

# Conceptual Data Model Evolution in Joint Strike Fighter Autonomic Logistics Information System of System Engineering

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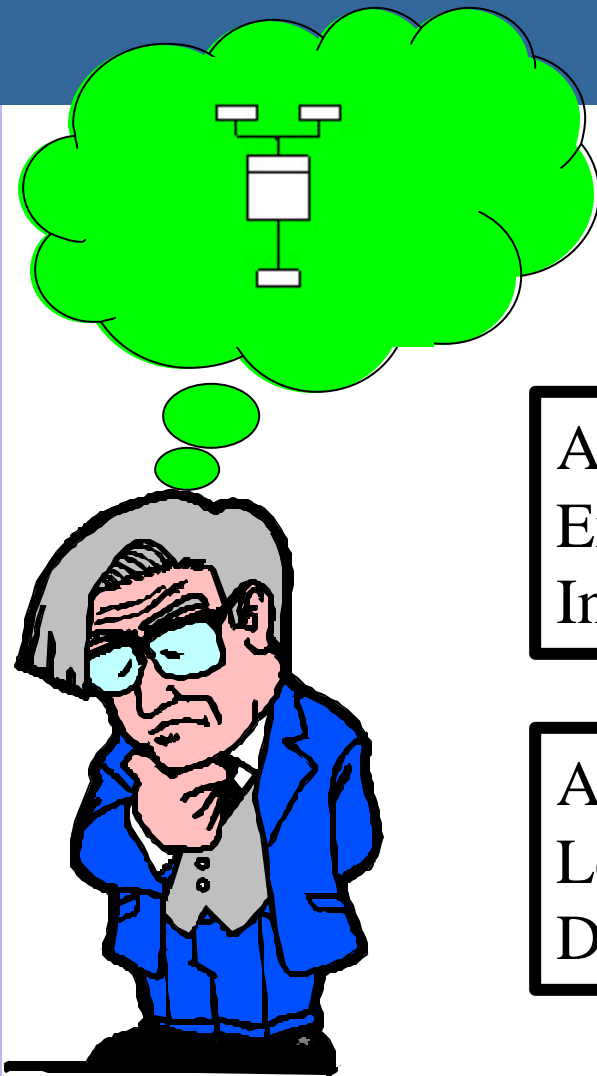
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# Agenda

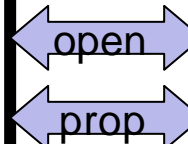
- Introduction
- Research Questions
- JSF Applied Research
- Research Goals
- Research Progress



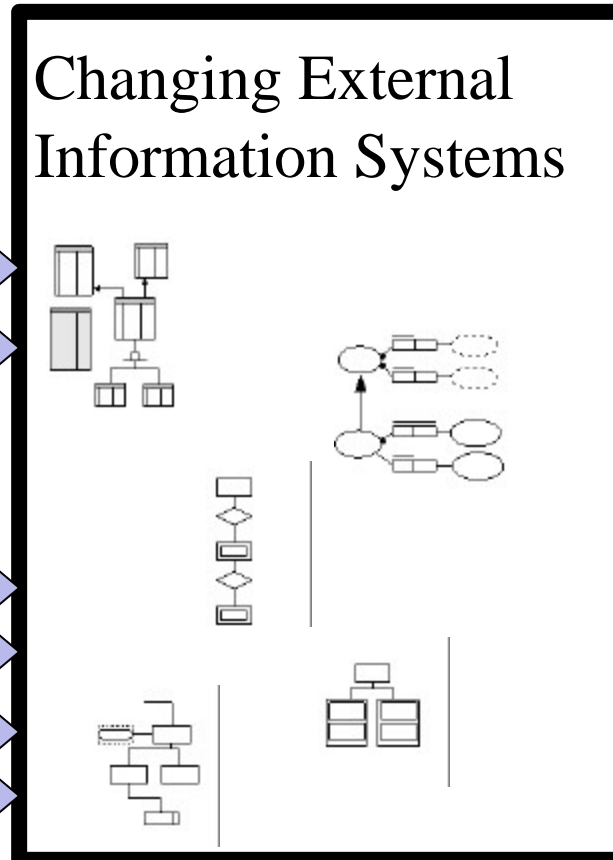
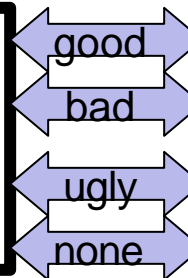
# Introduction



Allowable  
External  
Interfaces



Available  
Legacy System  
Documentation



- System Engineers have a difficult job building new real-time integrated systems using ever changing external legacy information systems. How can technology help?

# Research Questions

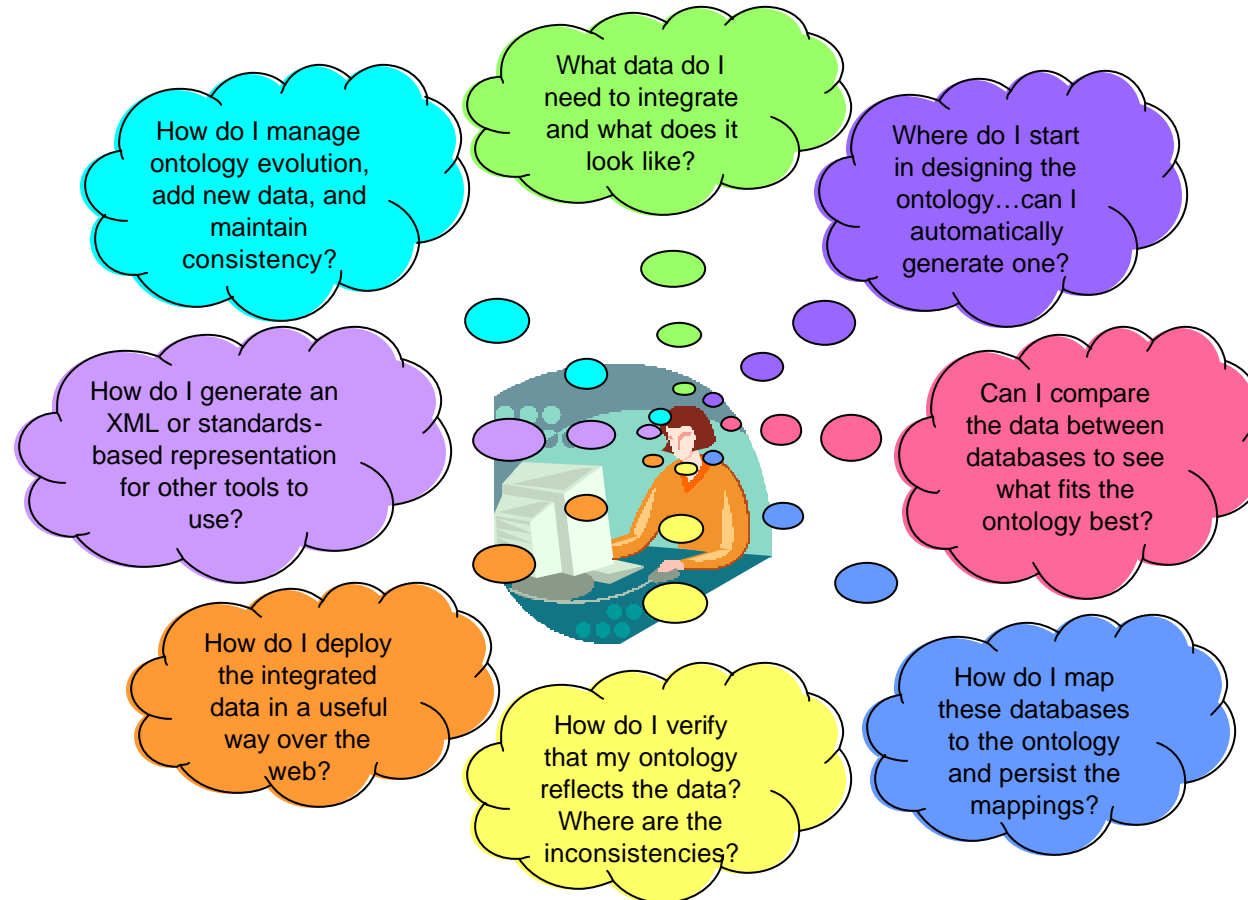
- How can relevant and meaningful data be discovered in existing information systems?
- How can the comparison of the target conceptual model to these information systems be automated and the comparison displayed in a meaningful and useful way?
- As the conceptual model and or the source data structures change, how do we reverify the mappings between the information systems and the conceptual model?

# JSF Applied Research

- Autonomic Logistics Information System (ALIS)
  - JSF is largest DoD acquisition in history
    - Joint DoD, 8 Partner Nations, Sub-Contractors
  - Unprecedented size and complexity
    - Large number of legacy, COTS and new information sources
      - CAMS, NALCOMIS, DECKPLATE, Seibel, etc.
  - Conceptual model developed using Borland Together
  - Many questions remain to be answered...

# Research Questions

JSF ALIS operational user questions:

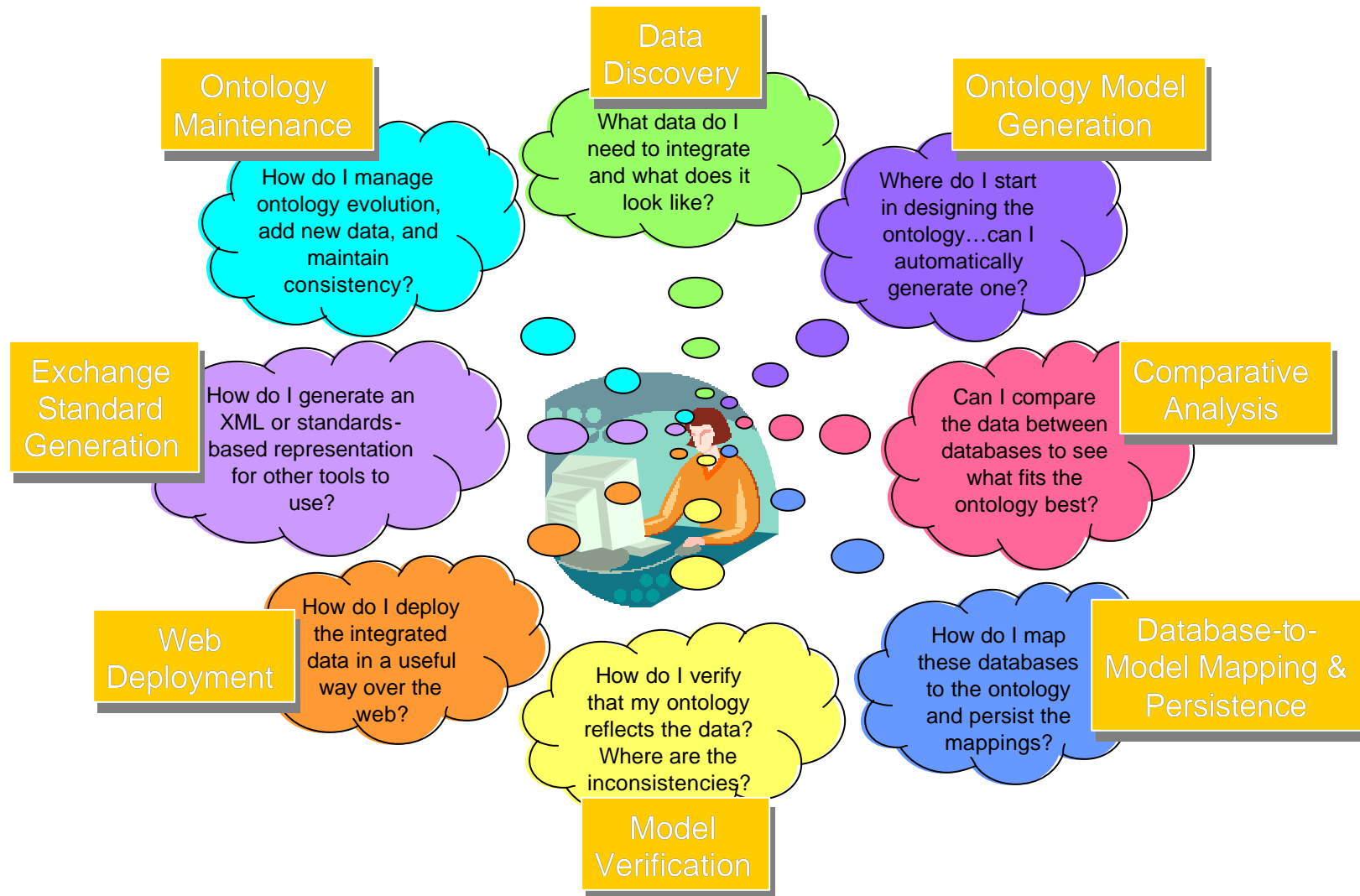


Definition: Ontology - Explicit formal specifications of the terms in a domain and relations among them (Gruber 1993)

# Research Goals

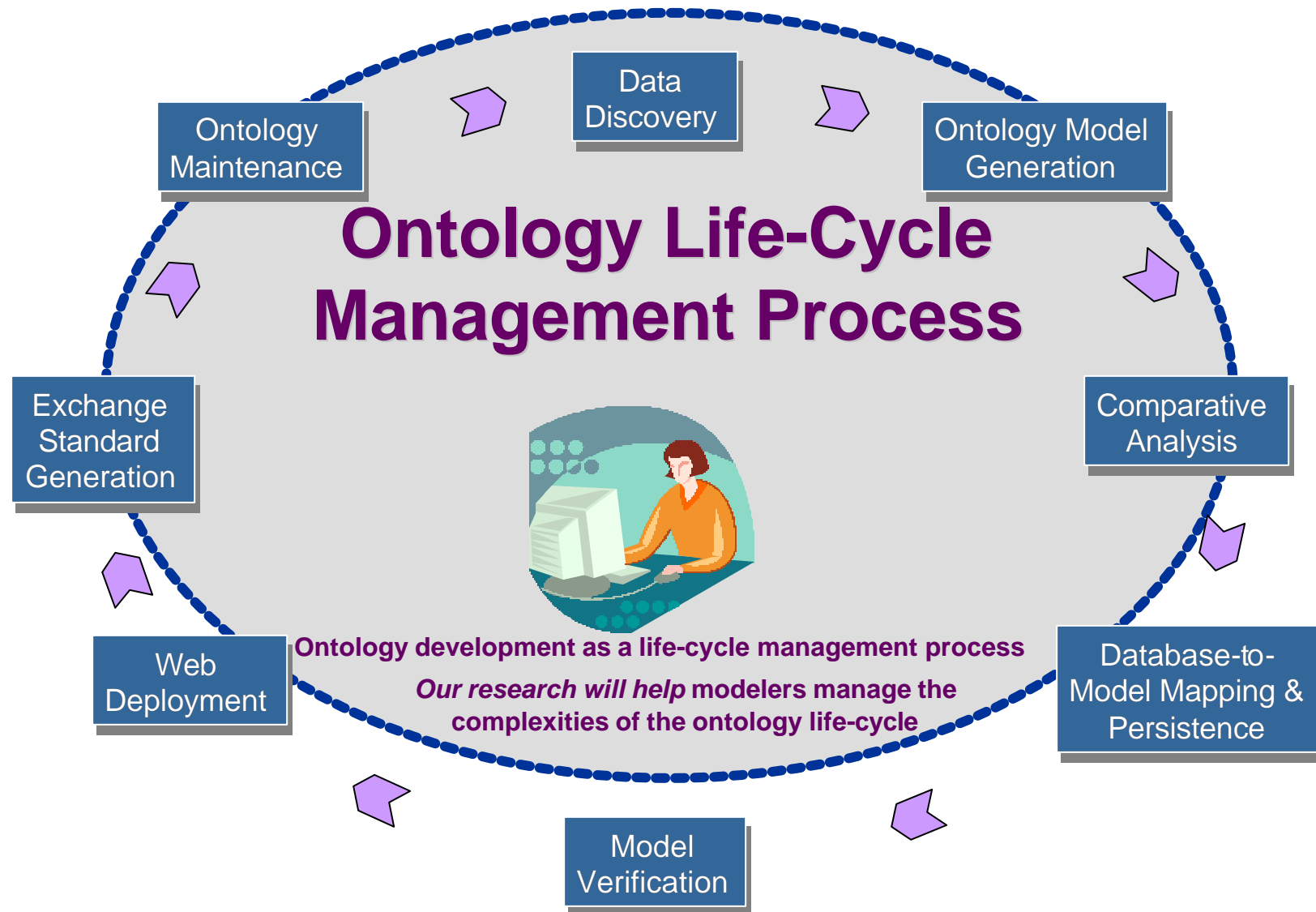
- Develop a automated physical data model discovery capability
- Develop a data model comparative analysis capability
- Develop a data model validation and verification capability
- Integrate this new capability with existing tools

# Target Capabilities for JSF





# Ontology Construction



# What Makes This Capability Different?

## Start Up



- Design ontology
- Discover databases
- Auto-generate ontology
- Compare databases
- Mine documents
- Generate lexicon

## Development & Deployment

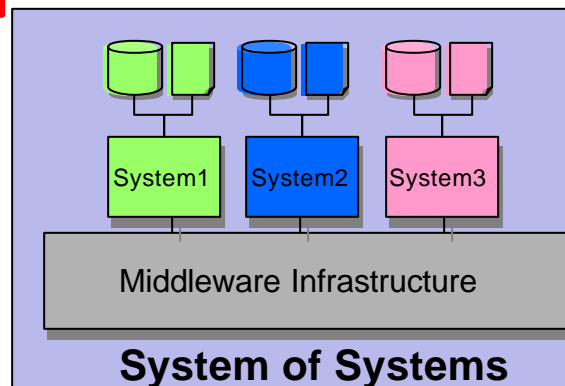


- Capture metadata
- Assess best fit
- Analyze inconsistencies
- Persist mappings
- Collaborate
- Export for web access

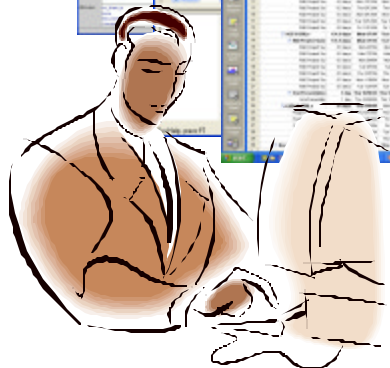
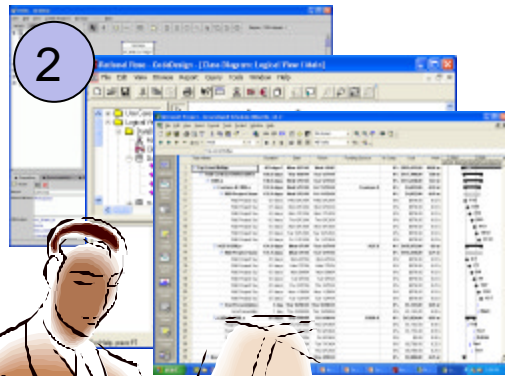
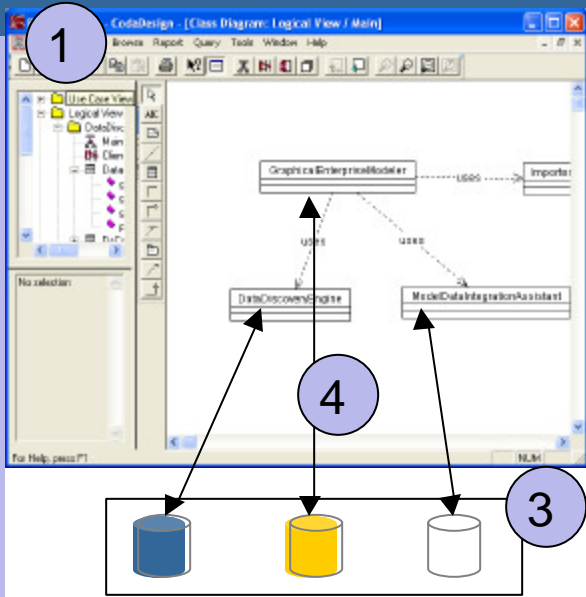
## Maintenance



- Add new data sources
- Modify ontology
- Re-verify mappings
- Regenerate XML
- In the context of your framework (OWL)



# JSF ALIS Scenario



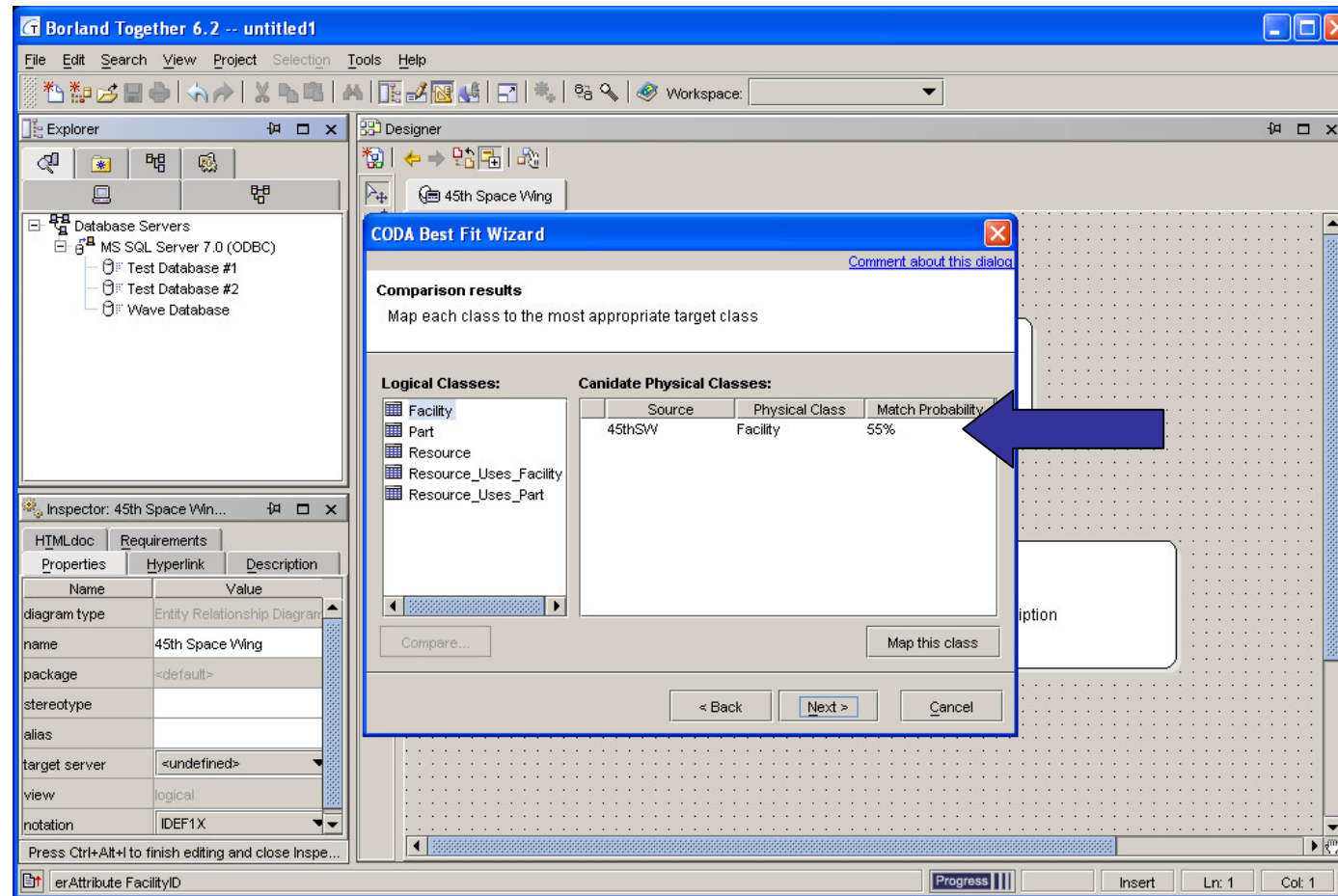
*ALIS Engineer*

## 5 Comparative Analysis

	Logical	Physical	Discrepancies
	WorkOrder	Work_Order	
	name	name	✓
	date	date	✓
	originator	originator	✓
6	status	status	Type Mismatch
	priority		Attribute Missing
7	Repair	Repair	

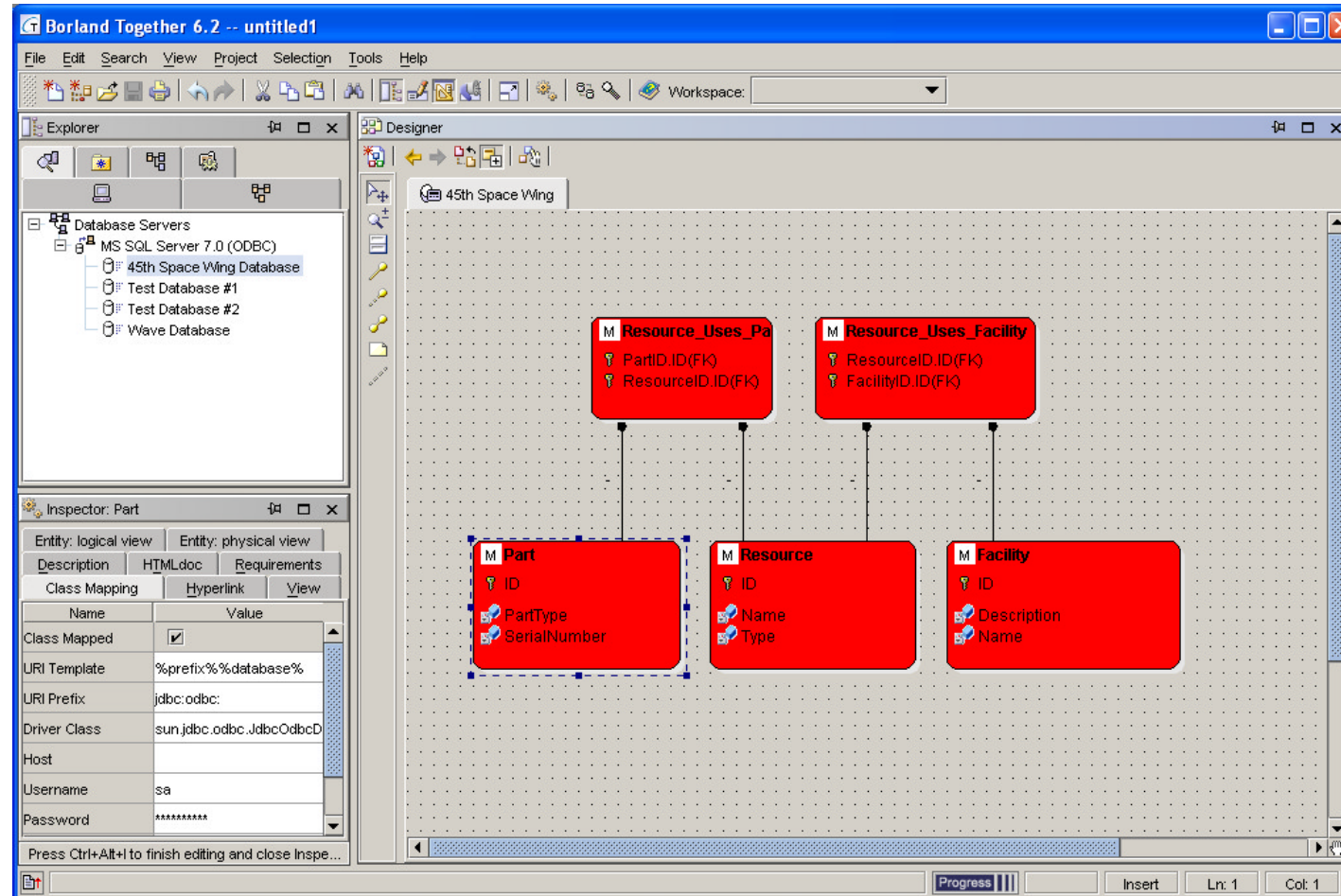
1. Logical model created in Borland Together
2. JSF applications and data model developed based on approved logical model
3. Data sources discovered and previewed
4. Logical classes mapped to data sources
5. The logical and physical models are compared. Does the “as designed” model match the “as built” model?
6. Model discrepancies reported
7. Repair discrepancies

# Progress: Best Fit Analysis



One candidate physical class for the logical class “Facility”

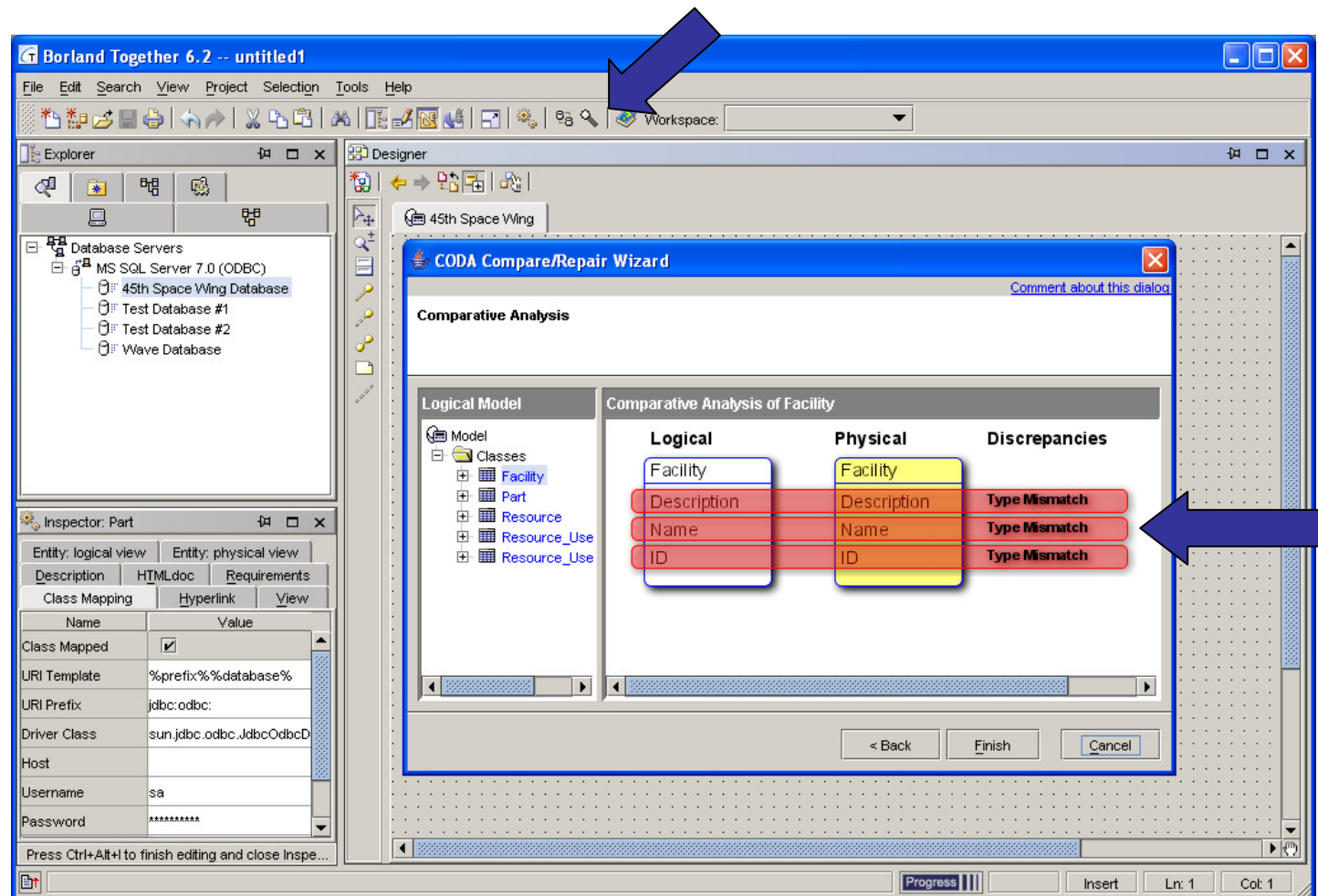
# Real Time Model Analysis



Over time, the logical and/or physical model will change. Classes highlighted in red indicate a discrepancy in the logical to physical model mapping.

# Detailed Comparative Analysis

For a detailed look at the discrepancies, select one or more classes and click



The “Facility” class contains three data type mismatches.

# Research Summary

- Supports development of logical models or ontologies for complex systems
  - Helps modelers define concepts, attributes & relations
  - Automatically generates “start-up” ontologies by mining concepts and inferring relations from domain documents (TBD)
- Facilitates understanding of data sources and how to integrate them
  - Visually discover and compare schema structures
  - Analyzes what data best fits the ontology
  - Analyzes inconsistencies between data and the ontology
- Deploys ontology and integrated data over the web
  - Web-enables access to integrated data via the ontology through searching, browsing and reporting capabilities
  - Exports ontology and integrated data to standard exchange formats (OWL, Web Services, etc.) for use by other tools