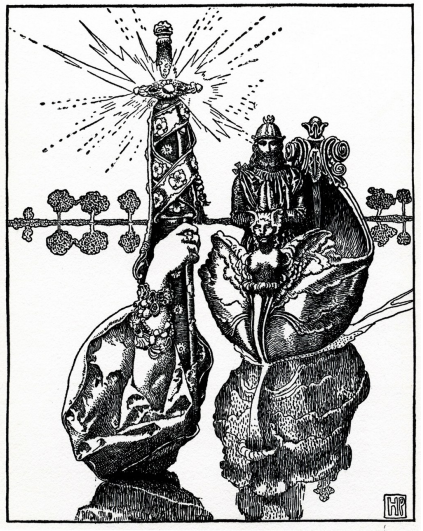
Lecture 18
Validating the Requirements:
Data and State Models



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SRS Project Assignment due ~~10/29~~ 10/30

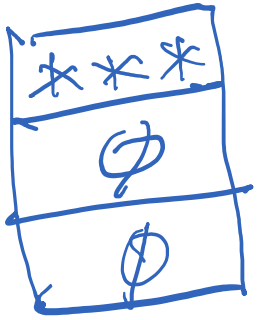
"Data: your secret weapon" (Chap. 10)

Lecture also based on [Weigers & Beatty, Software Requirements (Developer Best Practices), 2013]

We specify software functionality to create, modify, delete, display, process & use data

* Data model: "A model showing classes of data and the associations between them." (Glossary in textbook)

At requirements phase, often represented by UML class diagrams



high-level (Robertsons specify the class names & associations, omit attributes and behaviors that an object of the class can perform)

visual representation

logical links among classes & cardinalities of those links

relationships

Example 1

IceBreaker class diagram of stored data

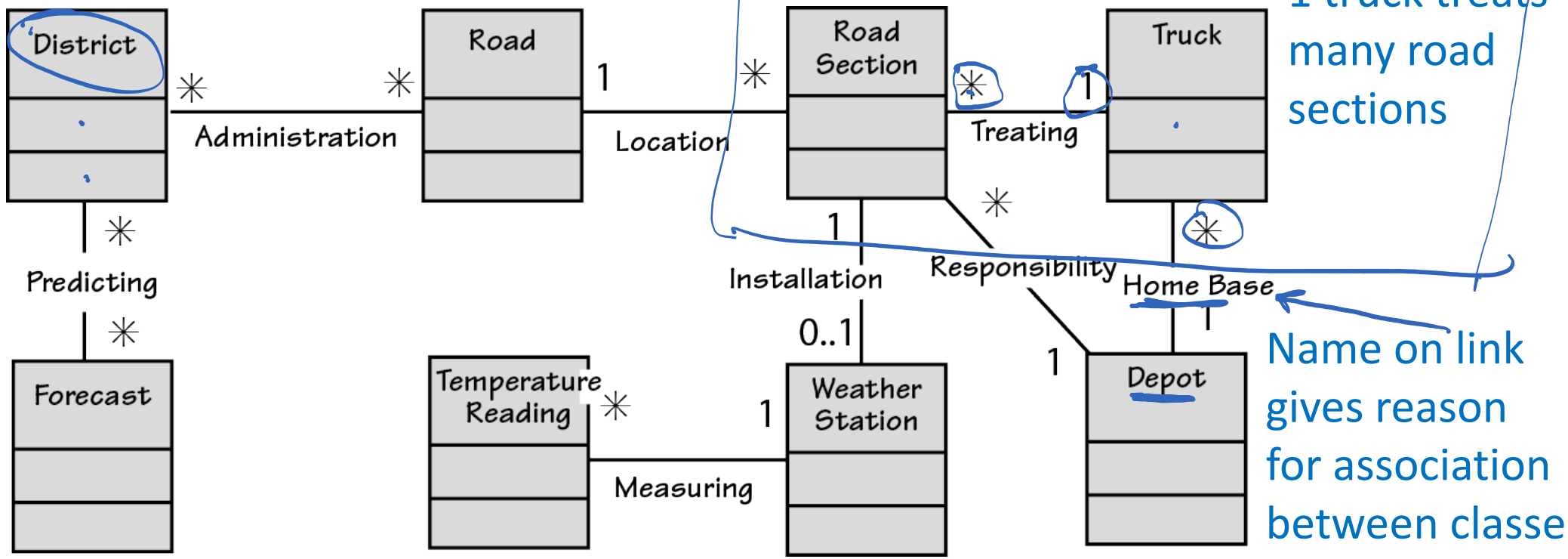


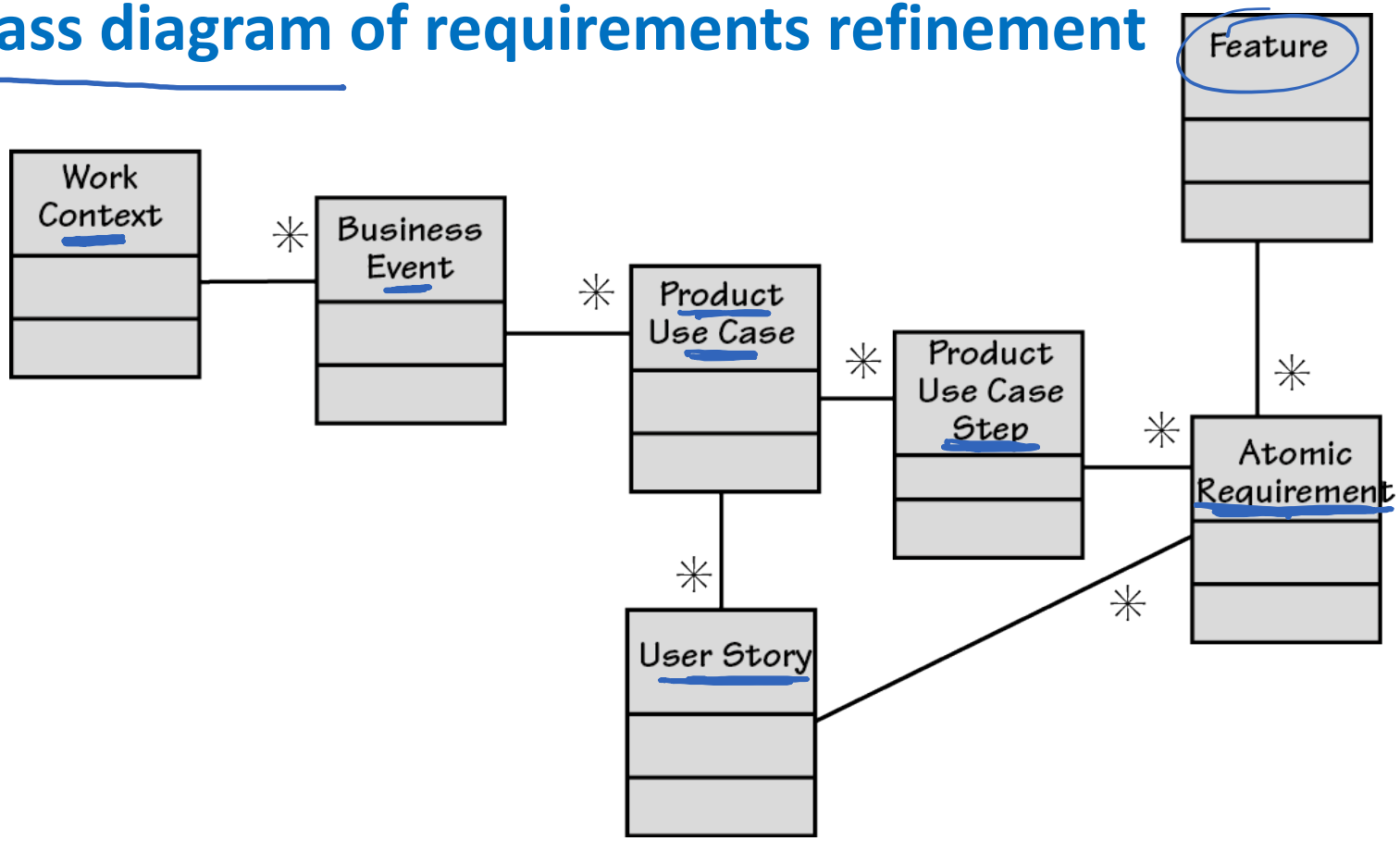
Figure 10.4

A class diagram showing the stored data that the business needs to predict the formation of ice on roads. A truck is dispatched to treat a road when the readings from the weather station and the forecast indicate the road section is about to freeze.

(Blue notes are Robyn's)

Example 2

Class diagram of requirements refinement



A feature is a unit of functionality that provides some service to users

Software Product Lines

Figure 10.6

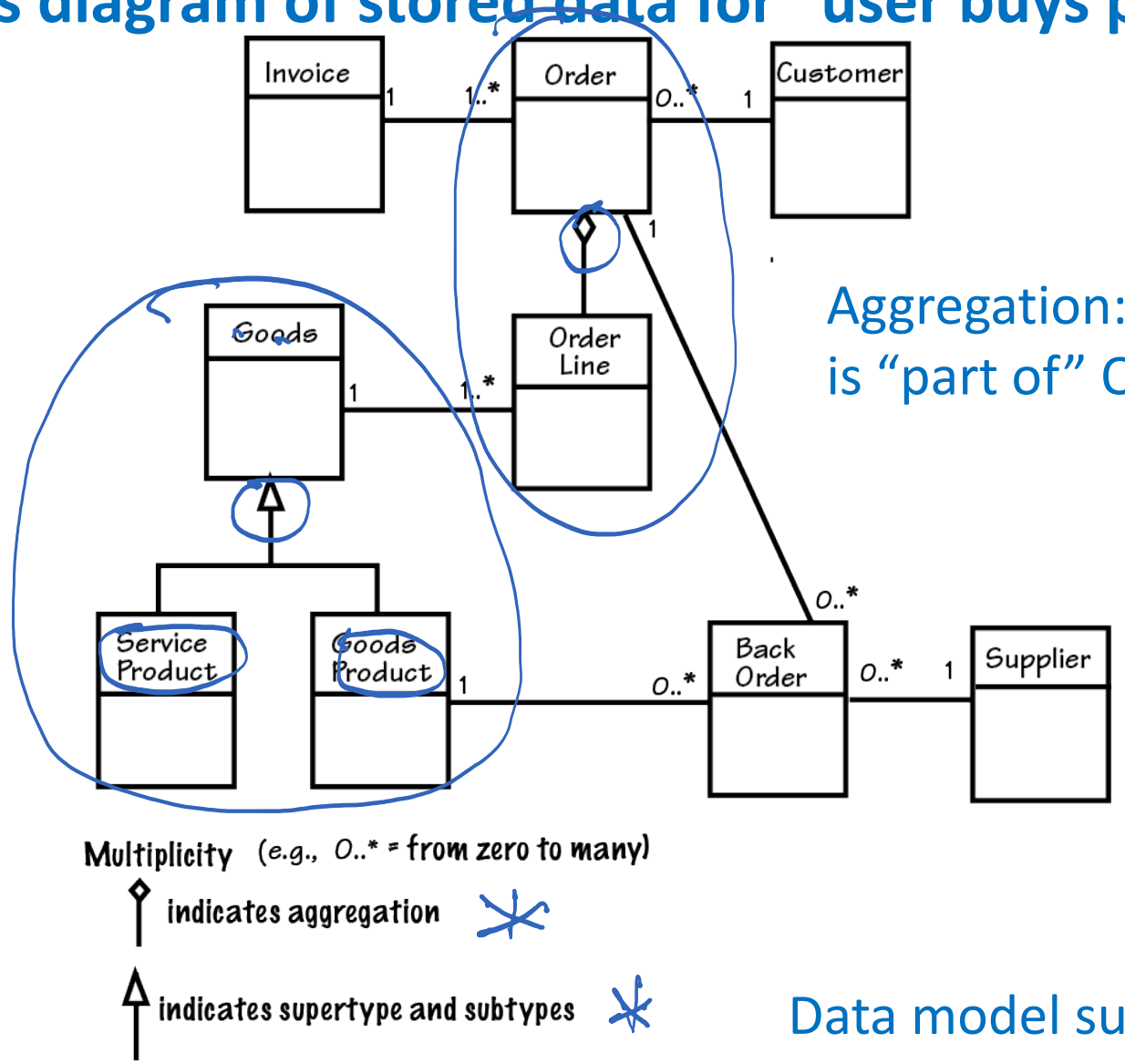
A hierarchy of requirements. The work context is the highest-level statement of requirements; it is decomposed into the next level, the business events. The level below the business events comprises the product use cases, each of which is decomposed into a number of product use case steps. The lowest level includes the atomic requirements, each of which can be traced back up the hierarchy. Activity diagrams and user stories are also used to group atomic requirements. Features are a grouping often used by stakeholders from marketing or product version planning.

Class diagram of stored data for “user buys product”

Example 3

Figure 15.6

This class diagram shows the classes and associations between them that are part of the pattern Customer Wants to Buy Goods. Consider the business rules communicated by this diagram. A Customer may make zero or many Orders, each of which is invoiced. The Order is for a collection of Order Lines. An Order Line is for Goods, which might be a Service Product or a Goods Product. Only Goods Products can have a Back Order. Now consider how many situations in which these business rules, data, and processes might be reused.

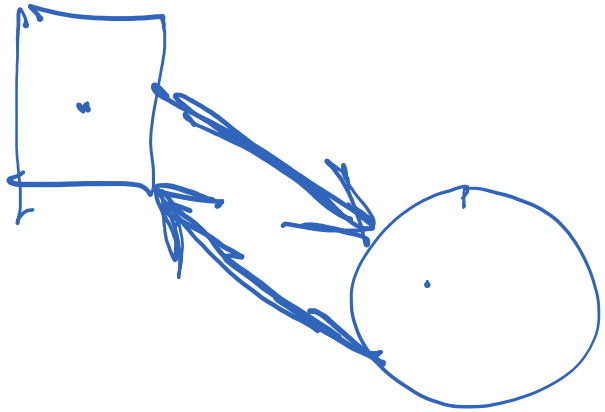


Aggregation: Order Line is “part of” Order

Supertype/Subtype:
Service Product “is-a” Goods
Goods Product “is-a” Goods

Data model supports reuse

Data modeling



Converge on a common terminology: Glossary

Start with input/output flows on context diagram

Data dictionary: "specification (to the elemental level) of the terms used in the requirements specification."

> "maintaining a data dictionary is a serious investment in quality" [Wiegers & Beatty]

Data *flow*: shows data that move from one process to another, usually represented by named arrows. Ex: Fig. 10.9

State modeling (not in textbook)

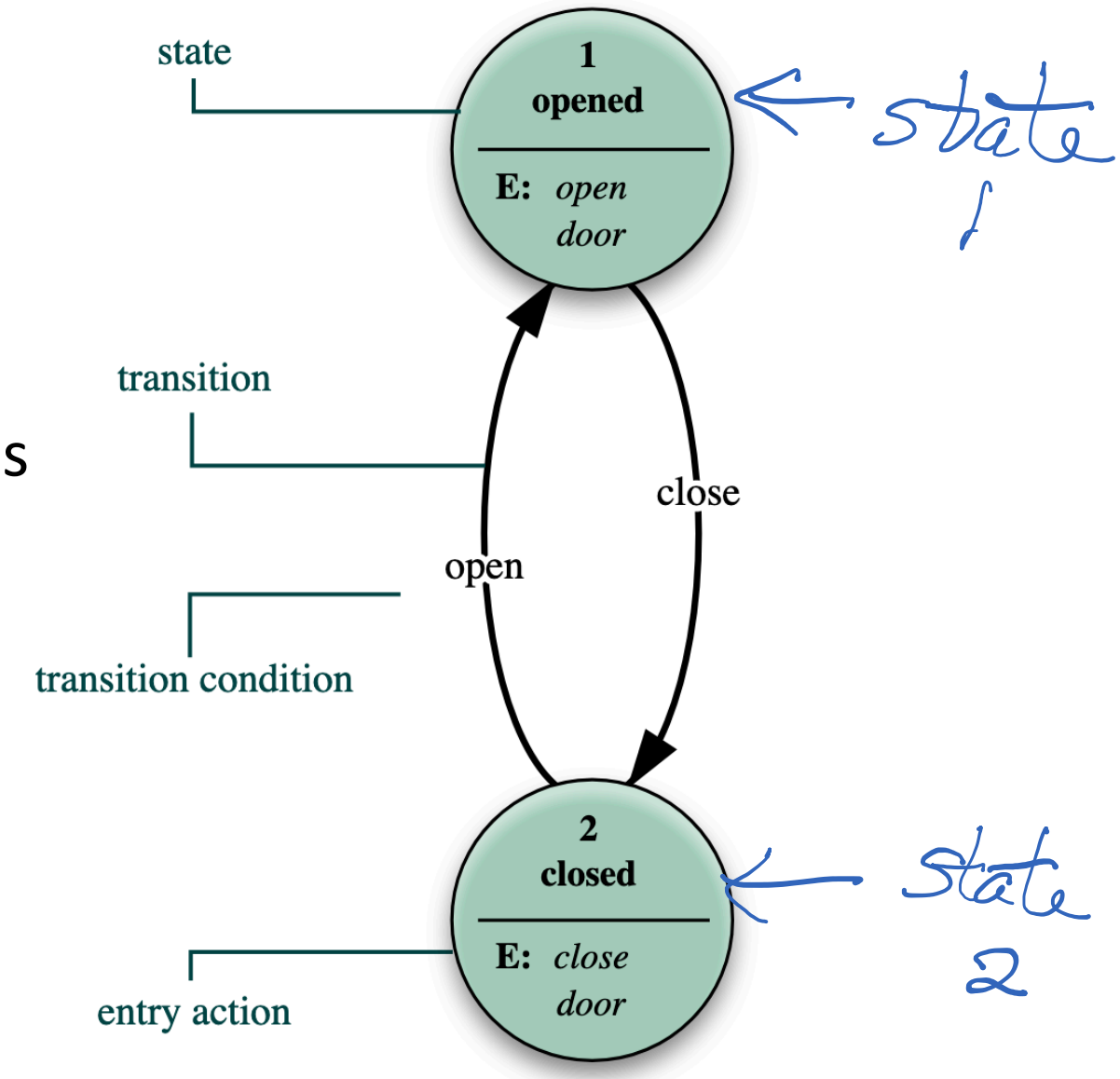
- Widely used for real-time systems where stimuli from outside the system drive its behavior
  - Ex: stimulus from motion sensor may move room_state from "empty" to "occupied"
  - Ex: operator's command may move a valve from "open" state to "closed" state
  - Ex: completion of a task may move the system from "processing" to "waiting"
- State machine model captures the behavior of system components in response to internal or external events
  - Behavior is a sequence of state transitions
  - Model shows how system (or component) changes its state in response to events
  - Event triggers transition from one state to another

Example: State model

State diagram for a door:

- Nodes are possible states
- Arrows are possible state-changes (transitions)

Visual representation of states & transitions prompts customer to review the requirement
& spot gaps or mistakes



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