Exercises on basic UML: structures

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Summary

• This is a set of exercises on writing and understanding the UML notations
• Some exercises have more than one correct answer
• Most of them are taken from the net
Diagrams covered

- Class diagrams
- Object diagrams
- Domain diagrams
- Context diagrams
- Feature diagrams
Think about it!
Reading exercises

- Read the UML class diagram
- Pay attention to the multiplicity
- Try to understand the relationship and describe it in natural language
Veterinary System

• Try to read & understand this UML diagram
Veterinary System

• Read and understand this UML diagram

• 1 or more Pets associated with 1 PetOwner
• Each pet has exactly one PetOwner
Computer System

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CPU 1 * Controller

DiskDrive 1..4 1 SCSIController
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Computer System

- 1 CPU associated with 0 or more Controllers
- 1-4 DiskDrives associated with 1 SCSIController
- SCSIController is a (specialized) Controller
Library System

- Shelf
- Book
- Patron
- Page

Relationships:
- Shelf has 1..* Books
- Book has 1..* Pages
- Patrons

Diagram representation of the library system components and their relationships.
• 1 or more Book associated with 1 or more Pages
• Patron & Shelf use (depend on) Books
Banking System

- **Bank**
  - 1
  - *
  - **Account**
    - audit():void
  - **Checking**
    - audit():void
  - **Savings**
    - audit():void
  - **MoneyMarket**
    - audit():void
• 1 Bank associated with 0 or more Accounts
• Each Account is associated with exactly one bank
• Checking, Savings, and MoneyMarket are Accounts
Home Heating System

- Room has 1 Thermostat
- Each Thermostat is associated with 0 or more Heaters
- A Heather has exactly one Thermostat
- ElectricHeater is a specialized Heater
- AubeTH101D is a specialized Thermostat
• Each employee works for one company (which can have 0 employees)
• Each AdministrativeAssistant has one or more supervisors (who can have 0 or more employees)
• Each Company has exactly one BoardOfDirectors (and viceversa)
• Each Office is allocated to zero or more Employees (an Employee can have no office or at most one)
• A Person is boardMember of 0 or more BoardOfDirectors (each BoardOfDirectors has from 3 to 8 Persons)
A woman can have as sons two twins?
On class diagrams

• A house may have any number of pets living in it
• The two possible types of pets that can live in a house are dogs and cats
• Each dog or cat has a name
• An animal’s house is its one and only home
• You can tell an animal to make noise and it will do its thing
Solution
On class diagrams

Given that having multiple spouses at the same time is prohibited, but it is allowed to have many spouses over time ...

a) The diagram represents the concepts to be modeled and no changes are required
b) Use the <<history>> stereotype to show the history over time and snapshot in time constraint in the model.
c) Promote the “is married to” association to an association class called Marriage and break up the Many-to-Many association between Husband and Wife
d) Create a link attribute called “wedding date” and attach it to the association, rather than to either Class in the Association
e) Create a link attribute called “wedding date” and attach it to either husband or wife class
Which sentences are coherent with this model?
a) A company may employ 0 or 1 person
b) A person may work for a single company
c) A person has one employment
d) A company has one employer that is a person
e) A company may have zero employers
On class diagrams

This diagram says that objects:

a) Persons have a name
b) Guitarists have a name
c) Guitars have a name
d) MusicPlayers have a name
On class diagrams

This diagram describes
a) a sequence
b) a domain
c) a system
d) a use case
e) a temporal behavior
On class diagrams

Which of the following aspects is not part of a design class diagram?

a) Attributes with their types
b) Operations with arguments and results
c) Composition relationship
d) Events and actions
e) Visibility information
f) Navigation information
On class diagrams

Classify the following into generalization (G), association (A), aggregation (AG), or composition (C):

a) A country has a capital city
b) A dining philosopher uses a fork
c) A file is an ordinary file or a directory file
d) Files contain records
e) A class can have several attributes
f) A relation can be association or generalization
g) A polygon is composed of an ordered set of points
h) A person uses a computer language on a project
On class diagrams

The arrow between the two classes indicates:

a) Inheritance
b) Association
c) Dependency
d) Sending a message
On class diagrams

Consider the following situation:
a company realizes projects; each project is executed by a team of employees. Which would be a suitable conceptual UML diagram?
On class diagrams

How do you express that some persons keep animals as pets?

A. Person 0..* pet Animal

B. Person pet 0..* Animal

C. Person 0..* animal Pet

D. Person 0..* keeps as pet Animal
On class diagrams

A visitor register is made of visitor entries

(1)  (ii)  (iii)  (iv)
On class diagrams

This diagram says that objects having a “main” method are
a) Persons
b) Guitarists
c) Guitars
d) MusicPlayers, when implemented by Guitarists
On class diagrams:

• Right or wrong?

- Student
  - passedModules: list of Strings

- Module
  - name: String
  - code: int
On class diagrams

• Right or wrong?
On class diagrams

Examine these two diagrams; true or false?

a) The right diagram has more information
b) The left diagram has more information
c) They are equivalent, but the right one is simpler
d) They are equivalent, but the left one is simpler
On class diagrams

This association could be translated in an interface like:

a) class Order { public OrderLine getLineItems();
    public void addLineItem(Number amount);
}

b) class Order { public OrderLine getLineItems();
    public void addLineItem(OrderLine lineItem);
}

c) class Order { public OrderLine getLineItems(Product aProduct); public void addLineItem(Number amount, Product aProduct);
}

d) class Order { public Object getLineItems(); public void addLineItem(OrderLine lineItem);
On class diagrams

Which of the following are illegal combinations of subtypes in the diagram?

a) Female, Patient, Nurse
b) Male, Physiotherapist
c) Female, Patient
d) Female, Doctor, Surgeon
e) Patient, Doctor
f) Male, Doctor, Nurse
On class diagrams

A benefit of using polymorphism is a reduction of:

a) methods in the associated classes
b) subclasses needed to accomplish the same functionality
c) case statements and conditionals
d) coupling between classes in the system
On class diagrams

Which sentences are true?
a) CheckingAccount implements BankAccount
b) CheckingAccount and SavingAccount are BankAccount
c) CheckingAccount and SavingAccount are associated
d) BankAccount is associated to CheckingAccount
e) SavingAccount can processCheck
f) CheckingAccount has a balance
On object diagrams

• This object diagram is instance of which class diagram(s)?
On object diagrams

This object diagram
a) Includes an anonymous object
b) Includes a class
c) Includes four instances
d) Includes three instances
On object diagrams

Which diagrams are correct?

a)  
Person  
:John  

b)  
Person  
Man  

c)  
Person  
:John  


d)  
Person  
Man  

On objects diagrams

Which one is a non valid instance of this model?

a) 

b) 

John : Person

employees

c) 

d)
On object diagrams

- Which is the class diagram which best corresponds to this object diagram?
Do-it-yourself exercises

Use case diagram describe how to play chess via an interface able to connect either different engines or a chess server via internet

Class diagram describe the pieces, chessboard and the game tree

Object diagram describe by object snapshots a chess position during a game

Activity diagram describe a game workflow including two players playing via a (telnet) chess server

Statechart describe a game workflow from the viewpoint of the chessboard

Sequence diagram describe a multiagent system evaluating a position

Communication diagram describe a multiagent system evaluating a position
References

www.pearsonvue.com/omg/
dn.codegear.com/article/31863
parlezuml.com
Think about it!