LESSON TITLE

Country	Cambodia
Language	■ English ■ Local Language
Course Title	Software Engineering
Lesson Title	05. Advanced Class Diagram
SME	Mr. TAL Tongsreng
Submission Date	November 09th, 2015
Version	1.0

Please provide the outline of course which will

☐ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

Advanced Class Diagram	
	1. Class Relationships 2. Composition 3. Aggregation 4. Abstract Classes 5. Interfaces

Please provide the introduction / overview on this lesson

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Overview
In this chapter, you are going to learn about • Know possible relationship between classes in class diagram • Know how and when to use composition relationship in class diagram • Know how and when to use aggregation relationship in class diagram • Definition of abstract class • Definition of interface

1. Introduction > 1.2 Learning Content

Please make sure the hierarch of the content is well formed.
Please organize the lesson in 3-5 main topics and use 3-level headings.

Level 1	Level 2	Level 3
1. Class Relationships	1.1 Dependency	
	1.2. Association	
	1.3. Inheritance	
2. Aggregation	2.1. Definition	
	2.2. Usage in Visual Paradigm	
	2.3. CMS Example	
3. Composition	3.1. Definition	
	3.2. Usage in Visual Paradigm	
	3.3. CMS Example	

1. Introduction > 1.2 Learning Content

Please make sure the hierarch of the content is well formed.
Please organize the lesson in 3-5 main topics and use 3-level headings.

Level 1	Level 2	Level 3
4. Abstract Class	4.1. Definition	
	4.2. Usage in Visual Paradigm	
	4.3. Store Example	
5. Interface	5.1. Definition	
	5.2. Usage in Visual Paradigm	
	5.3. Mail System Example	

1. Introduction > 1.4 Learning Objectives

Please provide objective of the lesson by high light keyword and follow (Audience, Behavior, Condition, Degree) to write the objective

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Objective
Upon completion of this chapter, you will be able to • Define class relationships in Class Diagram • Identify and use Aggregation • Identify and use Composition • Define Abstract Class • Define Interface in Class Diagram

Please provide keywords of the lesson with explanation

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Keywords	Description
Dependency	Basic relationship among objects.
Association	Represents a family of links noted as line between 2 classes.
Aggregation	a variant of the "has a" association relationship.
Composition	a stronger variant of the "has a" association relationship.
Interface	similar to a class, but the body of an interface can include only abstract methods and constants.

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

Pre-Test

Question	Possible answers	Correct Answer	Feedback of the question
Which one is Dra w-able?	1. Kettle 2. Gardener 3. Pencil	3. Pencil	Kettle is used for stocking water. G ardener is person who manage the garden.

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

Pre-Test

Question	Possible answers	Correct Answer	Feedback of the question
Which one is acc essory of Car?	1. Pen 2. Wheel 3. Dog	2	Pen is used for dr awing, it is not plu ggable to Car. Dog is an animal, it is not material in the Car.

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

Pre-Test

Question	Possible answers	Correct Answer	Feedback of the question
Which materials are required for a bicycle to be functioning?	1. Wheel 2. Seat 3. Chain	1, 2, 3	All

2. Learn> Topic: 1. Class relationships

(1) Learning Contents

☒ A : Text-based + Audio
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☐ C : Only Video

- Classes work together using different types of relationships
- The strength of a class relationship is based on how dependent the classes involved in the relationship are on each other

2. Learn> Topic: 1.1. Dependency

(1) Learning Contents

☒ A : Text-based + Audio
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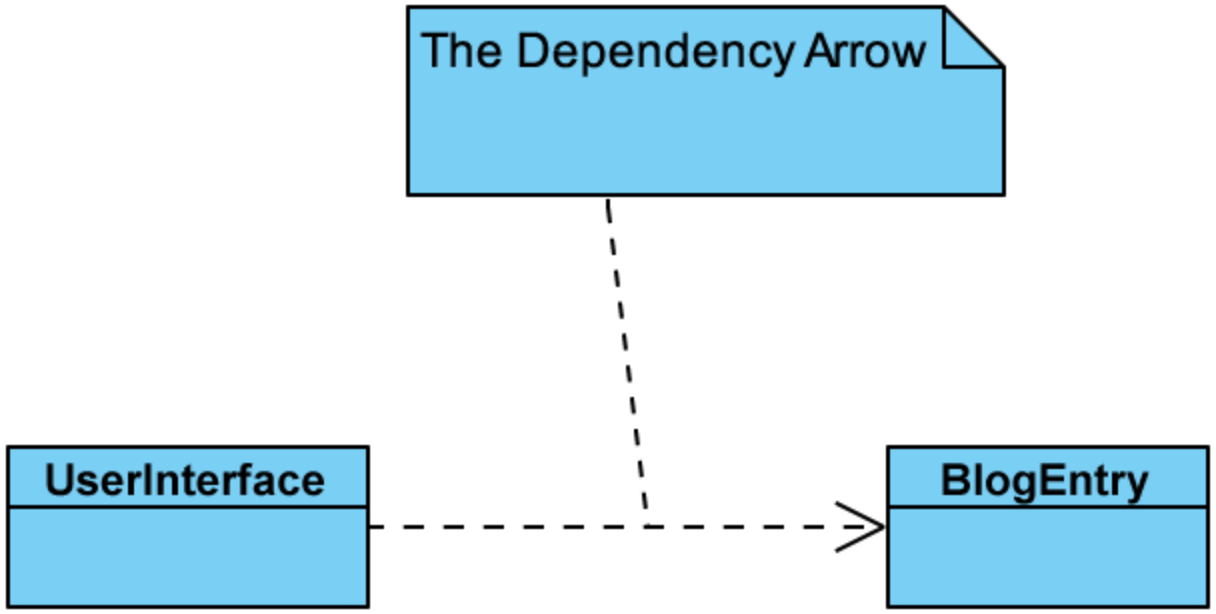
- When object of one class work briefly with objects of another class.
- It is considered the weakest direct relationship between two classes.



(1) Learning Contents

☒ A : Text-based + Audio
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☐ C : Only Video

- When objects of one class work with objects of another class for some prolonged amount of time
- Association means that a class will actually contain a reference to object or objects of another class

(1) Learning Contents

☒ A : Text-based + Audio
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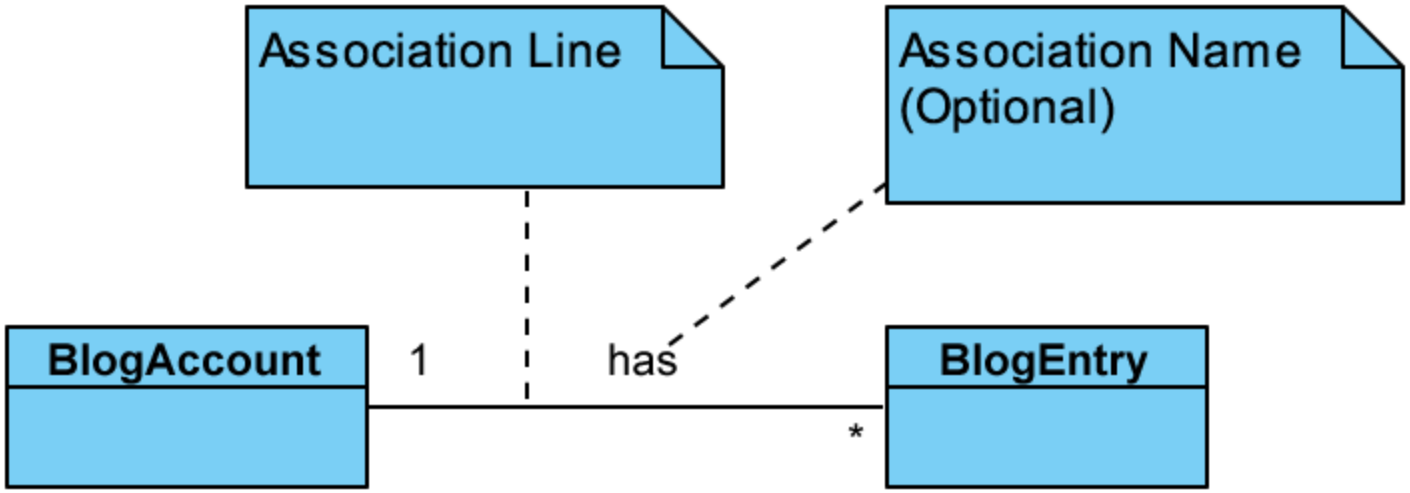
Example of association relationship between BlogAccount and BlogEntry



2. Learn> Topic: 1.3. Generalization or inheritance

(1) Learning Contents

☒ A : Text-based + Audio
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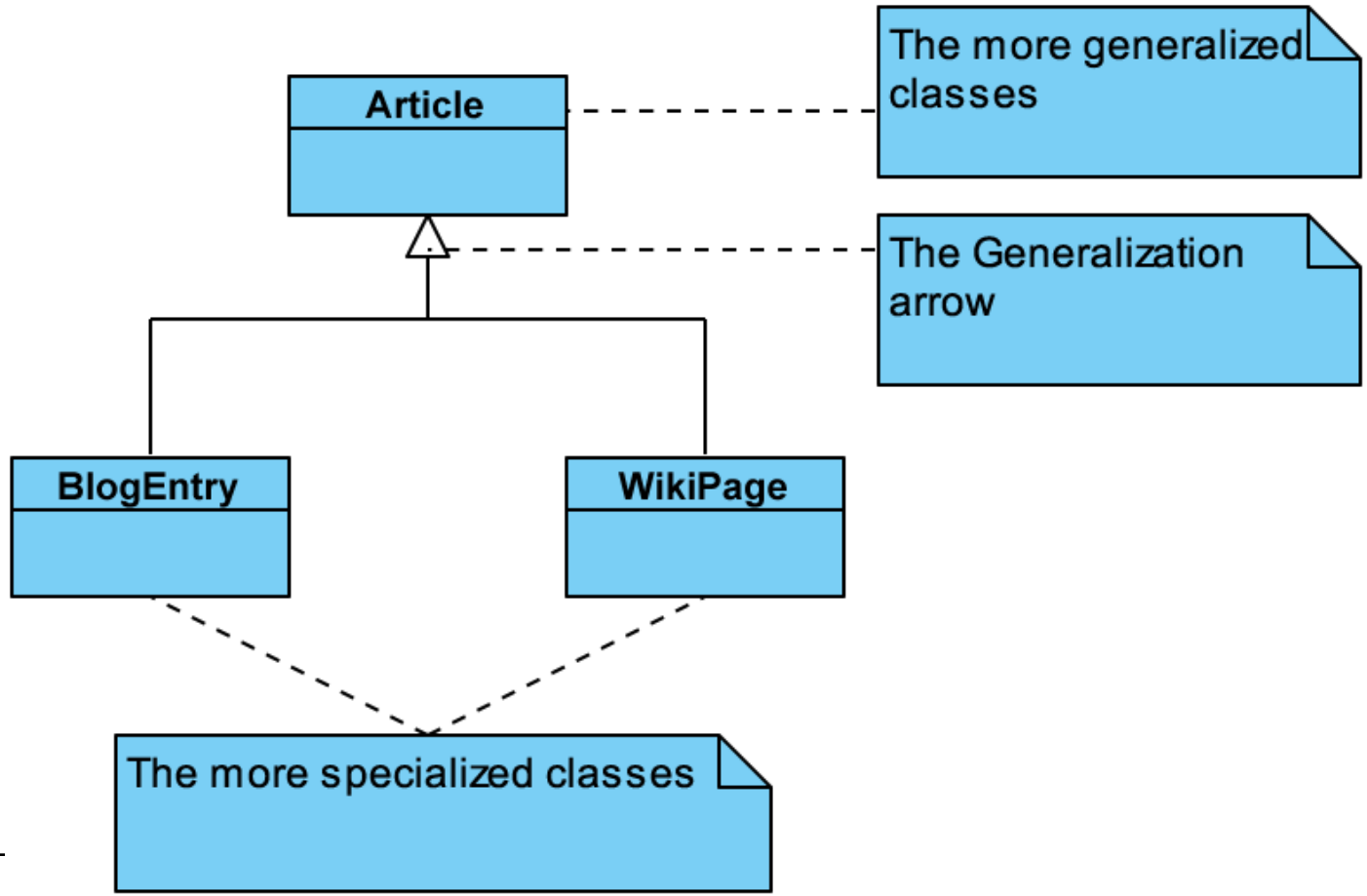
- when one class is a type of another class
- A child class inherits and reuses all of the attributes and methods that the parent contains
- It is the strongest relationship between two classes



2. Learn> Topic: 2.1. Definition of Aggregation

(1) Learning Contents

☒ A : Text-based + Audio
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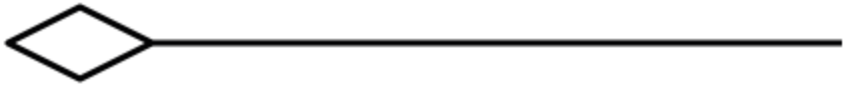
When one class owns but shares a reference to objects of another class.
In this case, the class that owns the objects of other class, holds the diamond.



(1) Learning Contents	☒ A : Text-based + Audio ☐ B : Text-based + Video ☐ C : Only Video
	First, create 2 classes, then ▪ First, create 2 classes, then ▪ Choose the aggregation sign in select box of association ▪ Click and drag on the class that contains aggregation (has a) relationship, to the second class (referenced class) and release mouse in that class.

(1) Learning Contents

☒ A : Text-based + Audio
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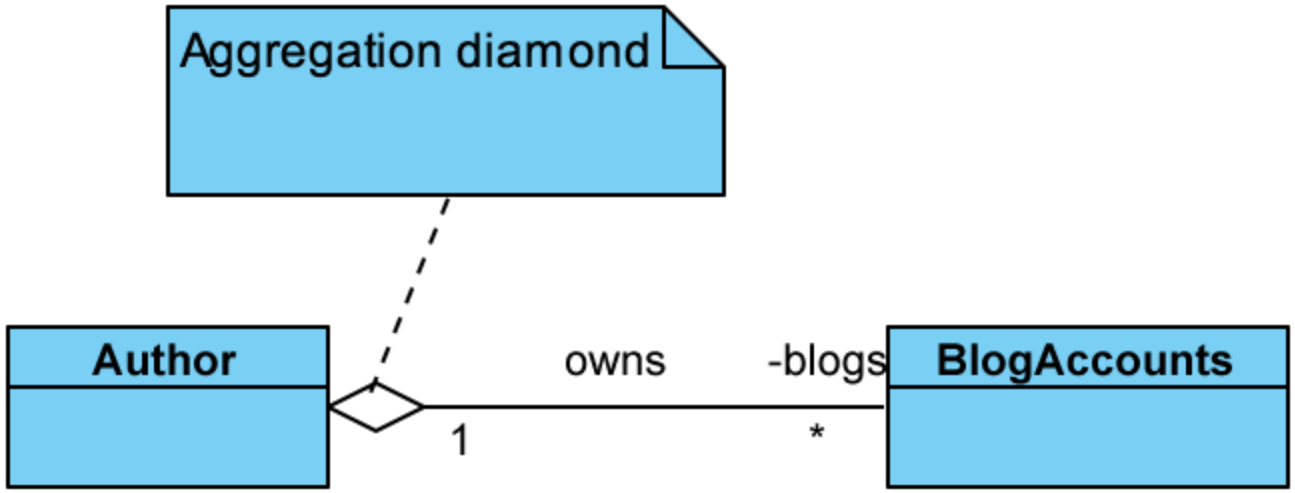
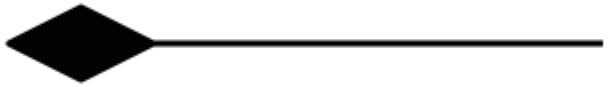
- Author class contains attribute (s) that is an object reference to BlogAccounts cla ss.
- Author owns many Blog Accounts



2. Learn> Topic: 3. 1. Definition of Composition

(1) Learning Contents	☒ A : Text-based + Audio ☐ B : Text-based + Video ☐ C : Only Video
	▪ When one class contains objects of another class ▪ Composition usually has a strong life cycle dependency between the container and the contained class 

(1) Learning Contents	☒ A : Text-based + Audio ☐ B : Text-based + Video ☐ C : Only Video
	▪ First, draw 2 classes, ▪ then select Composition sign in association select box ▪ Click and drag from 1 class to another and release inside that class ▪ The same as Aggregation, the class that hold the solid diamond has owned obje ct reference to another class.

(1) Learning Contents

☒ A : Text-based + Audio
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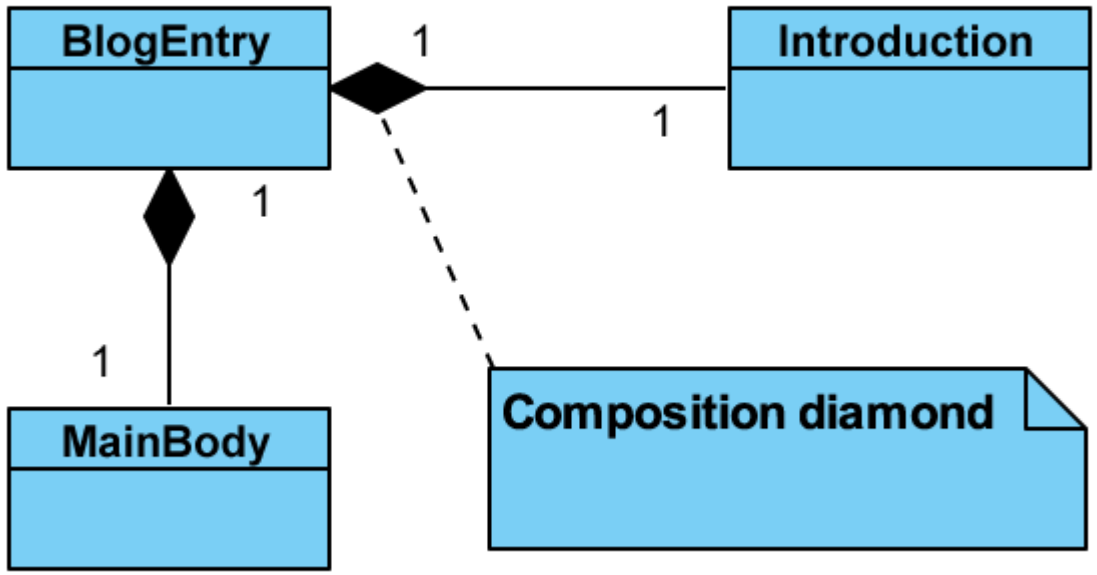
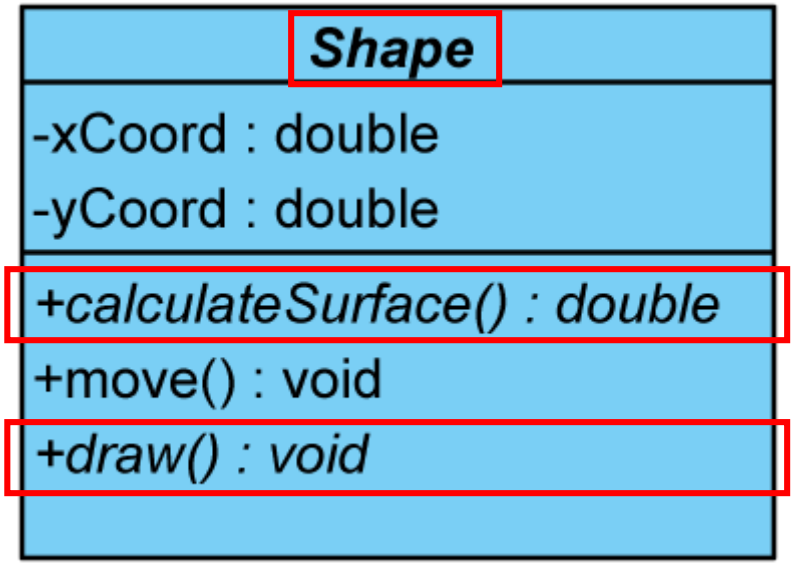
- BlogEntry class contains attribute of type Introduction class and another attribute of type MainBody. or
- BlogEntry class owns objects of type Introduction and MainBody,



(1) Learning Contents

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

- Sometimes the implementation of some methods a class is left to subclasses by declaring them as abstract
- The class that contains abstract methods are called abstract class
- To indicate that a method is abstract, we have to write its signature in *italics*
- The class itself also needs to be declared as abstract by writing its name in *italics*



2. Learn> Topic: 4.2. Usage of Abstract Class in Visual Paradigm

(1) Learning Contents	☒ A : Text-based + Audio ☐ B : Text-based + Video ☐ C : Only Video

	▪ Drawing Abstract Class
	  ▪ Draw a normal class,
	  ▪ then, open stereo type by selecting on the class and press ENTER
	  ▪ check Abstract checkbox, click on button OK
	▪ Adding Abstract method
	  ▪ Open Class stereo type, the select “Operations” tab
	  ▪ then, click on button “Add…”, an “Operation Specification” window opened
	  ▪ Give it a name, a return type,
	  ▪ and finally check the “Abstract” checkbox, and OK button

(1) Learning Contents

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

- The store can stock many articles,
- and user can retrieve the articles back from the store.

(1) Learning Contents

☒ A : Text-based + Audio
☐ B : Text-based + Video
☐ C : Only Video

- The abstract class Store above can be coded in Java as following:

```
public abstract class Store {
 public abstract void store(Article[] articles);
 public abstract Article[] retrieve();
}
```

(1) Learning Contents

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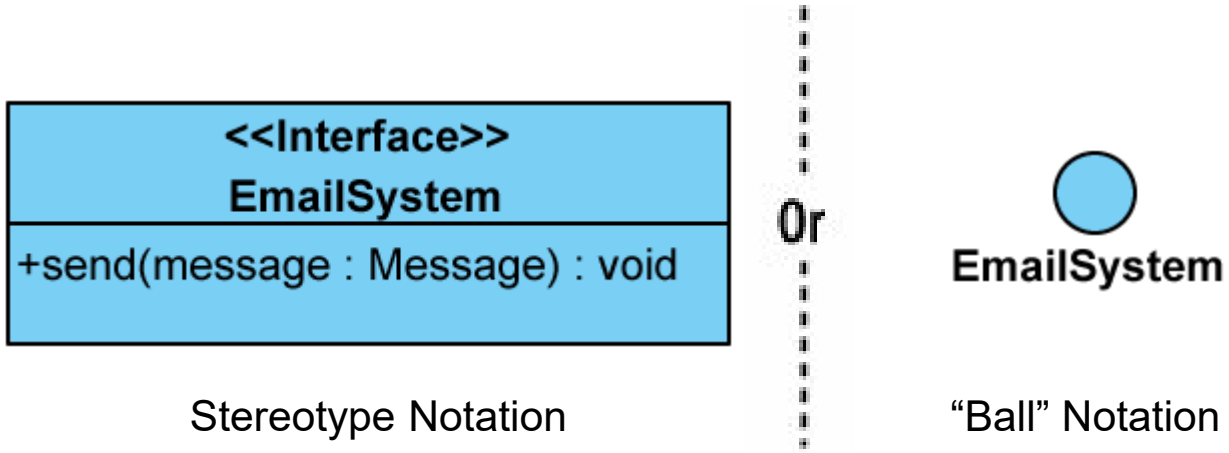
- An interface is a collection of operations that have no corresponding method im plementations
- There are two types of notation for interfaces: stereotype notation and ball nota tion



2. Learn> Topic: 5.2. Interface Usage In Visual Paradigm

(1) Learning Contents	☒ A : Text-based + Audio ☐ B : Text-based + Video ☐ C : Only Video

	▪ Add an Interface:
	  ▪ Select Interface in Class select box,
	  ▪ then, click on the drawing space,
	  ▪ give it name,
	▪ Adding Operation to interface: is the same as adding method to a class
	▪ Changing Presentation between Stereotype notation and “ball” notation
	  ▪ Right click the newly created Interface,
	  ▪ select Presentation Options,
	  ▪ Then click on “Interface ball”

(1) Learning Contents

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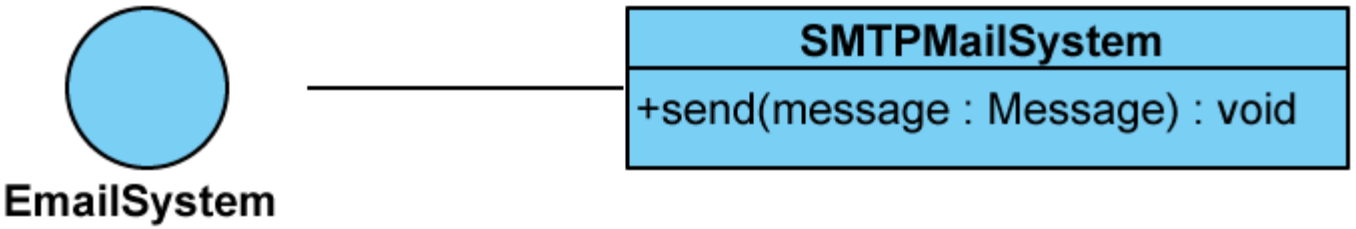
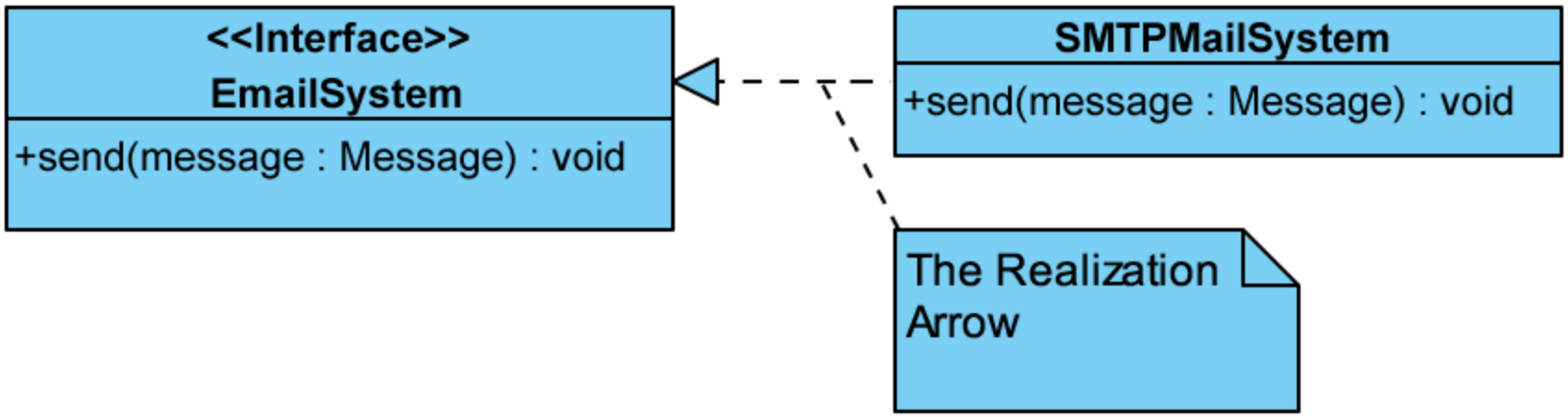
- If you are using the ball notation, then you realize or implement an interface by associating it with a class



- If you have the stereotype notation for you interface, then a new arrow is needed to show a realization relationship



3. Test

Question	Possible answers	Correct Answer
1. Dependency is:	a) When object of one class work briefly wi th objects of anothe r class b) When object of one class share referenc e with another class c) When object on one class depends on an other primitive type	a) When object of one class work briefly with obj ects of another class
2. Completing blank field:	When one class owns bu t shares a reference to o bjects of another class, is called ……	Aggregation
3. Choose a name that is not mention ed in this lesson:	a) Classifier b) Dependency c) Association d) Aggregation e) Composition	a) Classifier
4. Inheritance is:	a) when one class is a t ype of another class b) name a group of rel ated types c) a book written by 2 authors in the same family	a) when one class is a type of another class d) the strongest relationship between two classes

4. Practice

☐ A : Fill in the blank
☐ B : Short answer question
☐ C : Multiple Choice

Feedback type
☐ A : Text-based short answer
☐ B : Text-based short answer and more information
☐ C : Video based feedback

Practice

No.	Exercise	Solution
1.	Draw Detailed Class diagram of ATM system (see detail in Moodle)	
2,	Draw Detailed Class diagram of Insurance System	
3,	Draw Detailed Class diagram of Check-in-system	

5. Outro > 5.1 Summarize

Please give a lesson summary.
Each topic can be summarized into a sentence, diagram, or even a word.

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Summarize

- Class relationships show the logical relation structure of the system.
- Advanced Class diagram components include hierarchically Dependency, Association, Aggregation, Composition and Inheritance.
- Composition relationship is stronger relation than aggregation relationship.
- A Class can be abstract that contains at least one abstract operation.
- An interface is like an abstract class that contains all abstract methods and constants.

Provide references if you think the students need.

Reference

- Miles, R. (2006). Learning UML 2.0. O'Reilly
- Chonoles, M. & Schardt, J. (2003). UML 2 for Dummies. Wiley Publishing
- http://www.visual-paradigm.com/features/
- http://staruml.io/support
- http://staruml.sourceforge.net/v1/documentations.php
- http://www.math-cs.gordon.edu/courses/cs211/ATMExample/UseCases.html

5. Outro > 5.3 Next Lesson

This is the end of the lesson.
Ending message and introduction to next lesson including lesson title and topics should be given.

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Next Lesson Title	**Sequence Diagram** 1. Participants 2. Time 3. Events and Messages 4. Message Arrows 5. Sequence Diagram Example