

A.I.S. Class 8: Outline

- Flowcharts for automated Purchases
- REA Modeling Revisited
- UML 2.0 & VISIO
- Group Work: Problem 9 Solution
- Group Work: Problem 10 Solution
- Unresolved Issues ?
- Next Class

Group Work

- Narrative and flowcharts in the Chapter 1 Appendix for automated Purchases

Business Processes and Events

- We distinguish business events forming parts of business processes from information processes
- Information processes
 - ★ record data about business events
 - ★ maintain data
 - ★ report useful information to decision makers

Business Processes and Events

■ Business events

- ★ selecting a supplier
- ★ transporting and distributing goods
- ★ providing services
- ★ receiving payment

■ Information events

- ★ recording customer orders
- ★ issuing invoices
- ★ adding new suppliers to master files
- ★ printing customer statements

■ Decision events

- ★ selecting a new product line to develop
- ★ deciding to raise prices

Business Processes and Events

- Business processes may be linked in two ways
 - ★ by sharing common resources
 - ★ by an event in one process triggering an event in another process
- Decision processes may trigger
 - ★ Business events
 - ★ Information processes

Event-Oriented Modeling

- The Semantic Modeling Principle
 - ★ Data in an information system should model the structure of the relevant categories of reality in its application domain

Event-Oriented Modeling

- Applies Semantic Modeling specifically to accounting information systems
- Provides a way of identifying the relevant entities for EER diagrams
- The entities (or objects) of interest are the business events, and the resources, agents involved
- We generally do not model the information or decision processes or events

Event-Oriented Modeling

■ REA Ontology:

★ Economic Resources (R)

★ Business Events

- ◆ Economic Events (E)

- ◆ Commitments (C)

- ◆ Ancillary Events (N)

 - Instigation (I)

 - Facilitation (F)

 - Terminal (T)

★ Economic Agents

- ◆ Internal Agents (A)

- ◆ External Agents (A)

Event-Oriented Modeling

- REA Ontology:
 - * Relationships
 - ◆ Duality (E – E)
 - Transfer
 - Transformation
 - ◆ Stock-flow (E – R)
 - Inflow
 - Take
 - Production
 - Outflow
 - Use
 - Consumption
 - Give
 - ◆ Participation (E – A)
 - Inside
 - Accountability
 - Outside
 - ◆ Others . . .

Event-Oriented Modeling

■ REA Ontology:

★ Congruent events

- ◆ Congruency occurs when both events in an exchange happen simultaneously in time and space

→ E.g., Cash Sales

- Selling a movie ticket
- Receiving payment for a movie ticket
- Cinemas do NOT maintain Accounts Receivable!

REA Modeling Steps

- 1 Identify the significant business events
- 2 Identify the related resources
- 3 Identify the related internal and external agents
- 4 Identify relationships between entities
- 5 Specify the optionalities and cardinalities of the relationships
- 6 Identify the attributes of the REA entities
-
- 7 Identify the information processes
-
- 8 Design the data repository structure
-
- 9 Implement the design

UML 2.0

- Unified Modeling Language
- Developed from combination of competing methods for designing object-oriented systems, from 1995 onwards
- Flexible system works with other methodologies (e.g., for RDBMS design)
- UML 2.0 standard adopted June 2003

UML 2.0

■ 13 diagrams:

★ **Structural**

- ◆ Class diagram
- ◆ Object diagram
- ◆ Composite Structure diagram
- ◆ Deployment diagram
- ◆ Component diagram
- ◆ Package diagram

★ **Behavioral**

- ◆ Activity diagram
- ◆ Use diagram
- ◆ State Machine diagram

★ **Interaction**

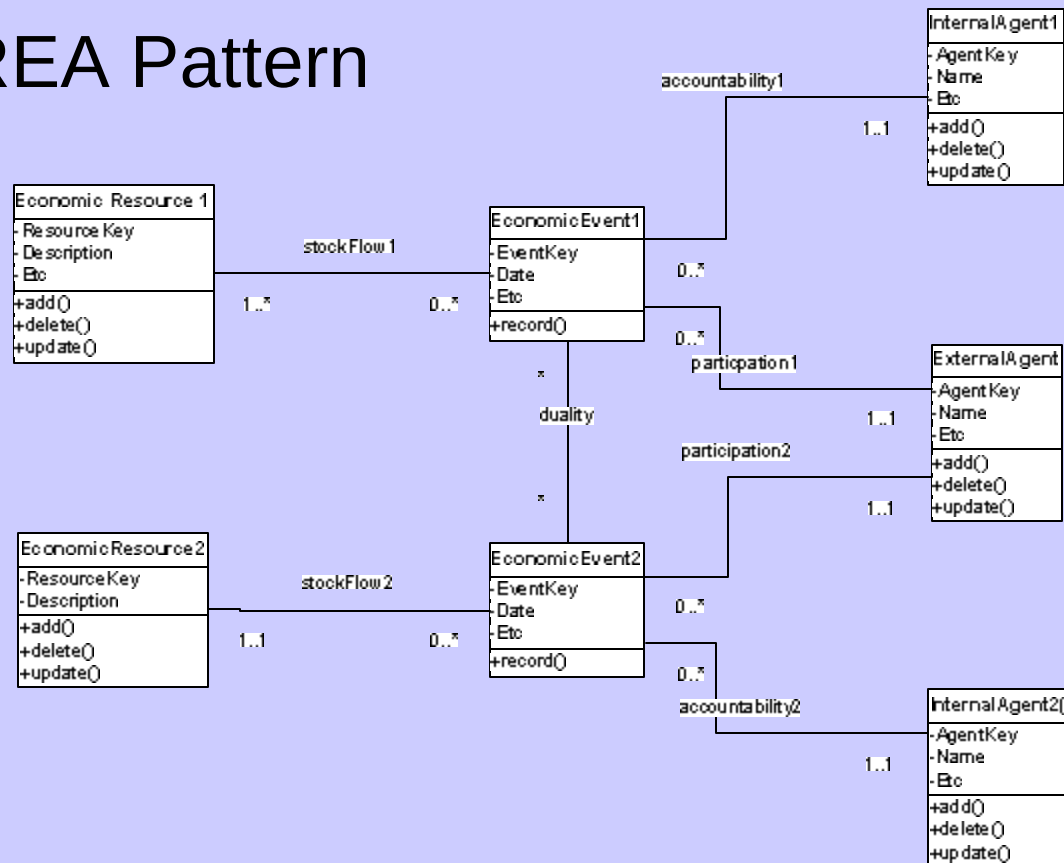
- ◆ Overview diagram
- ◆ Sequence diagram
- ◆ Communication diagram
- ◆ Timing diagram

UML Class Diagram (Static Structure)

- We may sometimes omit the names of the relationships when our understanding would not thereby be impaired
- We show optionalities and cardinalities in the form *optionality .. cardinality*
e.g. 0 ..1 0 .. * 1 ..1 1 .. *
- We will generally use lists (data dictionaries) instead of showing attributes on diagrams
- Show primary keys underlined and foreign keys in [] when required
 - ★ N.B. NOT required on REA diagrams

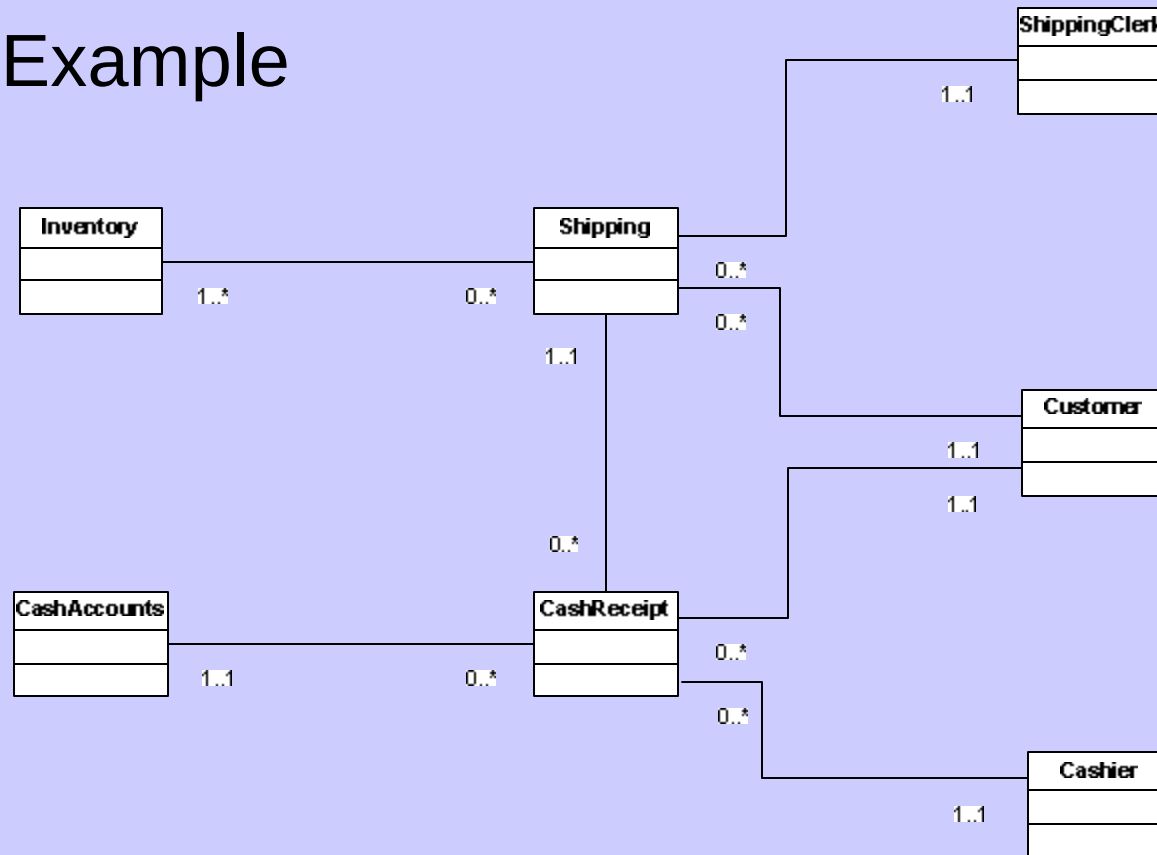
UML Class Diagram (Static Structure)

■ Core REA Pattern



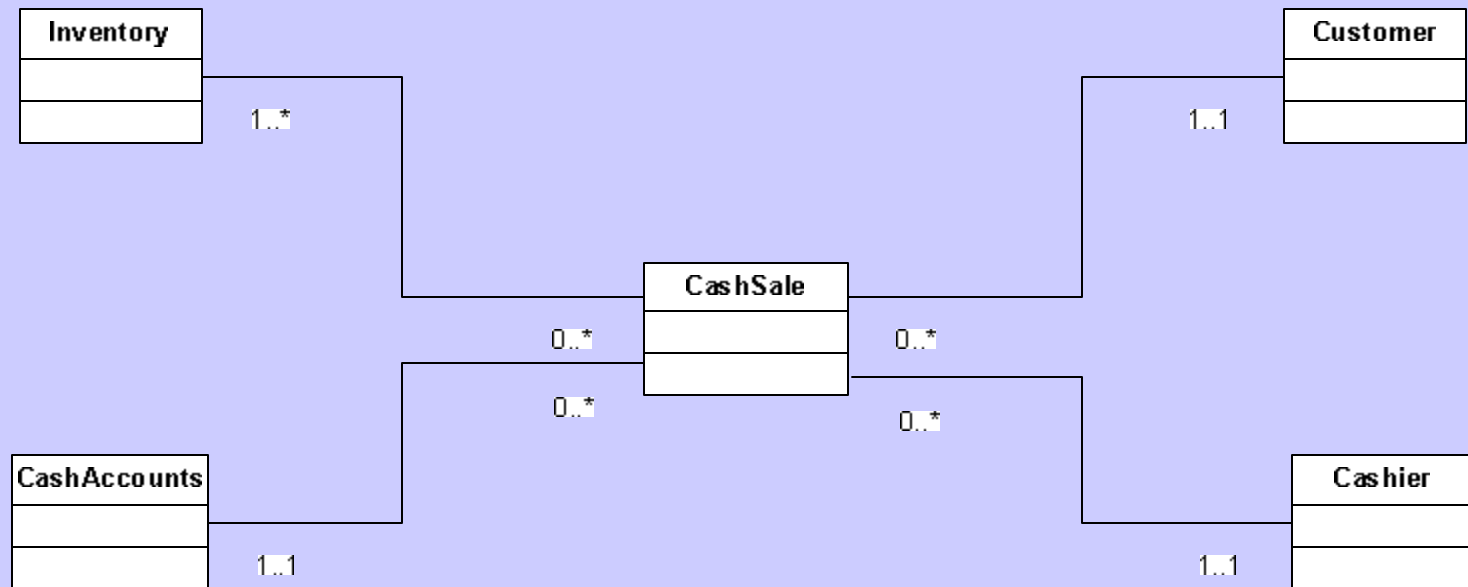
UML Class Diagram (Static Structure)

■ REA Example



UML Class Diagram (Static Structure)

■ REA Example – Congruent events



REA Modeling

■ N.B:

★ Official format:

- ◆ optionalities, cardinalities and attributes

★ Textbook format:

- ◆ omit attributes

★ UML format:

- ◆ omit attributes, omit names of relations, use 0 ..* etc. for optionalities and cardinalities

UML 2.0

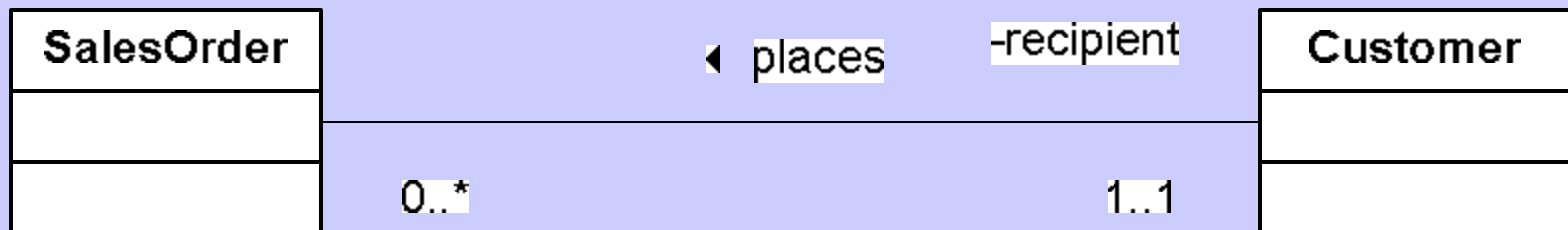
■ Unified Modeling Language

★ Associations

- ◆ N-ary associations e.g. binary associations
- ◆ (Aggregation) (*officially removed from UML 2.0?*)
- ◆ Composition
- ◆ Generalization
- ◆ Reflexive associations

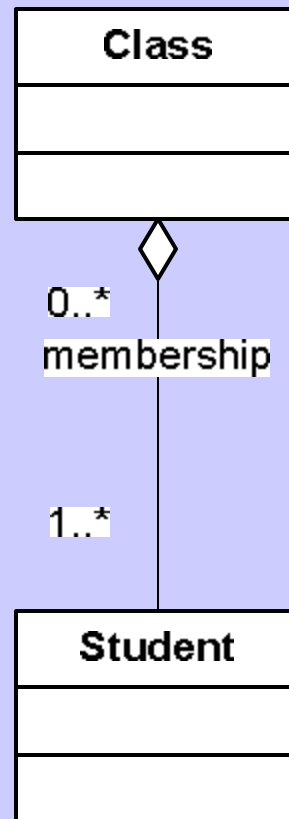
UML 2.0

■ Association



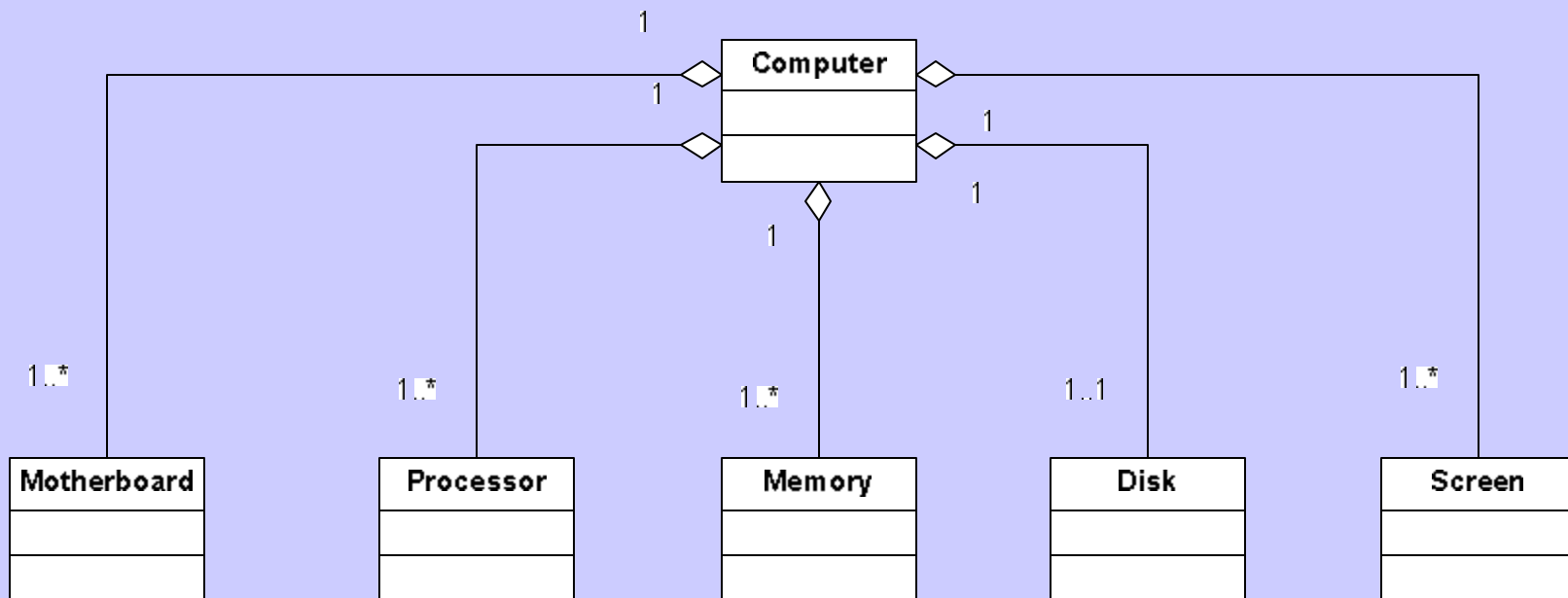
UML 2.0

■ Aggregation



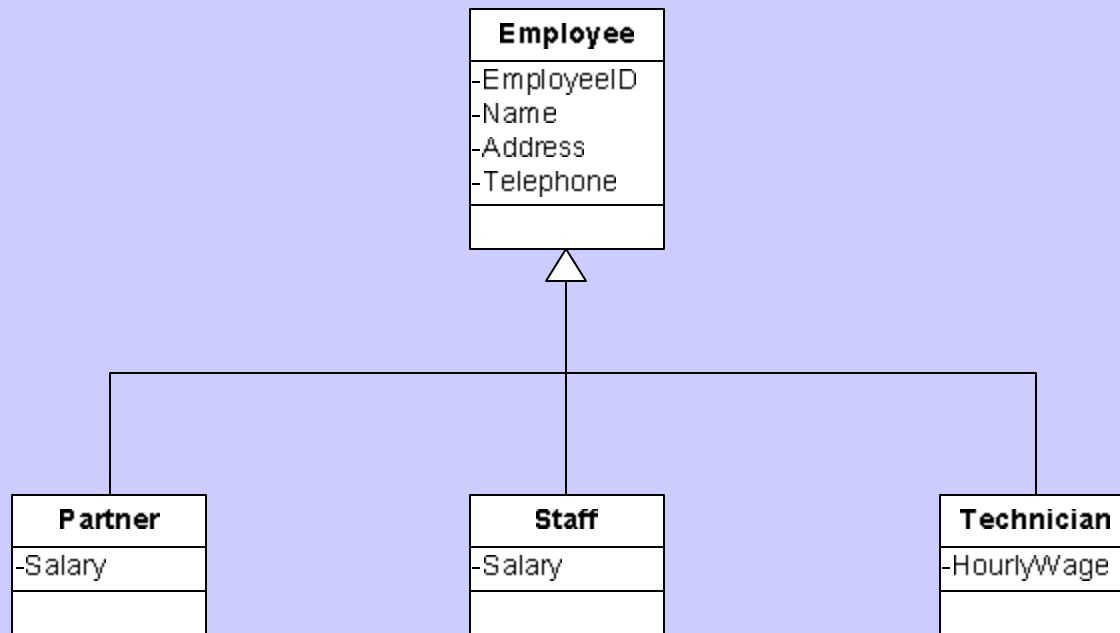
UML 2.0

■ Composition



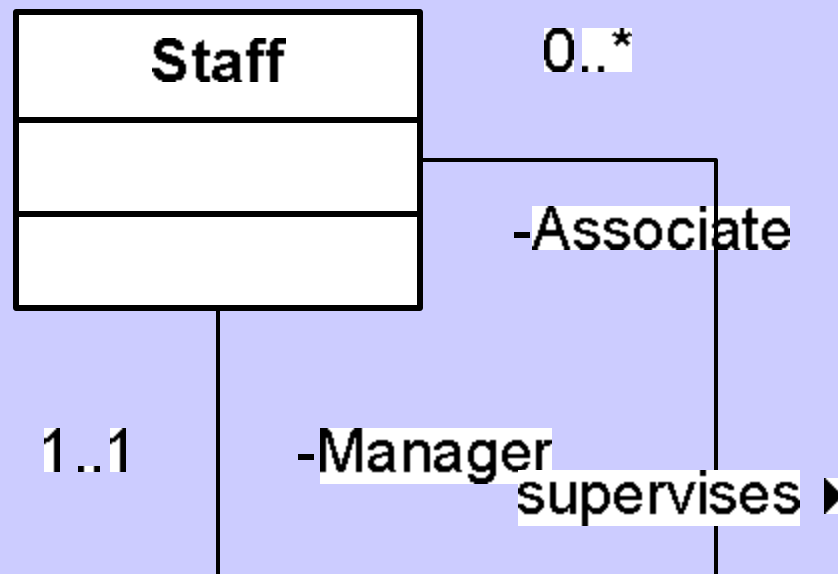
UML 2.0

■ Generalization



UML 2.0

■ Reflexive



UML & Visio

■ UML 2.0

- ★ Optionalities & Cardinalities (EER) are called Multiplicities (UML)

- ◆ 1 (abbreviates 1..1 – we will NOT use)
- ◆ * (abbreviates 0..* – we will NOT use – default)
- ◆ 0..1
- ◆ 0..*
- ◆ 1..1
- ◆ 1..*

- ★ “Roles” are now called “association end names”

UML & Visio

■ VISIO

- ★ File, New, Software
- ★ UML Model Diagram (US units)
- ★ UML Static Structure
- ★ You will initially need only two symbols
 - ◆ Class
 - ◆ Binary Association
- ★ After you have drawn the first association
 - ◆ Right click
 - ◆ Shape Display Options
 - ◆ End Options
 - Deselect “First end name” and “Second end name”
 - Select the two options at the bottom of the screen
- ★ To change association properties, double-click

UML & Visio

■ VISIO

★ EER Diagrams (ERD)

- ◆ Visio 2000 contained Templates for a variety of different ERD notations (yes, there are many variants . . .)
- ◆ Visio 2002 removed most of them, including the ones we want to use . . .
- ◆ Visio 2003 failed to put them back as expected . . .
- ◆ We can “improvise” by using the Basic Flowchart (US units) template
 - ➔ Use the “Process” symbol for Entities
 - ➔ Use the “Decision” symbol for Relationships
 - ➔ Draw Dynamic Connectors FROM Relationship diamonds TO Entities
 - ➔ Change the line endings as necessary (last icon on toolbar)

★ DFDs

- ◆ Use the Data Flow Diagram (US units) template under Flowcharts

Step 7: Information Processes

- What information processes are required?
 - ★ A recording process for each event
 - ★ A maintenance process for each other entity
 - ★ A reporting process for each required report

Group Work for Chapter 8 (1)

■ What are the events?

- ★ Reserving videos?

- ★ Renting videos?

 - ◆ Checking out videos?

 - ◆ Paying for videos?

 - ◆ Processing rentals?

 - ◆ Giving videos?

 - ◆ Giving rental receipts?

- ★ Late charges?

 - ◆ Returning videos late?

 - ◆ Paying late fees?

- ★ Verifying customers?

Group Work for Chapter 8 (1)

- Problem 9 Solution - see Handouts

Group Work for Chapter 8 (2)

■ Problem 10

- ★ Work through the 9 REA steps in sequence
- ★ Use UML Class Diagram

Chapter 8 Problem 10 Solution

- Step 1: Identify the significant business events
 - ★ Submit Proposals
 - ★ Check Proposals
 - ★ Approve Proposals
 - ★ Return Rejected Proposals

Chapter 8 Problem 10 Solution

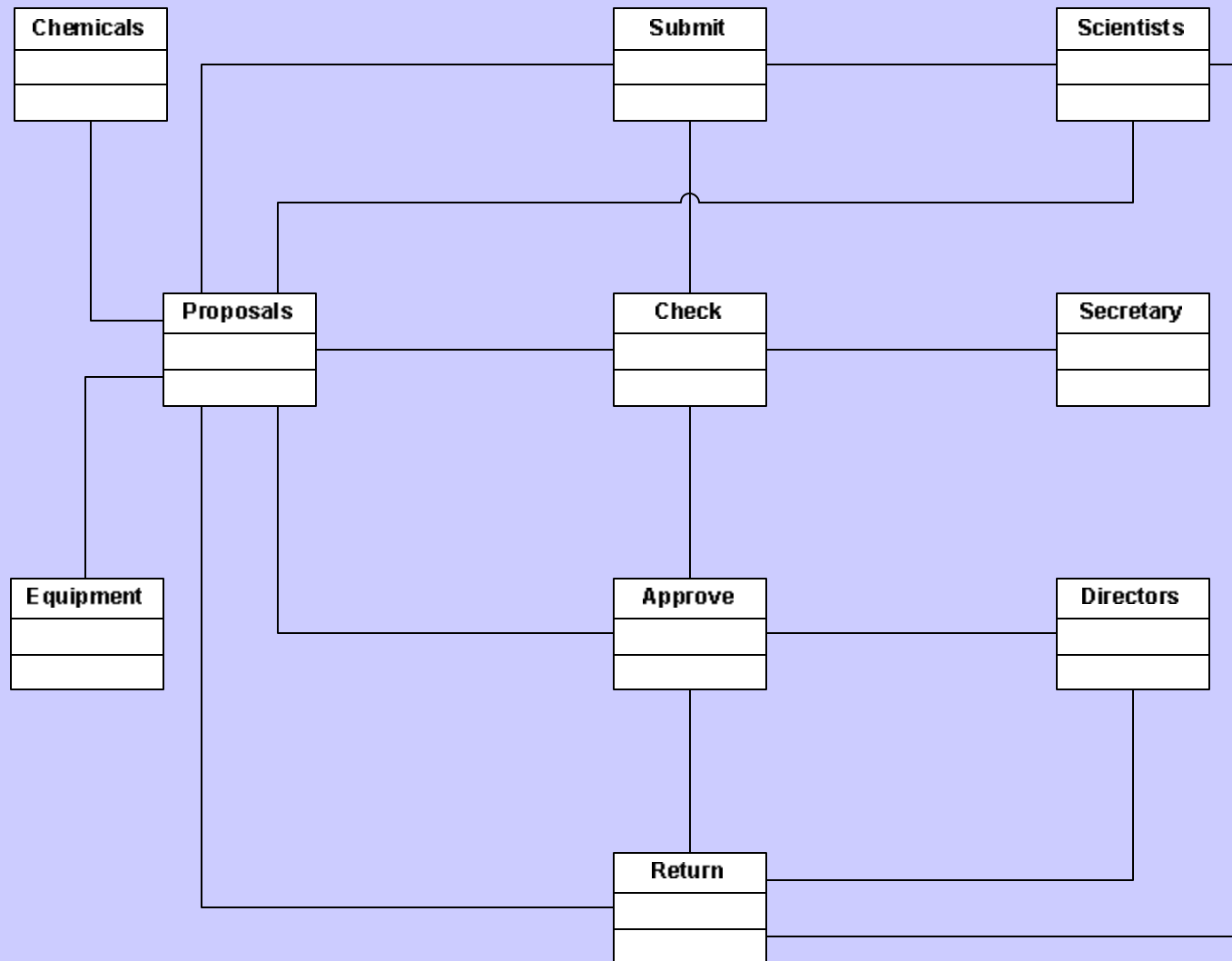
- Step 2: Identify the related resources
 - ★ Equipment
 - ★ Chemicals
 - ★ Proposals

Chapter 8 Problem 10 Solution

- Step 3: Identify the related internal and external agents
 - ★ Directors
 - ★ Scientists
 - ★ *Secretary/Clerk (someone must check the proposals!)*

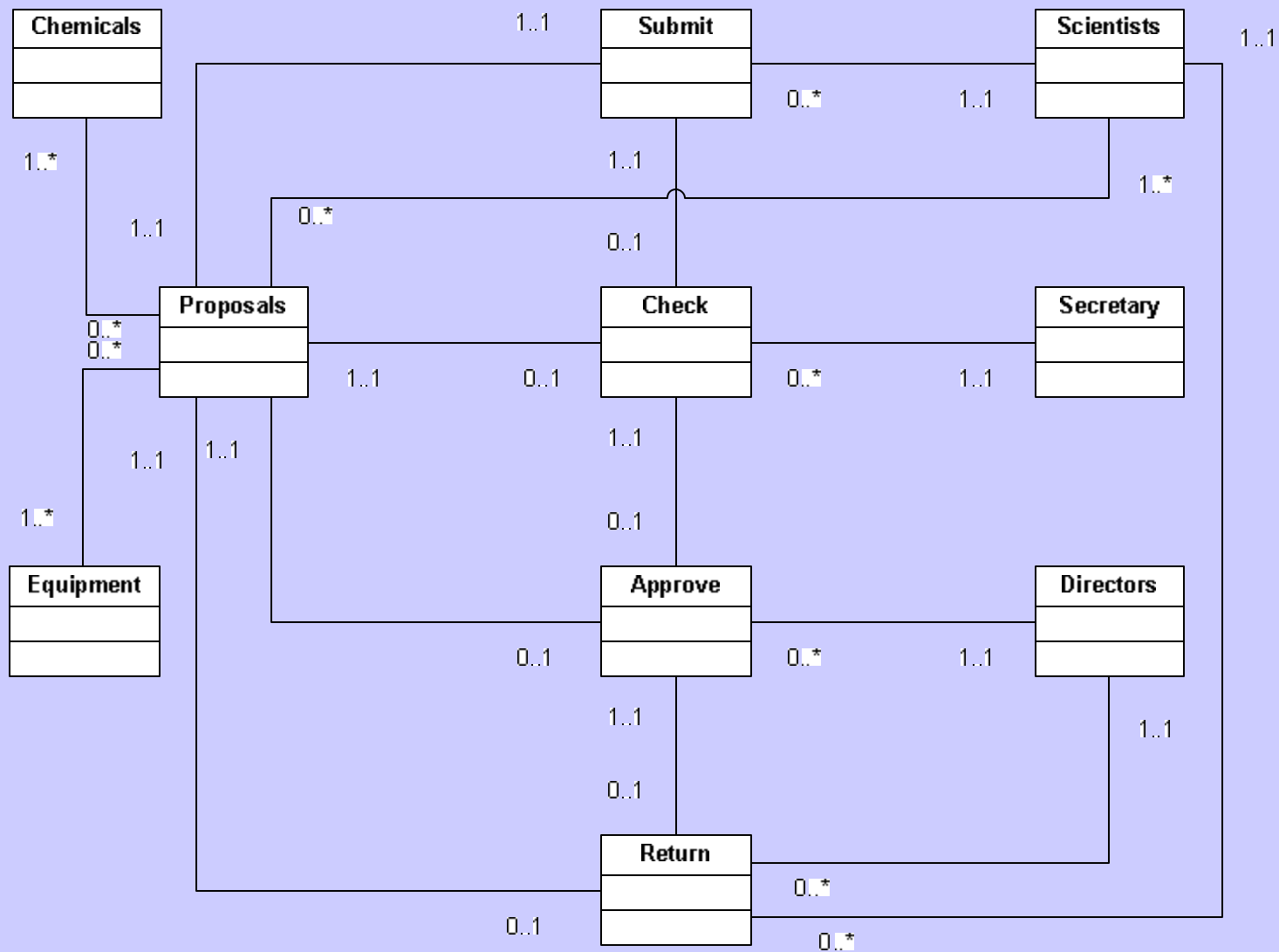
Chapter 8 Problem 10 Solution

- Step 4: Identify relationships between entities



Chapter 8 Problem 10 Solution

- Step 5: Specify the optionalities and cardinalities of the relationships



Chapter 8 Problem 10 Solution

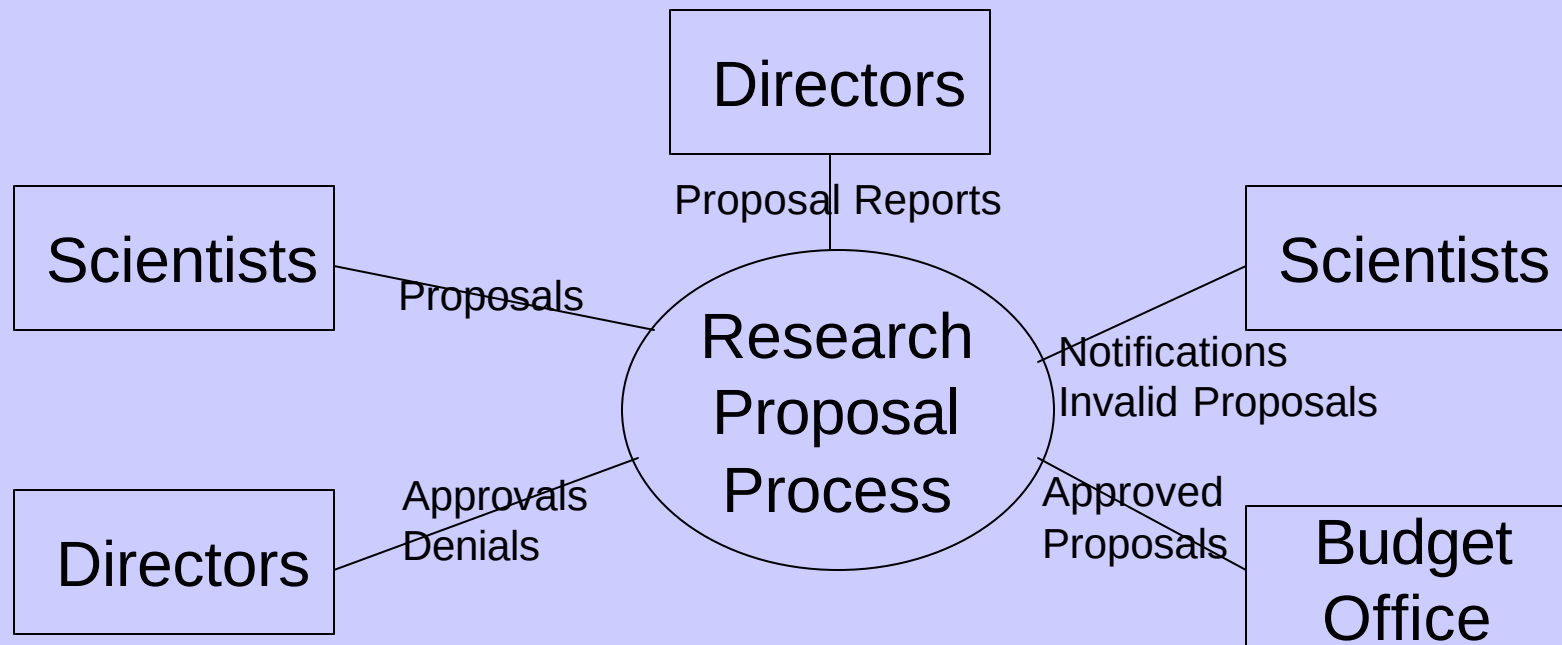
- Step 6: Identify the attributes of the REA entities (*not required for this problem*)

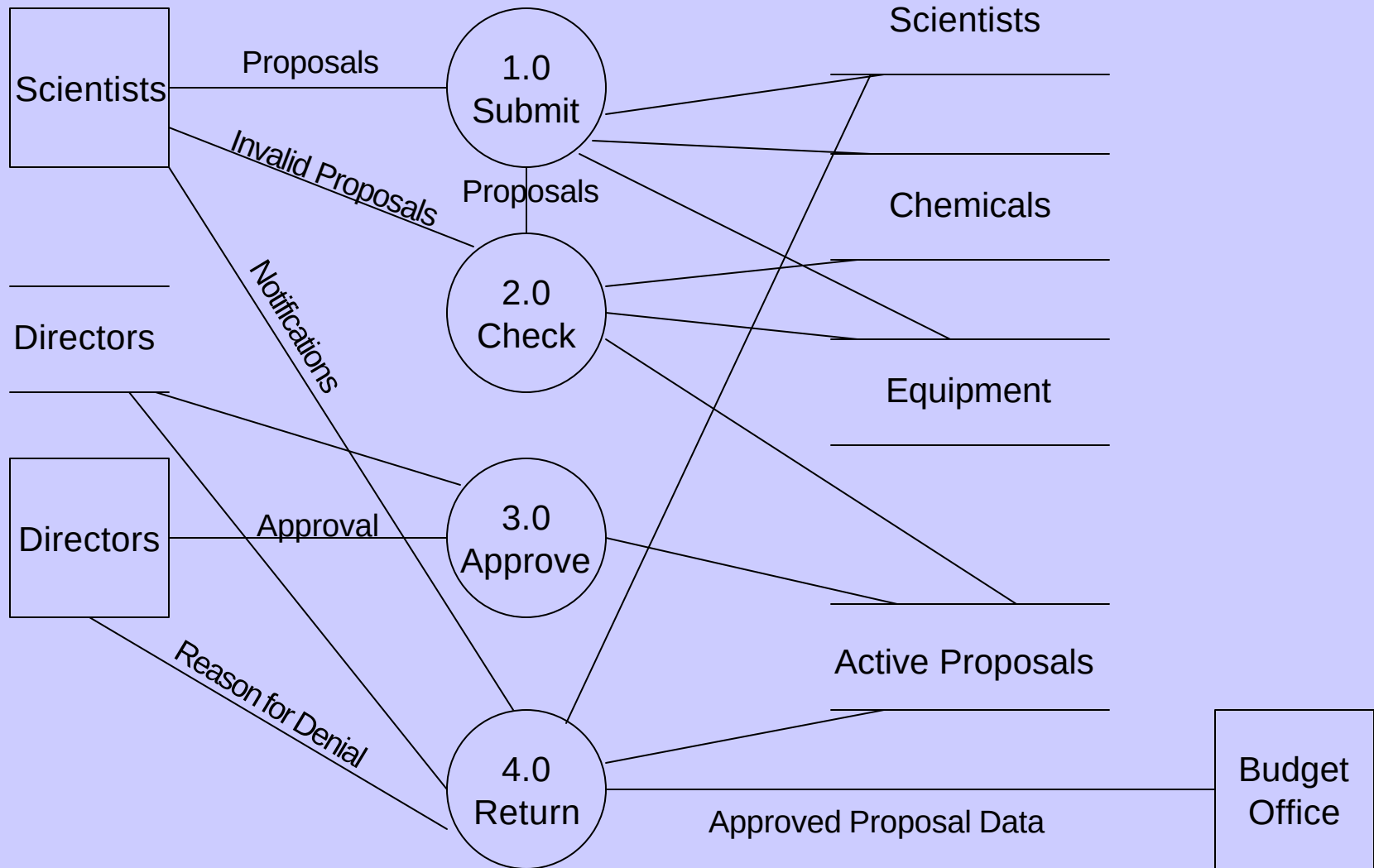
- ★ e.g., Proposal

- ◆ Proposal #
- ◆ Scientist Preparing
- ◆ {Scientist Working}
- ◆ {Equipment Requested}
- ◆ {Equipment Used}
- ◆ {Procedures, Chemicals Requested}
- ◆ {Procedures, Chemicals Used}

Chapter 8 Problem 10 Solution

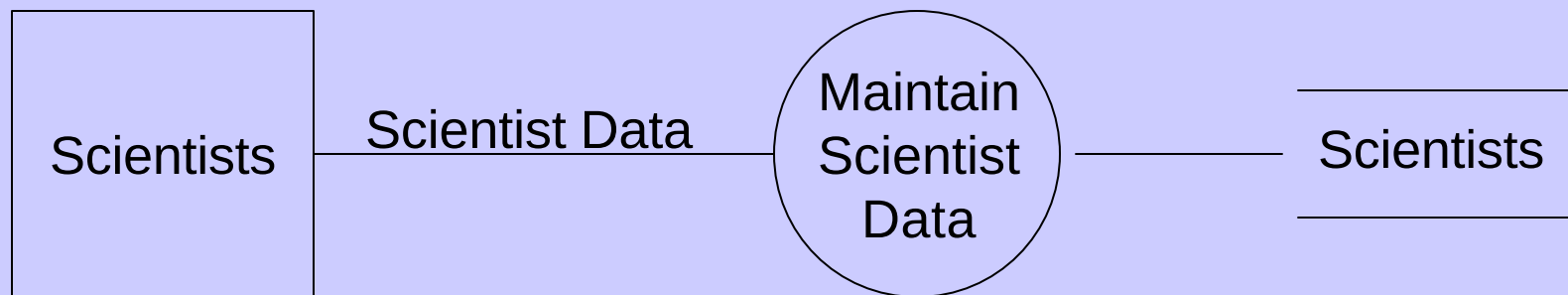
- Step 7: Identify the information processes
 - ★ Context Diagram





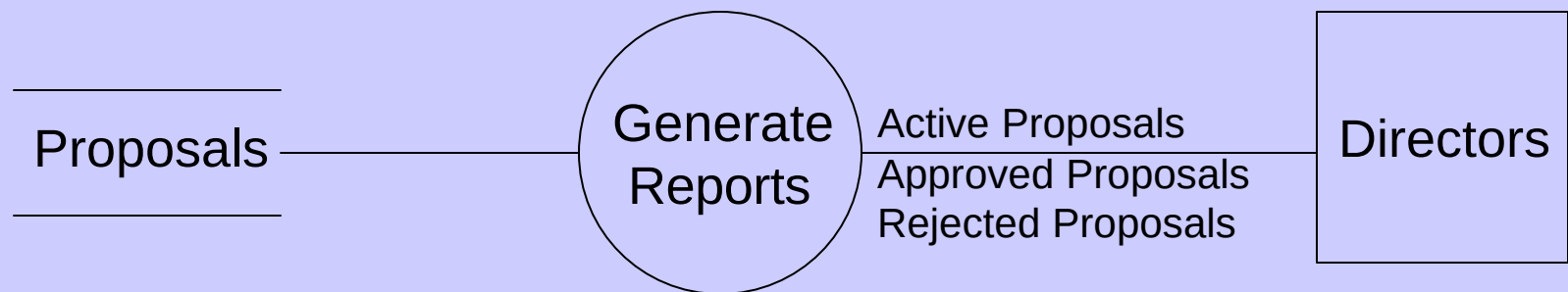
Chapter 8 Problem 10 Solution

- Step 7: Identify the information processes
 - ★ DFDs are also required for maintenance processes for all non-event entities e.g.



Chapter 8 Problem 10 Solution

- Step 7: Identify the information processes
 - ★ DFDs are also required for reporting processes for all reports not included in the main DFD e.g.



Benefits of REA (so far)

- Identifies the entities for EER modeling
- Identifies the required processes so that model integration is automatic
- Leads to tables already in 3NF (to be discussed in Chapter 9)

Unresolved Issues ?

- Be aware that Chapters 12 & 13 address the Sales and Purchases cycles
- Even though we won't get to these chapters for some time, it is O.K. to read ahead and look for ideas that may help with College Computing

Unresolved Issues ?

- You must use a (large) ring binder to submit future stages of the Group Project
- Obtain a set of file dividers
- File the Group Logs FIRST
- File Stage 1 in Section 1
- File Stage 2 in Section 2 etc.
- File any re-submissions in the appropriate Section ON TOP OF the existing graded versions

Three “Events” . . .

- Please remember to download from Blackboard (Course Documents – Supplemental Materials), print, read, and bring to class next time, the document:

Three “Events” That Define an REA Methodology

Extended REA Ontology

- A four-page document “Extended REA Ontology” will be available from Blackboard (Course Materials – Resources) tomorrow. Please download it, print it, and bring it to the next class.