The University of Iowa

CS:2820 (22C:22)
Object-Oriented Software Development

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Requirements and Use Cases

by

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System Requirements

Capabilities and conditions the system, and more generally the project, must conform to

System Requirements

- On average, 25% of the requirements change on software projects
- The Unified Process
  - includes a systematic approach to finding, documenting, organizing, and tracking the changing requirements of a system
  - UP embraces change in requirements as a fundamental driver on projects

Main Requirement Types

- **Functional**—features, capabilities, security
- **Usability**—human factors, documentation, help
- **Reliability**—frequency of failure, recoverability, predictability
- **Performance**—response times, throughput, accuracy, availability, resource usage
- **Supportability**—adaptability, maintainability, internationalization, configurability

Other Requirement Types

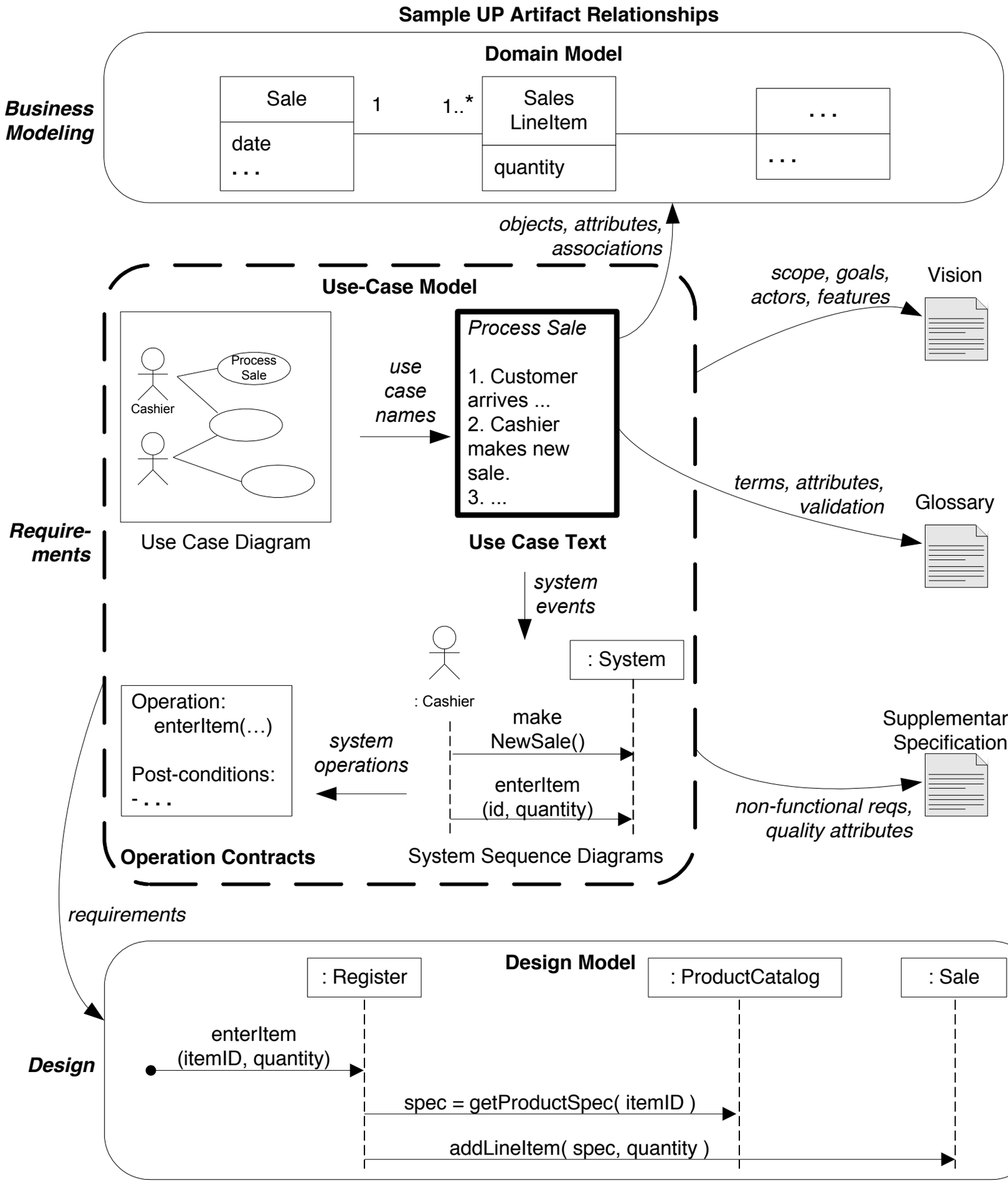
- **Implementation**—resource limitations, languages and tools, hardware, ...
- **Interface**—constraints imposed by interfacing with external systems
- **Operations**—system management in its operational setting
- **Packaging**—for example, a physical box
- **Legal**—licensing and so forth

Requirement Artifacts

- **Use Case Model**—a set of typical scenarios of using a system
- **Supplementary Specs**—all non-functional requirements
- **Glossary**—definitions of noteworthy terms and data
- **Vision**—high level requirements and business case
- **Domain Rules**—requirements and policies that transcend one software project

Use Cases

- Text stories, widely used to discover and record requirements.
- They influence many aspects of a project, including OO A & D
- Are used as input to many subsequent artifacts in A & D


Sample UP Artifact Relationships
Business Modeling
Domain Model
Sale
date
...
1
1..*
Sales LineItem
quantity
...
...
objects, attributes, associations
Use-Case Model
scope, goals, actors, features
Vision
Process Sale
Cashier
use case names
Process Sale
1. Customer arrives ...
2. Cashier makes new sale.
3. ...
terms, attributes, validation
Glossary
Requirements
Use Case Diagram
Use Case Text
system events
: System
: Cashier
Operation:
enterItem(…)
Post-conditions:
- ...
system operations
make NewSale()
enterItem (id, quantity)
Supplementary Specification
non-functional reqs, quality attributes
Operation Contracts
System Sequence Diagrams
requirements
Design Model
: Register
: ProductCatalog
: Sale
Design
enterItem (itemID, quantity)
spec = getProductSpec(itemID)
addLineItem(spec, quantity)

Uses Cases

- A use case describes an interaction between an external agent and a software system that accomplishes some task
- The interaction is presented as a sequence of steps
- A complete sequence of steps is a use case scenario

Uses Cases are Stories

- Use cases are text stories of some actor using a system to meet goals
- The essence of use cases is
  - discovering and recording functional requirements
  - by writing stories of using a system to fulfill user goals

Terminology

- **Actor**—Entity with behavior, such as a person (identified by role), computer system, or organization
- **Scenario**—a specific sequence of actions and interactions between actors and the system
- **Use case**—a collection of related success and failure scenarios that describe an actor using a system to support a goal
- **Use case model**—set of all written use cases

Use Cases

- Use cases are a good way to help keep it simple
- They can be written by or with domain experts or customers
- They can be seen as defining a *contract* of how a system will behave
- They emphasize the user goals and perspective
  - *Who is using the system, what are their typical scenarios of use, and what are their goals?*

Typical Structure of UC
(details vary)

- Name in *Verb Noun* form
  - Open Account, Get Drink, Register Participant
- Description
  - One paragraph high-level description of the UC
- Actors
  - List of actors involved that can trigger a UC

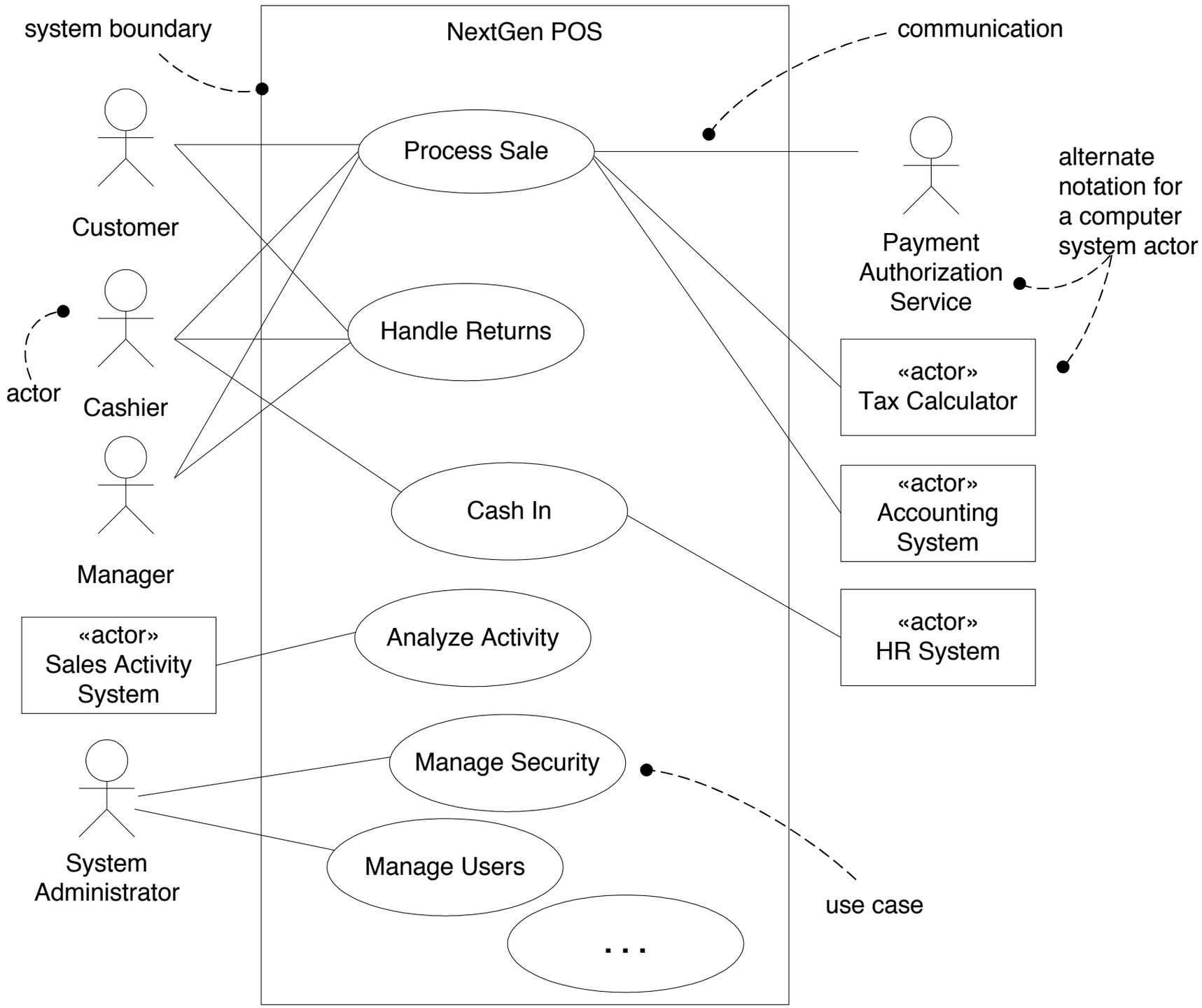
Typical Structure of UC

- Preconditions
  - What must hold before UC can be triggered
- Postconditions
  - What must holds upon completion of the UC
- Base Scenario
  - Optimistic, main scenario with sequence of actions assuming no alternative flows or error conditions
- Alternative Scenarios
  - alternative action sequences with triggering condition

Use Cases and UML

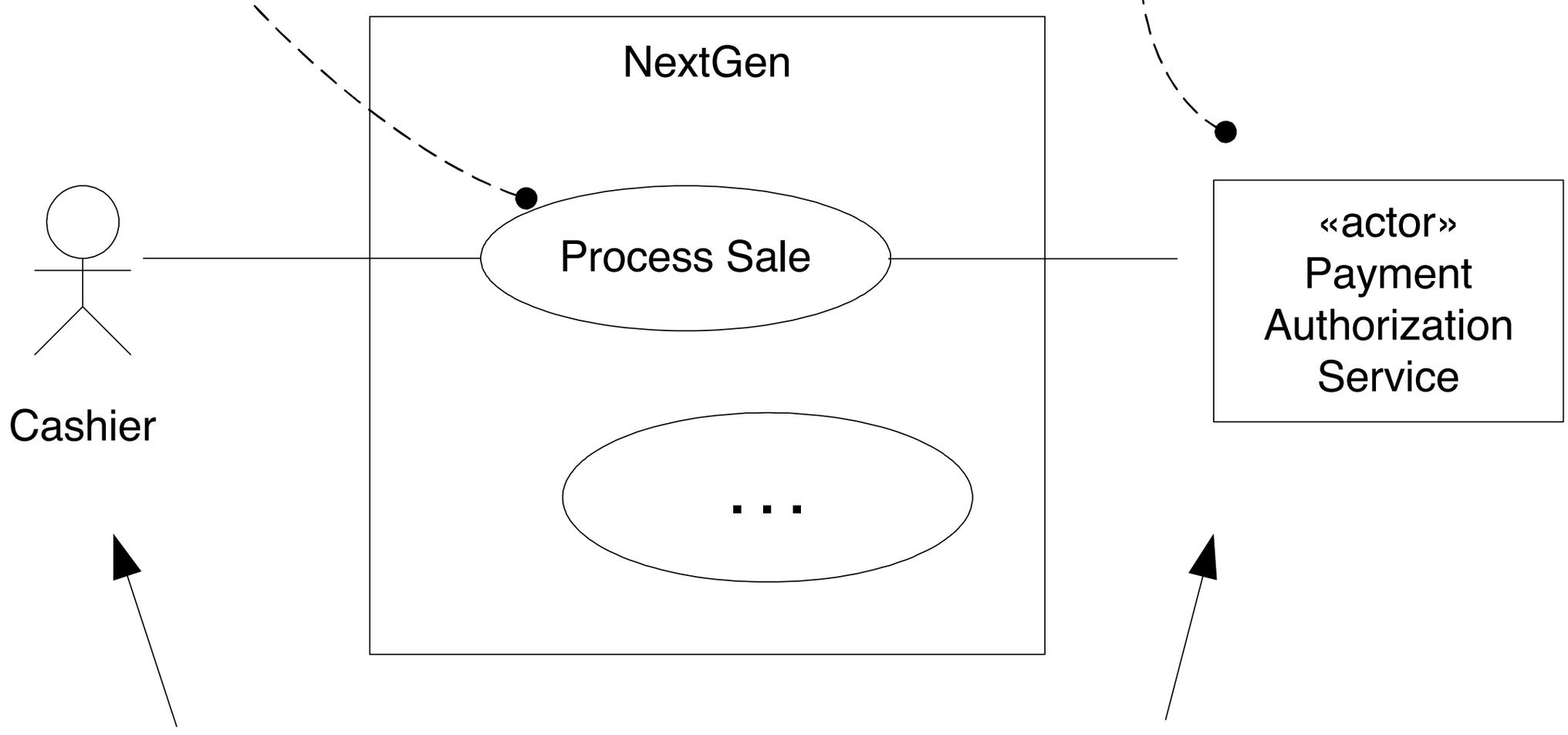
- The Use Case Model may optionally include a UML *use case diagram*
- The diagram shows the names of use cases and actors, and their relationships
- This gives a visual contextual information of a system and its environment
- While there nothing objected-oriented about use cases, they are a key requirements input to OOA/D

A Use Case Diagram



For a use case context diagram, limit the use cases to user-goal level use cases.

Show computer system actors with an alternate notation to human actors.



primary actors on the left

supporting actors on the right

POS System Example

Process Sale: A customer arrives at a checkout with items to purchase. The cashier uses the POS system to record each purchased item. The system presents a running total and line-item details. The customer enters payment information, which the system validates and records. The system updates inventory. The customer receives a receipt from the system and then leaves with the items.

Detailed Use Case

[see Section 6.8 of textbook]

Credits

Notes and figures adapted from

Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development by C. Larman. 3rd edition. Prentice Hall/Pearson, 2005.