# CSSE 490 Model-Based Software Engineering: Cougaar Model-Driven Architecture Example

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# Learning Outcomes: MBE Discipline

***Relate Model-Based Engineering as an engineering discipline.***

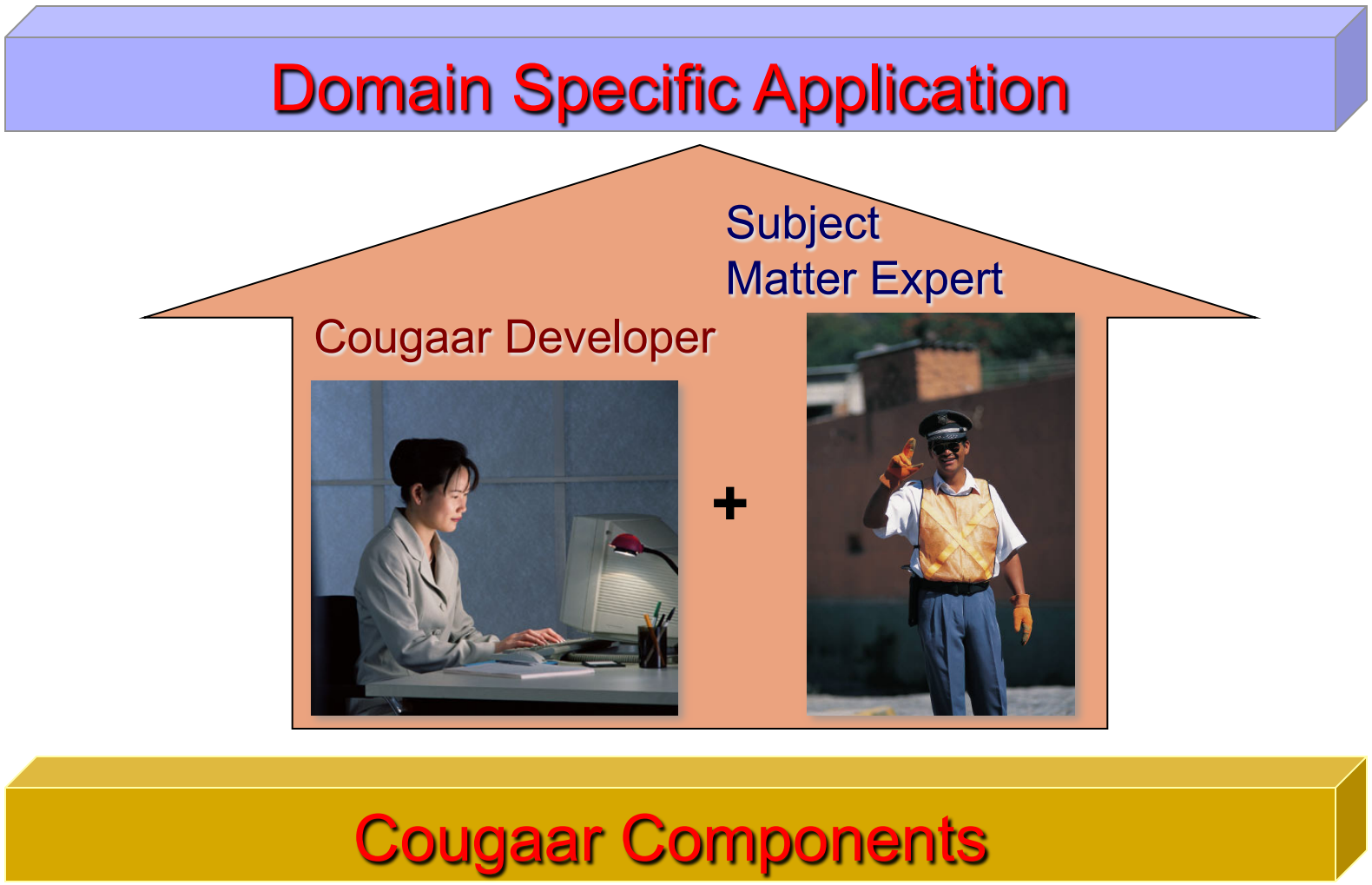
- Discuss more Milestone 3
- Examine the Cougaar Model-Driven Architecture Project
- Short exercise with Books Online
- Topics for Term Papers (if time)

# Recall MBSE for Software Defined Radios – complexity was in the low-level details of the representations.

## Can MBSE be used when the complexity is in the behavior sophistication (e.g. Agents)?

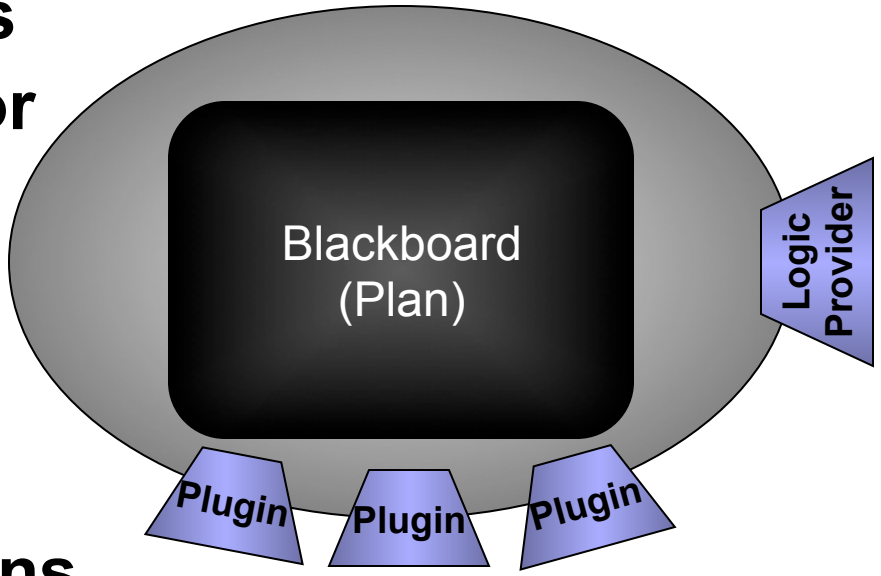

- Think for 15 seconds…
- Let's talk…

# Original Cougaar Development Problem



# Cougaar Agent Internals in a Nutshell

- **Agent** is logical collection of Plugins
- **Blackboard** - shared areas
- **Plugins** – provide behavior for agents and can subscribe to receive objects from Blackboard or publish to Blackboard
- **Message system** handles inter-agent communications
- **Community** of one or more agents on each node

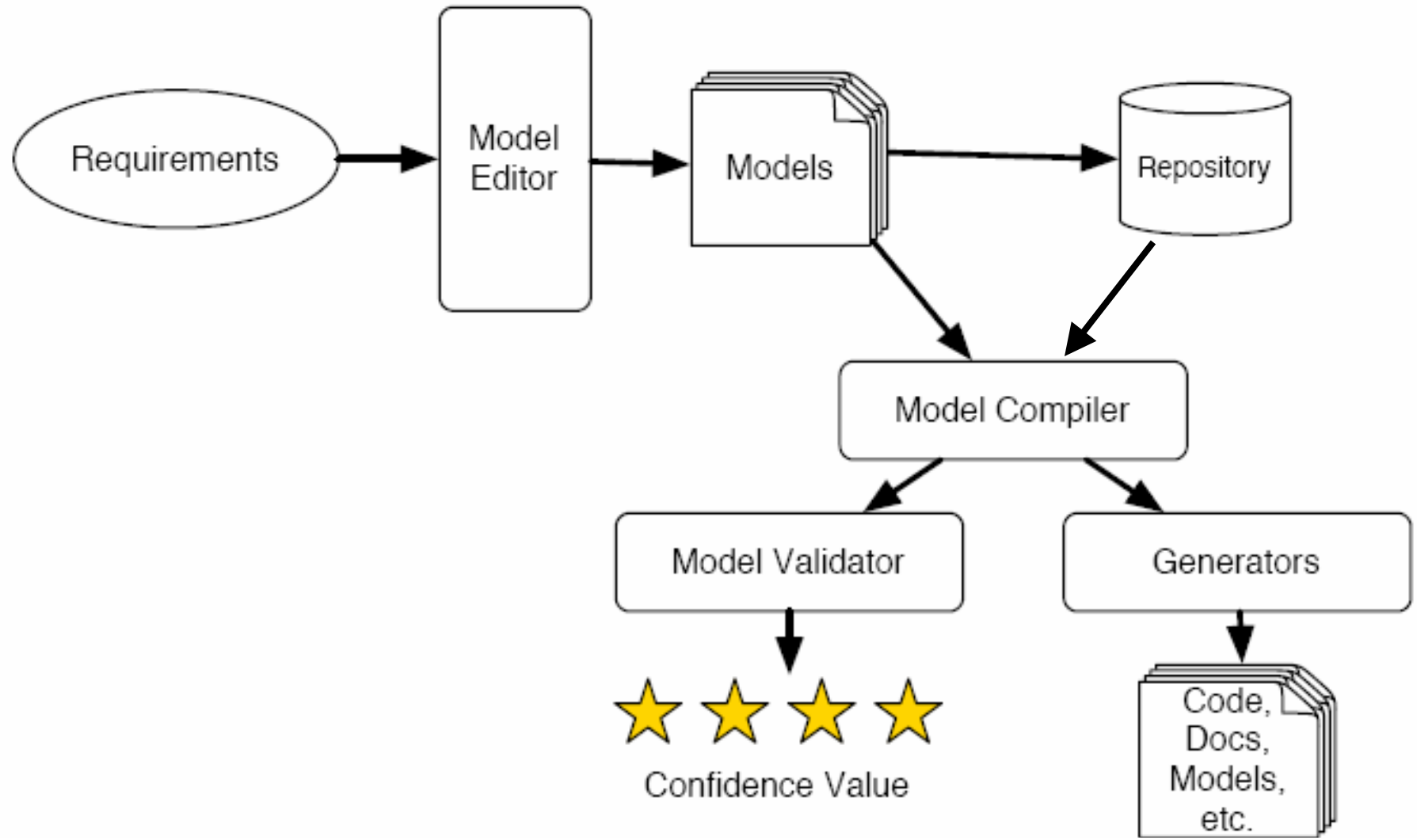


# Complexity: Cougaar Agents in Systems

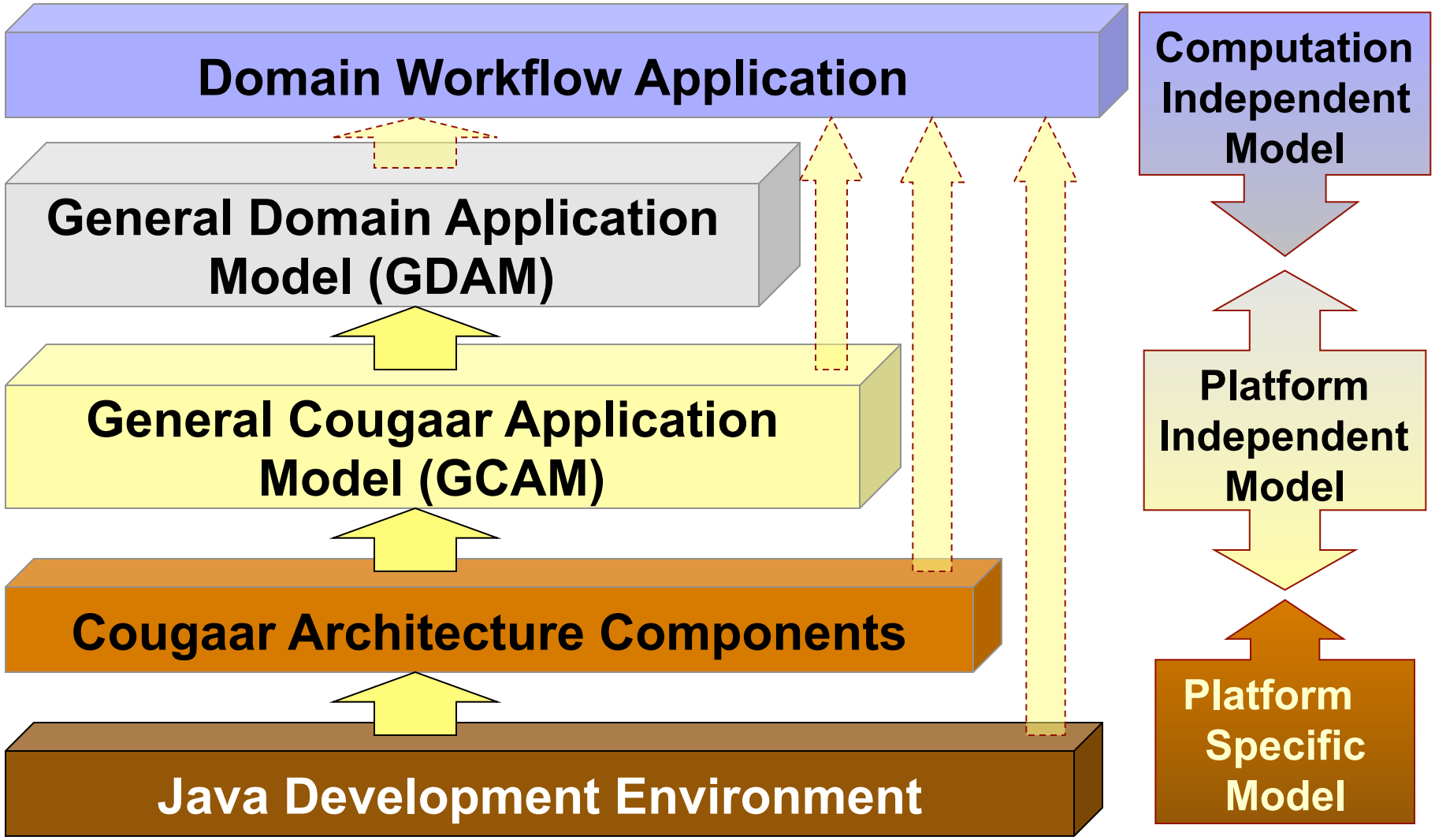
## Capturing the Human Cognitive Process

1. Receive tasking
2. Decompose task into doable subtasks
3. Assign tasks to skills or subordinates
4. Monitor execution, replan as required
5. Report status periodically

# Simple Cougaar MDA Vision



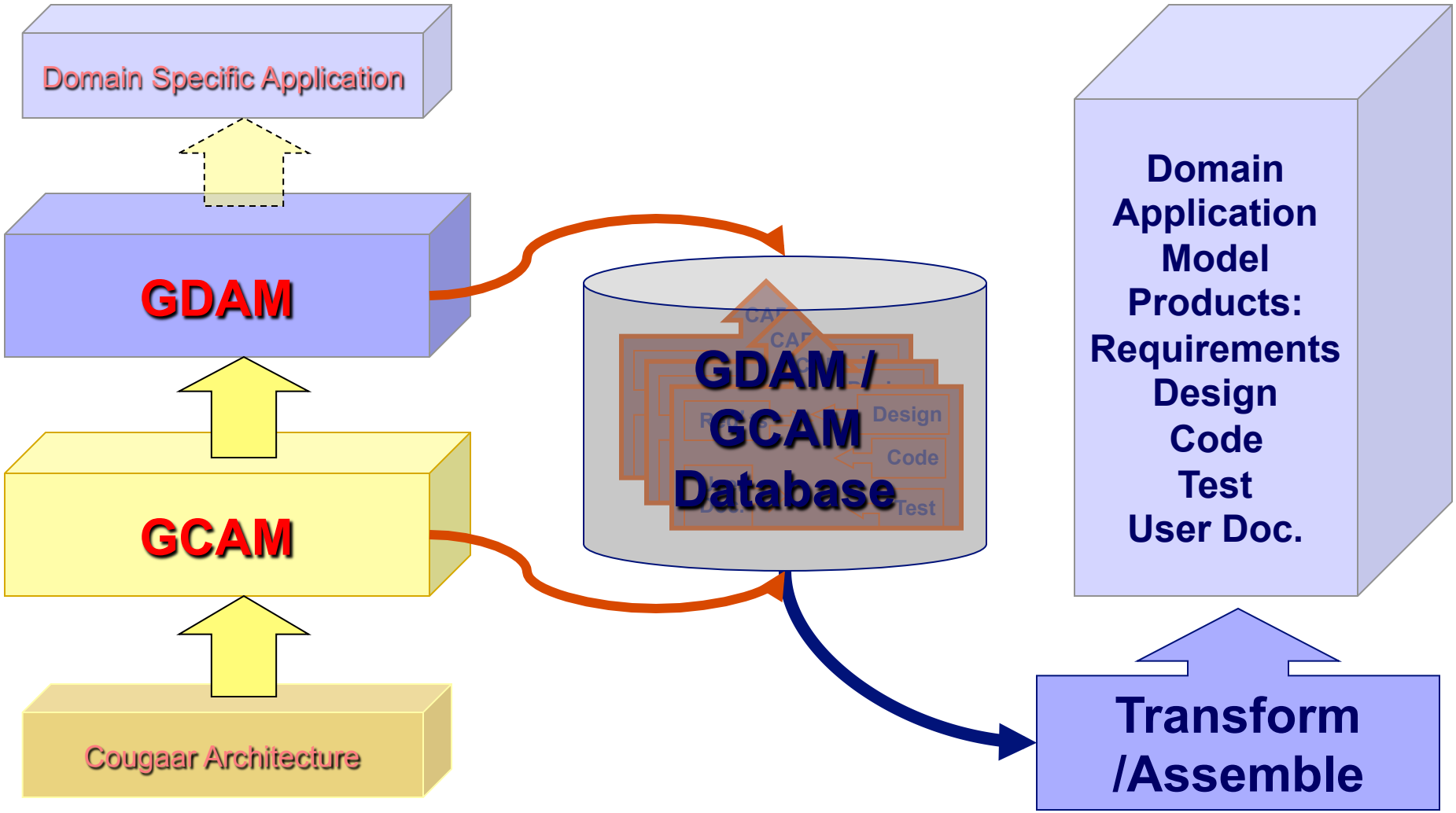
# Cougaar Model Driven Architecture



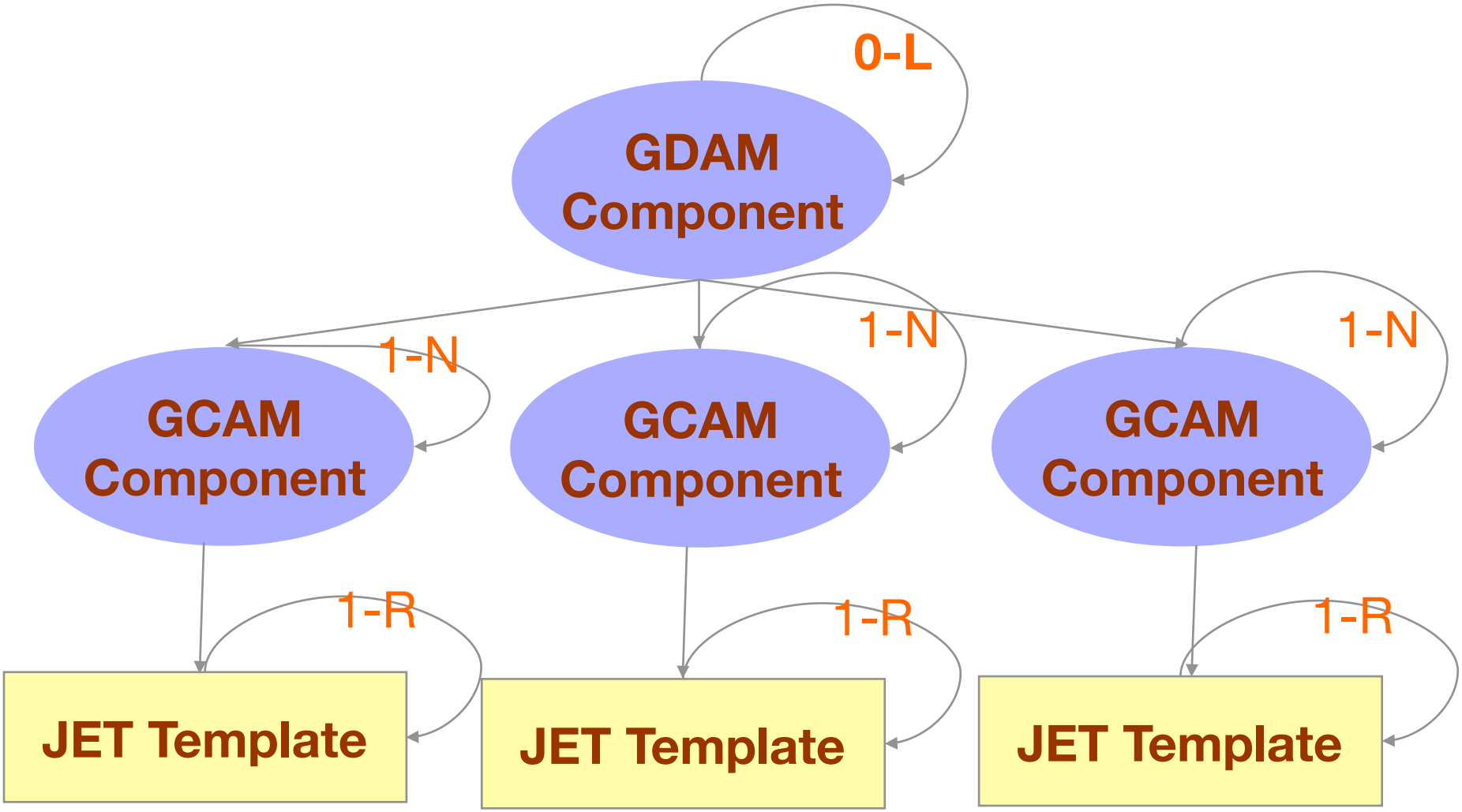
# So, what is a reasonable mental model of the major components for doing CMDA?

- Again, think for 15 seconds…
- Let's talk…

# CMDA Model and Transform Approach

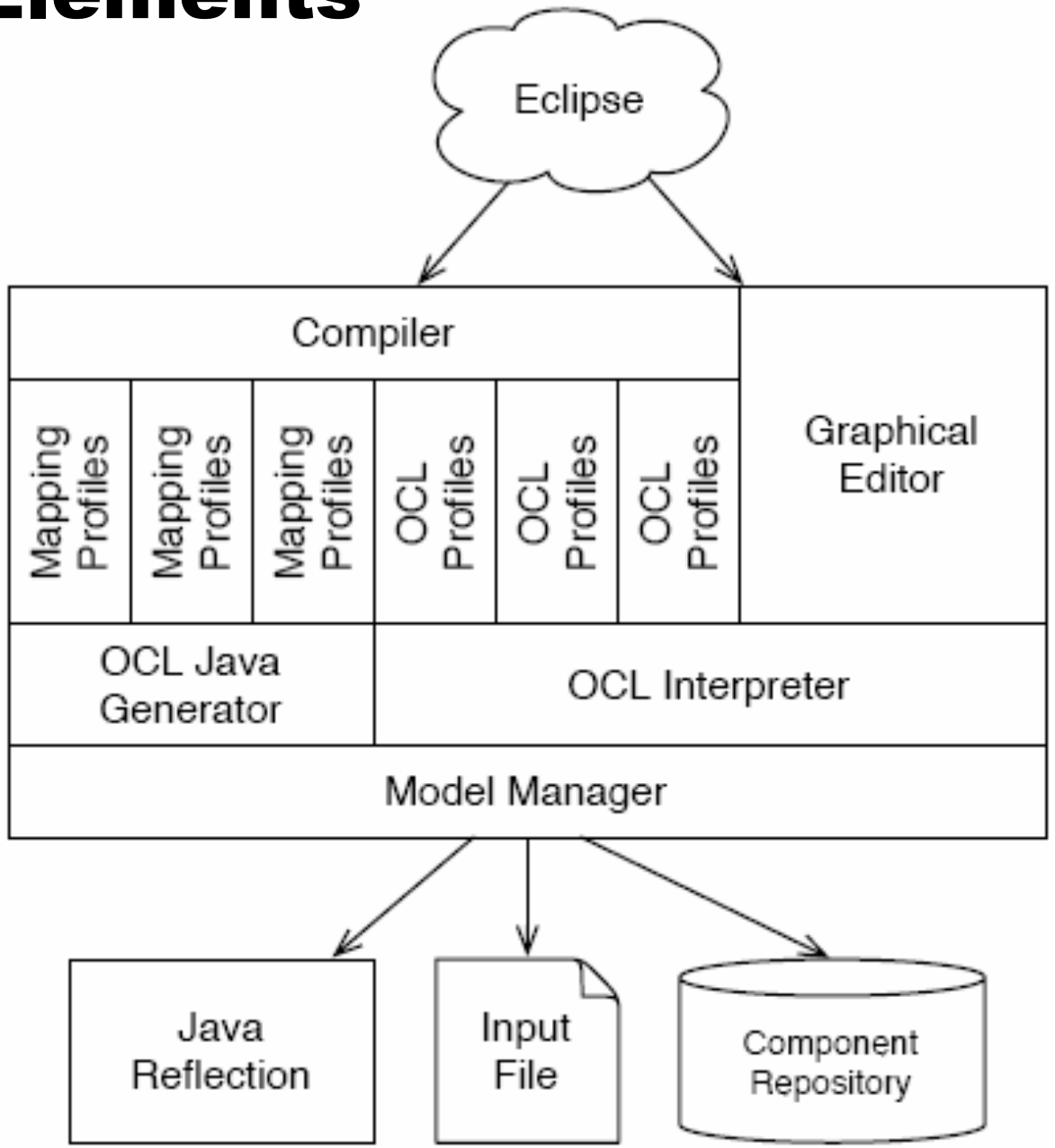


# Recall: CMDA Metamodel



# Basic CMDA Elements

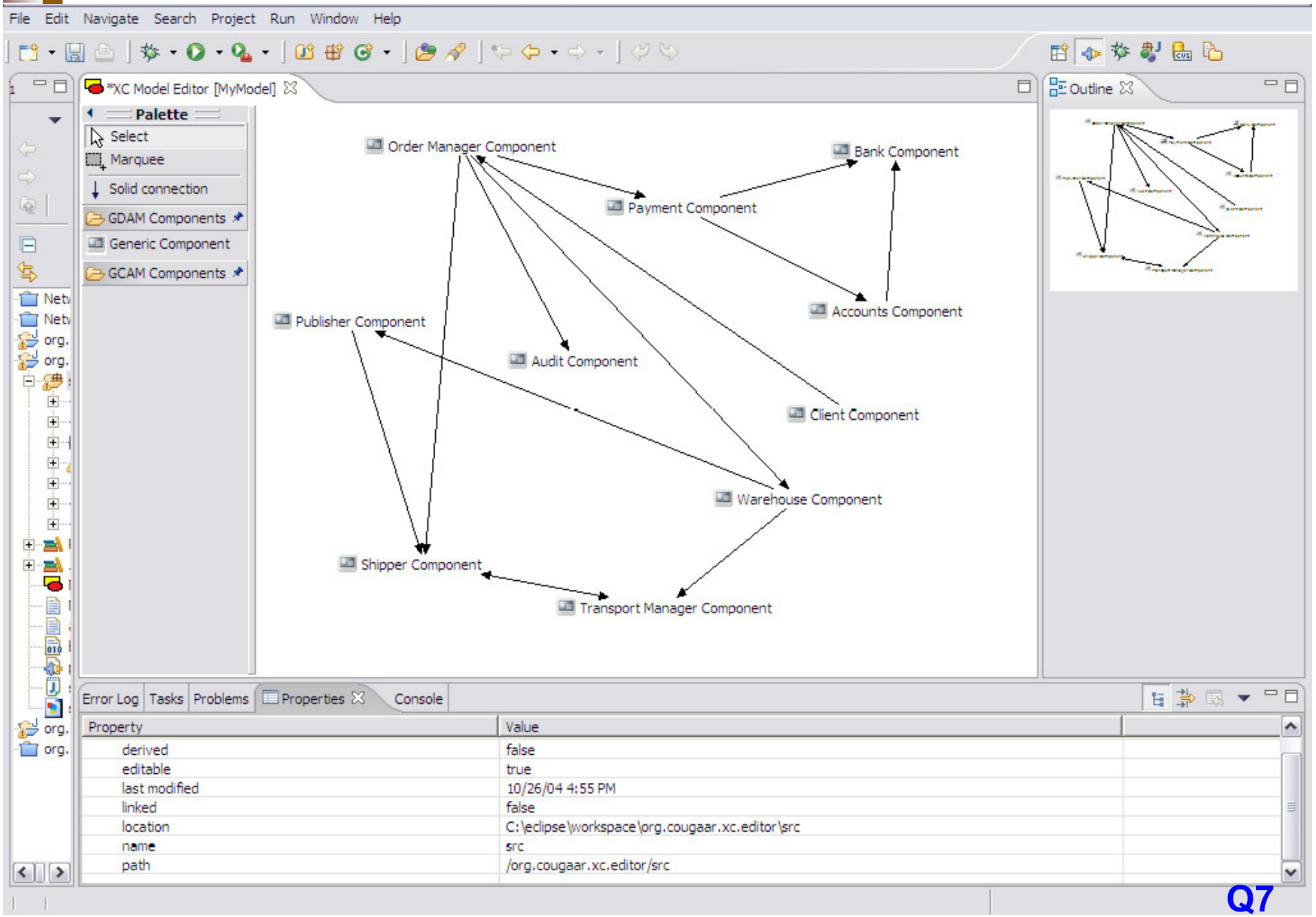
- Graphical Cougaar Model Editor (GCME)
- MetaModel
- Model Manager
- Compiler
- OCL Interpreter
- JET Templates
- Component Model Repository



# CMDA Core Technologies

- Eclipse – Development Platform
- EMF – Modeling Framework
- GEF – Graphical Framework
- JET – Template Framework
- ANTLR – OCL Interpreter Framework
- GFE – Component Editor Framework
- Cougaar – Underlying Platform

# Graphical Cougaar Model Editor (GCME)

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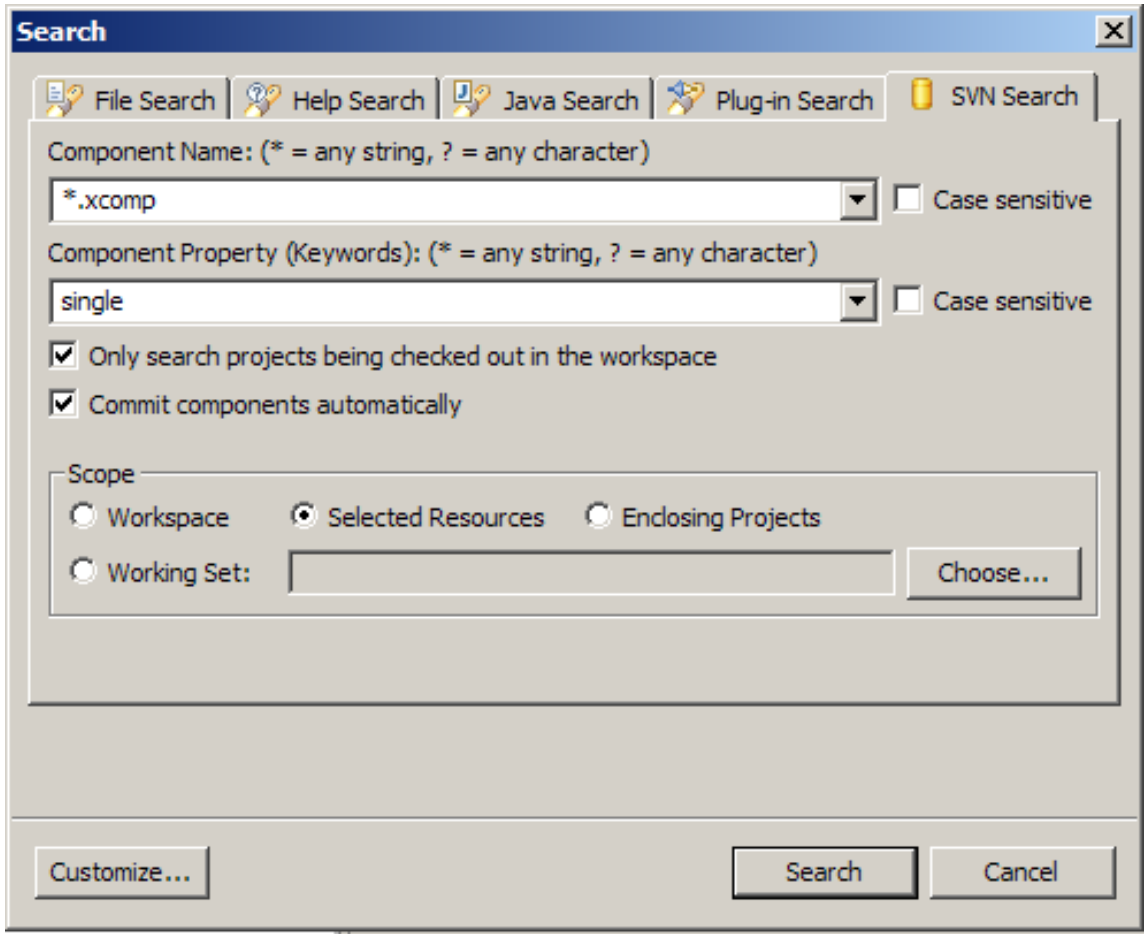
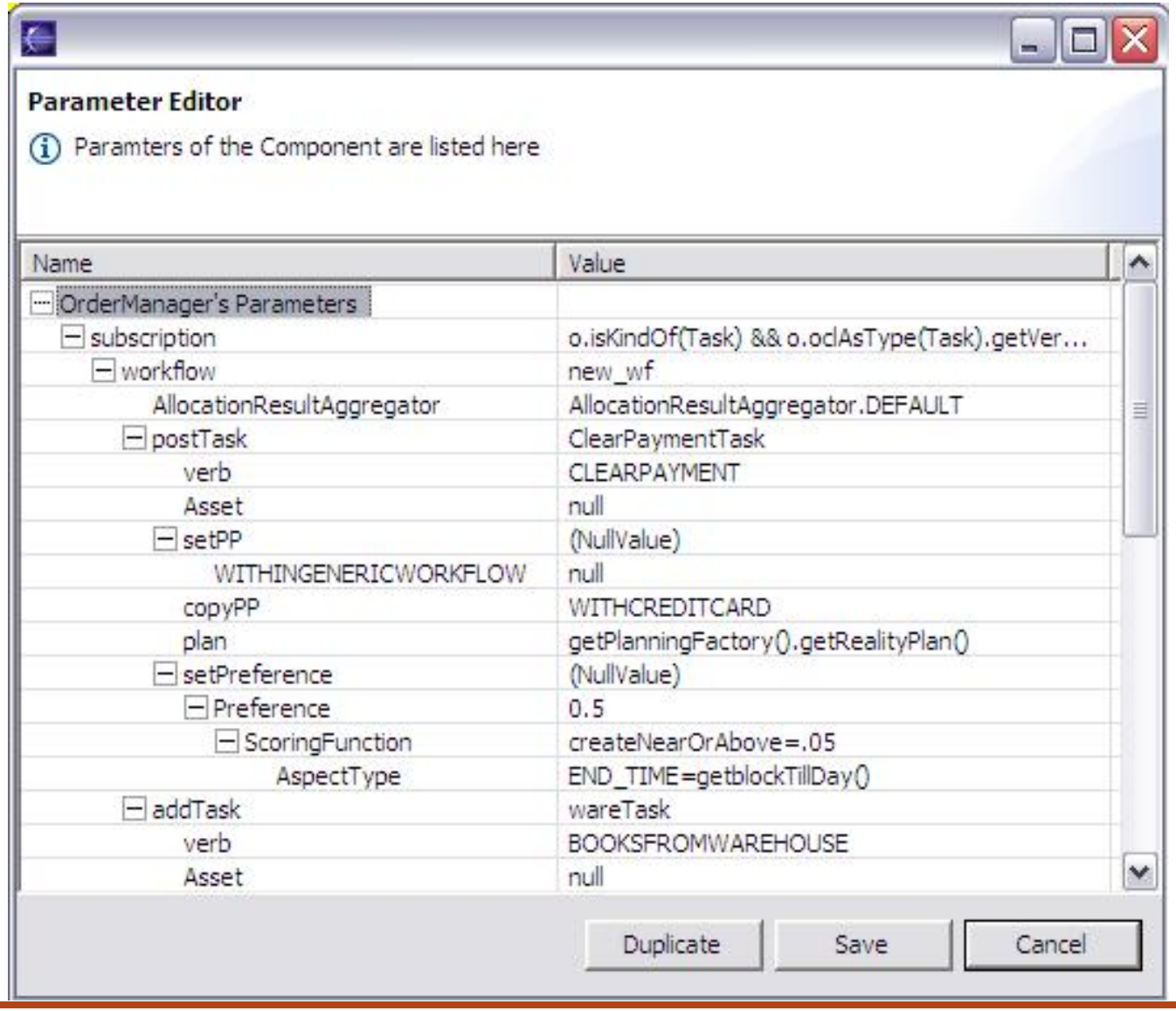
# Repository Integration

- Subversion is used as the Repository
- Search function developed to improve user productivity
  - Include Repository Search and Workspace Search
  - Include the option of automatically committing components in workspace to repository



# Property Editor

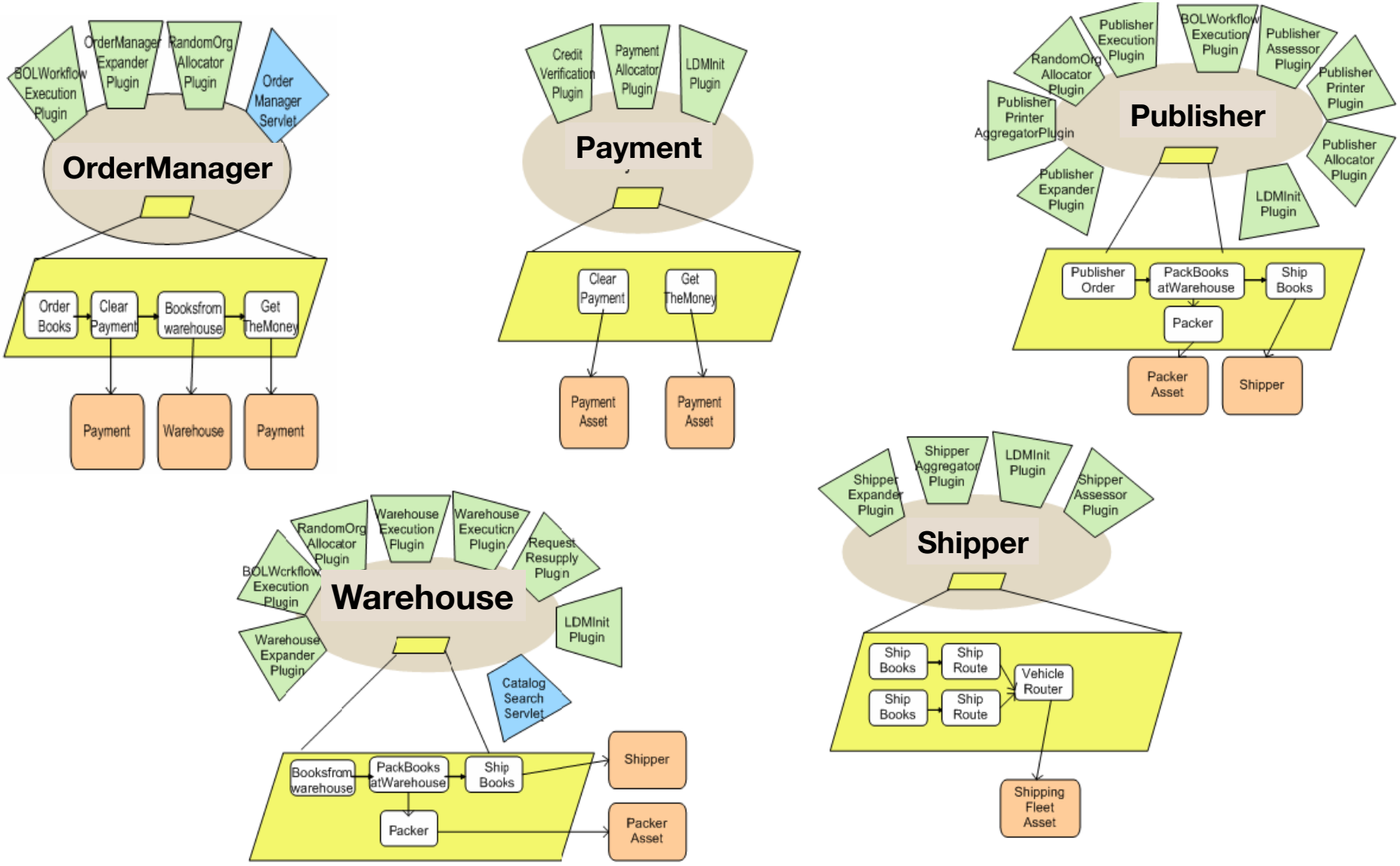


# Short Discussion/Exercise:

***Recall the Online Video Example in CSSE 374? What would that workflow look like for Books-Online using Agents?***

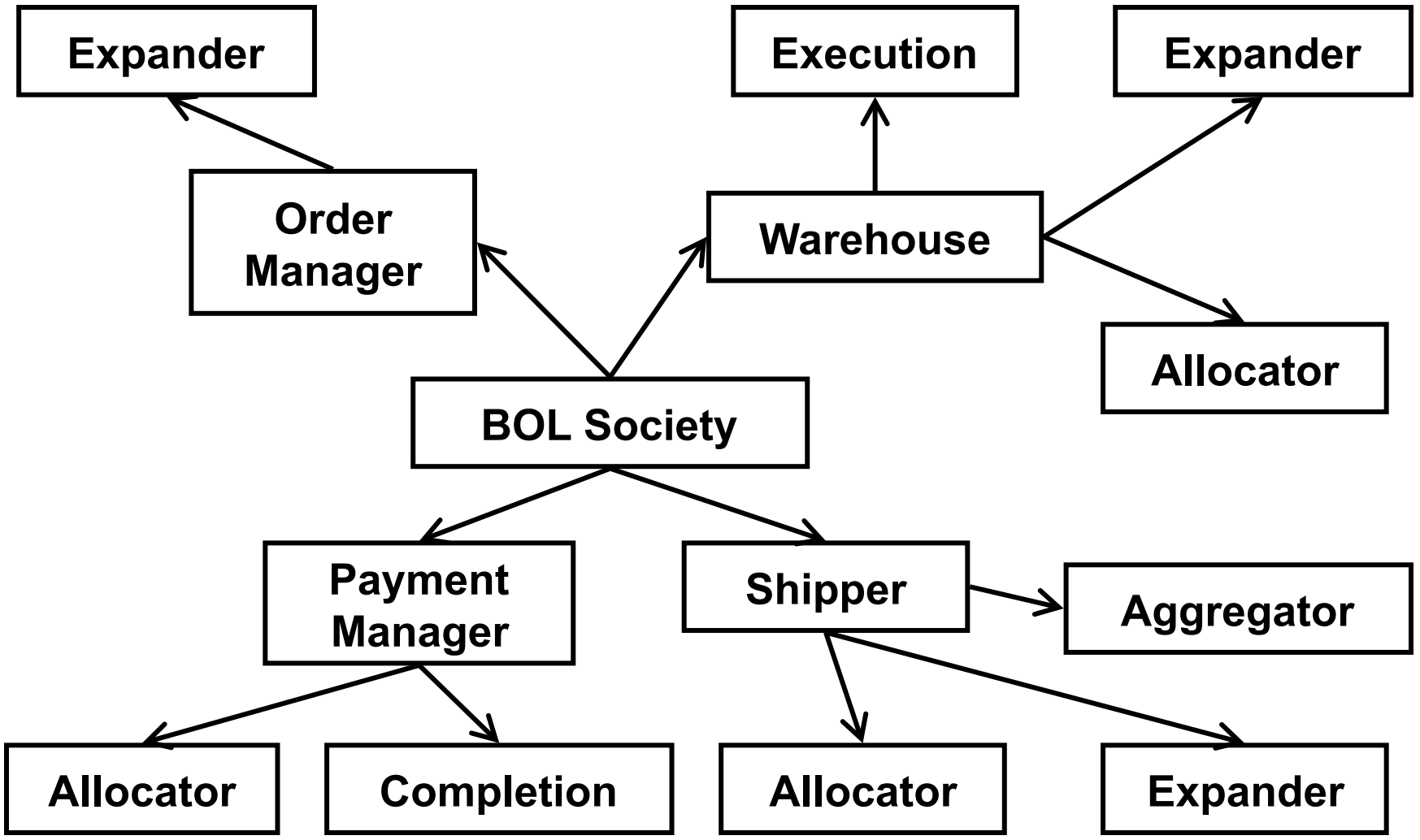
- How do you make an order?
- How do you pay for books?
- How do you ship books?
- How do you store books?
- How do you get books to sell?

# Example…BooksOnLine



# Beware of Workflow… it could be coming your way ☺

# Cougaar Components in BOL



# Recall: Write & Present Term Paper

- Use IEEE/ACM format for the paper (template provided on Angel)
- Include abstract, introduction, background/ related work, analysis, and conclusion (along with references)
- Target 5-7 pages
  - If you are not a strong writer, use a lot of tables and figures to organize your work
- Use your own words - copied elements without reference are considered plagiarism
- Paper due May 17th, 2011
- Presentation on May 19th, 2011

# Recall: Topics for Term Paper

1) Critically analyze the state of software productivity and the potential for Model-Based Engineering to make an impact.
2) Conduct a survey of Model-Based Engineering approaches (e.g., MDA/MDD, MBSE, DSL, MIC, etc.) to compare and contrast them.
3) Survey Model-Based Engineering in other disciplines (e.g., civil, mechanical,) comparing them with MBSE.
4) From a macro-economic perspective, evaluate the cost-benefit of Model-Based Engineering for software.
5) Critically analyze advances in automatic programming from a feasibility perspective and outline how these implications are relevant for software today.
6) Survey applications of "Product-Lines" to software systems and present arguments for a Model-Based Engineering approach.
7) Critically analyze transformation technology in the production of Model-Based/Driven Engineering software solutions.
8) Survey studies of Model-Driven Architecture (MDA) for the state-of the practice and outline key criteria for success and failures.
9) Suggest one that you would be more motivated to do!

# Homework and Milestone Reminders

- Read Case Study Paper "Model-Driven Systems Engineering" by Balmelli et. al.
  - To be discussed in Class this Thursday
  - Do assigned questions and bring document to class
  - Be prepared to discuss and even lead the discussion
- Term Paper Proposal due tonight by 11:55pm
- Milestone 3: Light-Weight Transformation Environment (see Milestone 3 assignment)
  - Due by 11:55pm, Friday, April 29th, 2011.