Class Diagrams

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UML References

- http://www.ibm.com/developerworks/rational/library/769.html (UML Tutorials at IBM)
- http://www.omg.org/spec/UML/2.4.1/Infrastructure/PDF/ (UML2 OFFICIAL SPECS)
- http://www.eclipse.org/modeling/mdt/papyrus/

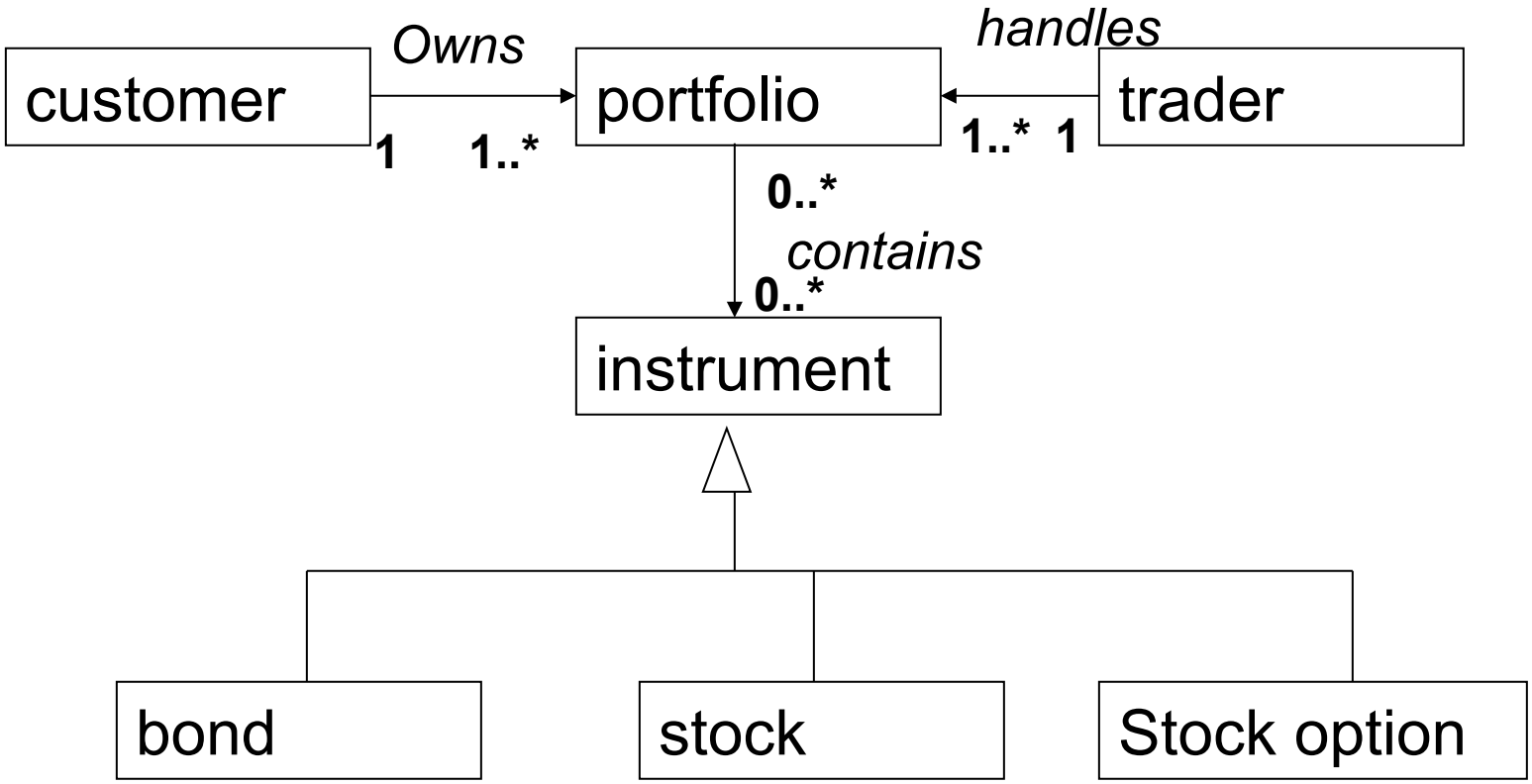
After this lesson, you will know about

- what is a class diagram
- the class element
- class relationships
    - assocation
    - aggregation and composition
    - generalization
    - dependency
    - realization

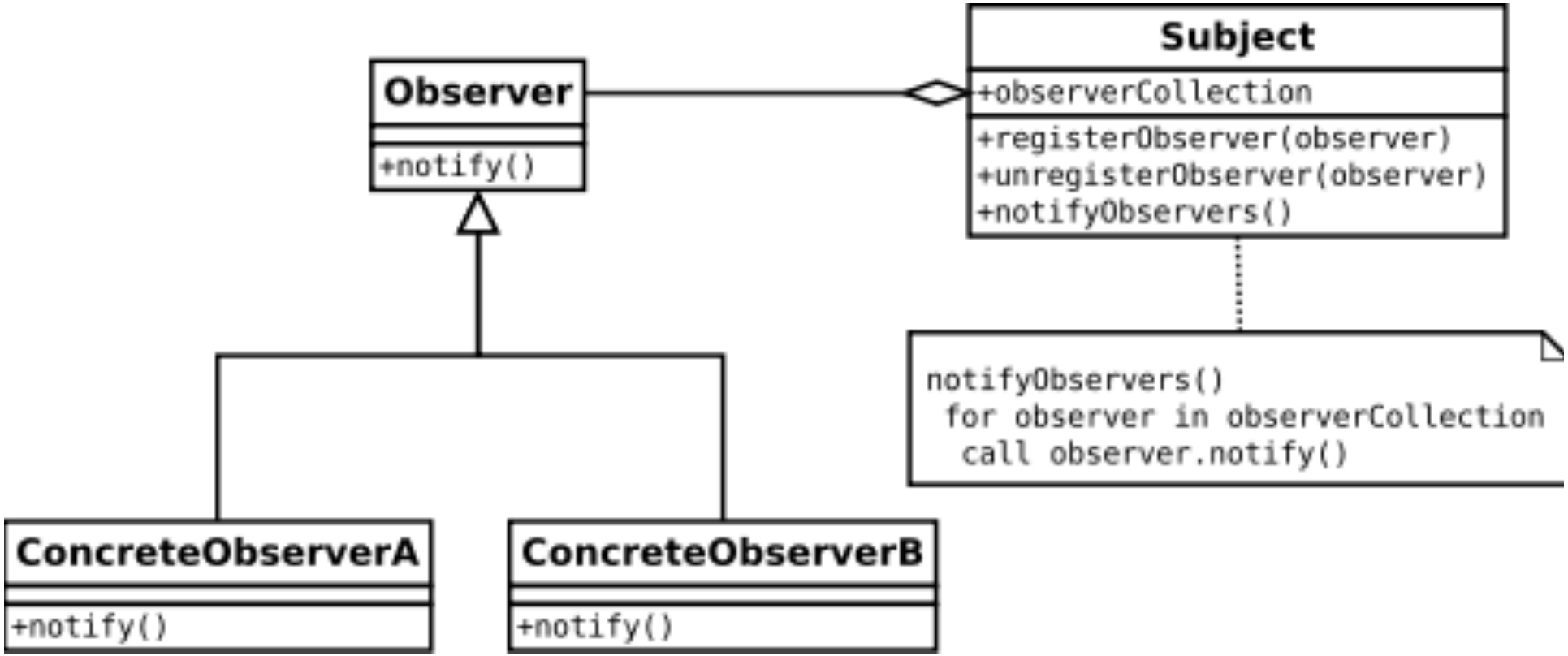
WHAT IS A CLASS DIAGRAM?

A class diagram
shows
classes and
their relationships

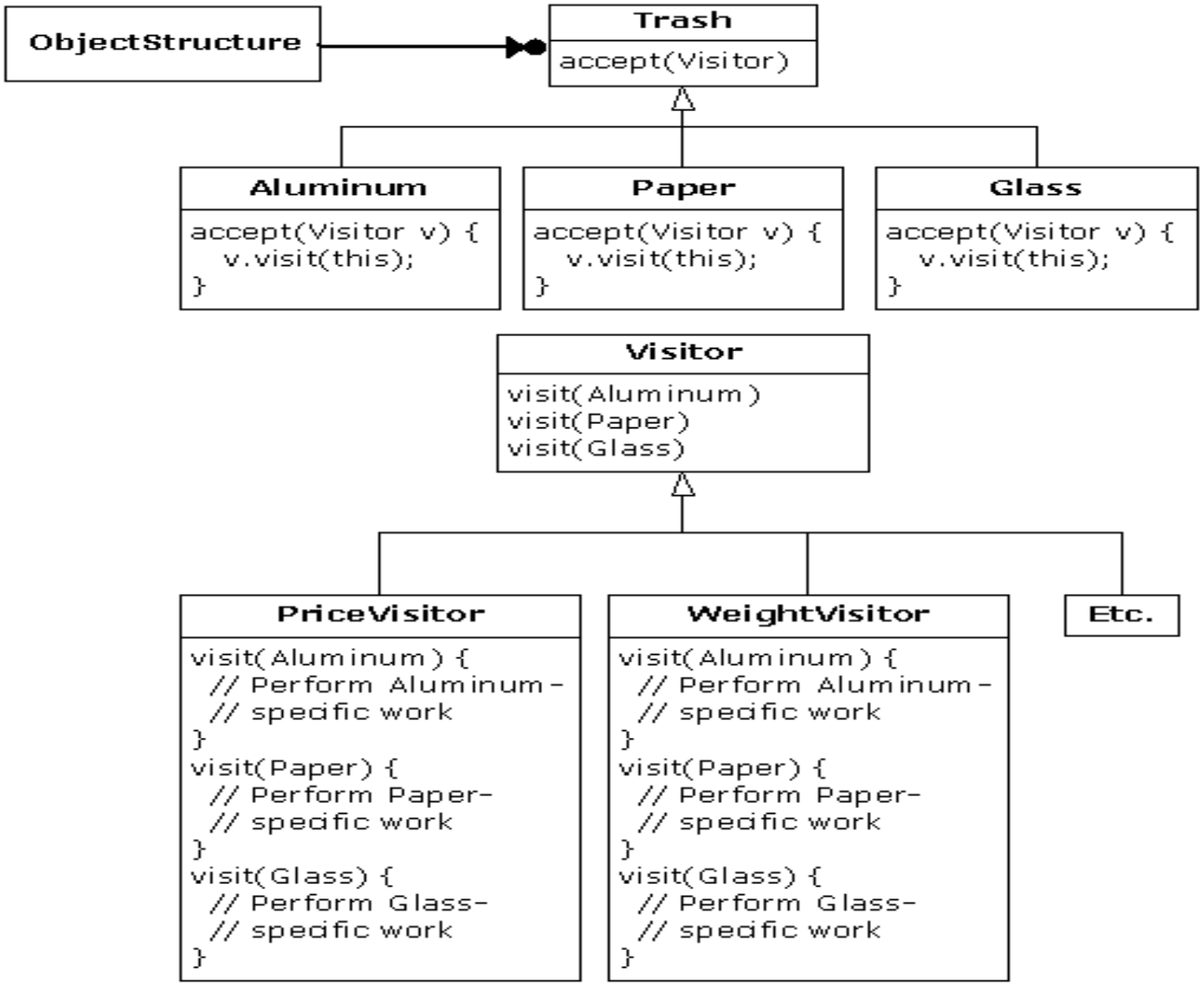
An example (class diagram)



Observer Pattern



Visitor pattern



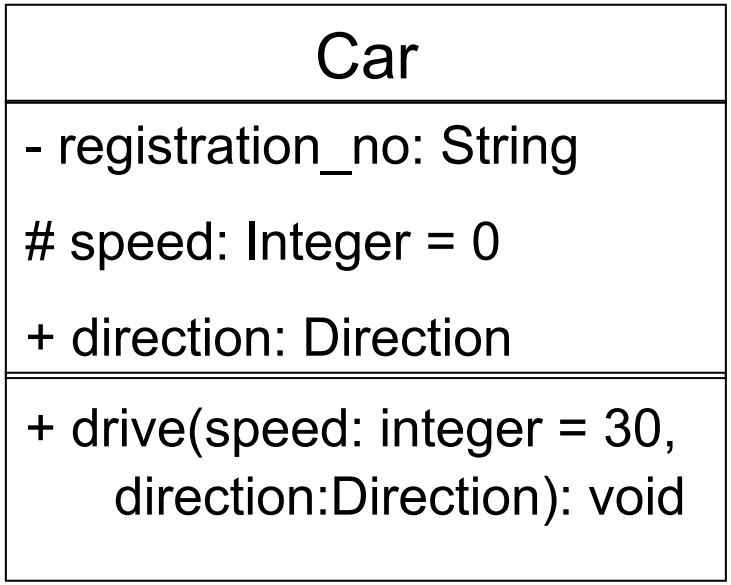
A class diagram has two types of elements:

1. Class elements
2. Relationship Elements

THE CLASS ELEMENT

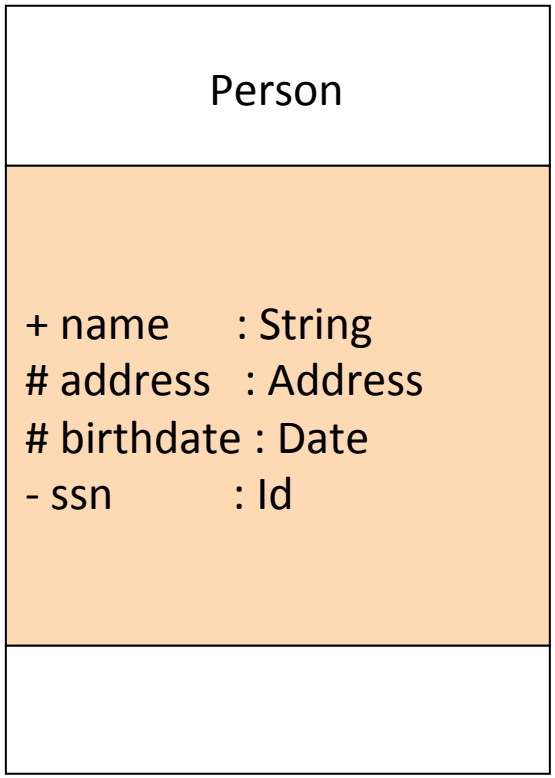
Class element – three compartments

LONG FORM



SHORT FORM

Class Attributes

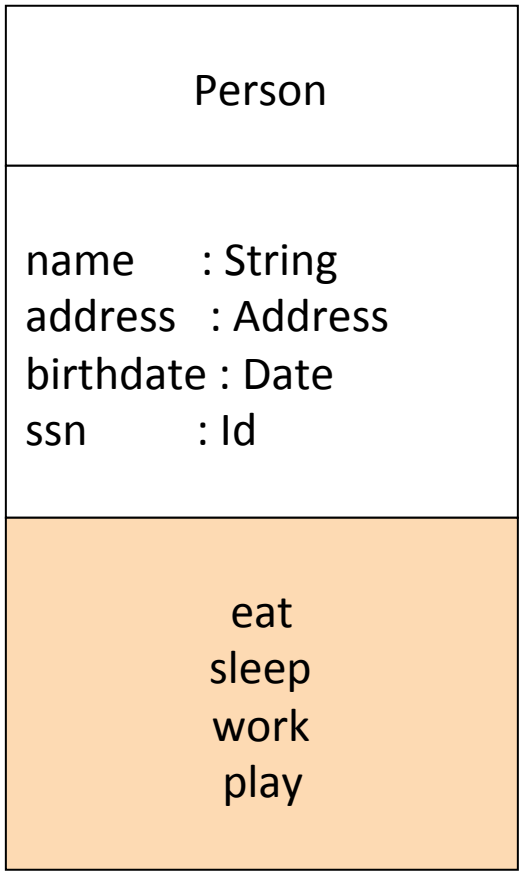


An *attribute* is a named property of a class that describes the object being modeled.

Attributes can be:

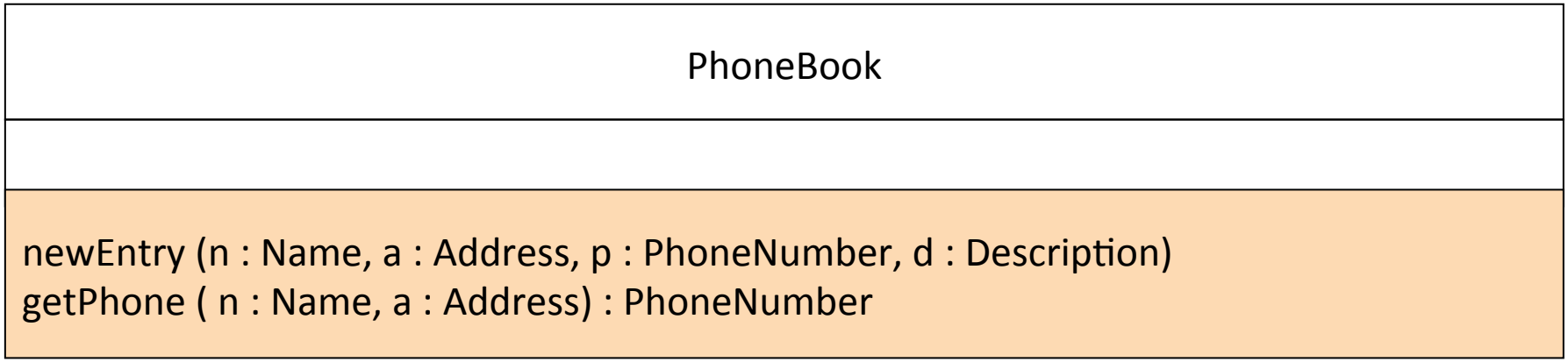
+ public
# protected
- private

Class Operations



Operations describe the class behavior and appear in the third compartment.

Class Operations (Cont'd)

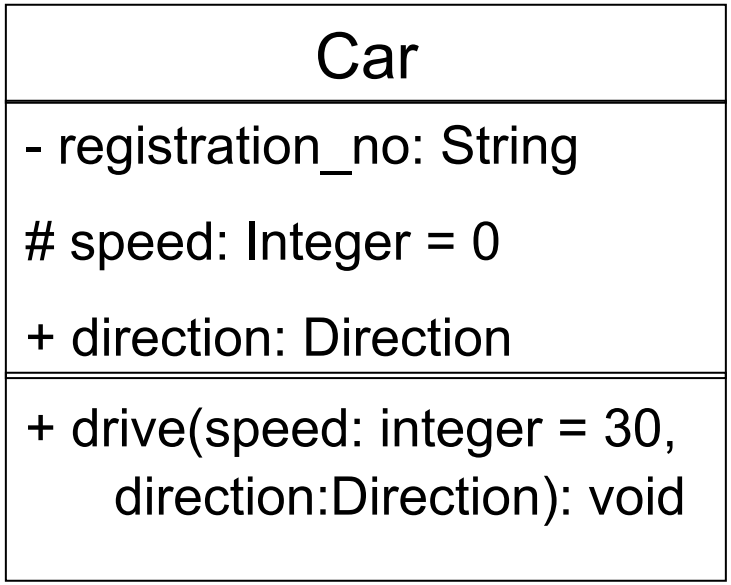


Operations describe the class behavior.

Specify an operation by stating its signature: listing the name, type, and default value of all parameters, and a return type.

Class element example

LONG FORM



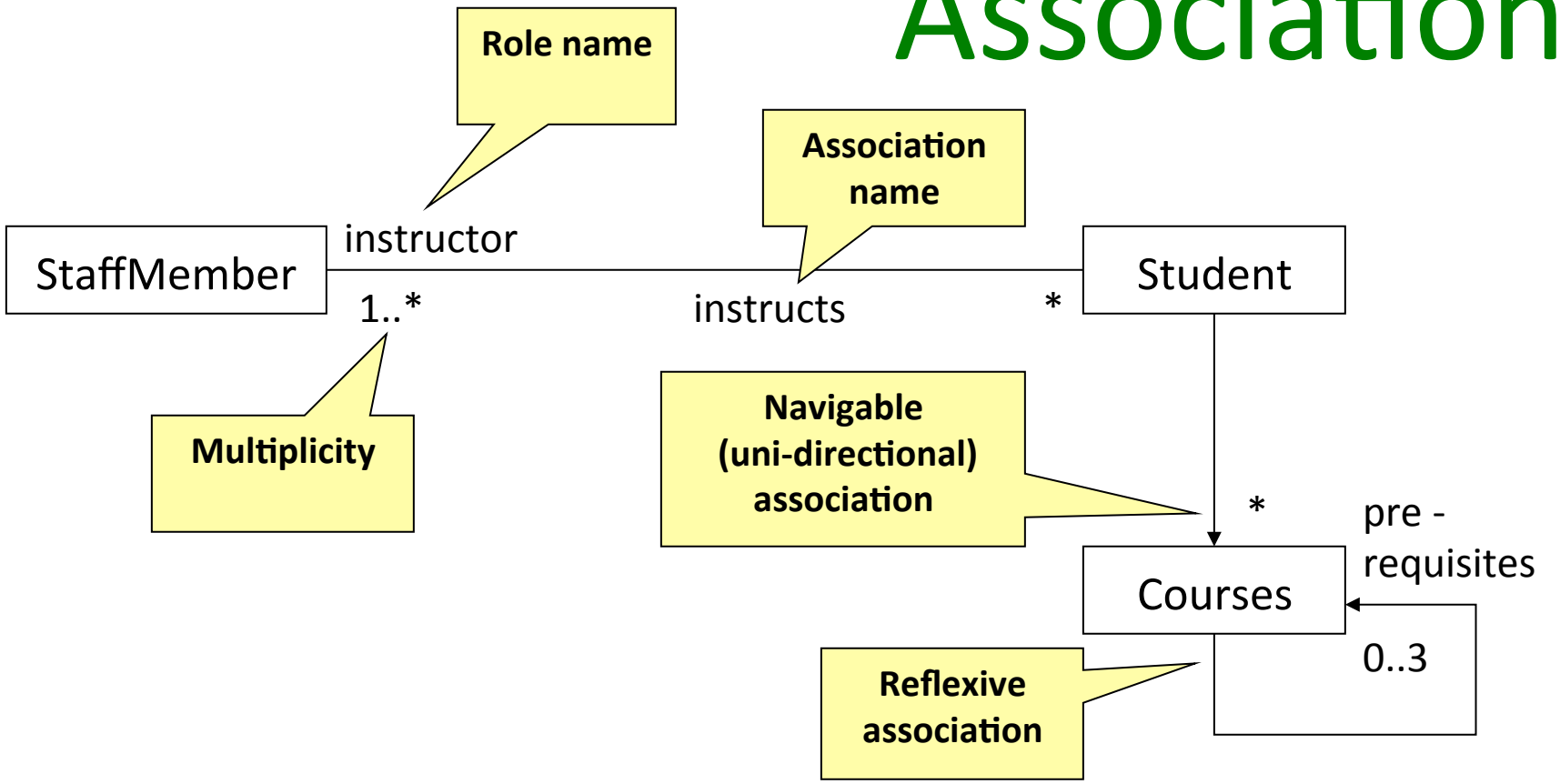
SHORT FORM

CLASS RELATIONSHIPS

Types of Relationships

- Associations - is a broad term that encompasses just about any logical connection or relationship between classes.
- Aggregation – **has-a** relationship
- Composition – parts whole relationship
- Generalization – **is-a** relationship
- Realization – implements or realizes relationship

Associations

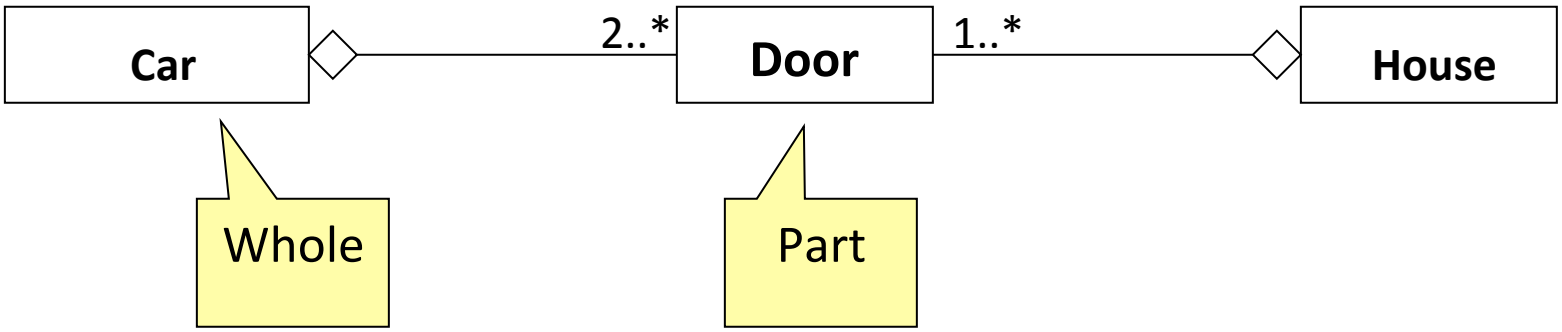


1. Name - (in each direction)
2. direction (optional)
3. roles - context (optional)
4. multiplicity (optional)

Exactly one	1
Zero or more (unlimited)	* (0..*)
One or more	1..*
Zero or one (optional association)	0..1
Specified range	2..4

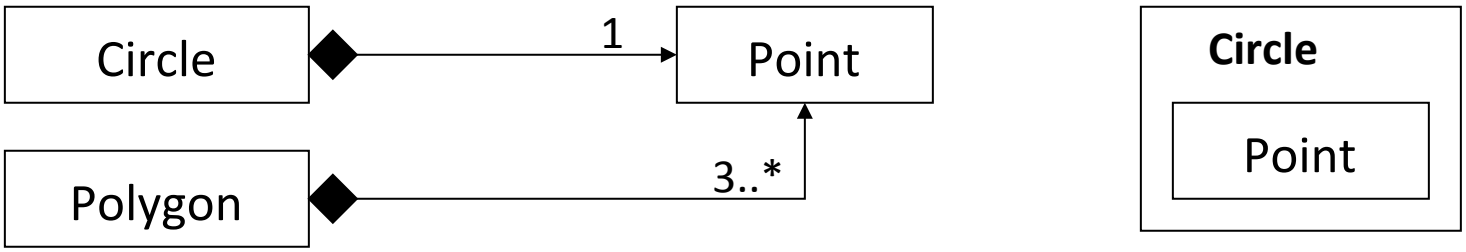
Aggregation

- Models "has-a" relationship



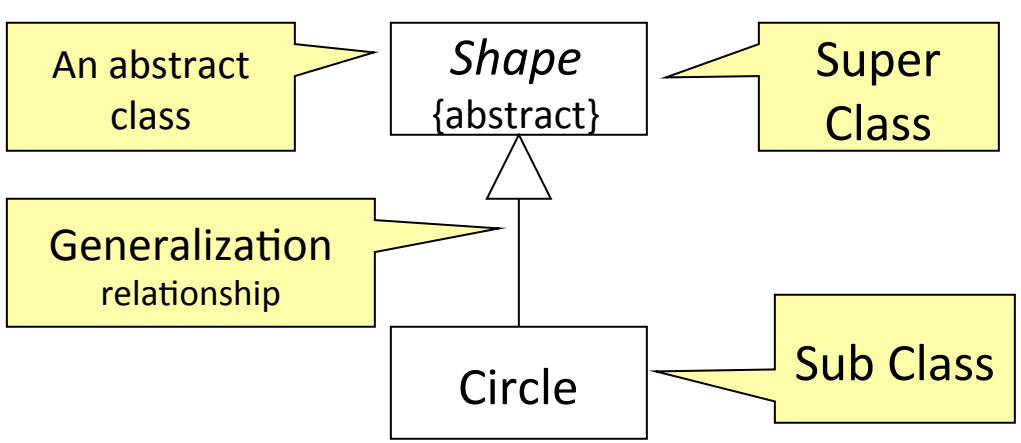
Composition

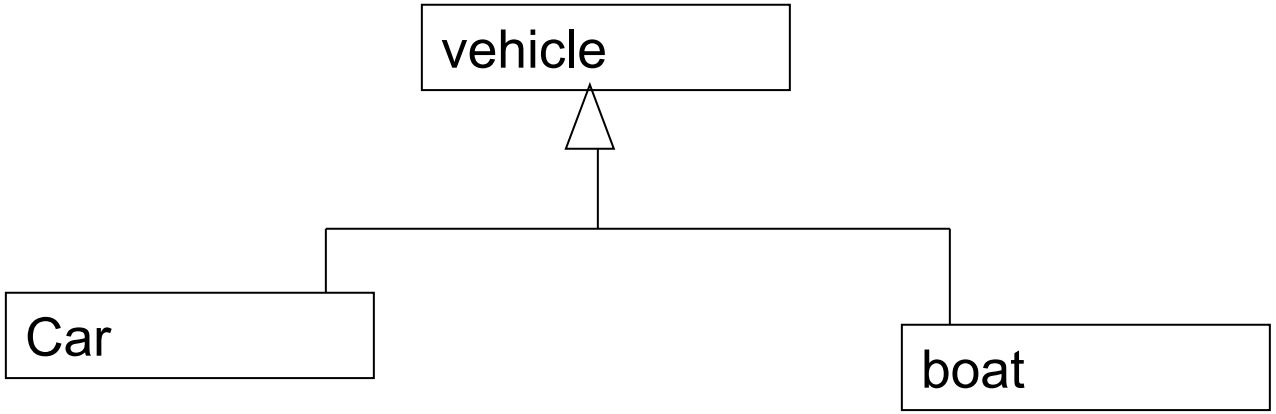
- A stronger form of aggregation
  - The whole is the sole owner of its part.
    - The part object may belong to only one whole
  - Multiplicity on the whole side must be zero or one.
  - The life time of the part is dependent upon the whole.
    - The composite must manage the creation and destruction of its parts.



Generalization

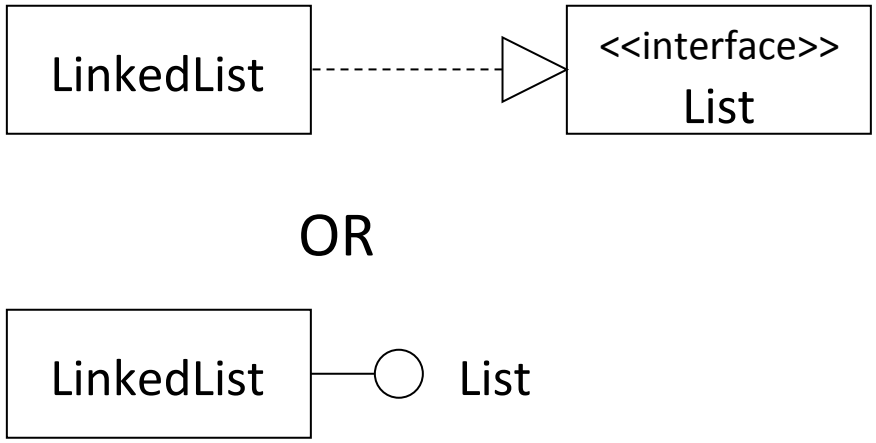
- is-a



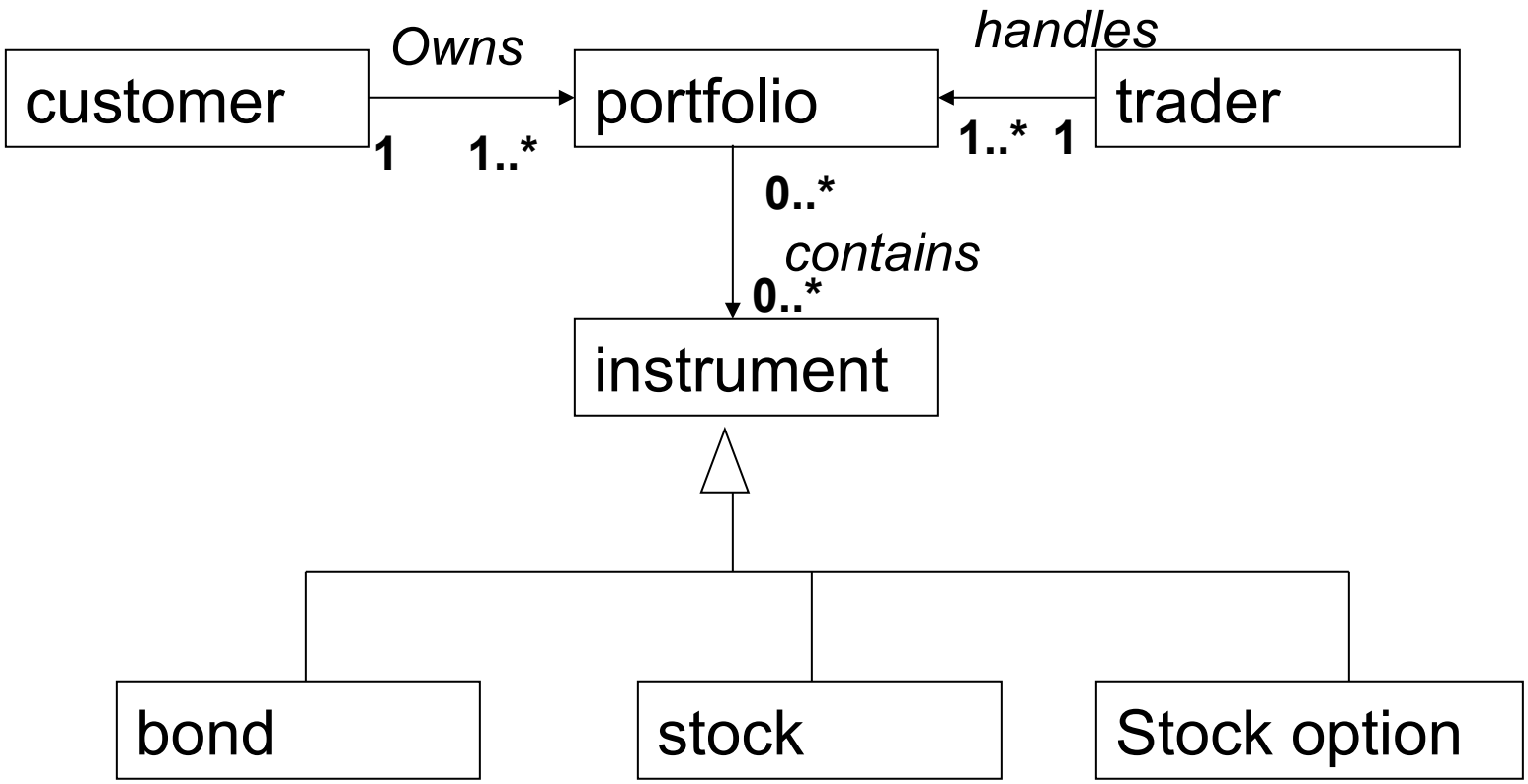


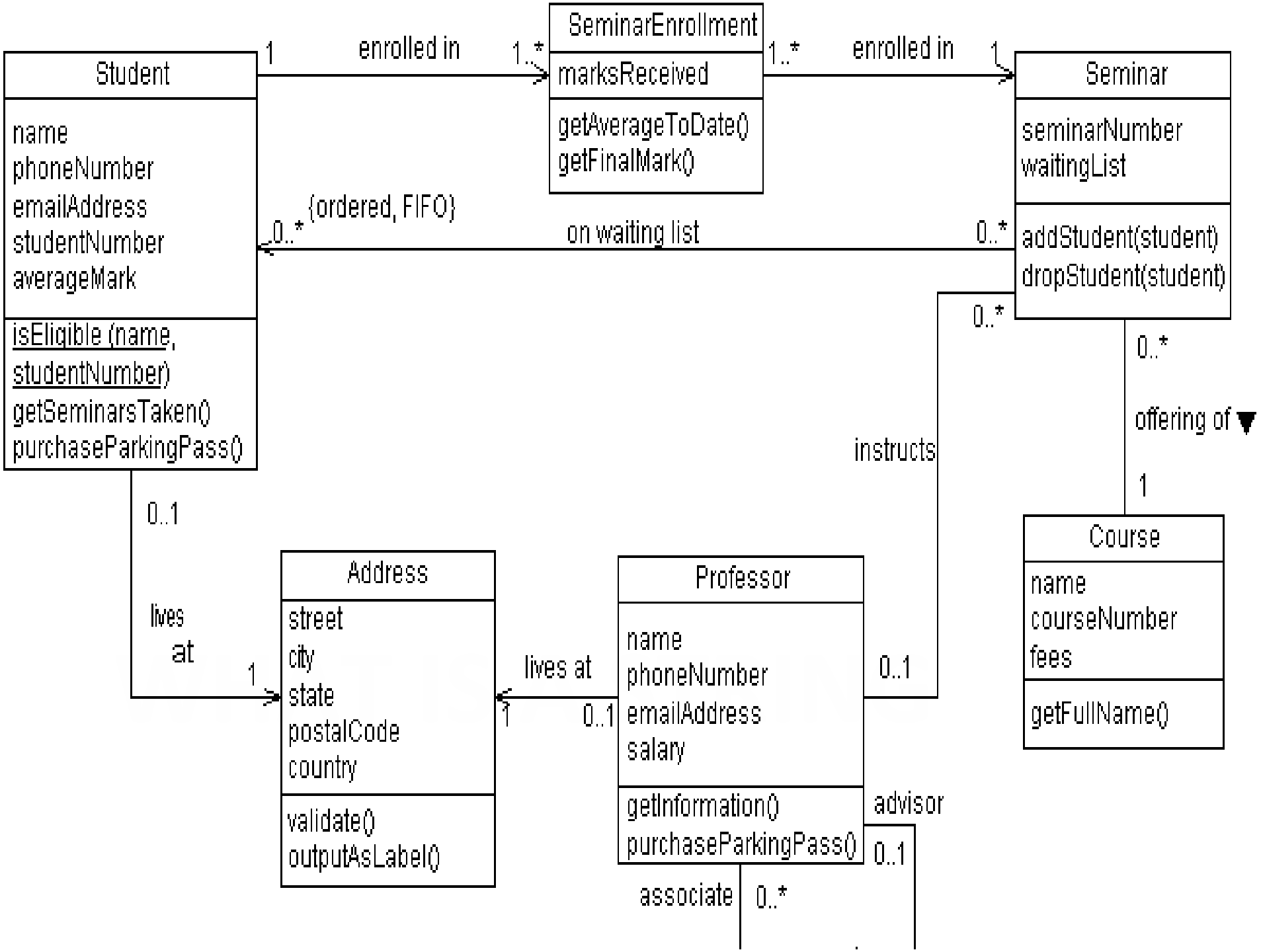
Realization

- A realization relationship indicates that one class implements a behavior specified by another class (an interface or protocol).
- An interface can be realized by many classes.
- A class may realize many interfaces.



An example (class diagram)




Student
name
phoneNumber
emailAddress
studentNumber
averageMark
isEligible (name, studentNumber)
getSeminarsTaken()
purchaseParkingPass()
1
enrolled in
1..*
SeminarEnrollment
marksReceived
getAverageToDate()
getFinalMark()
1..*
enrolled in
1
Seminar
seminarNumber
waitingList
addStudent(student)
dropStudent(student)
{ordered, FIFO}
0..*
on waiting list
0..*
0..*
instructs
0..*
offering of
1
Course
name
courseNumber
fees
getFullName()
0..1
lives at
1
Address
street
city
state
postalCode
country
validate()
outputAsLabel()
lives at
1
0..1
Professor
name
phoneNumber
emailAddress
salary
getInformation()
purchaseParkingPass()
0..1
advisor
0..1
associate
0..*

To summarize, we learnt about

- what is a class diagram
- the class element
- class relationships
  - association
  - aggregation and composition
  - generalization
  - realization

Self Check

Q1 Draw a class diagram that captures ALL the information in the below description.

1) A BANK has upto 1000 customers.

2) It also has four loan managers.

3) A customer can have one or more of three different types of accounts: loan accounts, savings accounts, and checking accounts.

4) There are three different types of loan accounts namely personal loans, car loans, and home-equity loans.

5) Loan managers manage loan accounts.

6) Accounts have attributes amount, interest, and time-period.

7) One Account belong to one customer.

Q2 describe relationships shown