



SE 2 [CS 446, CS 646, ECE 452, SE 464]
Software Design & Architecture – Spring 2011
MIDTERM

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DC 1350, 4:30-6:00 PM, Date: Jun 20th, 2011
90 minutes duration

Marking:

Topic	Question	Max Mark	Mark
Section 1 – Multiple choice	1 to 39	39	
Section 2 – Design	I	6	
	II	6	
Section 3 – Feedback	A	2	
	TOTAL	53	

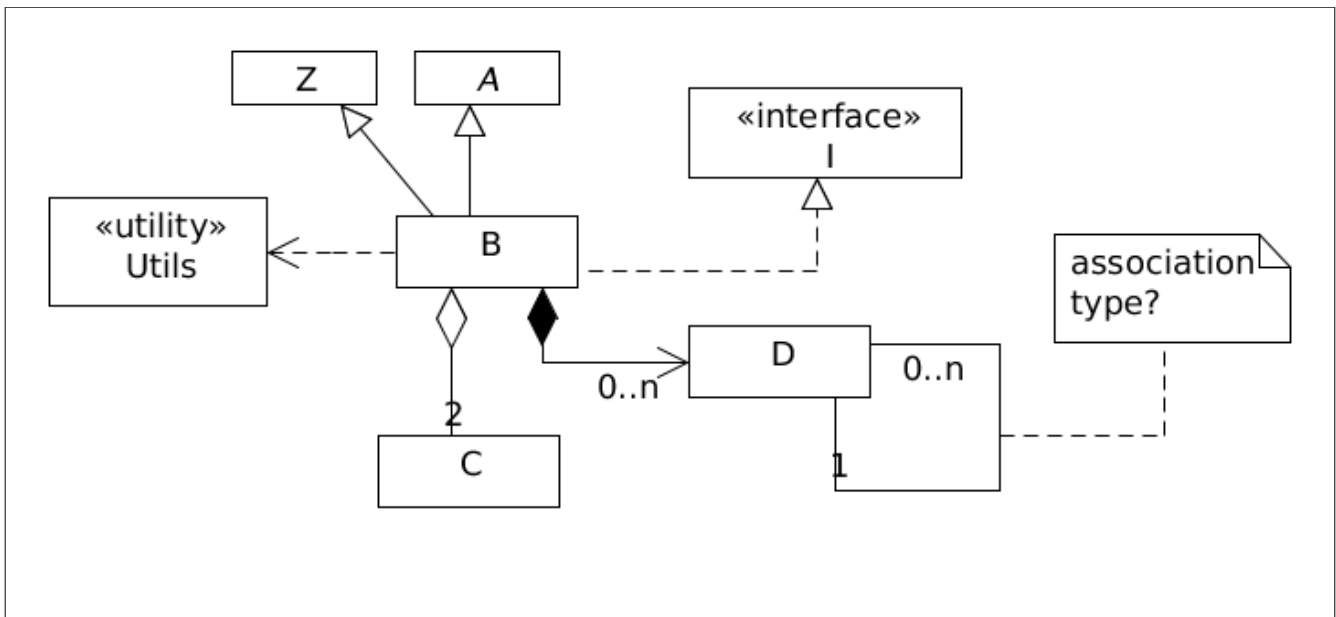
Instructions:

- You have **90 minutes** to complete the midterm, therefore make good use of the time.
- Answer **all** questions.

Name _____

Student number _____

Section ☐ CS446/646 ECE 452
☐ SE464



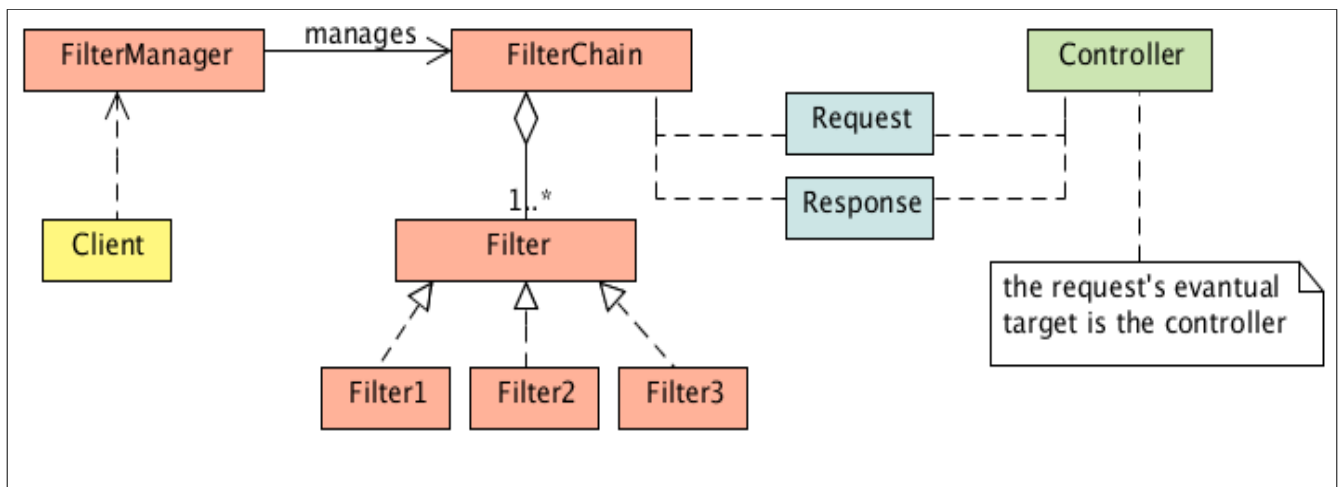
- What type of relationship exists between class A and class B?
 - inheritance***
 - polymorphism
 - dependency
 - composition
 - aggregation
- What type of relationship exists between class A and class Z?
 - none***
 - polymorphism
 - dependency
 - composition
 - shared super class
- Instances of class B are also instances of (select all that apply)
 - interface I ***
 - class A ***
 - class C
 - class D
 - class Utils
- Class B has an aggregation relationship with Class C. Which of the following are true?
 - an object of class B holds references to two objects of class C***
 - class B holds a references to two classes of type class C
 - when an object of class B is destroyed, the referenced objects of class C are also destroyed
 - when class B is destroyed, the referenced class C is also destroyed
 - when an object of class B is destroyed, the referenced objects of class C are not destroyed***

5. Class D has an association to itself. This type of association is called
 - a. composition
 - b. aggregation
 - c. self-composition
 - d. self aggregation
 - e. **reflexive association***
6. What design pattern would you use to control the exact number of instances of your objects?
 - a. command
 - b. facade
 - c. strategy
 - d. **singleton***
 - e. observer
7. What pattern would you use to integrate two dissimilar systems?
 - a. bridge
 - b. **adapter***
 - c. decorator
 - d. facade
 - e. interpreter
8. Which design pattern would you use to decouple an abstraction from its implementation?
 - a. **bridge***
 - b. adapter
 - c. visitor
 - d. facade
 - e. interpreter
9. Which pattern would you use to compose objects into a tree structure?
 - a. **composite***
 - b. bridge
 - c. visitor
 - d. interpreter
 - e. proxy
10. Which design pattern would you use to define a family of interchangeable algorithms?
 - a. interpreter
 - b. **strategy***
 - c. command
 - d. composite
 - e. adapter

11. According to Garlan & Shaw what does a component represent in a software architecture?
 - a. **computation units working together ***
 - b. boxes representing software implementation artifacts
 - c. simple diagram boxes for architectural comprehension
 - d. anything can be represented by a component
12. Bounded pipes are limited by:
 - a. the type of data that can flow through the pipes
 - b. **the amount of data that can flow through the pipes ***
 - c. the total number of pipes that can be utilized
 - d. the duration of time that data is allowed to flow through
13. In implicit invocation architectural style how do the components communicate with each other?
 - a. direct method calls
 - b. **they do not communicate ***
 - c. indirect method calls
 - d. interprocess communication
14. What type of styles best support a change in data representation? Select all applicable.
 - a. pipes & filters
 - b. implicit invocation
 - c. **data abstraction ***
 - d. layered systems
 - e. repository
15. What type of styles best support a change in algorithm (how the computation is performed)? Select all applicable.
 - a. **pipes & filters ***
 - b. **implicit invocation ***
 - c. data abstraction
 - d. **layered systems ***
 - e. repository
16. What type of styles best support a change in functionality (what computation is performed)? Select all applicable.
 - a. **pipes & filters***
 - b. **implicit invocation ***
 - c. data abstraction
 - d. **layered systems ***
 - e. repository
17. Which architecture type describes and defines the implementation?
 - a. reference architecture
 - b. **concrete architecture***
 - c. conceptual architecture
 - d. all of the above

18. Which architecture type describes the domain knowledge?
- a. **reference architecture***
 - b. concrete architecture
 - c. conceptual architecture
 - d. all of the above
19. Architectural drift is a difference between
- a. reference and concrete architectural types
 - b. conceptual and reference architectural types
 - c. **concrete and conceptual architectural types***
 - d. all of the above
20. Which is **not** a view in the “4+1 view model”?
- a. logical view
 - b. development view
 - c. **testing view***
 - d. process view
 - e. scenario/use case view
21. What kind of UML diagram is most commonly used for Object Oriented Logical view representation?
- a. **class diagrams***
 - b. sequence diagrams
 - c. state diagrams
 - d. ER diagrams
 - e. flow diagrams
22. The 4+1 process view addresses
- a. functional requirements only
 - b. non-functional requirements only
 - c. **both functional and non-functional requirements***
 - d. is not for addressing functional or non-functional requirements
23. How do we map 4+1 logical view into development view
- a. **by decomposing architectural entities into design components***
 - b. by creating many different designs and prototyping them
 - c. by identifying main system processes
 - d. all of the above
24. What architectural styles are most commonly used to describe enterprise web based applications? Select all applicable.
- a. **client server style ***
 - b. **layered style ***
 - c. **repository style ***
 - d. **pipes & filters style ***
 - e. implicit invocation

25. In web based applications business components (reusable functionality) should be designed as:
- a. statefull components
 - b. stateless components ***
 - c. thick components
 - d. user specific components
 - e. none of the above
26. In web based applications controllers are
- a. statefull components***
 - b. stateless components
 - c. thick components
 - d. user specific components
 - e. none of the above
27. In applications based on Google web toolkit, the request & response cycle after the first page load is:
- a. synchronous
 - b. asynchronous ***
 - c. is not required
 - d. none of the above
28. In Google Web Toolkit client side application code is developed in:
- a. Java***
 - b. Javascript
 - c. Python
 - d. PHP
 - e. Any preferred software development language
29. When considering system throughput we should design the system for
- a. peak throughput
 - b. average throughput
 - c. both average throughput and peak throughput
 - d. average throughput and estimated peak throughput ***
 - e. estimated average and estimated peak throughput
30. Non-functional requirements of a system focus on
- a. non-behavioural aspects of the system
 - b. security
 - c. performance
 - d. all of the above***
31. System utility is determined by
- a. functional requirements of a system
 - b. non-functional requirements of a system
 - c. both functional and non-functional requirements***
 - d. all of the above



32. The figure above describes intercepting filter JEE design pattern. Which of the following statements are true (select all applicable)
- a. **a filter chain can have many filters***
 - b. all filters must finish their processing before the controller is invoked
 - c. **the client request can be mapped to a specific filter***
 - d. **the client request can be mapped to a specific filterchain***
 - e. the controller must return a filterchain
33. The intercepting filter is similar to which GoF design pattern
- a. singleton
 - b. **decorator***
 - c. bridge
 - d. adaptor
 - e. composite
34. Which of the following are true about the intercepting filter JEE design pattern?
- a. **can check if an HTTP request is from an authenticated user***
 - b. **can filter on the IP address of the requesting client***
 - c. **detect client's browser type***
 - d. **reroute client request to a different resource***
 - e. **premature termination of the client HTTP request***
35. Which of the following does Bill Moggridge NOT identify as a core skill of a designer?
- a. to synthesize a solution from all relevant constraints
 - b. to frame, or re-frame, the problem and objective
 - c. to create alternatives
 - d. to select from those alternatives
 - e. **to sketch clearly and accurately***

36. Analogies are often used as a starting point for new ideas. Sanders & Thagard classify analogies in computer science as either distant or local. Select the distant analogies (select all that apply):
- a. **genetic algorithms ***
 - b. **neural networks ***
 - c. the Macintosh is like the Xerox Alto
 - d. Facebook is like Friendster
 - e. **Babbage's Analytical Engine is like the Jacquard Loom***
37. Casual mode creativity is when an idea just pops into your head while you're talking a walk or having a shower etc. Sanders & Thagard studied interviews and stories of casual mode creativity in computer science and identified some preconditions for it to work. Which of the following is NOT one of the preconditions that they identified:
- a. immersion in problem domain
 - b. absence of immediate pressure
 - c. **caffeine ***
 - d. absence of distractions
 - e. unstructured time
38. Edward de Bono describes a group thinking exercise in which different "hats" describe different thinking tasks. How many hats are in his system?
- a. 3
 - b. 4
 - c. 5
 - d. **6 ***
 - e. 7
39. Which of the following are good tips for brainstorming? (select all that apply)
- a. **set a quota ***
 - b. **defer judgement ***
 - c. set a time limit
 - d. annotate ideas with constructive criticism
 - e. **lower inhibitions ***

Section 2 – Design

I) Imagine that you are implementing a file system. The main abstractions in your design would be files and directories. Directories can contain zero or more files or directories. You want to treat directories and files in a uniform way, e.g., both will have name and will provide operations to stream content in and out, and to list children.

a) What design pattern could be used to achieve this design? [1 mark]

Composite, Bridge.

b) Please explain your design by giving a class diagram. [5 marks]

Hint: Consider introducing an additional abstraction.

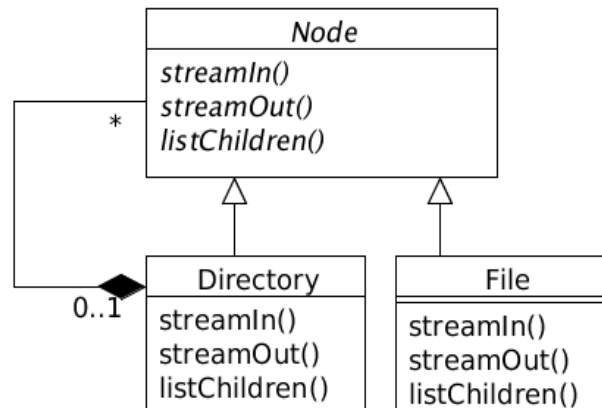


Fig 1: Composite

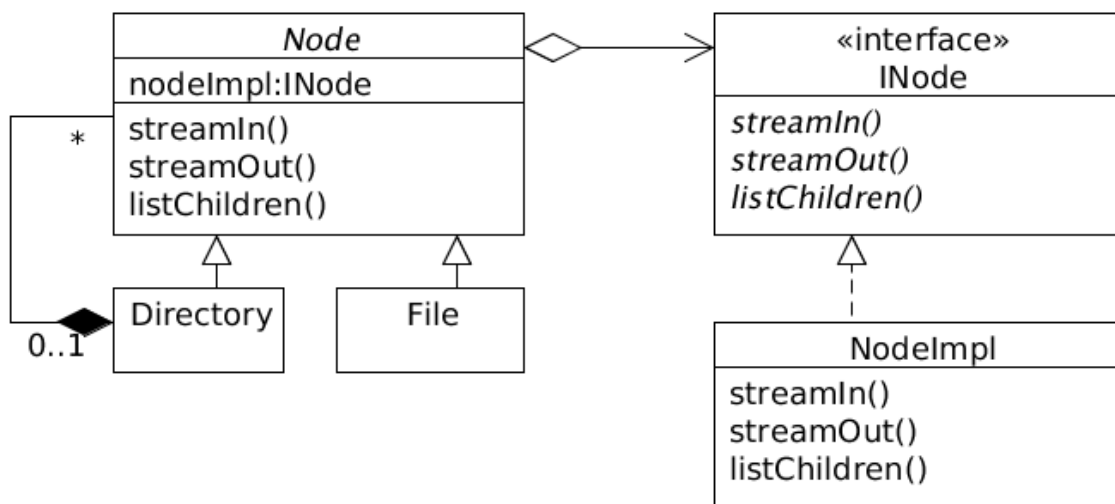


Fig 2: Bridge

Section 2 – Design

II) Imagine that you would like to implement utility programs such as *ls* and *chmod* that need to iterate over file/directory structures from the previous question and perform operations on the visited nodes. In your design, you would like to avoid the need to extend the interface of the classes representing the file/directory structure whenever you add a new utility program.

a) What design pattern could be used to achieve this design? [1 mark]

Visitor.

b) Please explain your design by giving a class diagram. [5 marks]

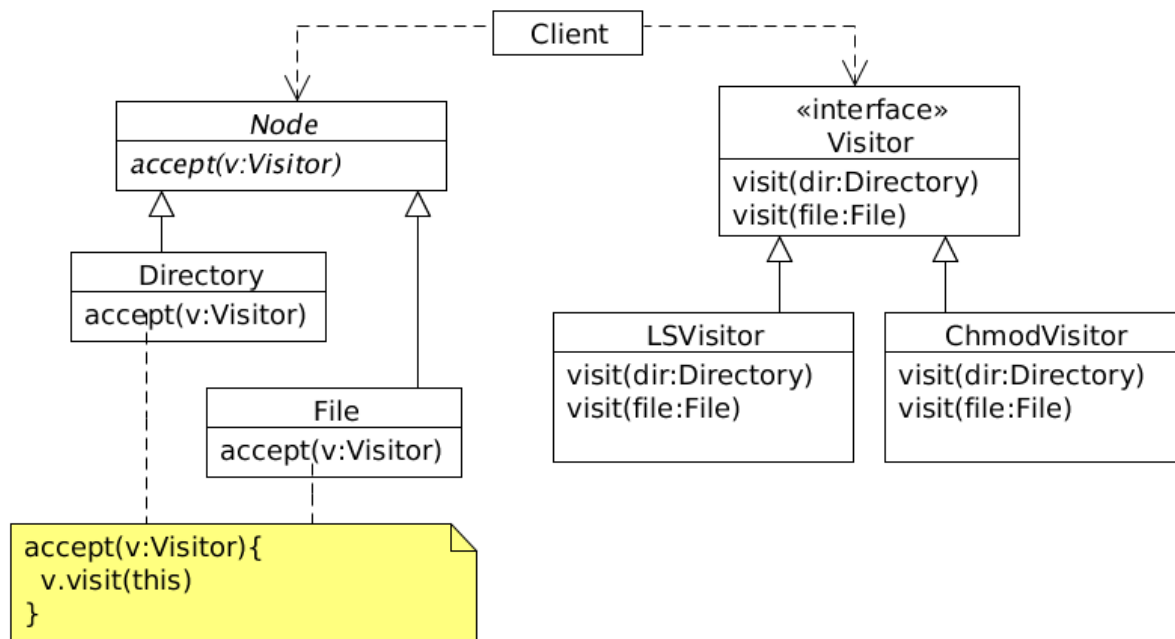


Fig 3: Visitor