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Introduction to Entity-Relationship Diagrams, Data Flow Diagrams, and UML

Todd Bacastow
Penn State University
Geography 583
Geospatial System Analysis & Design



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What is the UML?

- Unified Modeling Language
- It is a modeling language, not a process
- In 1996, work on the UML was begun by Rational.



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UML Diagrams

1. Class Diagrams
2. Use Case Diagrams
3. Collaboration Diagrams
4. Sequence Diagrams
5. Package Diagrams
6. Component Diagrams
7. Deployment Diagrams
8. Activity Diagrams
9. State Diagrams





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Class Diagrams

- Are the most fundamental UML Diagram.
- Describe the classes in the system, and the static relationships between classes.
- Class diagrams are used during Analysis, Design and Development.



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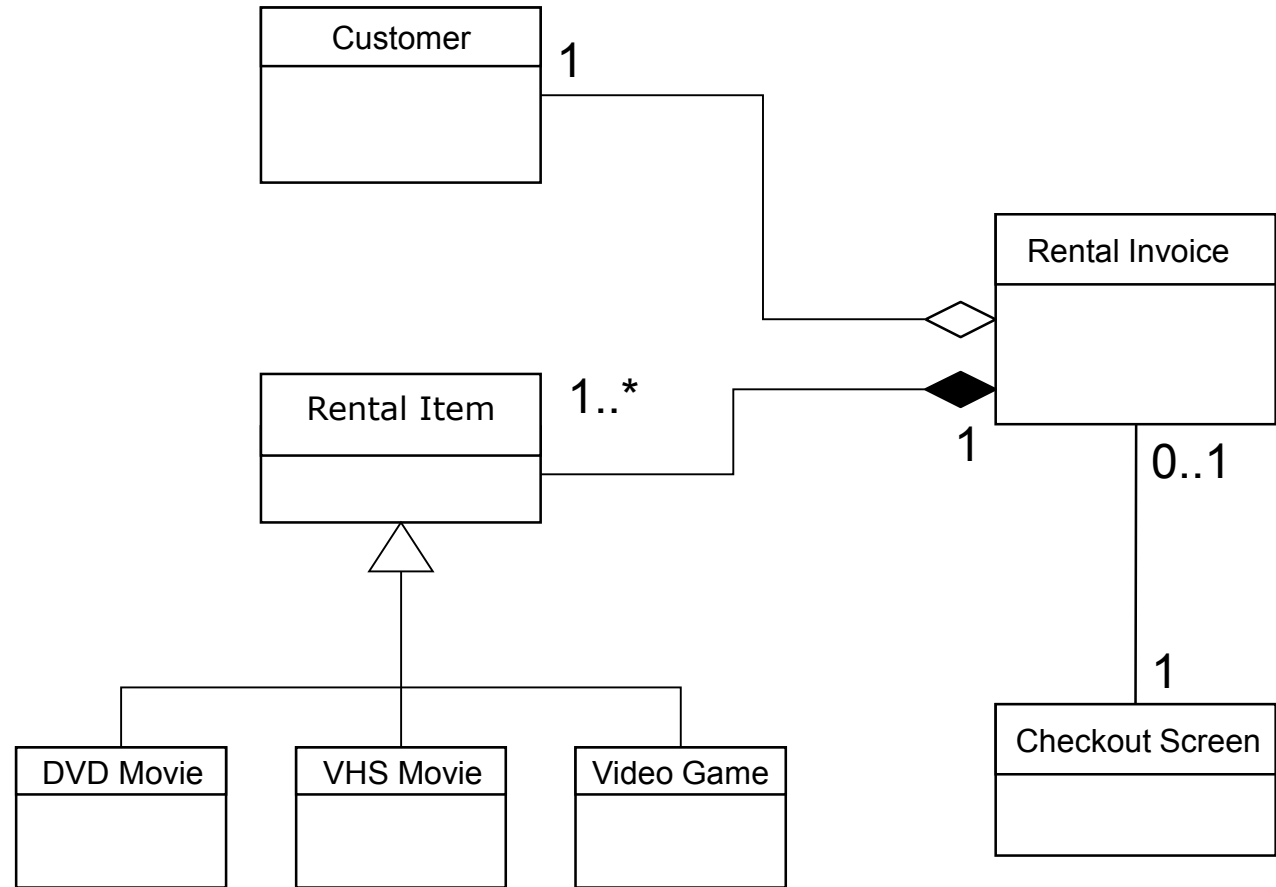
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UML Class Diagram



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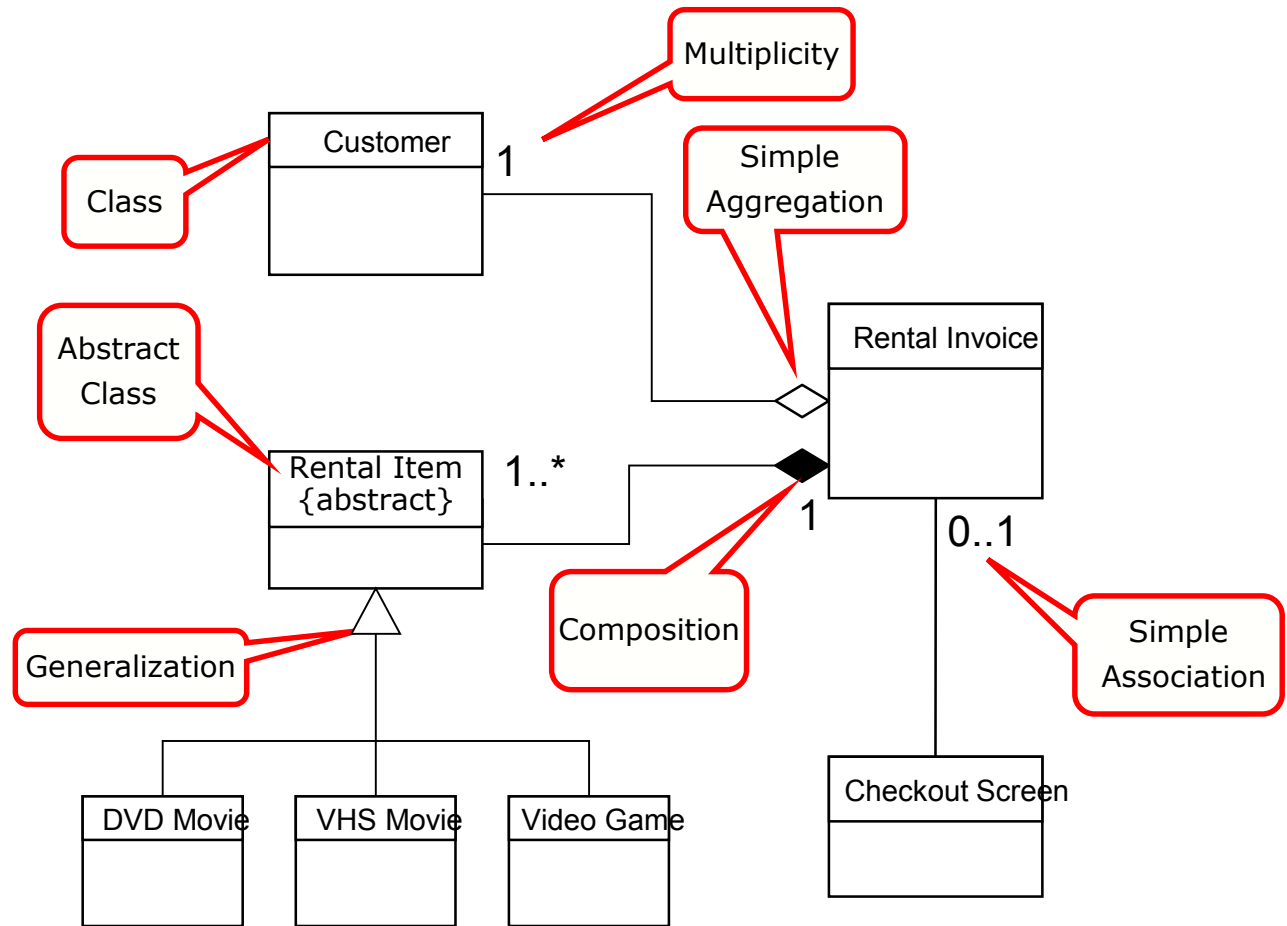
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UML Class Diagram





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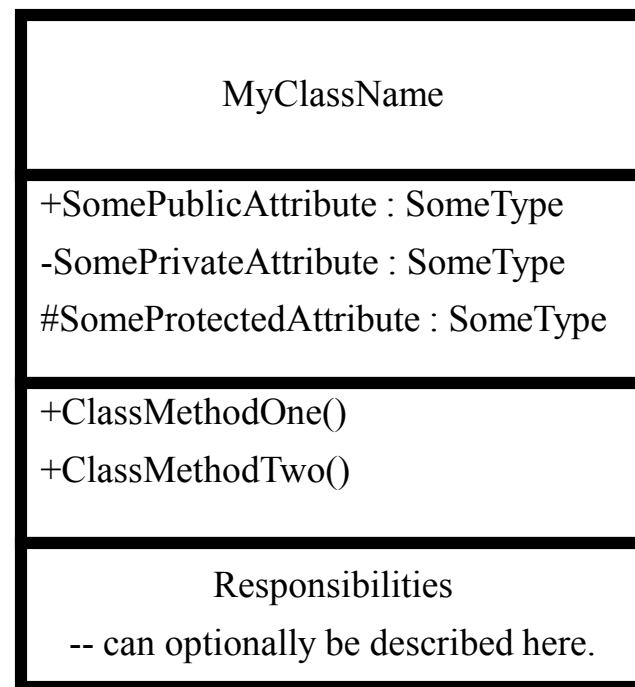
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Parts of a Class

- Classes can have four parts
 - Name
 - Attributes
 - Operations
 - Responsibilities
- Classes can show visibility and types.
- All parts but the Name are optional.





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Object Diagrams

- An Object is an instance of a class.
- Object names are underlined.
- Object diagrams are similar to class diagrams. Many of the same notations are used.
- Object diagrams capture instances of classes, and allow the dynamic relationships to be shown.

ThisOne : MyClassName

+SomePublicAttribute : SomeType
-SomePrivateAttribute : SomeType
#SomeProtectedAttribute : SomeType

+ClassMethodOne()
+ClassMethodTwo()

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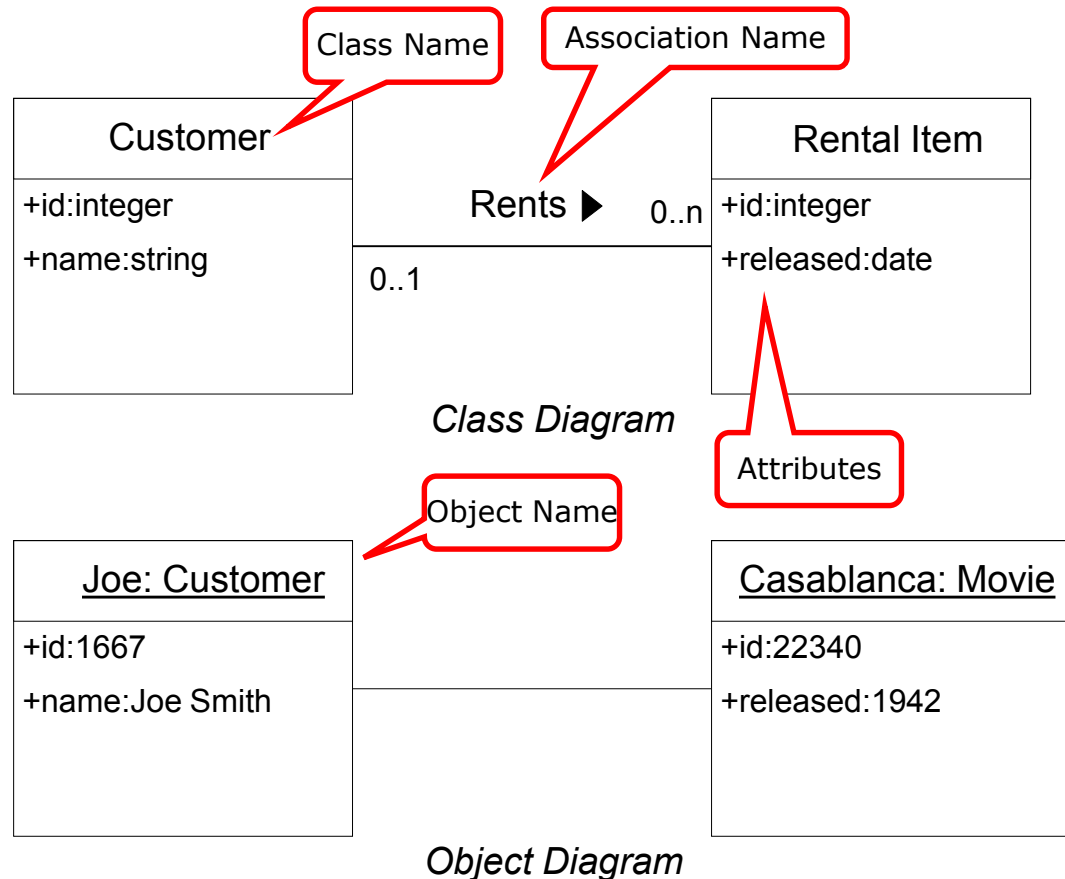
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Class and Object Diagrams





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Use Cases

- Describe interactions between users and computer systems (both called actors) .
- Capture user-visible functions.
- Achieve discrete measurable goals.
- Are typically used during Analysis and Design.

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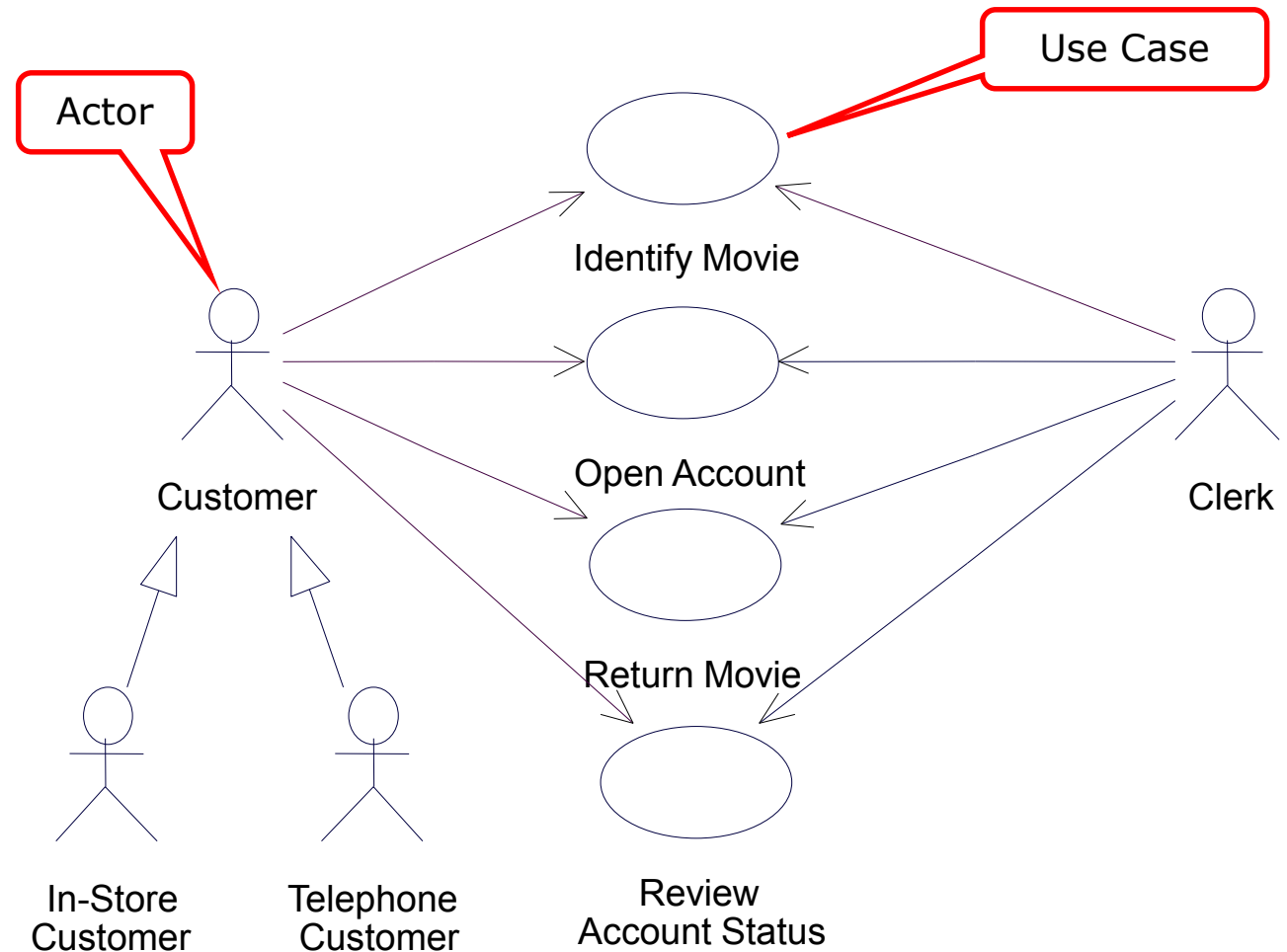
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Use Case Diagram





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Collaboration Diagrams

- Collaboration diagrams describe interactions and links
- Focus on exchange of messages between objects
- Appears during Analysis phase
- Enhanced during Design phase

Collaboration Diagram - Rent Movie

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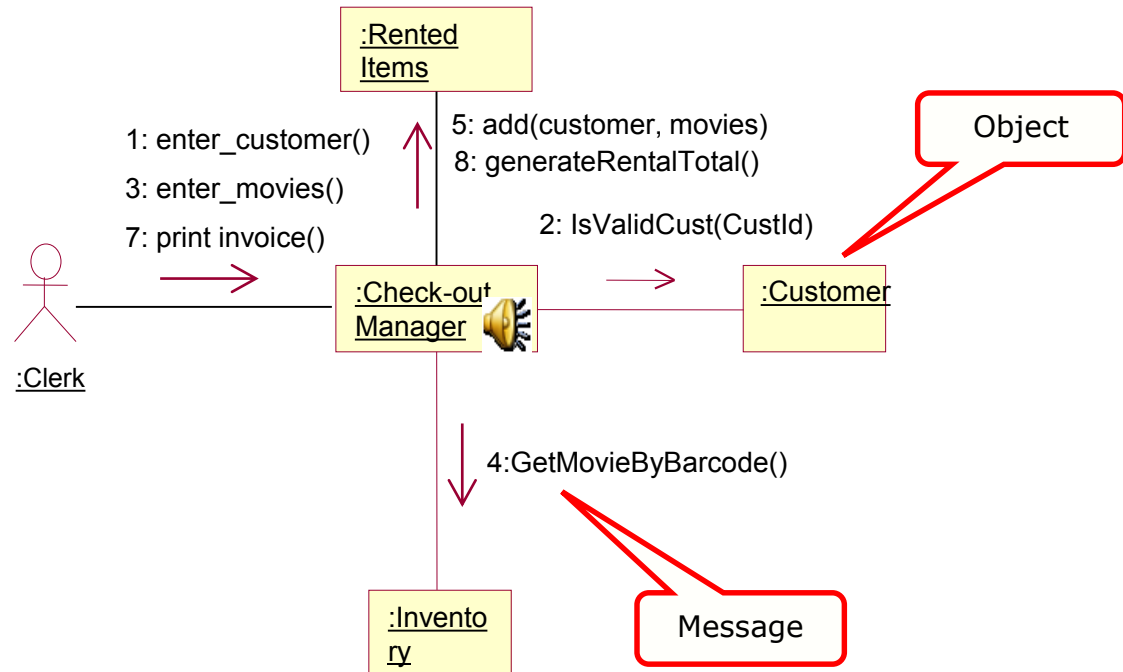
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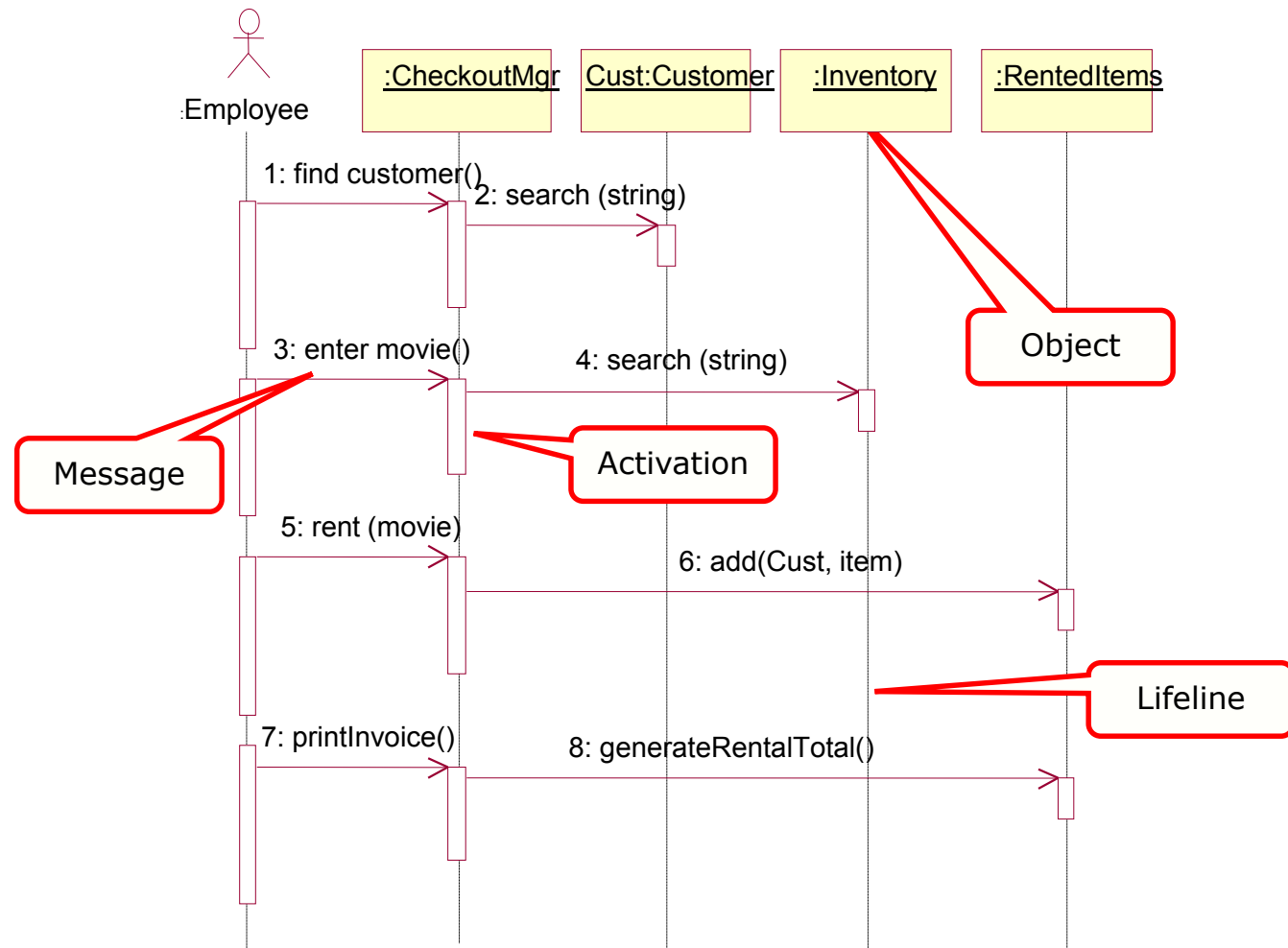
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Sequence Diagrams

- Can be “morphed” from Collaboration Diagrams.
- Describe interactions between objects arranged in time sequence
- Focus on objects and classes involved in the scenario and the sequence of messages exchanged
- Associated with use cases
- Used heavily during Analysis phase and are enhanced and refined during Design phase

Sequence Diagram - Rent Movie



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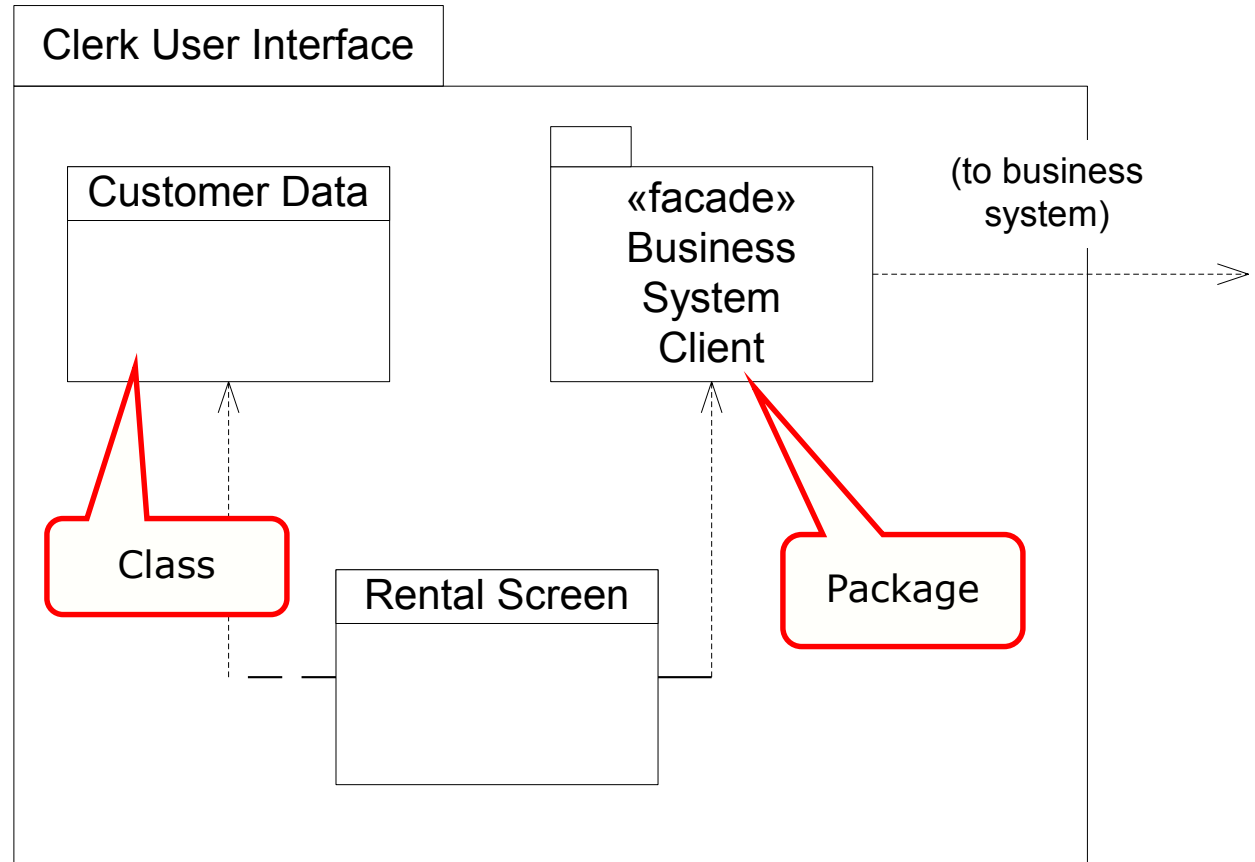
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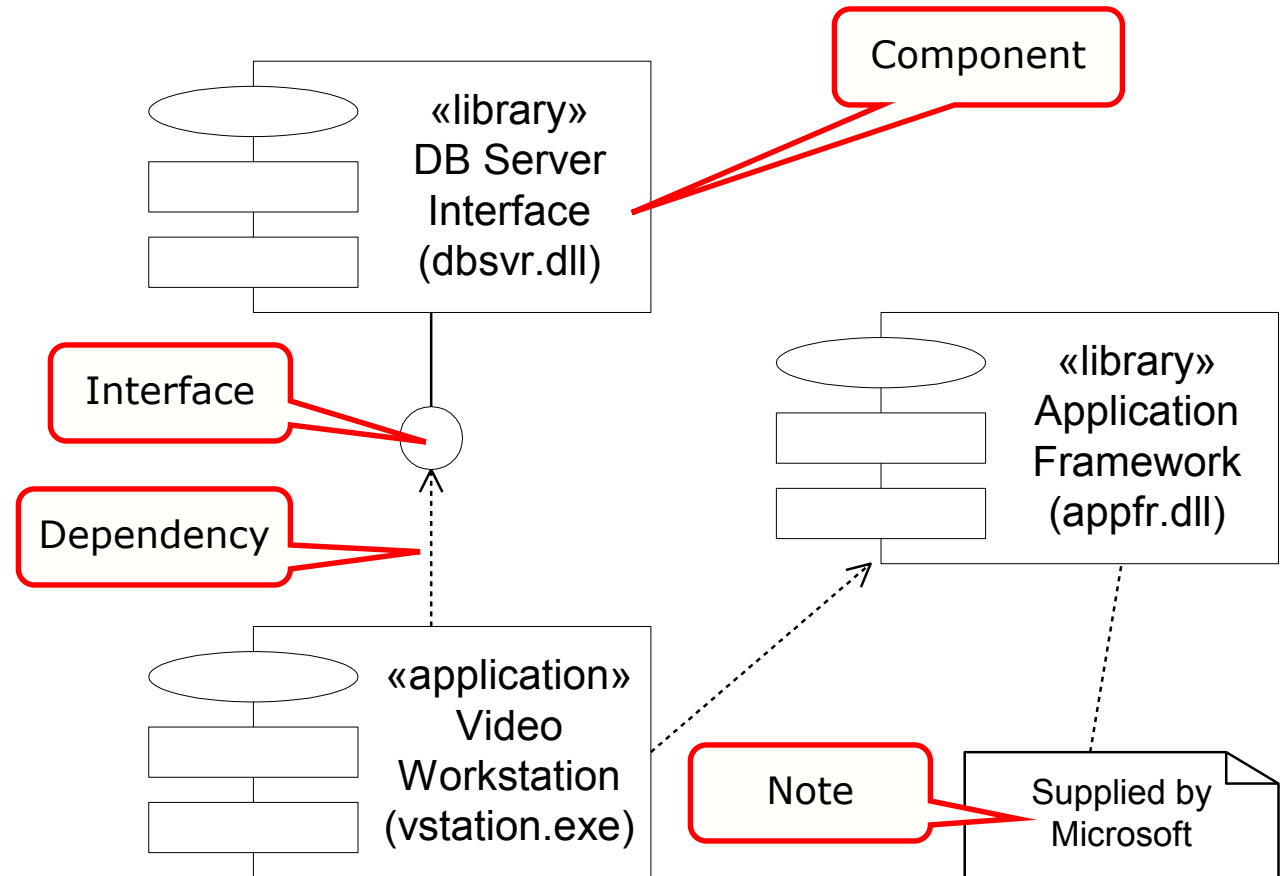
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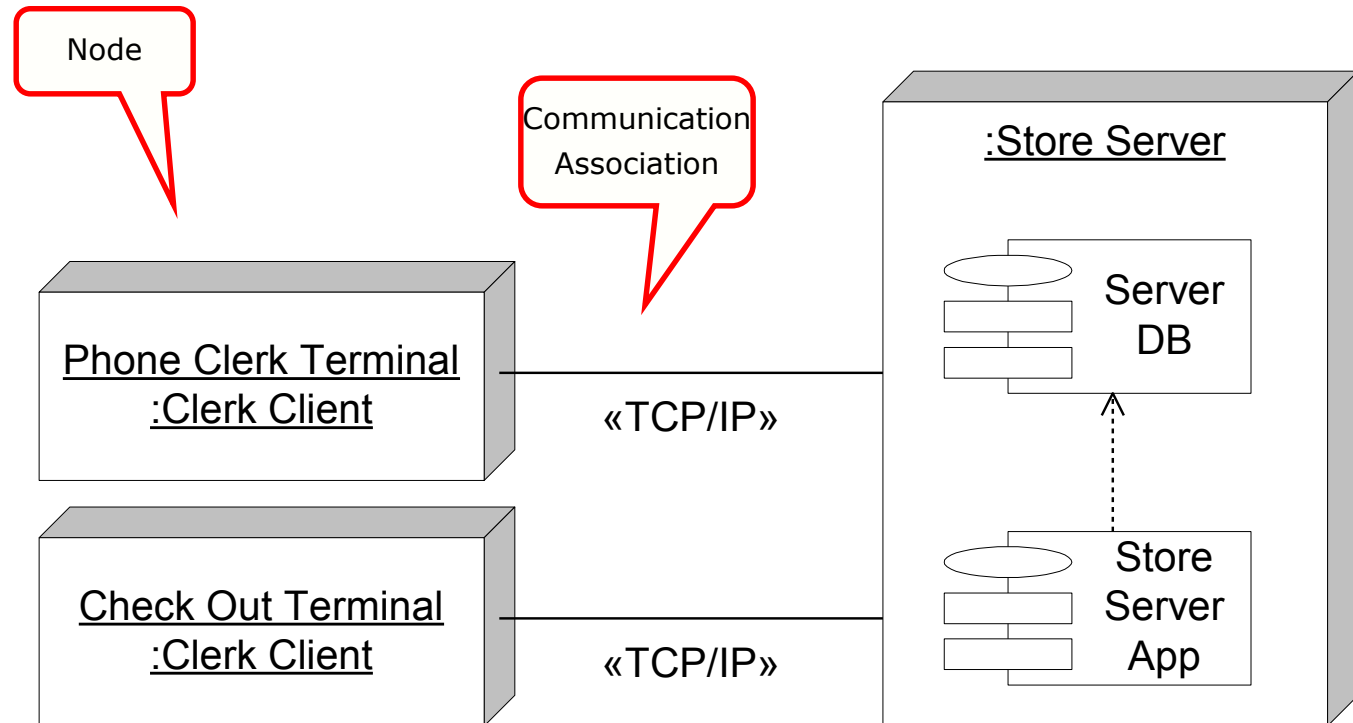
Package Diagram



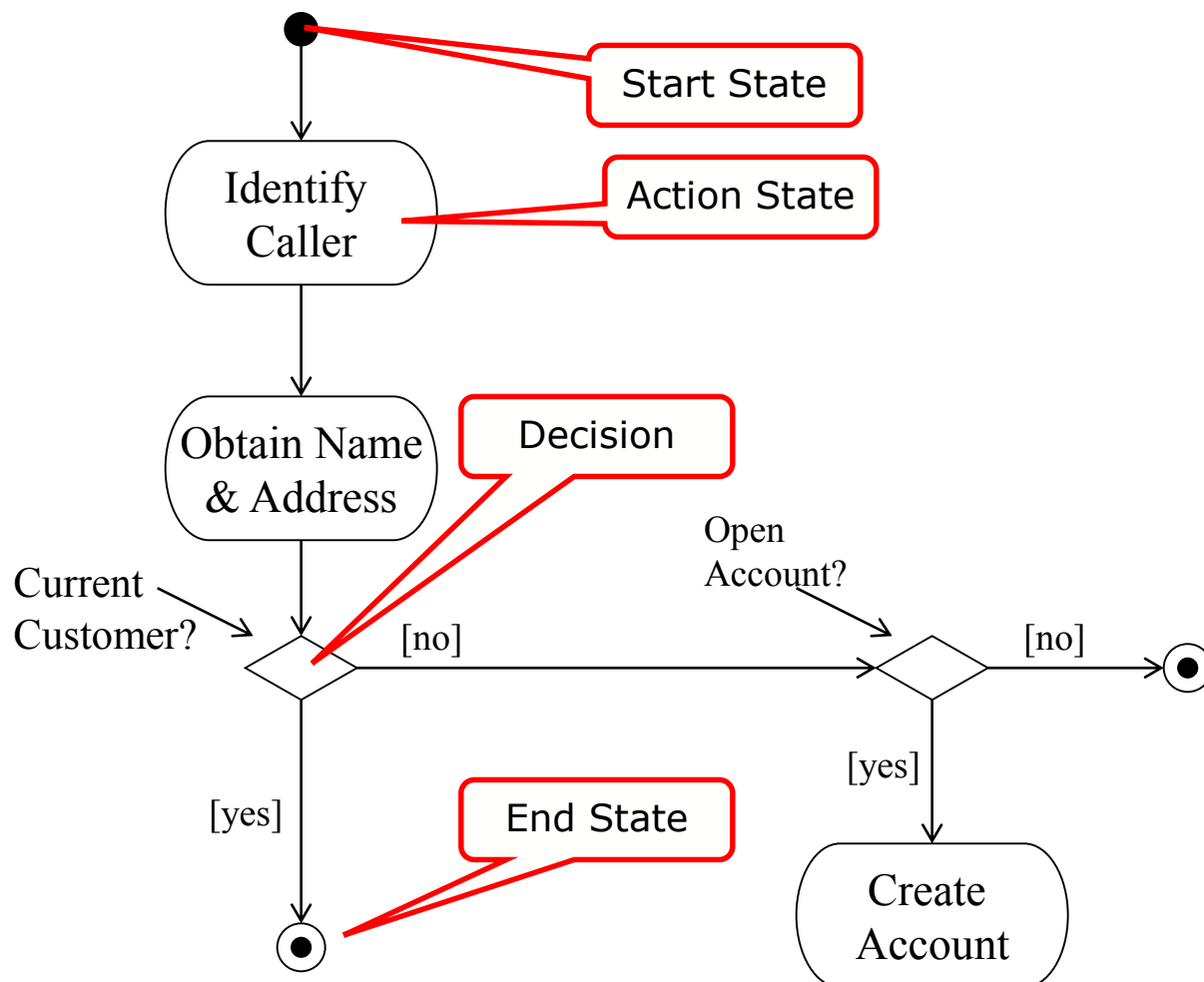
Component Diagram



Deployment Diagram



Activity Diagram



Swimlanes and Fork/Join Points

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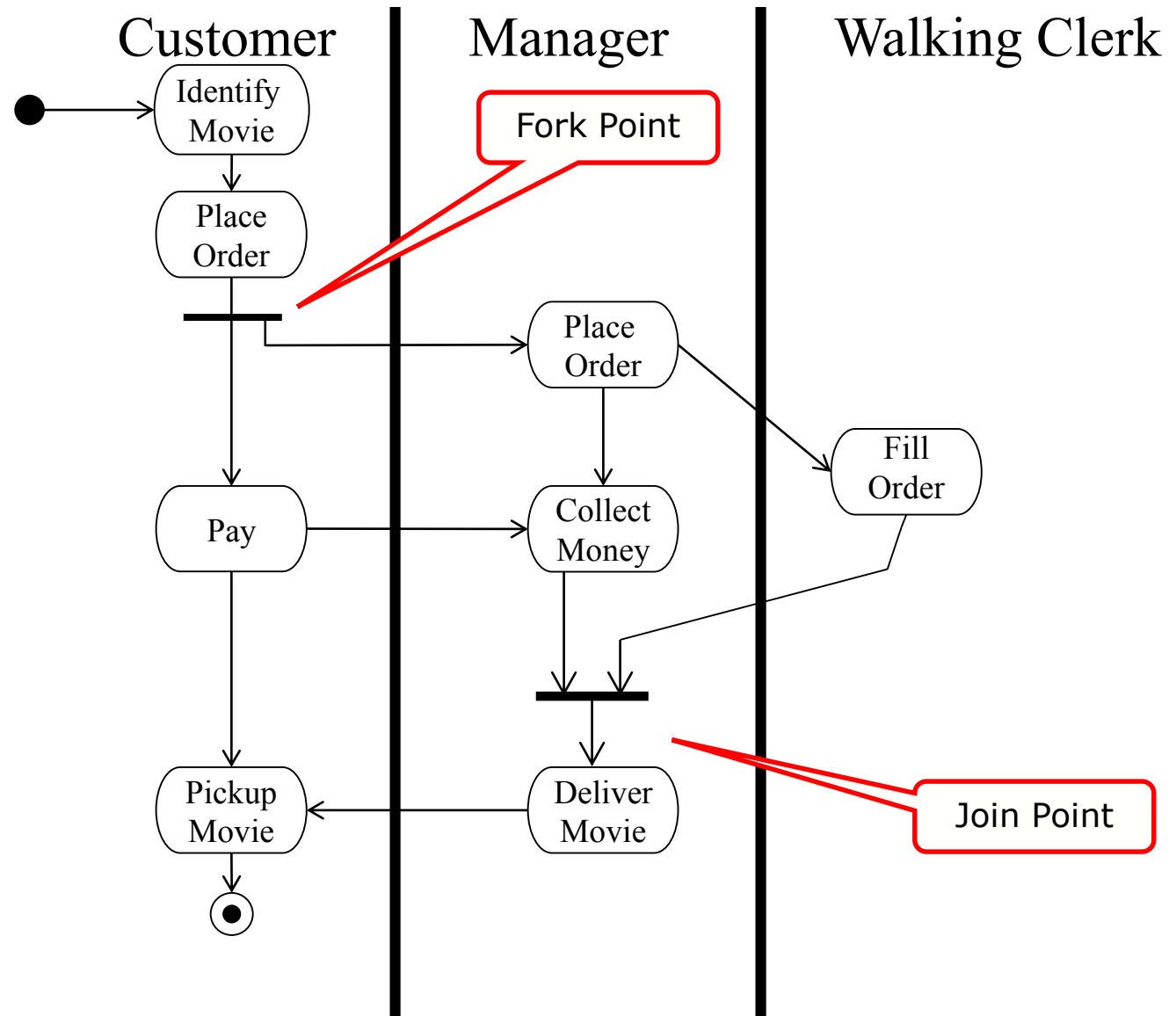
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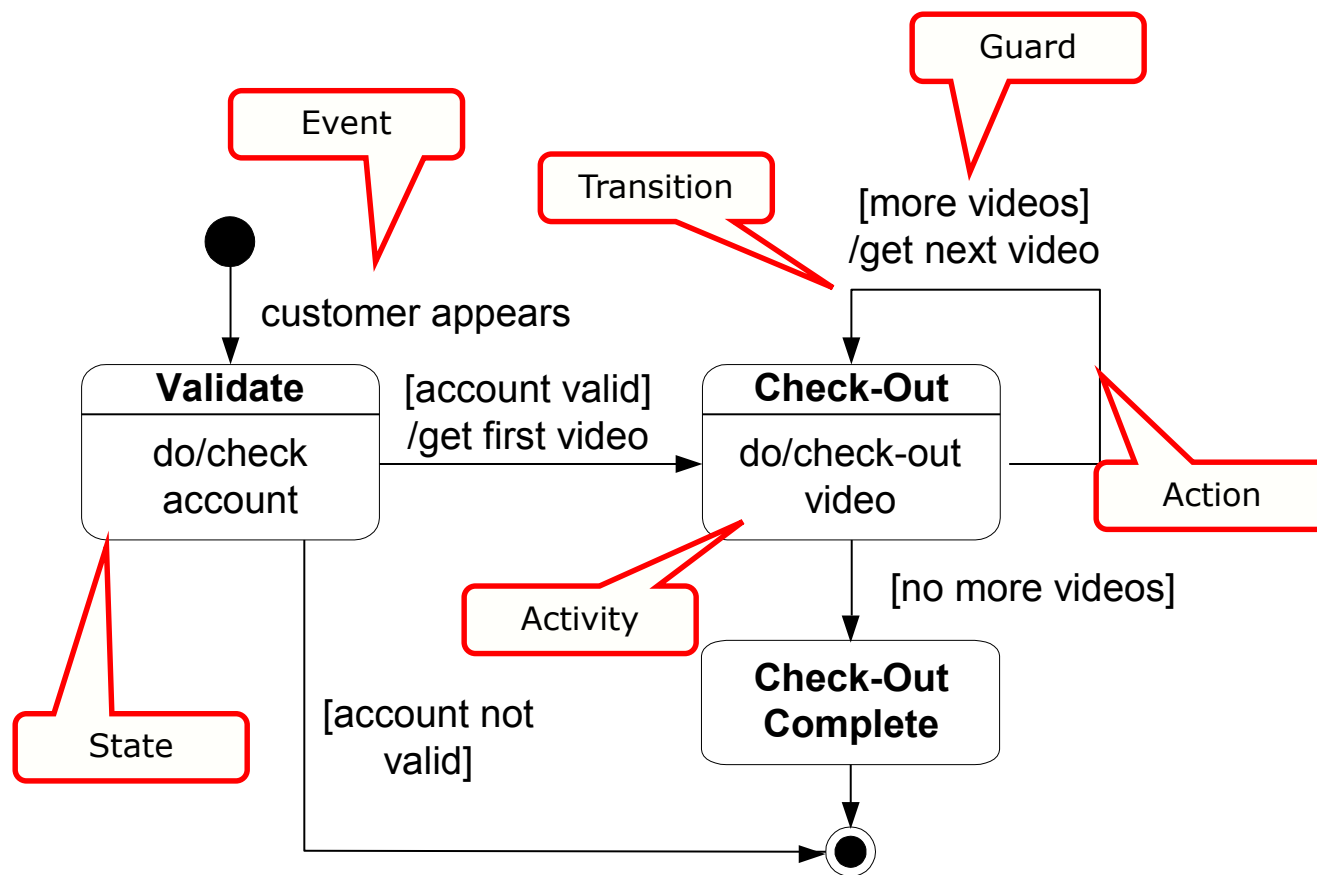
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State Diagram





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UML Diagram Usage

Development Phase	UML Diagrams
Analysis	Use Cases, Class Diagrams, Activity Diagrams, Collaboration Diagrams, Sequence Diagrams
Design	Class Diagrams, Collaboration Diagrams, Sequence Diagrams, State Diagrams, Component Diagrams, Deployment Diagrams
Development	Collaboration Diagrams, Sequence Diagrams, Class Diagrams, State Diagrams, Component Diagrams, Deployment Diagrams
Implementation	Package Diagrams, Deployment Diagrams



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Conclusion

- UML is a robust notation that can express information gathered throughout a project's lifecycle.
- Adopting standard use of UML can improve communication between clients and developers.
- UML can be used as an effective data modeling tool as well as an object modeling tool.