Applying Design Patterns to SCA Implementations

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Outline

- ✓ Design Patterns
  - ➢ Creational
  - ➢ Structural
  - ➢ Behavioral
- ✓ Applying Design Patterns to SCA
  - ➢ Factory Method
  - ➢ Chain of Responsibility
  - ➢ Adapter
  - ➢ Singleton
  - ➢ Facade
- ✓ Conclusion

Design Patterns

- ✓ Design Patterns
  - ➢ Optimum solutions to common software engineering problems
  - ➢ Appying Design Patterns
    - ❖ Speed up development process
    - ❖ Provides tested and proven design paradigms
    - ❖ Improves code readability
  - ➢ Become famous after
    - ❖ “Design Patterns: Elements of Reusable Object-Oriented Software”, Gang of Four (GoF)

Design Patterns

- ✓ Design Patterns
  - ➢ Creational Patterns
    - ❖ Abstract Factory
    - ❖ Builder
    - ❖ Factory
    - ❖ Prototype
    - ❖ Singleton
  - ➢ Deals with object instantiation problems
  - ➢ Solves object creation problems

Design Patterns

- ✓ Design Patterns
  - ➢ Structural Patterns
    - ❖ Adapter
    - ❖ Bridge
    - ❖ Composite
    - ❖ Decorator
    - ❖ Facade
    - ❖ Flyweight
    - ❖ Proxy
  - ➢ Define ways to compose objects
  - ➢ Can be applied
    - ❖ Design from scratch
    - ❖ Modify existing systems

Design Patterns

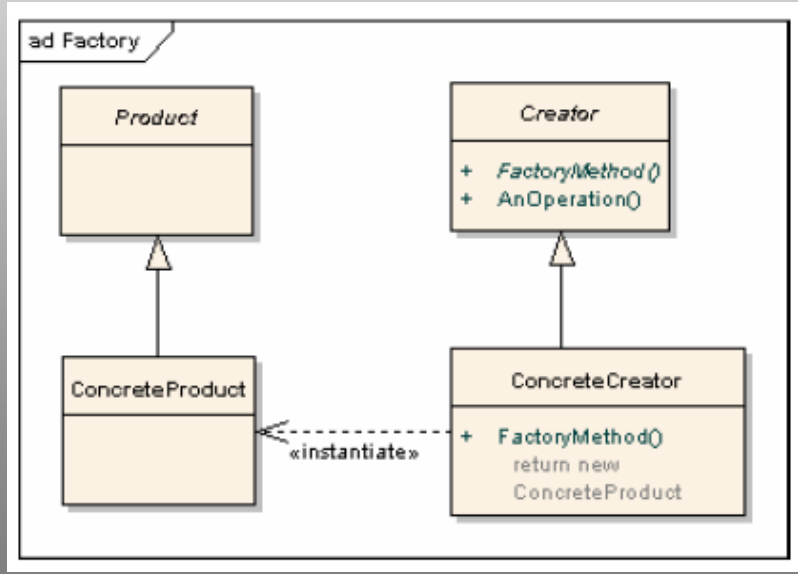
- ✓ Design Patterns
  - ➢ Behavioral Patterns
    - ❖ Chain of Responsibility
    - ❖ Command
    - ❖ Interpreter
    - ❖ Iterator
    - ❖ Mediator
    - ❖ Memento
    - ❖ Observer
    - ❖ State
    - ❖ Strategy
    - ❖ Template
    - ❖ Visitor
  - ➢ Solves object communication problems
  - ➢ Depicts how objects act together

Design Patterns

- ✓ General Rules about Design Patterns
  - ➢ All client objects should always call the abstraction
  - ➢ Future changes should not impact the existing systems
  - ➢ Change always what is changing
  - ➢ Have loose coupling between objects

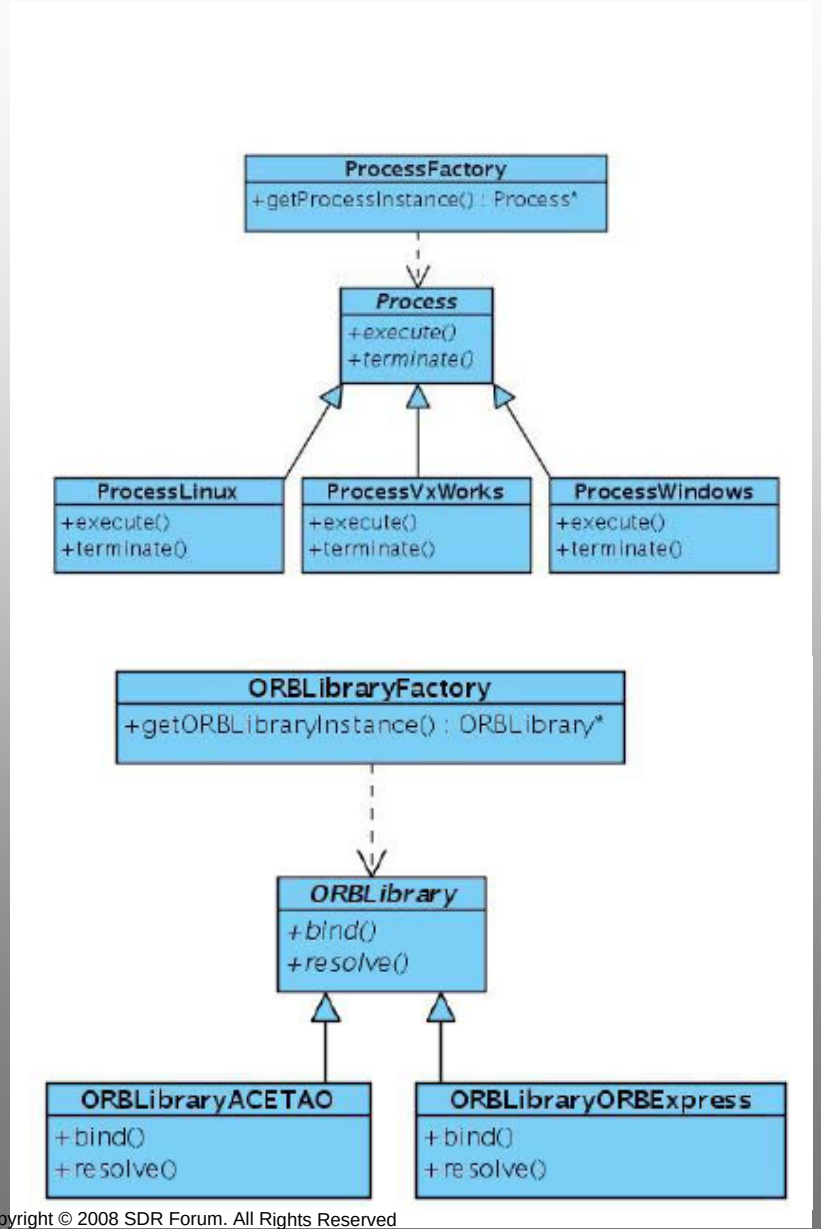
Design Patterns

- ✓ Factory Method
  - ➢ Defines an interface for creating objects
  - ➢ Lets subclasses to decide which class to instantiate



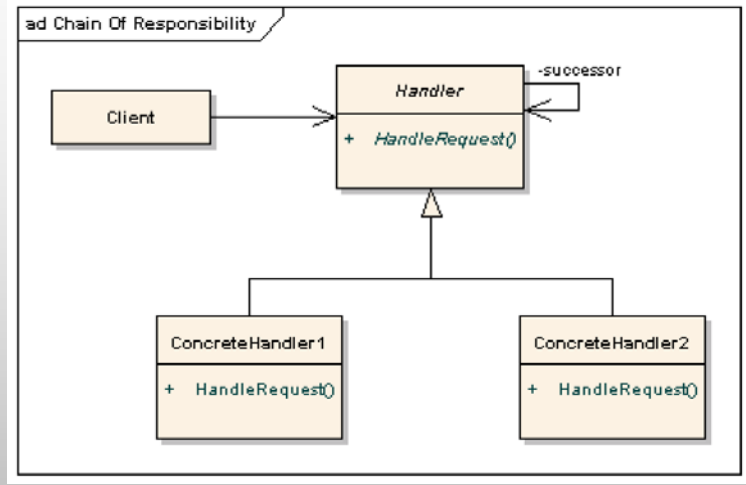
Design Patterns

- ✓ Applying Factory Method
  - ➢ Solves portability problems
    - ❖ Seperate OS and ORB specific codes with the rest of the systems
  - ➢ Manages configuration specific issues
    - ❖ Change only the configuration of the factory class
  - ➢ Deals with future changes
  - ➢ Allows insertion of new derived subclasses



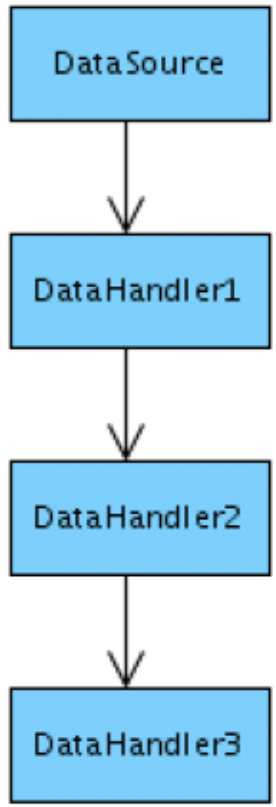
Design Patterns

- ✓ Chain of Responsibility
  - ➢ Avoids coupling of the sender of a message to its receiver
  - ➢ Allows more than one object to handle the request
  - ➢ It chains the receiving objects and passes the request along the chaing until an object handles it



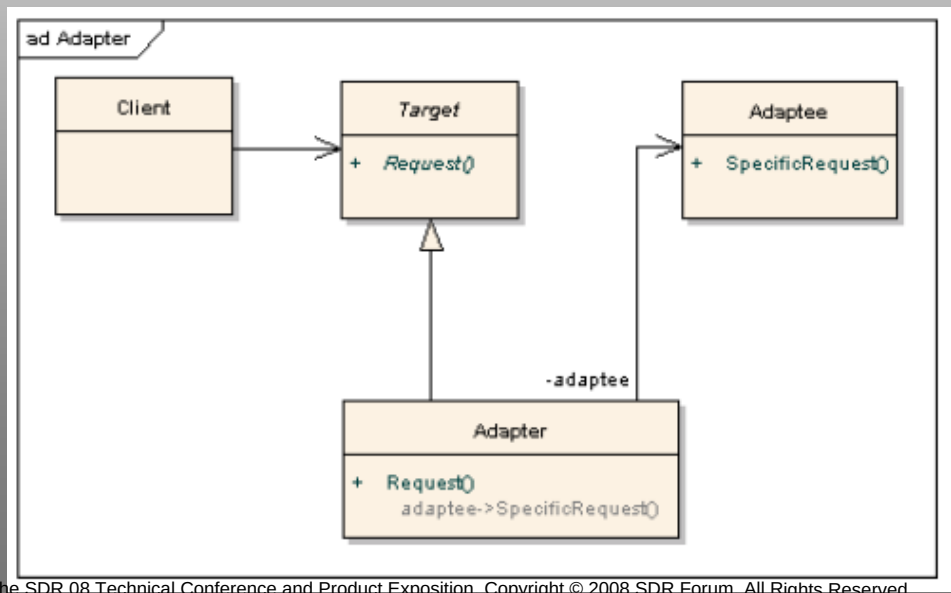
Design Patterns

- ✓ Applying CoR
  - ➢ Can be applied in conjuction with Port concept
  - ➢ Components can be chained to handle incoming data or not
  - ➢ Each component decides by checking
    - ❖ Permissions
    - ❖ Capacity values
    - ❖ Priorities
    - ❖ Dependencies
    - ❖ Performance reqs
    - ❖ Props of incoming data
  - ➢ Allows insertion or removal of new components without affecting existing codes.
  - ➢ Can be life saving for applications where requirements frequently change.



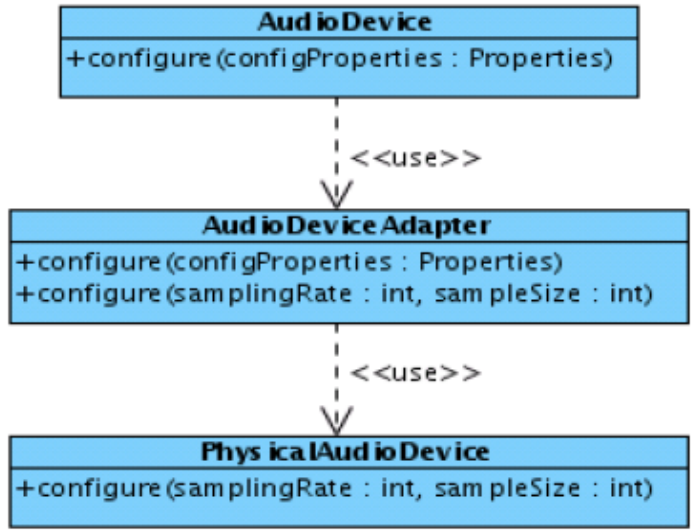
Design Patterns

- ✓ Adapter
  - ➢ Converts the interface of a class to another interface
  - ➢ Adapter lets classes to work together that otherwise can't
  - ➢ It simply adapts old interface to the new one



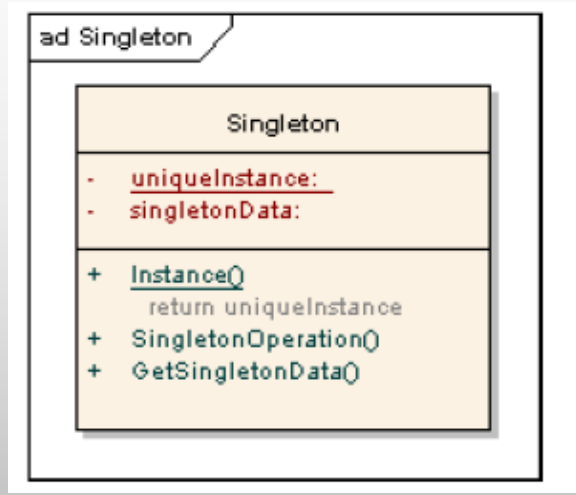
Design Patterns

- ✓ Applying Adapter
  - ➢ Can be applied to adapt nonSCA code to SCA classes
  - ➢ Typically not used to design from scratch but rather applied to modify existing design



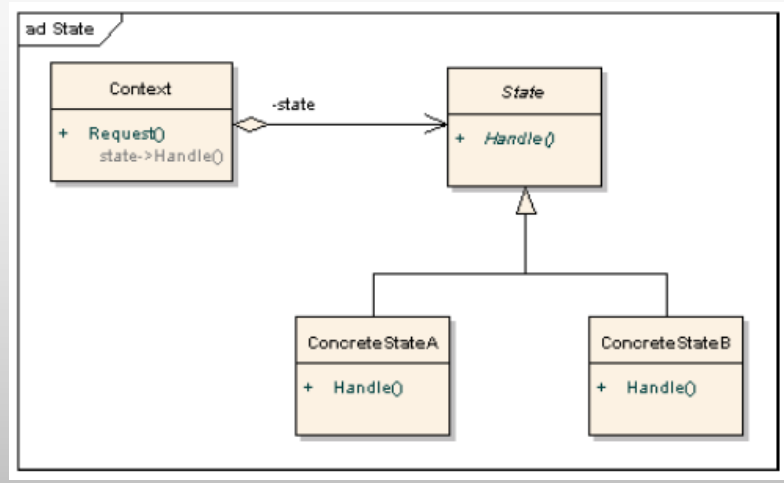
Design Patterns

- ✓ Singleton
  - ➢ Ensures a class to have only one instance
  - ➢ Provide a global point of access
  - ➢ Relatively simple pattern to apply
  - ➢ From SCA point of view
    - ❖ Device classes that wraps a hardware should have only one instance
      - – To have only one capacity manager
      - – Device cannot be initialized more than once.
    - ❖ ORB classes can implement Singleton pattern to ensure central policy manager
    - ❖ Can be applied in conjuction with Factory Method pattern to ensure returned concrete classes has only one instance.



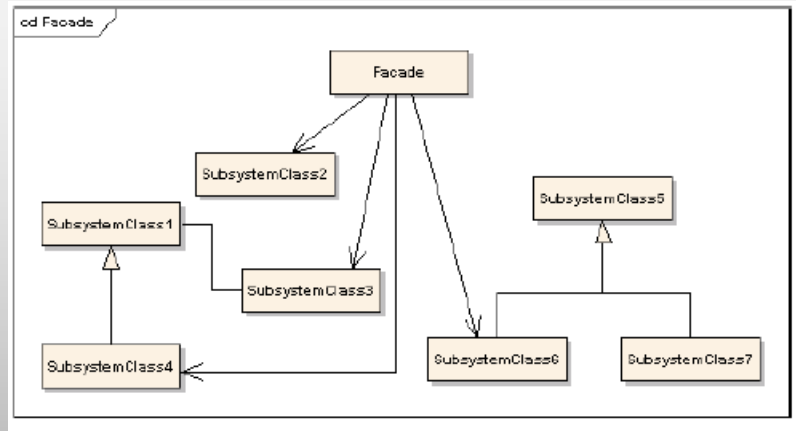
Design Patterns

- State
  - Allows an object to alter its behaviour when it's internal state changes.
  - Benefit of State pattern is specific code is localized in the class that represents that state.
  - Reduces complexity by seperating state depending code with the rest of the system.
  - Can be applied in conjuction with the SCA state variables
    - ENABLED, DISABLED, SHUTTING_DOWN, LOCKED, UNLOCKED, IDLE, ACTIVE, BUSY



Design Patterns

- ✓ Facade
  - ➢ Provides a unique interface to a set of interfaces
  - ➢ Makes the subsystem easier to use
  - ➢ Beautifies an existing cumbersome class by behaving a door to its complex interface
  - ➢ Facade classes can be used as a wrapper to nonSCA classes to prevent re-implementing the existing codes
  - ➢ It can also be used to collect seperate CORBA interfaces into a single interface



Conclusions

- ✓ We have summarized Design Pattern concept and provided example application areas to some of them
- ✓ SCA tells developers
  - ➢ “What to implement”
  - ➢ Not “How to implement”
  - ➢ Appying OOP concepts is essential to maximize the benefits of SCA
    - ❖ Portability
    - ❖ Reconfigurability
    - ❖ Reusability
- ✓ Applying Design Patterns helps developers to implement better SDR applications

Questions