



Using Ontologies to Harmonize Warfighter Data Exchanges

SSTC 2006



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U.S. Army

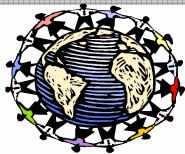


Software Engineering Center

MISSION - OBJECTIVES

Facilitate the execution of the Army Data Strategy by providing users with common and overarching data products and services to promote interoperability and faster access, retrieval, analysis and utilization of data.

Migrate from Development/CM of Messaging Standards to development of common data products for the Army Warfighter and ensure interoperability with Joint, Inter-agency, and Multinational (JIM) communities.



COI Administration



Data System Engineering



Data Modeling & Products

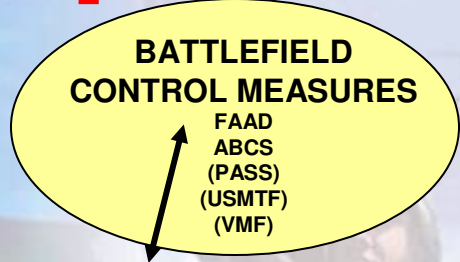


Data Validation & Test Support



Configuration Management & Control

Data Interoperability



Blue Air
FAAD
PATRIOT
ADSI
(HAWKEYE)
(AWACS)

THREAT WARNING
ABCS
(USMTF)

AIR SITUATION
ABCS
(PASS)
(AMDDS)

COMBINED ARMS UNITS
MANEUVER
AIR DEFENSE
FIELD ARTILLERY
FBCB2

THEATER MISSILE DEFENSE
ADSI
(JTAGS)
(TIBS/TDDS)

IMAGERY
DTSS
NGA PRODUCTS
UAV FEED

RED AIR
FAAD
PATRIOT
ADSI
(HAWKEYE)
(AWACS)

INTELLIGENCE
ASAS

ARTILLERY
AFATDS
(D210)

BLUE GROUND
ABCS
(PASS)
MCS
AFATDS
(USMTF)

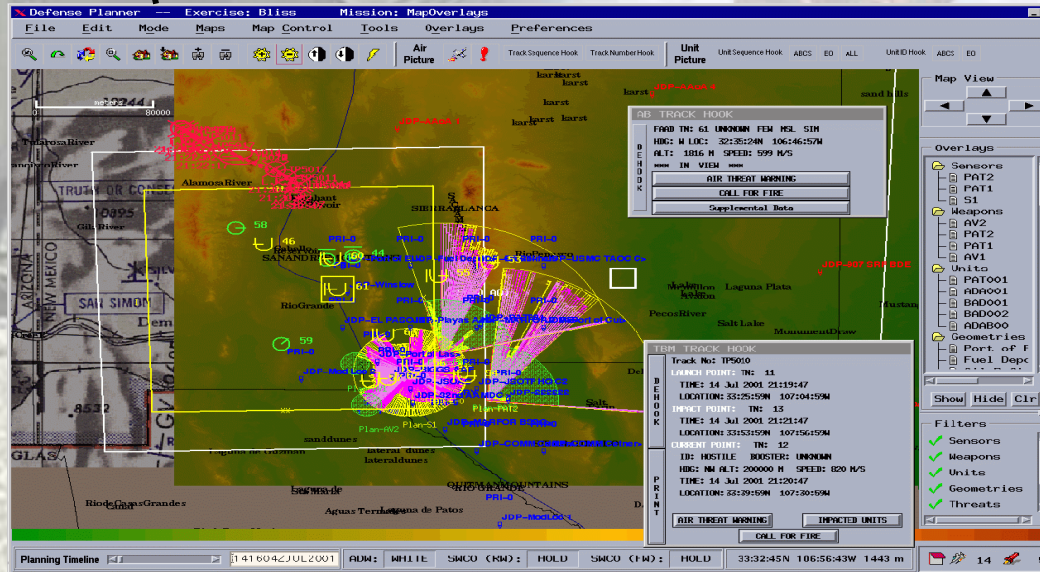
WARGAMING / SIM
CBS
WARSIM

TASK ORGANIZATION
AIR DEFENSE
AVIATION
MANEUVER
COMBAT SUPPORT
FIELD ARTILLERY

JOINT INTERFACES
- AIR FORCE
+ JDP
+ TBMCS

NATIONAL MISSILE DEFENSE
COMMAND & CONTROL
BATTLE MANAGEMENT COMPUTER (C2BMC)
(MISSILE DEFENSE AGENCY)
(INTER-AGENCY)

COALITION SURFACE-TO-AIR MISSILE OPERATIONS CENTER (SAMOC)
(GERMAN)
(MULTI-NATIONAL)



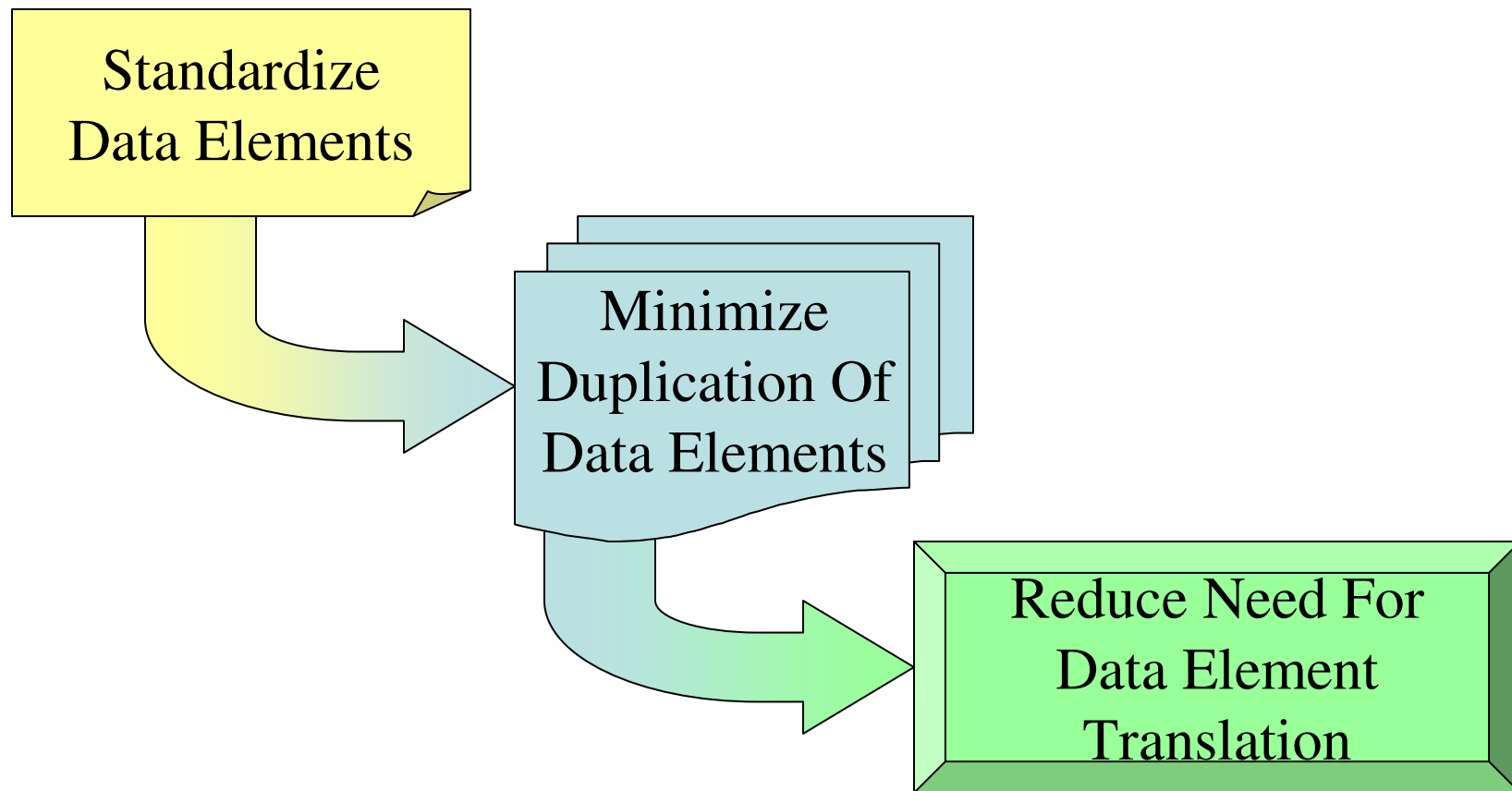


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Traditional Approach To Data Interoperability

Data Administration



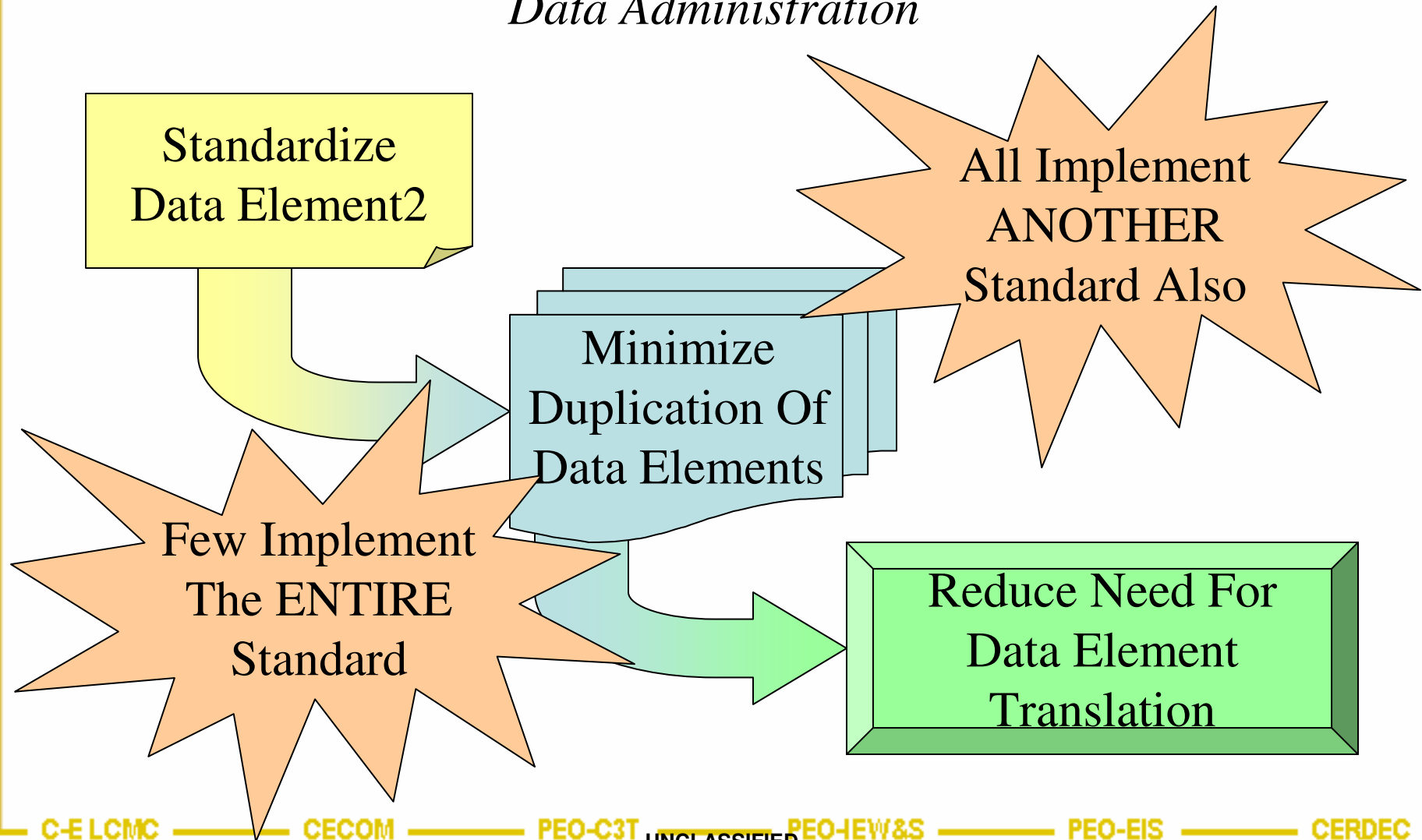


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Traditional Approach To Data Interoperability

Data Administration





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Traditional Approach To Data Interoperability

Data Administration

Need Pair-Wise Interface Specifications

Eventually

Nobody Implements

The SAME VERSION

of the Standard

ement
OTHER

Few Implement
The ENTIRE
Standard

**N-squared
Problem**



A New Approach

Interoperability without pair-wise interfaces

- Focus on **visibility** and **accessibility** of data
- Recognize the need for data **usability** by unanticipated users/applications
- Improve **flexibility** in data exchange

GOALS

1. Increase the amount of data available
2. Ensure that data is understandable



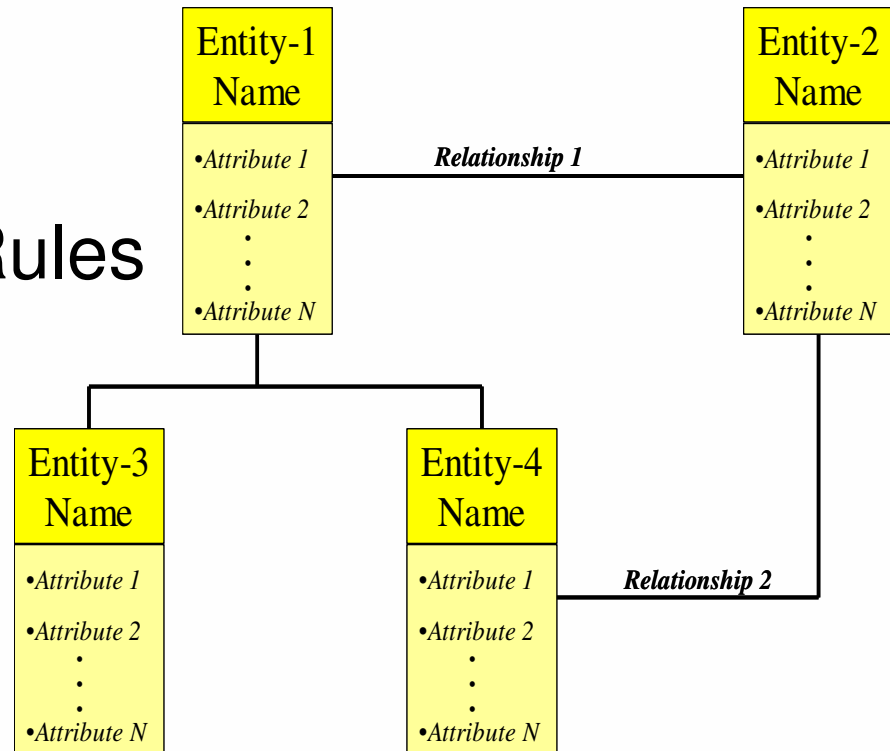
Some Basic Terminology

- Taxonomies – Simple tree-like semantics
- Thesauruses – More complex term semantics
- Conceptual Models (e.g., Ontologies)
 - Entities
 - Relationships
 - Attributes and Values
 - Rules

Ontologies
organize
metadata to
enable automated
visibility and
accessibility

Logical Data Model (OV-7)

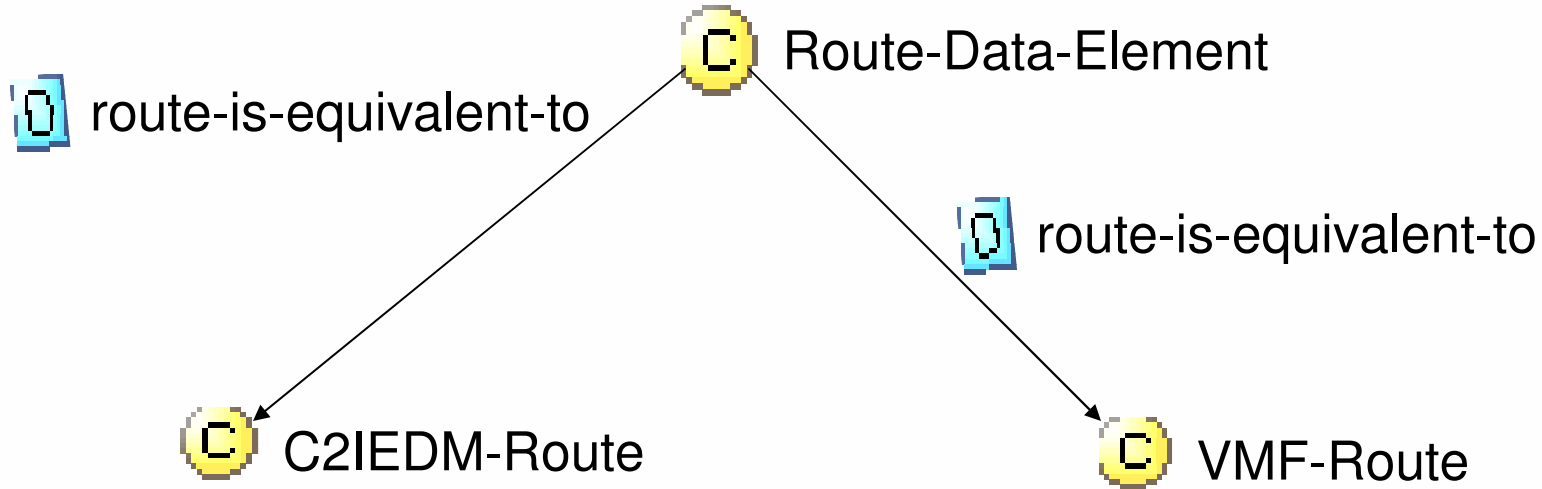
- Describes
 - Data Requirements
 - Business Process Rules



- Highlights shared data syntax and semantics

C4ISR Data Ontology

Common Concepts



Route: A line of travel. An established or selected course of travel or action.

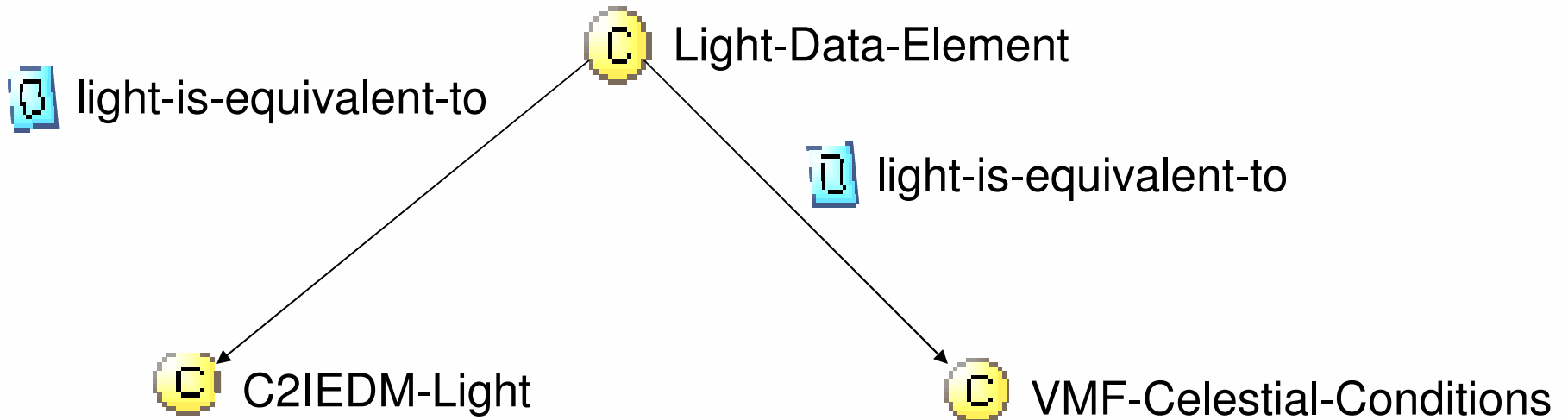


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C4ISR Data Ontology

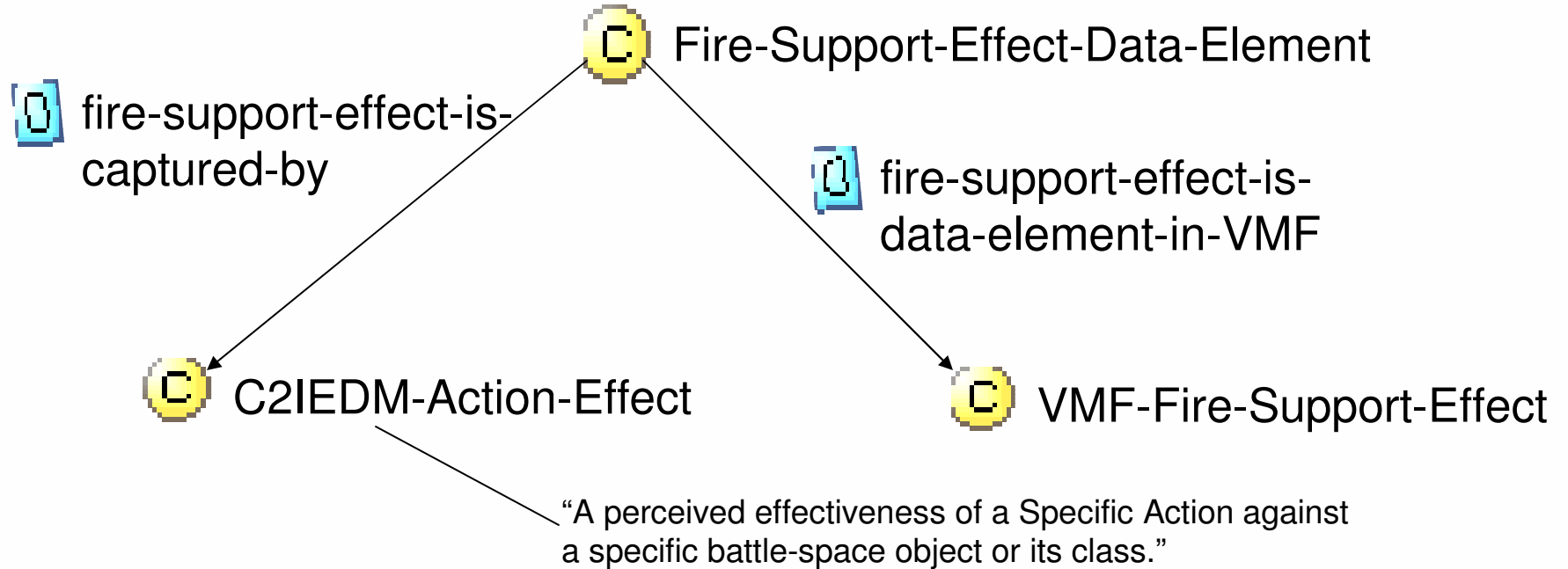
Common Concepts



Light: An electromagnetic radiation, visible to the human eye, traveling in a vacuum with a speed of about 186,281 miles (300,000 kilometers) per second. A celestial body is a source of light.

C4ISR Data Ontology

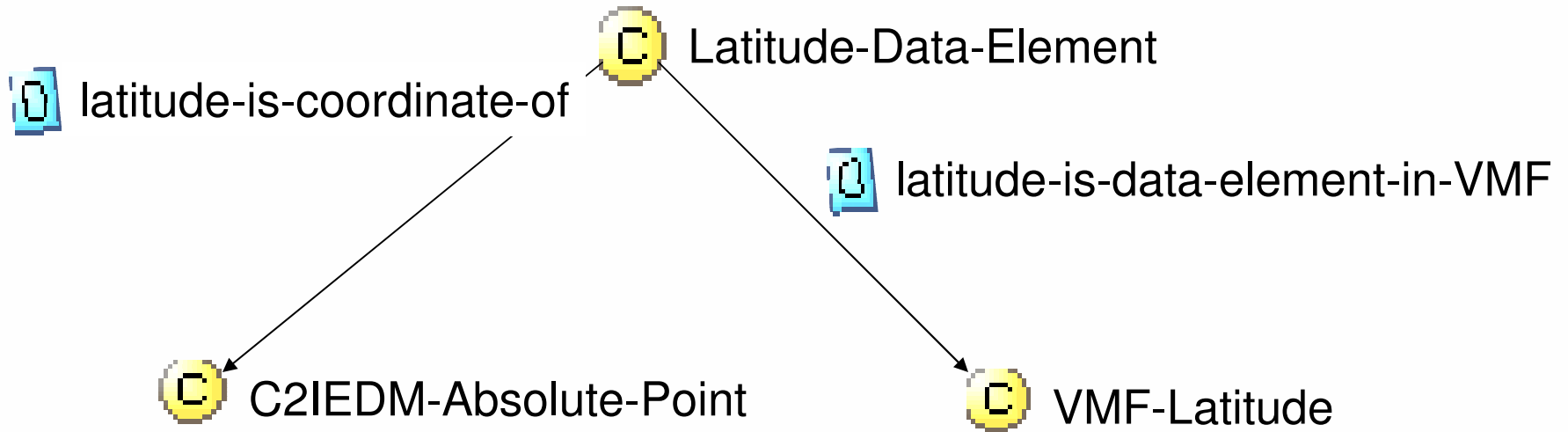
Common Concepts



Fire-Support-Effect: Indicates the result or effect of firing weapons (as firearms, artillery, or missiles) on a defined target.

C4ISR Data Ontology

Related Concepts

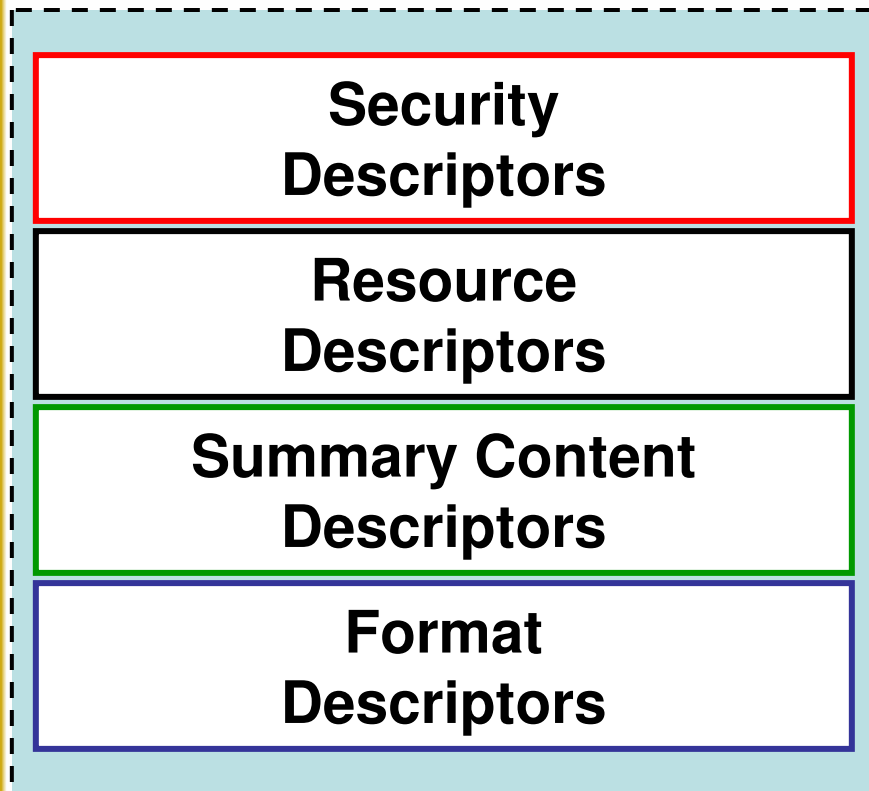


Latitude: Angular distance from some specified circle or plane of reference. Specifically, angular distance north or south from the earth's equator measured through 90 degrees.



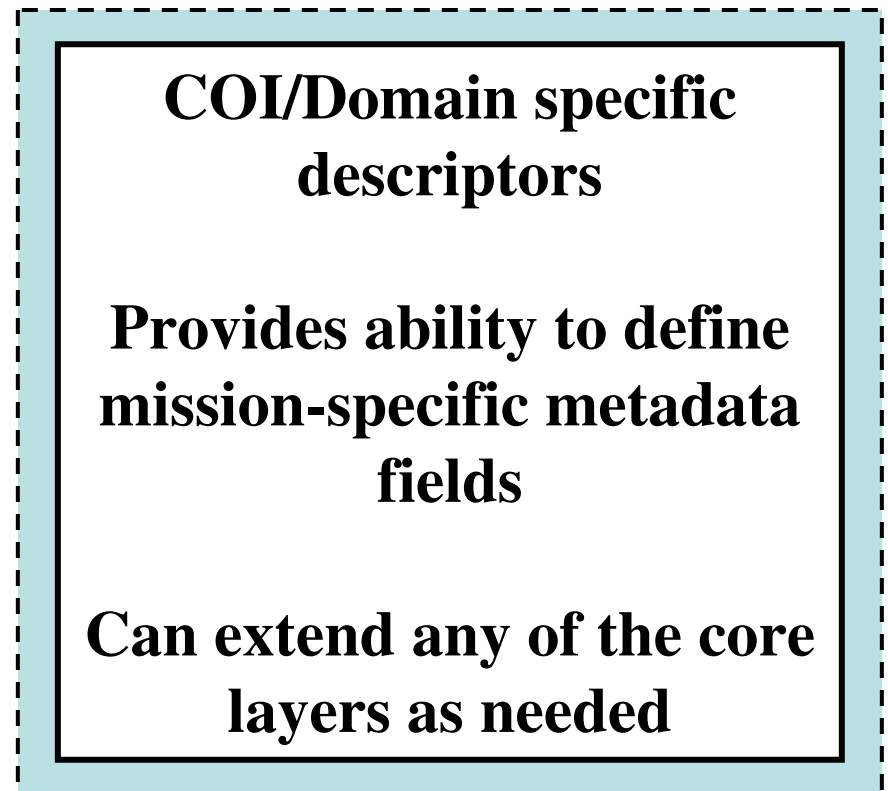
DoD Net-Centric Data Strategy

Core Layer

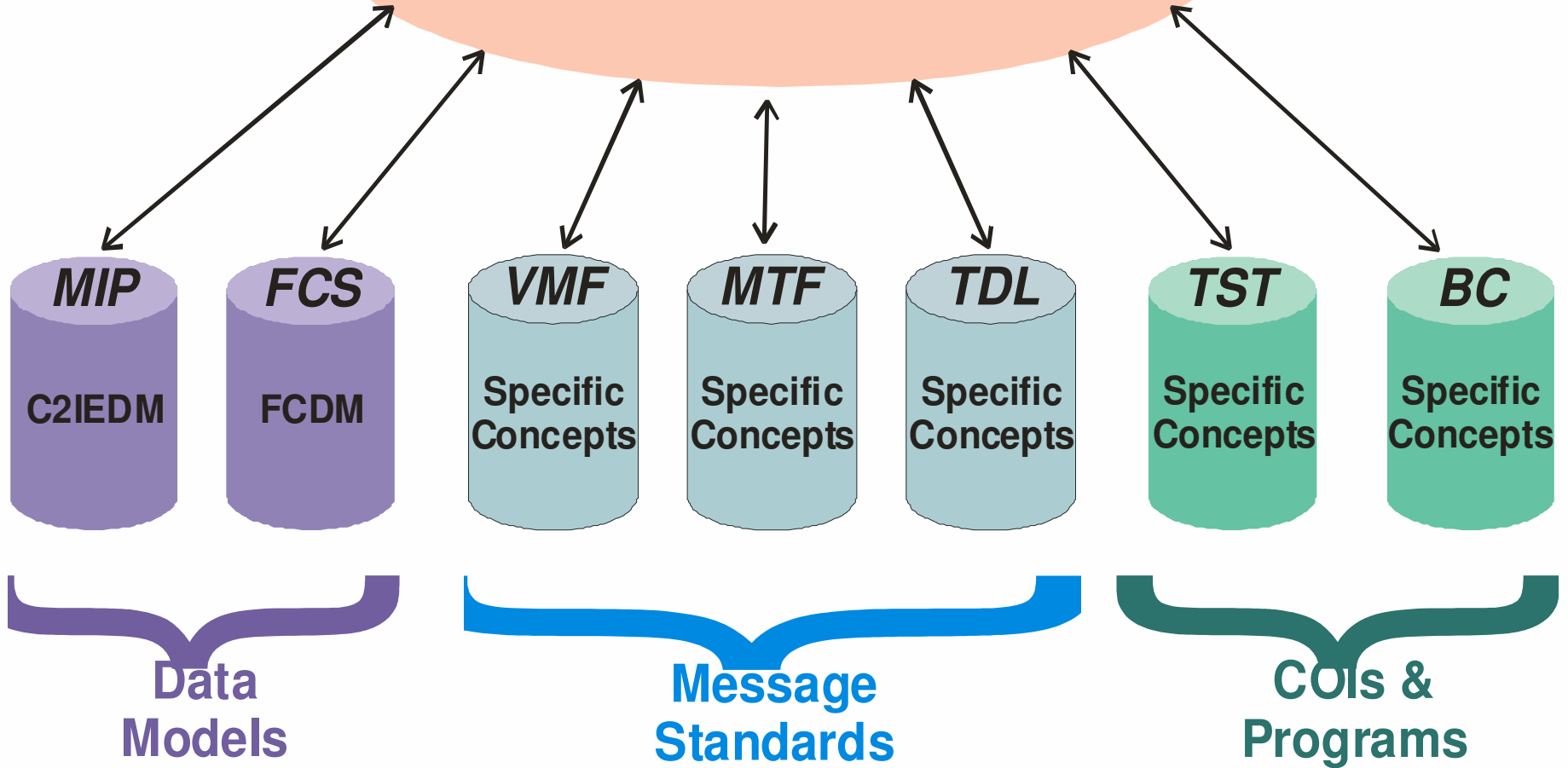


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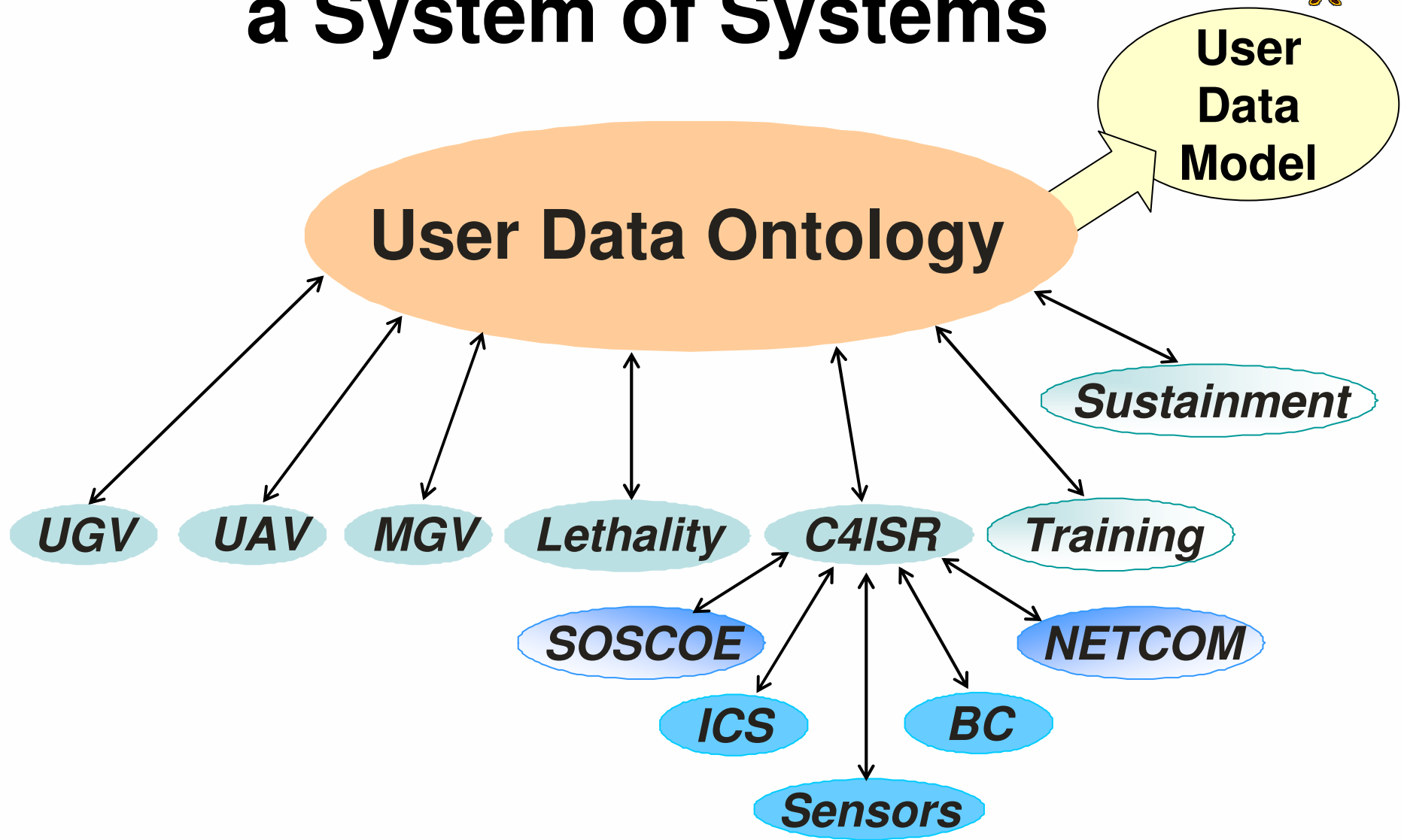
Extensible Layer



C4ISR Data Ontology

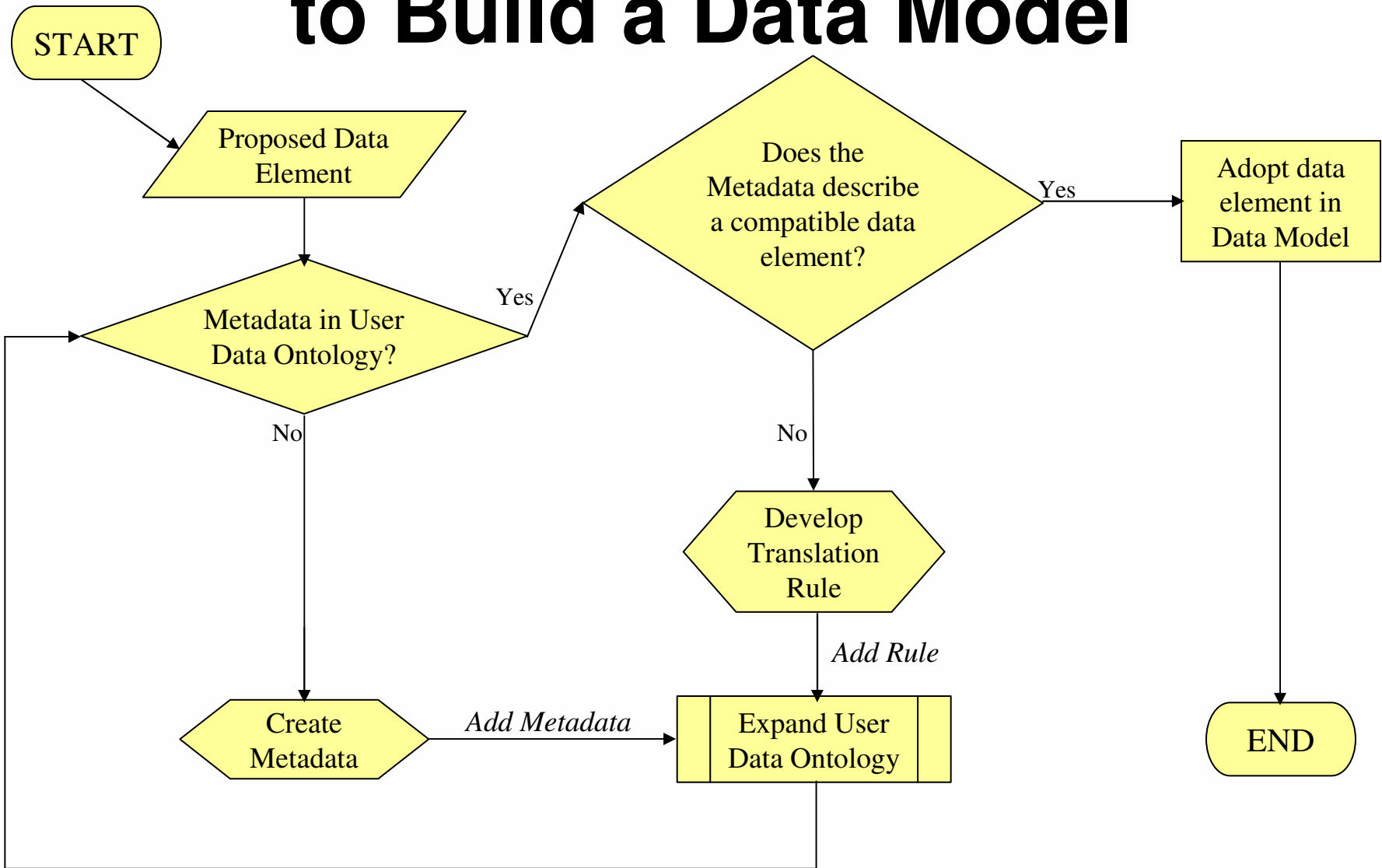


Harmonizing Data Within a System of Systems



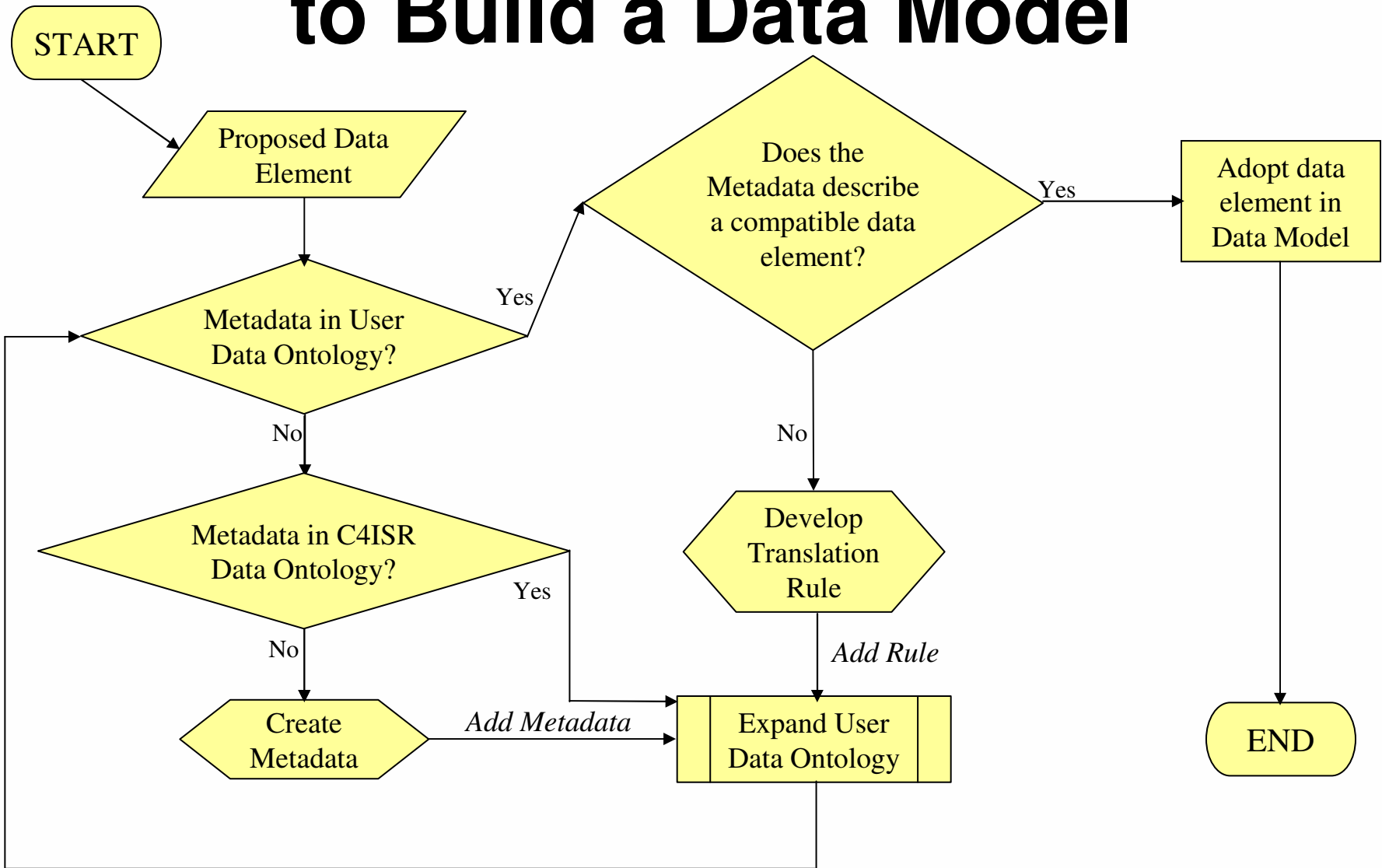


Using a User Data Ontology to Build a Data Model

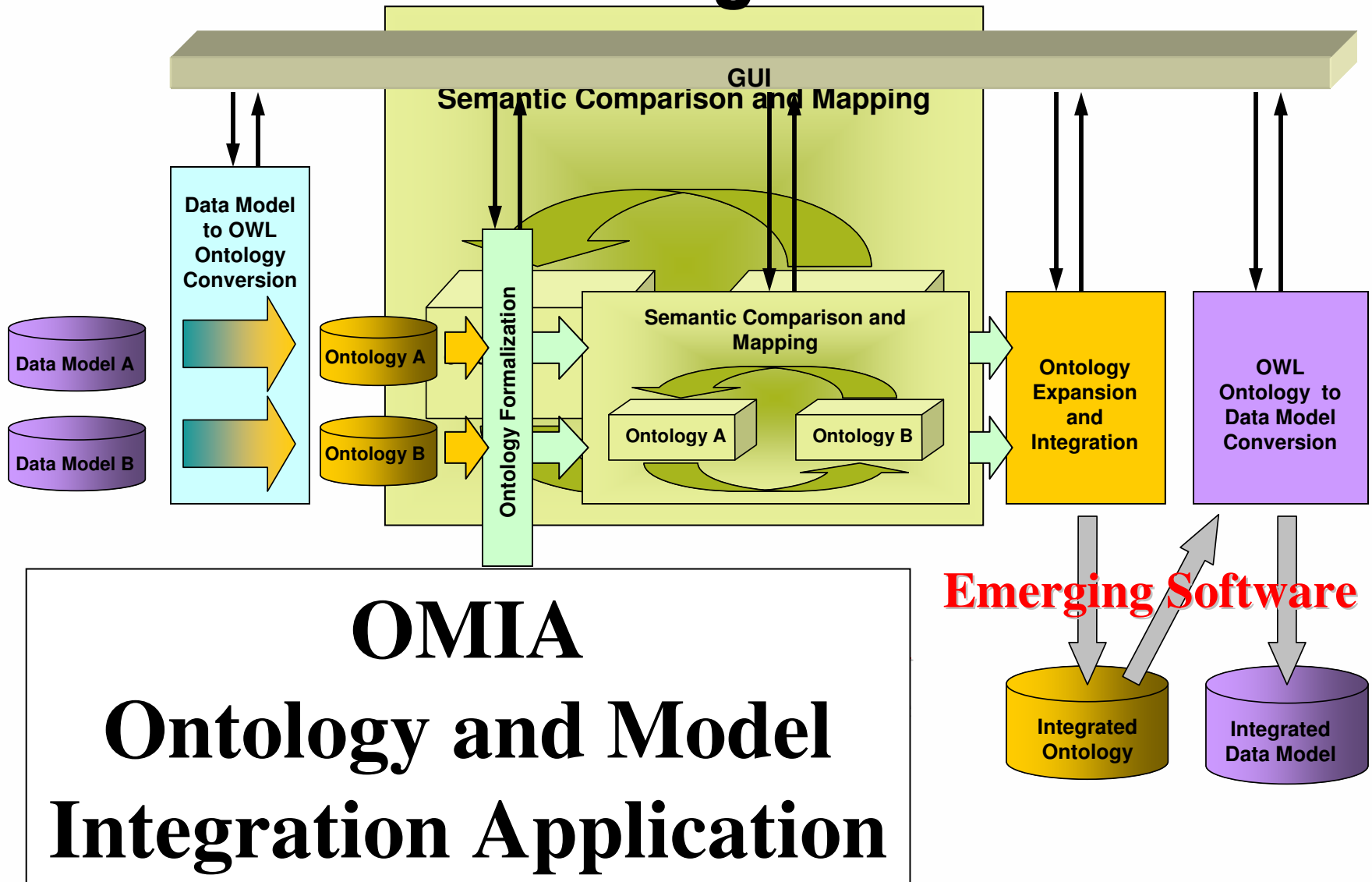




Using a User Data Ontology to Build a Data Model



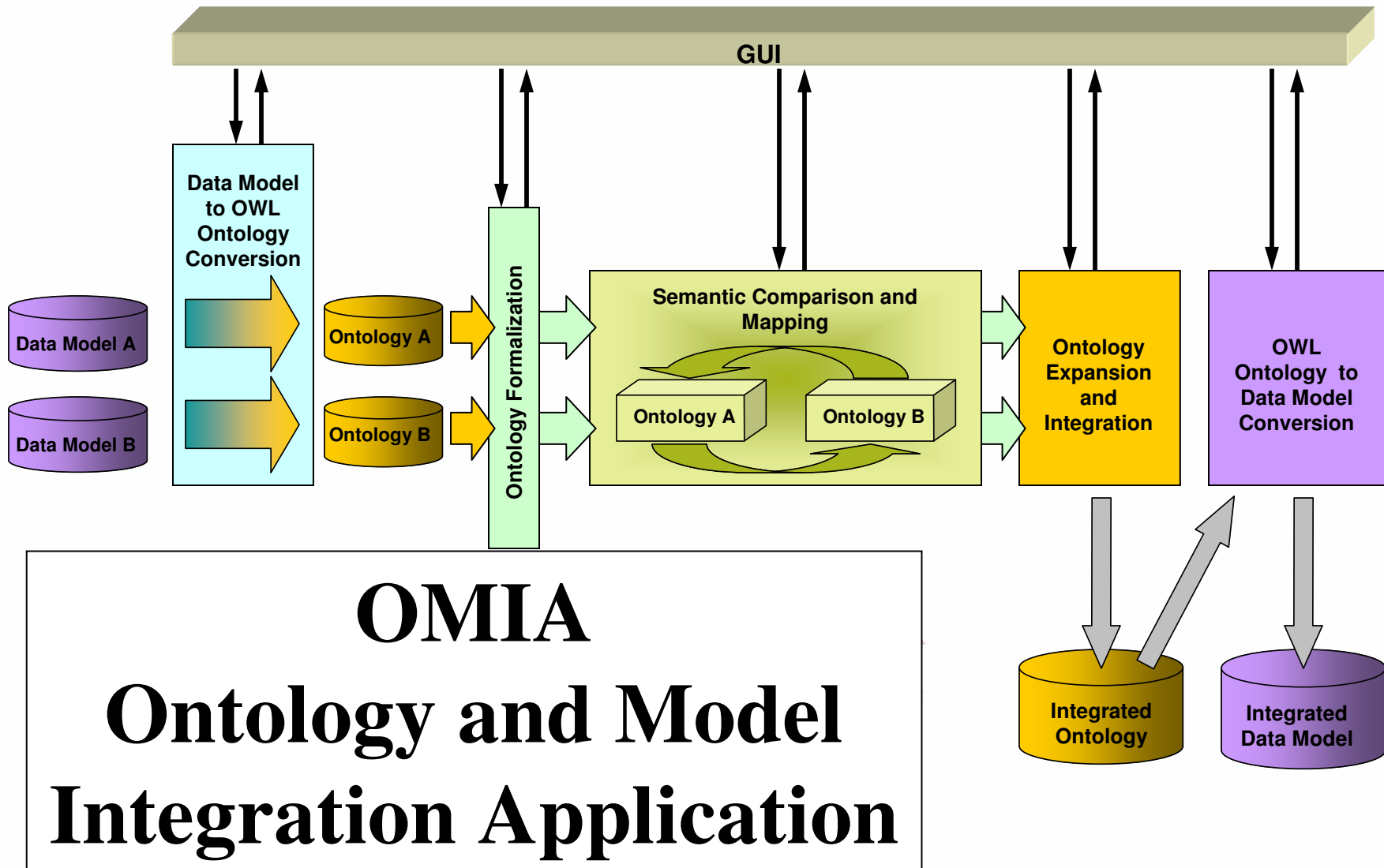
Institutionalizing the Process



OMIA Ontology and Model Integration Application

Emerging Software

Institutionalizing the Process



OMIA Ontology and Model Integration Application



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Net-Centricity Demands a Global Perspective

- Enabling Rather Than Constraining Methods
- Scalable Information Architectures
- Supportive XML-Based Technology
 - Multi-use
 - Growing Inventory
- Innovative, Visionary Engineering



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Additional Information

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**C4ISR Data
Ontology**

OMIA