Design Defects and Restructuring

LECTURE 02

SAT, AUG 31, 2019

Object Oriented Concepts

Concepts
- Abstraction
- Class
- Object
- Encapsulation
- Information Hiding (Scope)
- Inheritance
- Interface
- Messaging
- Polymorphism (Ad hoc – Overload, Subtype – Override, Parametric – Templates or Generics)
- Delegate (Function Pointer)
- Relationship

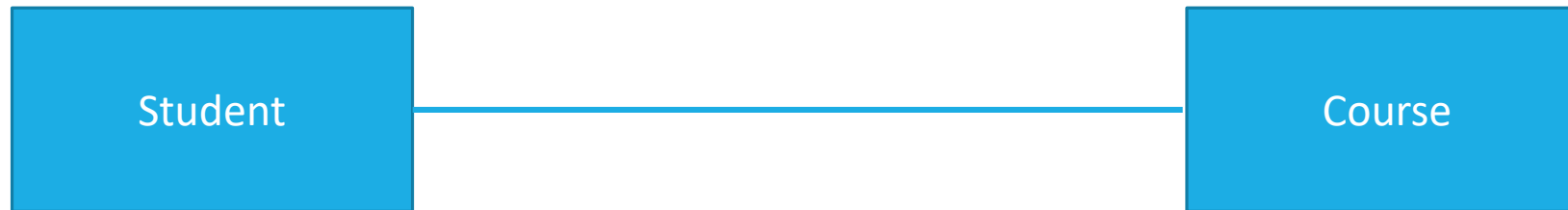# Relationships

Association

Classification
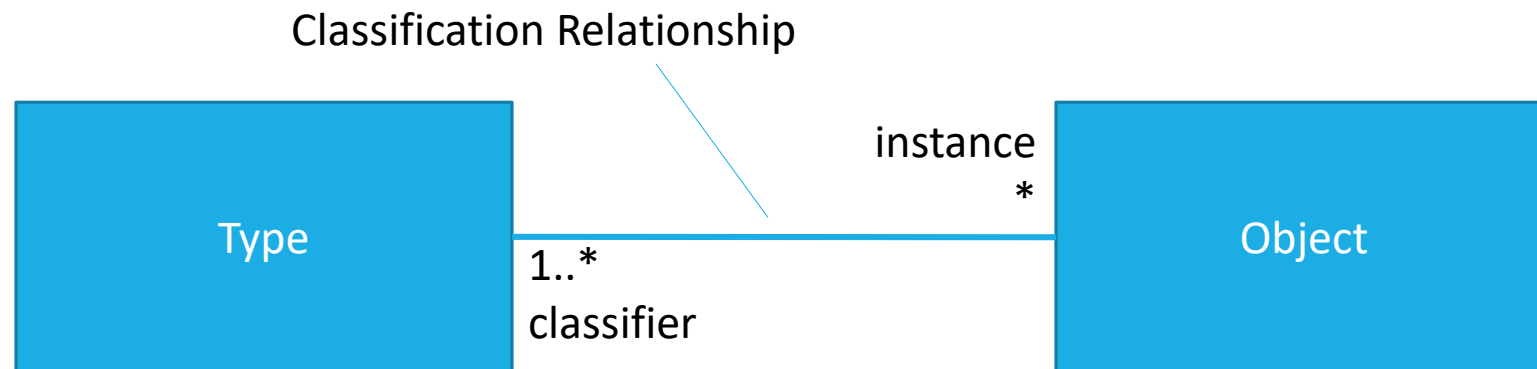
Generalization

Aggregation

Composition

Association

An association is a user defined relationship

Classification

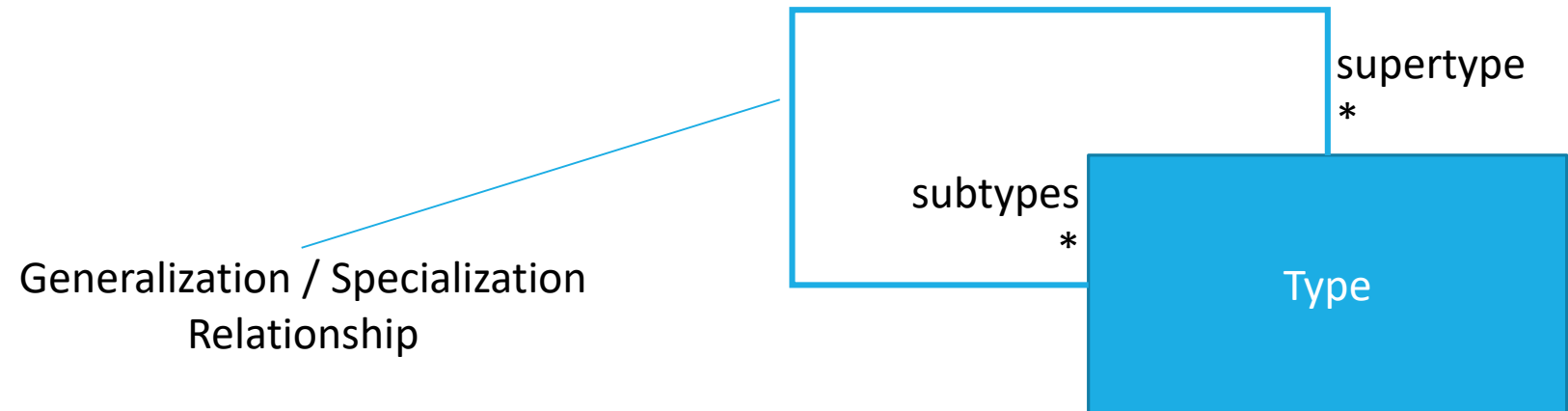It is the act or result of applying a concept (type) to an object

Generalization / Specialization

It is the act or result of distinguishing a concept (type) that completely includes or encompasses another

Generalization enables us to define our types in more general terms by using super-types

Specialization allows us to be more specific about our types by using subtypes

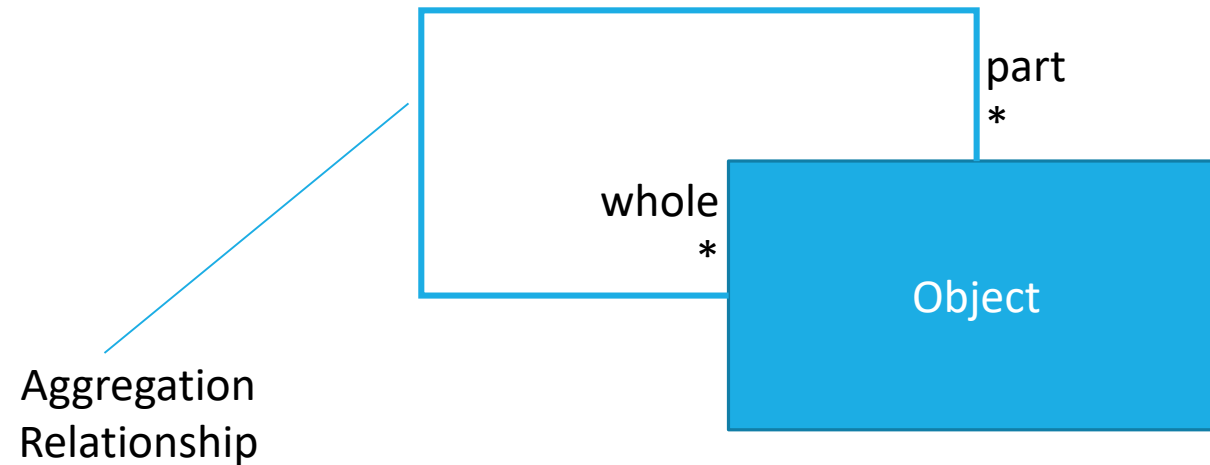Generalization / Specialization Relationship

supertype
*

subtypes
*

Type

Aggregation / Composition

It is the act or result of forming an object whole using other objects as its parts

Aggregation is a mechanism for forming a whole from component parts

part
*

whole
*

Object

Aggregation
Relationship

Generalization / Classification

Objects are instances because they have been classified

Type of objects are subtypes because they have been specialized

Classification and Generalization / Specialization are two different phenomenon and have different hierarchies

Classification is the relationship between object and type

Generalization / Specialization is the relationship between types only

Example

Consider the following phrases

1. Fido is an Alsatian
2. An Alsatian is a Dog
3. Dogs are Animals
4. An Alsatian is a Breed
5. Dog is a Species

1 & 2
- Fido is a Dog ✓

2 & 3
- Alsatians are Animals ✓

1 & 2 & 3
- Fido is an Animal ✓

1 & 4
- Fido is a Breed ✗

2 & 5
- An Alsatian is a Species ✗

Example – Contd.

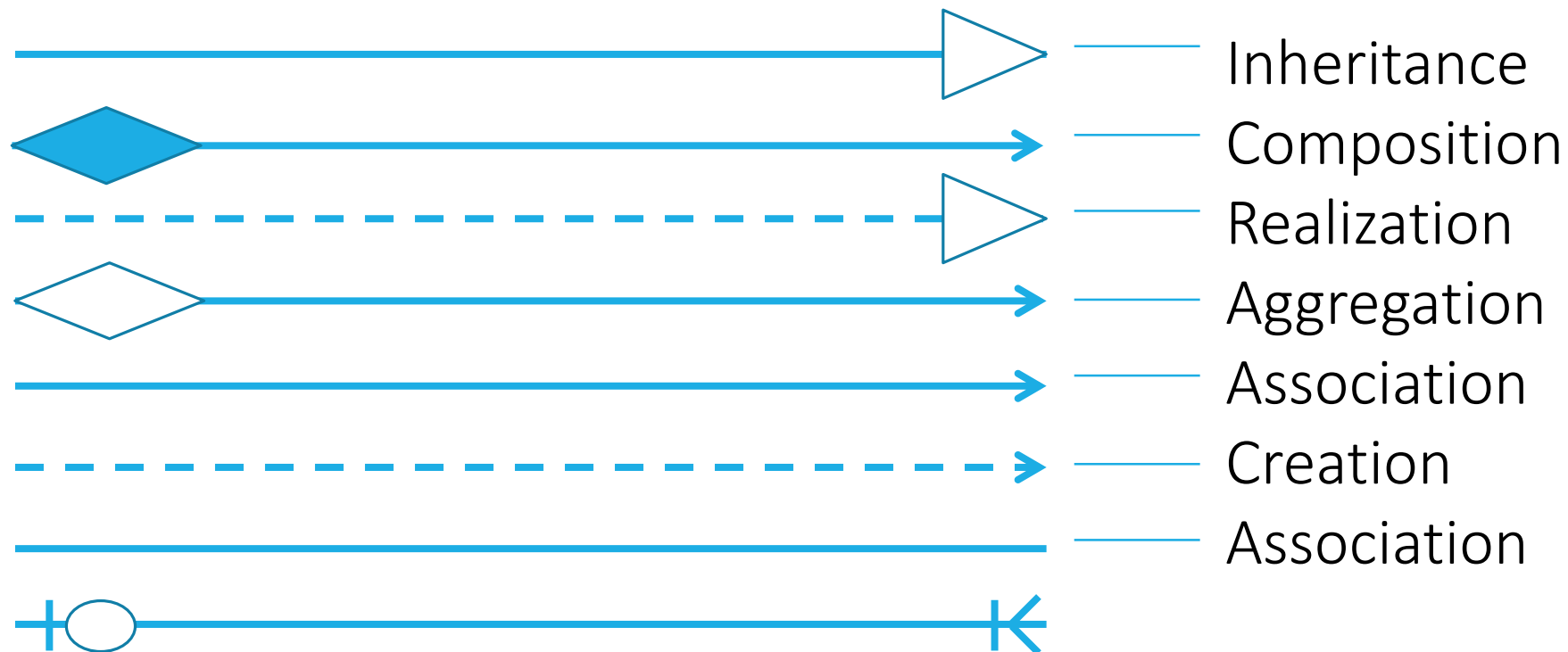|	
Fido is an Alsatian	• Classification
An Alsatian is a Dog	• Generalization
Dogs are Animals	• Generalization
An Alsatian is a Breed	• Classification
Dog is a Species	• Classification

Generalization / Classification

Generalization → Generalization → Classification ✓

Generalization → Classification → Classification ✗

Links – Relationships (UML Notations)

Inheritance

Composition

Realization

Aggregation

Association

Creation

Association

Class Exercise

Person, Doctor, Patient, Nurse, Student, Teacher, Freshman, Sophomore, Junior, Senior, In-Patient, Out-Patient, Surgeon, Physician, Prof. Ahmed Khan, Dr. Mahmood Hasan

Vehicle, Car, Truck, Bus, Bike, Sedan, Coupe, SUV, Toyota, Corolla, Prius, Suzuki, Mehran, Alto

List, Array, Queue, Stack, Linked, Doubly, Singly, Linear, Circular, Sorted, Unsorted, Ascending, Descending