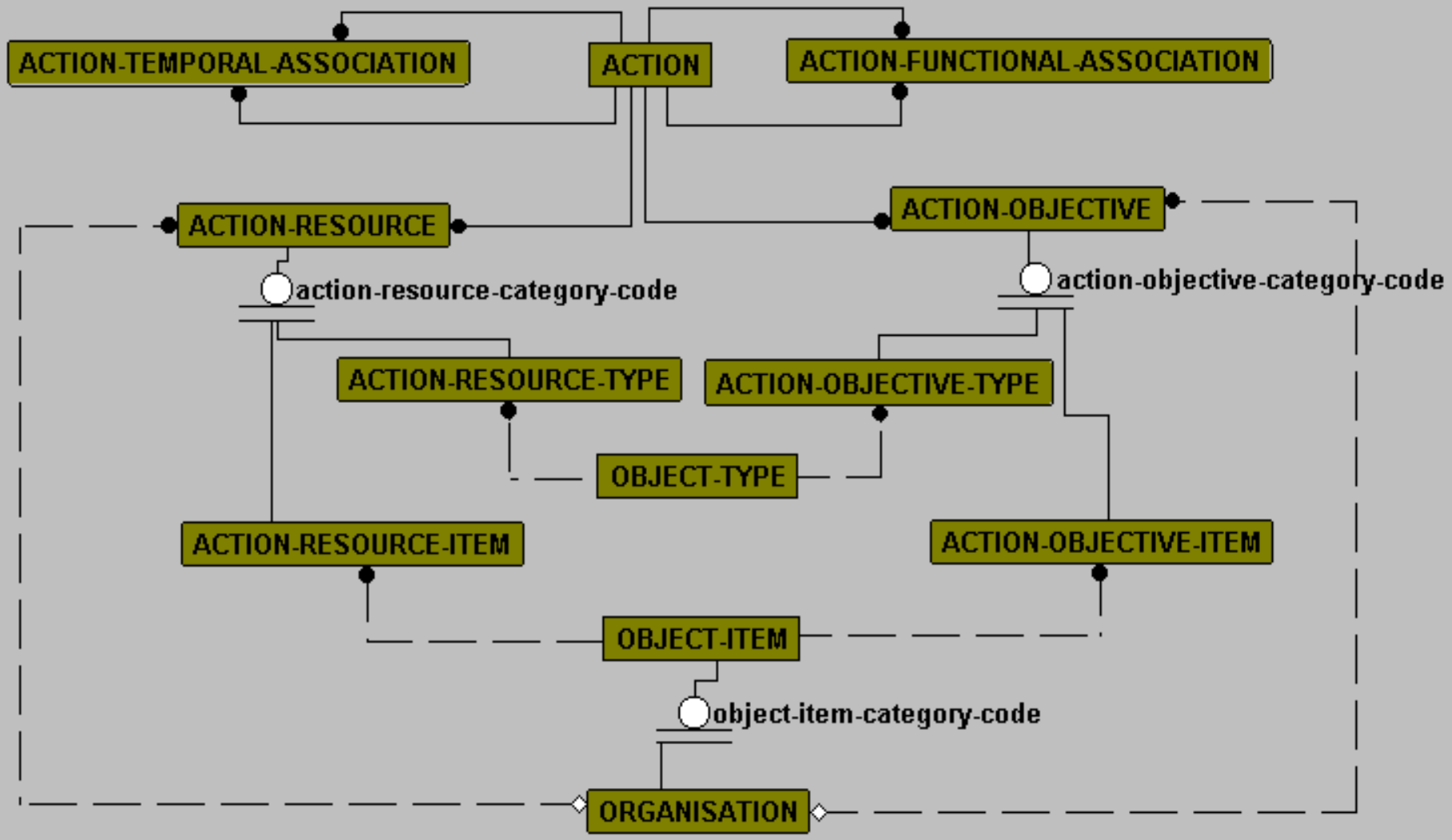


ATCCIS Data Model: LC2IEDM

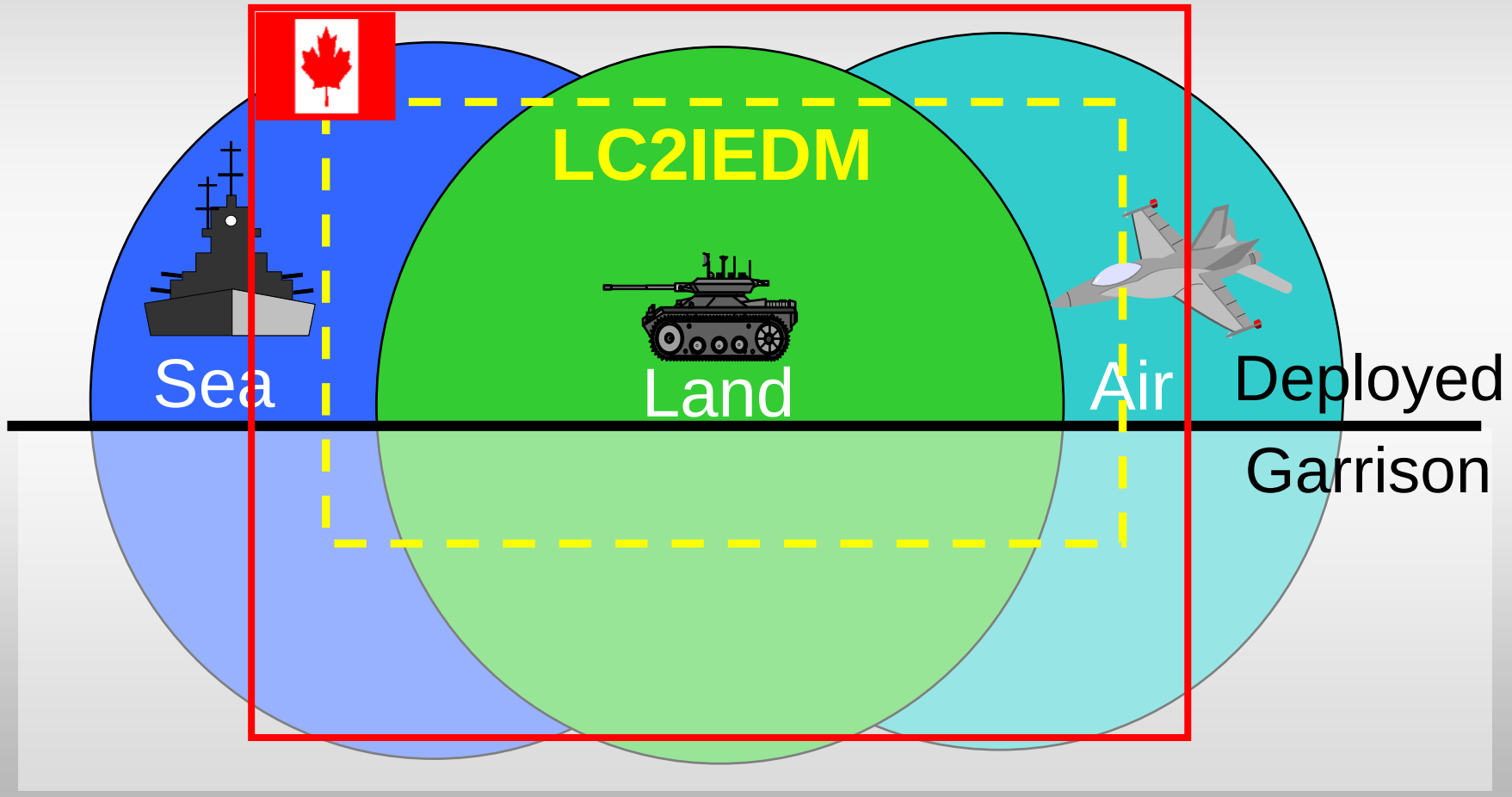
➢ Key Entities of the LC2IEDM



Event Reporting



Scope of the ATCCIS Data Model



ATCCIS Replication Mechanism

National Issue

ATCCIS

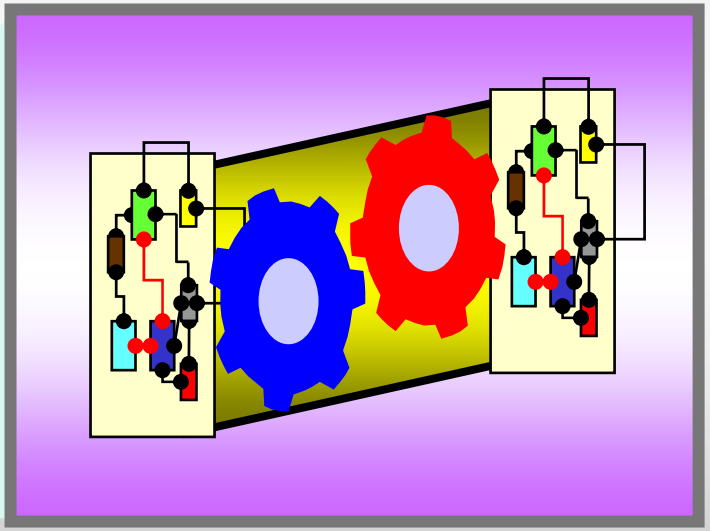
C2 Applications

C2 Databases

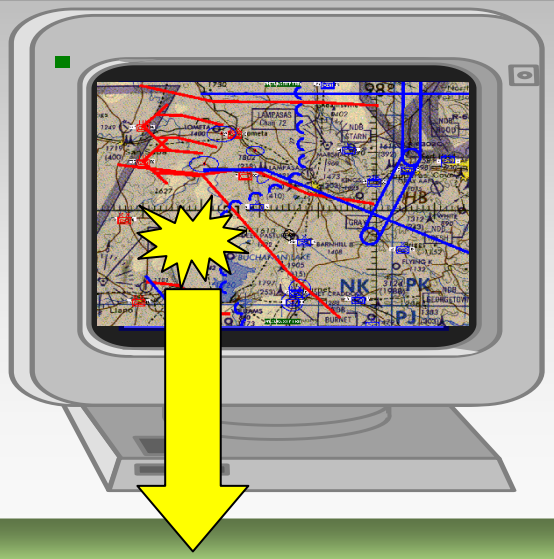
ATCCIS Data Model

ATCCIS Replication Mechanism

Transfer Facility



ATCCIS Concept of Operation



National C2 System
Processing and Presentation

National Database

Physical Data Storage

Conceptual Data Model

Standard Data Definitions

ATCCIS Replication Mechanism

Common Replication Architecture

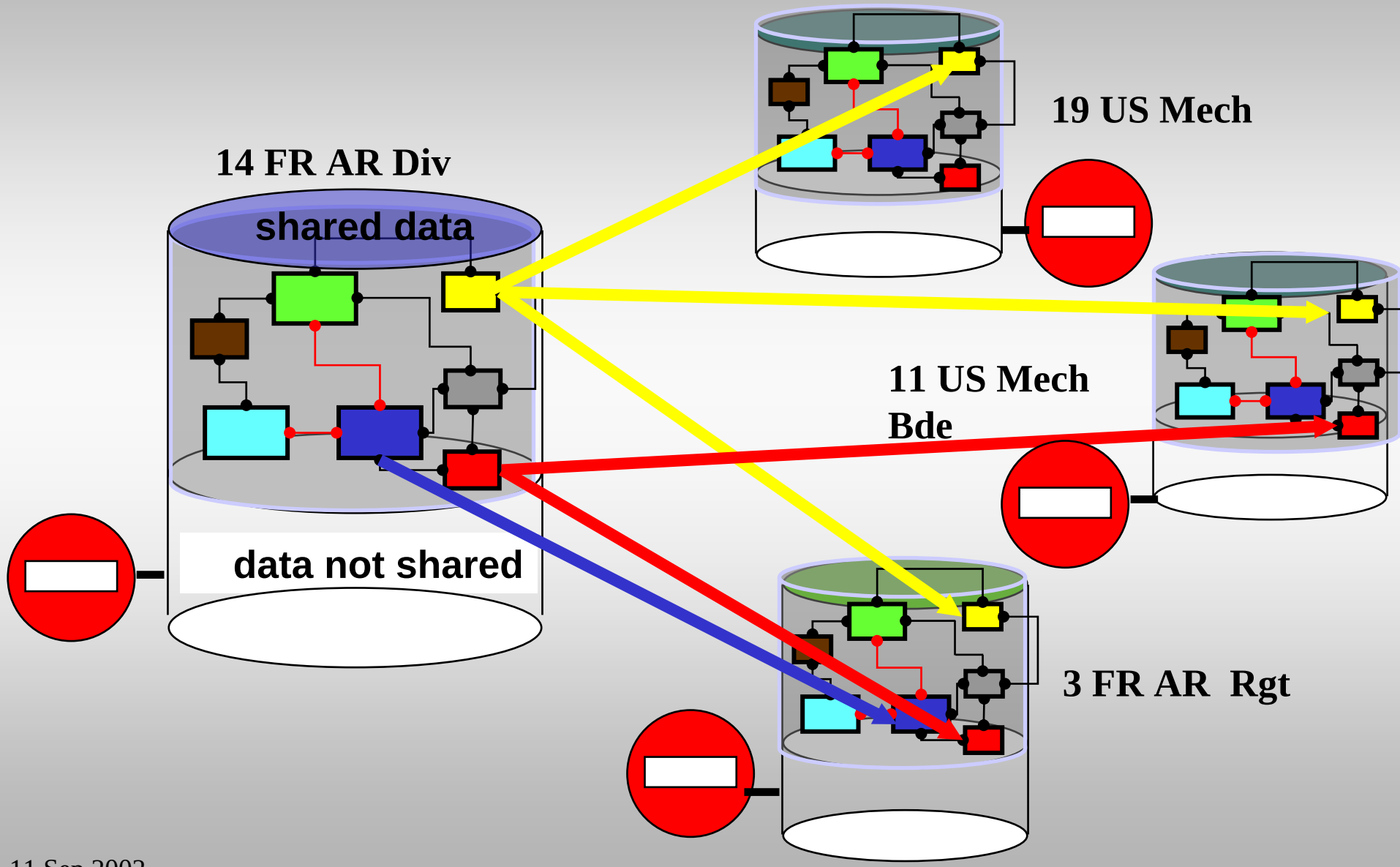
Data Transfer Protocols

Communications Link

ATCCIS Replication

- **Replication Contracts**
  - "Negotiated Push"
  - Agreement by both Parties -> Automated Exchange
- **Filters**
  - Data Value and Data Source
  - Simple (domain range) and Complex (set-based)
- **Payload Reduction**
  - Reference Data
  - Transmission Efficiency Rules
- **Replication Messages**
  - Incremental Update (new/changed data only)
  - Bulk Update (for synchronization)
  - Control Messages (e.g. activate node, propose contract)

Selective Replication



ARM Layers

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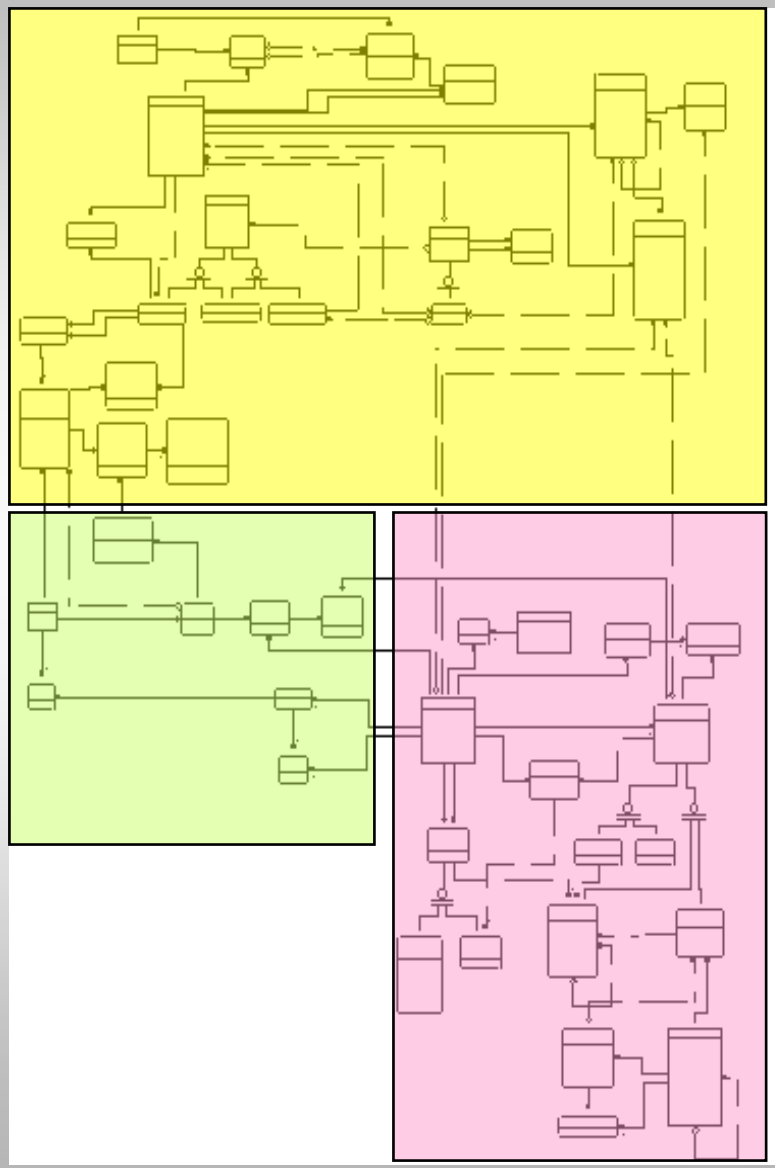
ARM

ATCCIS Database	**Logical database that stores operational data in ATCCIS format (LC2IEDM).**
Data Manager	**Performs all read/write operations against the ATCCIS Database; Responds to data events and prepares data payloads in accordance with contracts and filters.**
Replication Manager	**Establishes a replication session between nodes and manages the flow of replication messages (e.g. enforces message sequence; optimizes payloads for each recipient; monitors replication topology).**
Transfer Facility Manager	**Establishes a connection-orientated communication link over specified Transfer Facilities (TF).**
Communications Profile	**Specific Transfer Facility, using standard comms profile (e.g. TCP/IP or X.400).**

ARM Management Data Model



Dynamic Replication Management Data
(Nodes, Contract State, etc)

Contract Catalogue
(Contract and Filter Templates)

Static Meta Data for LC2IEDM and Mgt Model
(Entities, Attributes, Domains, etc)

Sample Replication Message

1(FR) Mech Armd BN reports at 230845 Z Nov 99 that it is at 14R PV 0770578183, with a bearing of 45 degrees and a speed of 30km/hr

{752}A05{2047700042037700030002|7|R05{2047700042037700030002|6|X01{10000063{{I|{204770000002121|PT}|{20477001400|330}}}|10000037{{J|{204770000000002143|ABS||SEC}|{20477001400|334}}}|10000037{{J|{204770000000002142|ABS||SEC}|{20477001400|333}}}|10000105{{J|{204770000002121|ABS||}|{20477001400|331}}}|10000001{{J|{204770000000002143|36120|50509}|{20477001400|336}}}|10000001{{J|{204770000000002142|36120|31500}|{20477001400|335}}}|10000002{{J|{204770000002121|LOC|31.433330|97.866675}|{20477001400|332}}}|10000099{{J|{204770000000002121|REP||204770000000002142|204770000000002143|204330814880003|VER}|{20477001400|337}}}|10000092{{J|{204330814880008|204770000002121|204770002123||45.0|30|204770000000002121}|{20477001400|338}}}}}}

ARM over Tactical Networks

- **Benefits of structured data**
- **Layered Architecture of ARM**
  - ❖replace current TCP/IP Transfer Facility
  - ❖must address concept of guaranteed delivery
- **Payload Size**
  - ❖incremental updates are relatively small
  - ❖use of payload reduction techniques
- **Modified Replication Contracts**
- **Filters**

Issues to be Addressed

- **Broadcast Capability**
- **Quality of Service – Payload Prioritization**
  - queue management
  - completeness of individual payloads
- **Re-synchronization Methods**
  - specification still weak in this area
- **Key Fusion / Retirement**
  - effectively communicating results of data fusion

Questions?

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