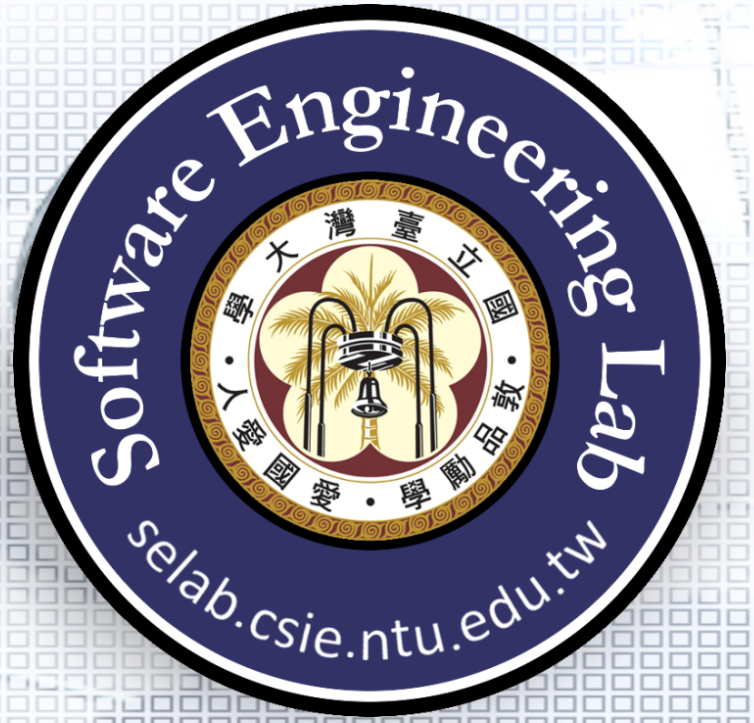

Bridge Pattern

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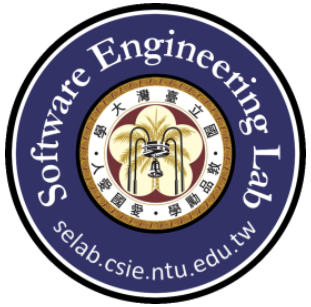
Department of CSIE
National Taiwan University



Design Aspect of Bridge

Implementation of an object

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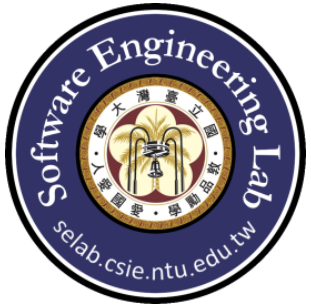

Outline

- Window Framework Requirements Statements
- Initial Design and Its Problems
- Design Process
- Refactored Design after Design Process
- Recurrent Problems
- Intent
- Bridge Pattern Structure
- TV Remote Control: Another Example

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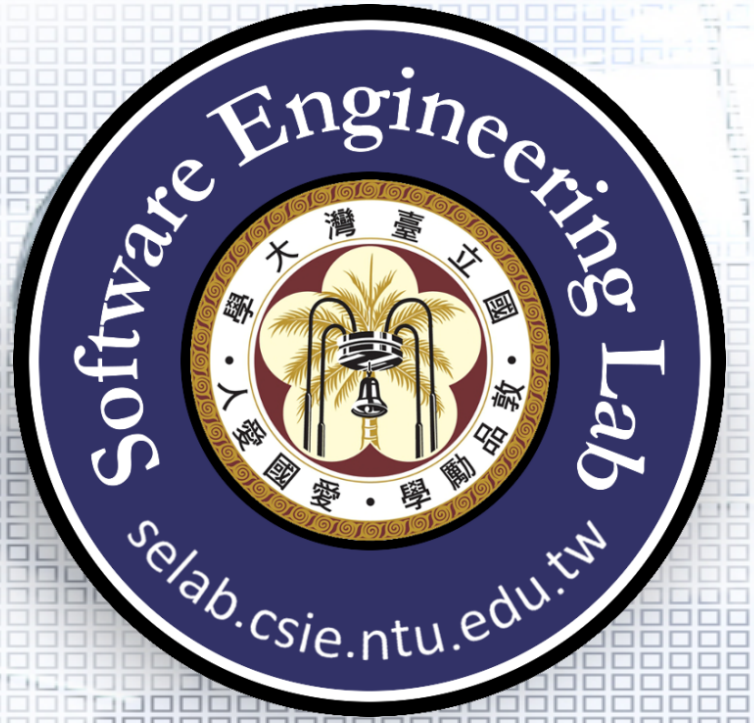

Window Framework

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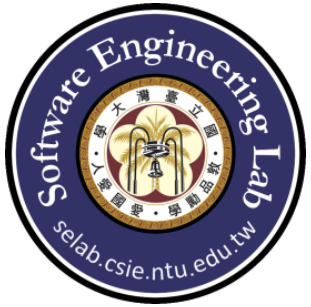
National Taiwan University



Requirements Statements

- In a window framework, the two basic functionalities of a window are drawing text and drawing rectangles.
- A window has two subtypes, Icon Window and Transient Window; Icon Window is able to draw a border by drawing rectangles and text while Transient Window is able to draw a close box by drawing rectangles.
- Both of the two windows can be implemented by X Window or Presentation Manager Window.

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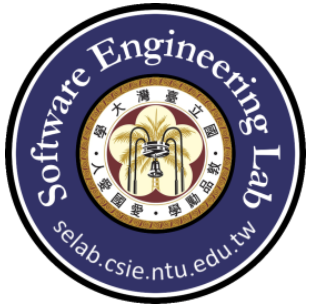

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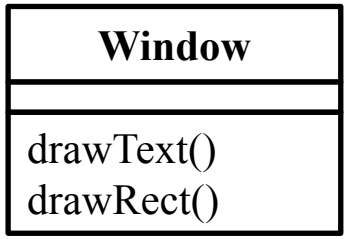

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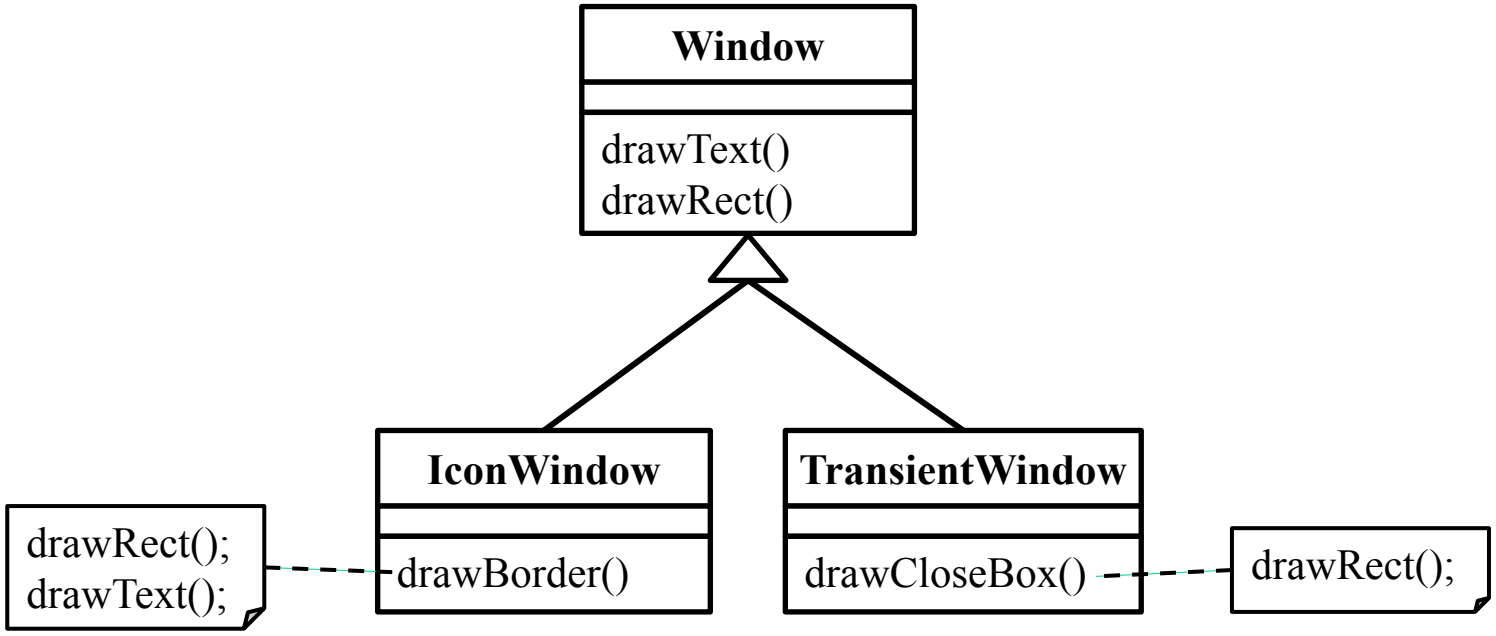

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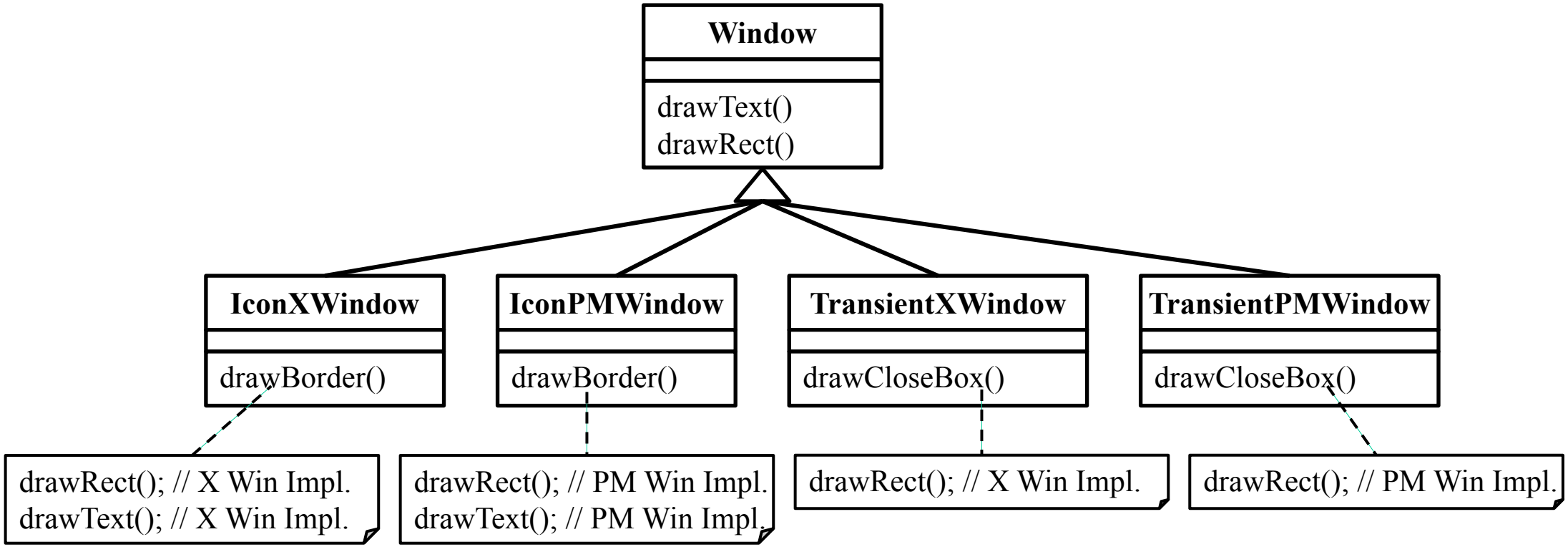
Requirements Statements$_3$

- Both of the two windows can be implemented by X Window or Presentation Manager Window.



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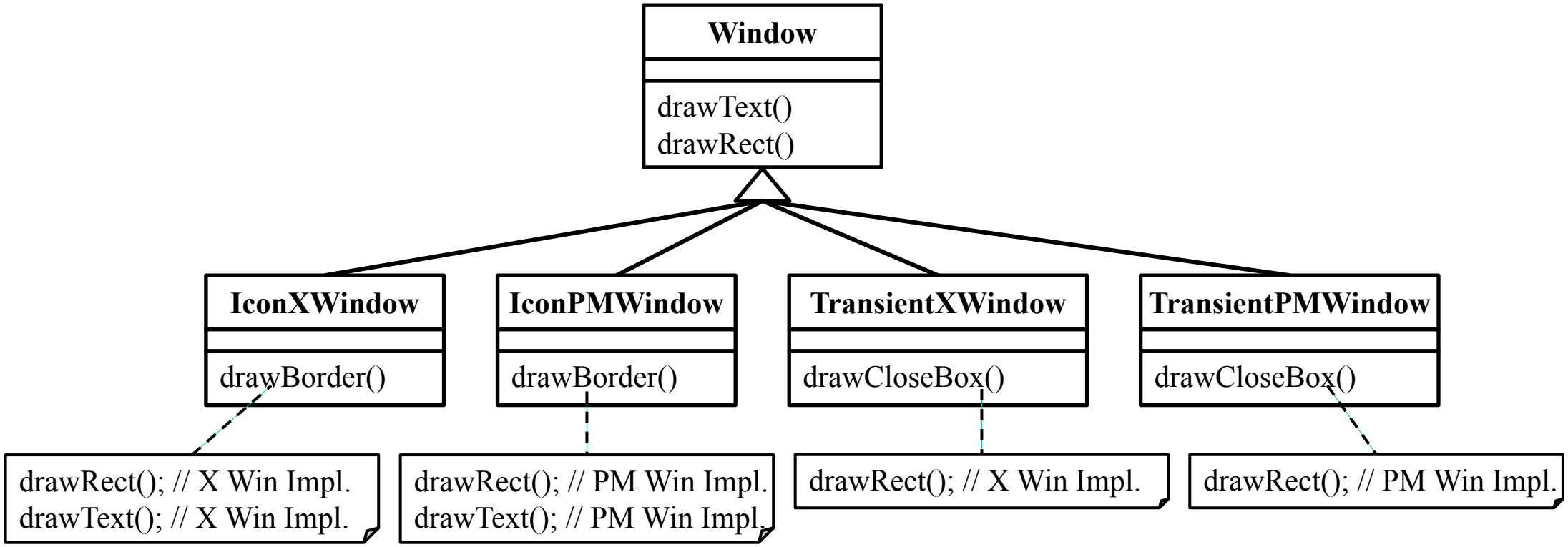
Initial Design – Class Diagram



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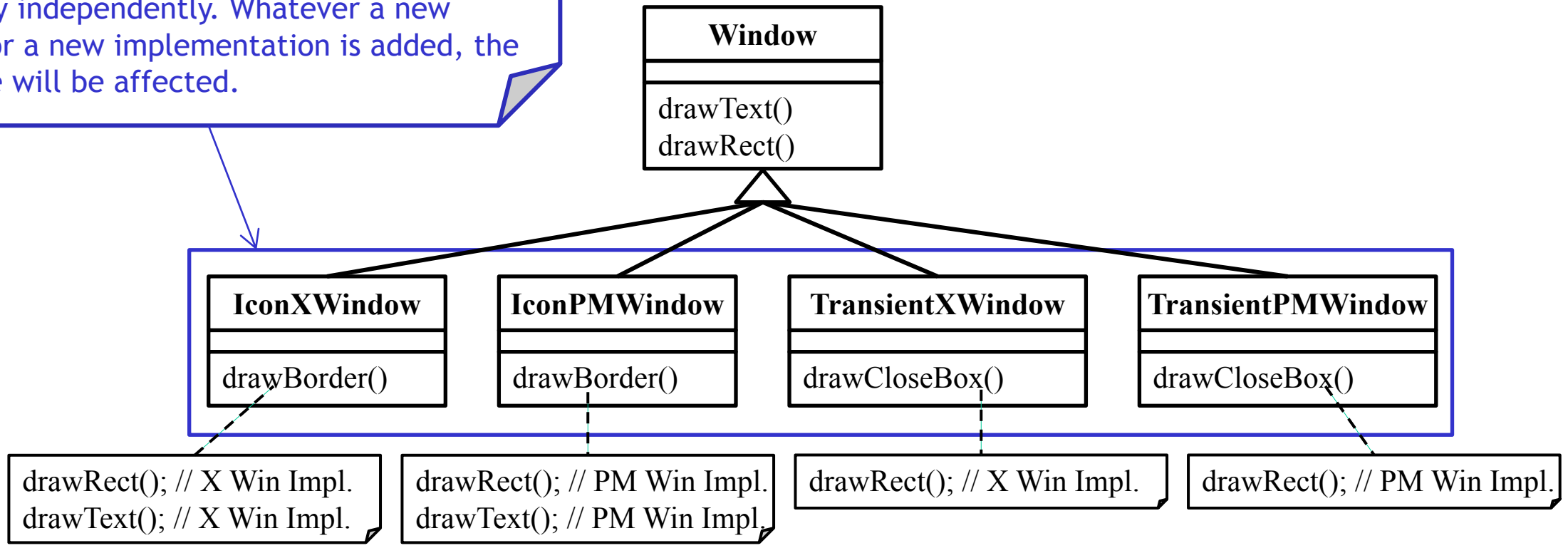
The Problem with the Initial Design

Problem: The subtypes of Window and the Window implementations are highly coupled and can't vary independently. Whatever a new subtype or a new implementation is added, the other one will be affected.



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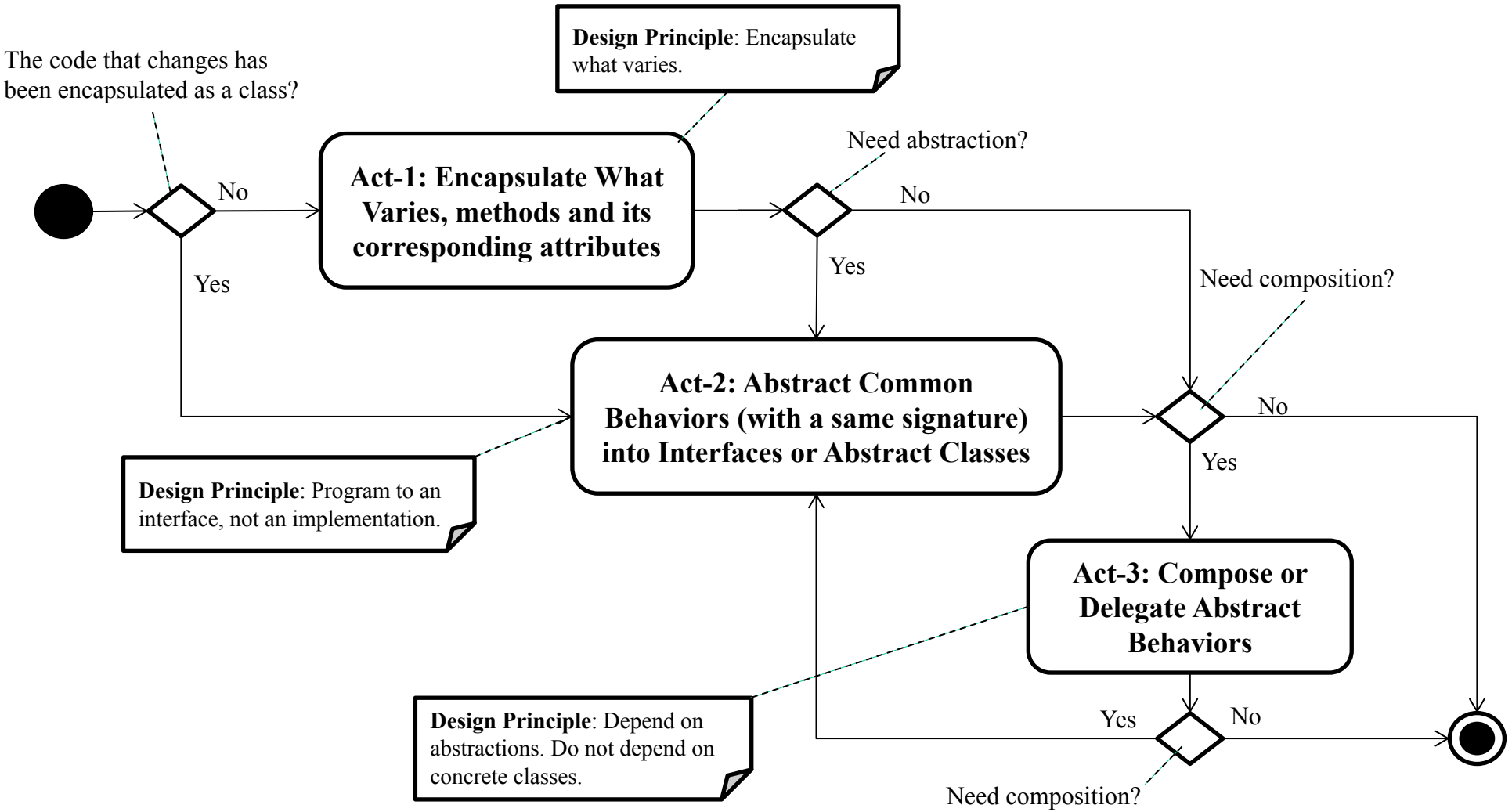
Design Process for Change



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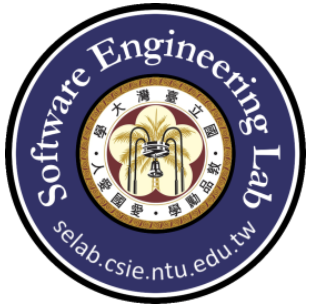
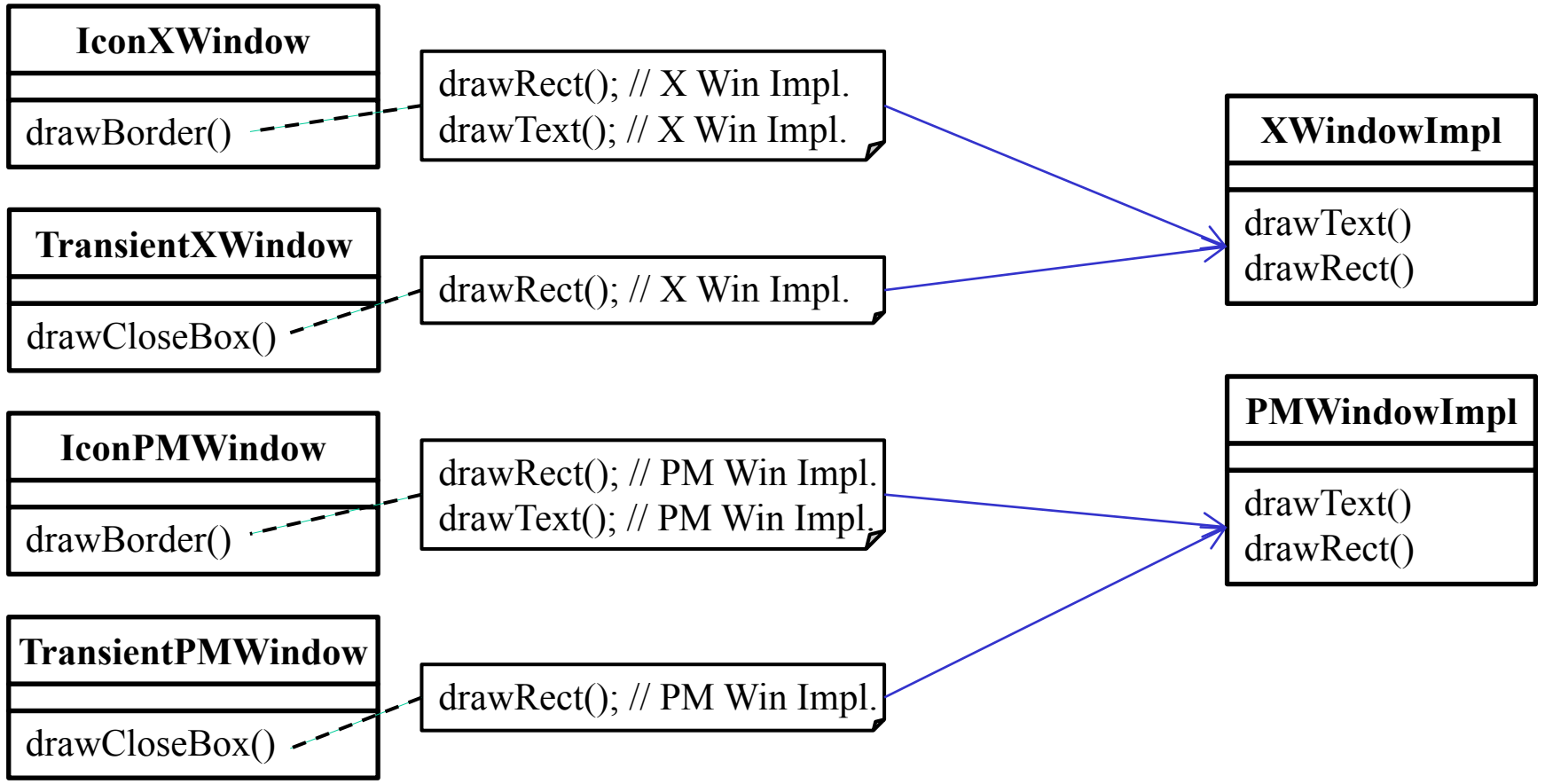


Act-1: Encapsulate What Varies

Act-1.3: Encapsulate a part of a method body into a concrete class



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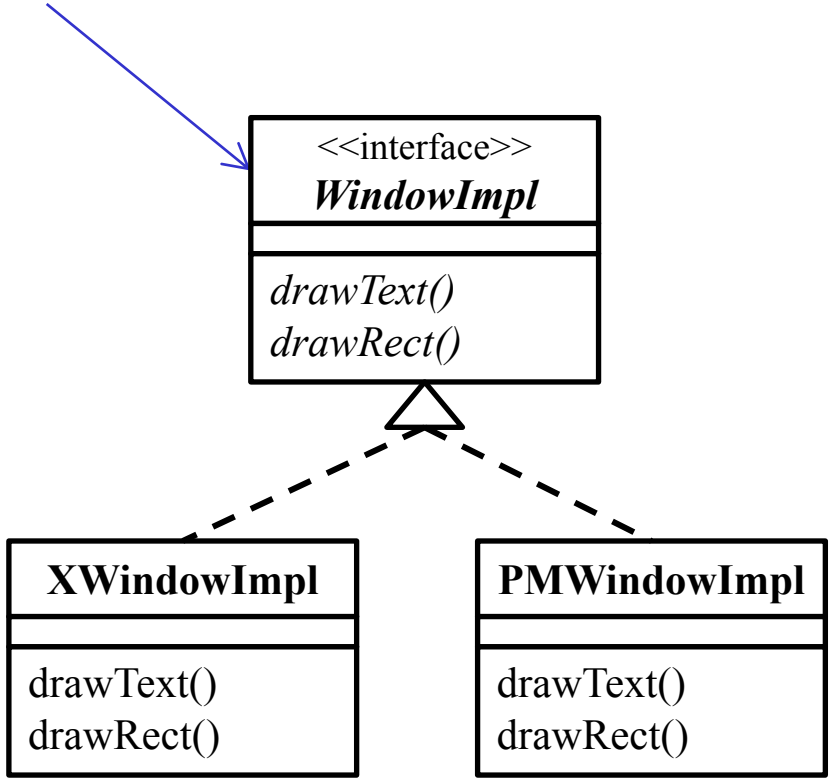
Act-2: Abstract Common Behaviors

Act-2.1: Abstract common behaviors with a same signature into interface through polymorphism



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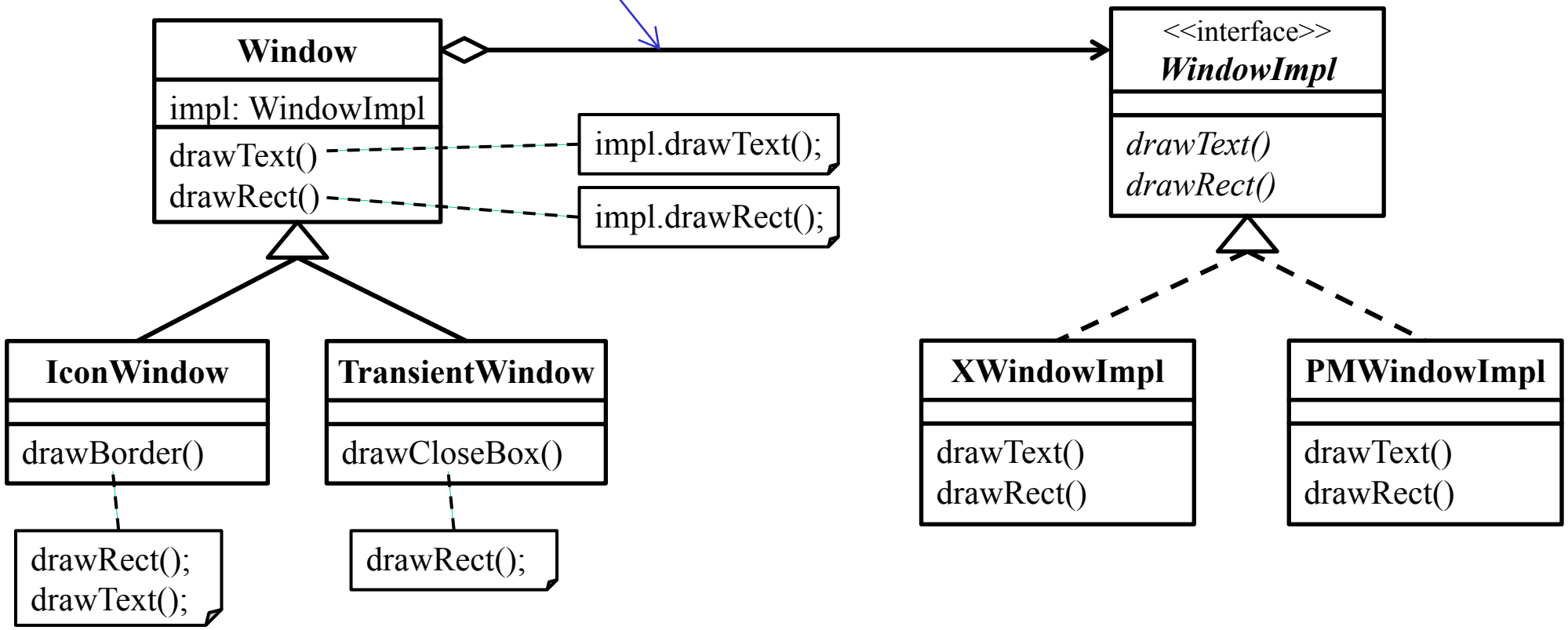
Act-3: Compose Abstract Behaviors

Act-3.3: Delegate behavior to an interface or an abstract class



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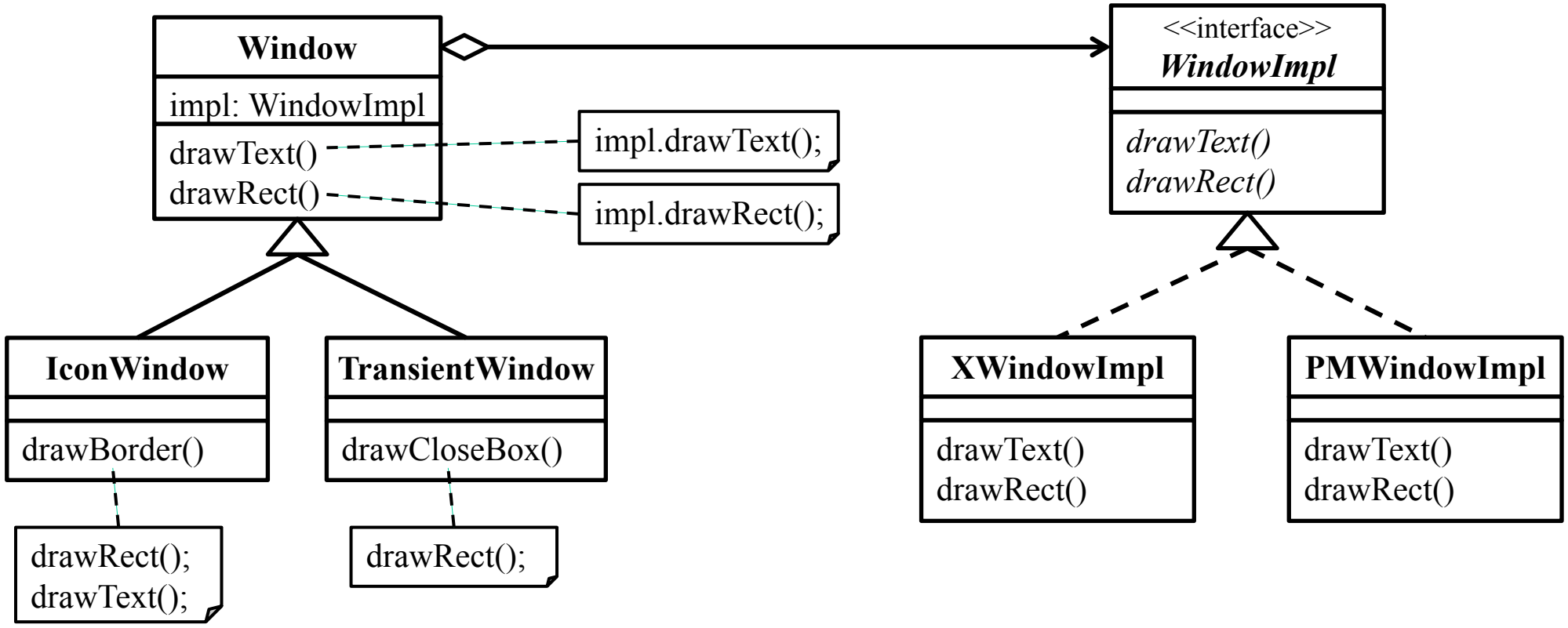
Refactored Design after Design Process



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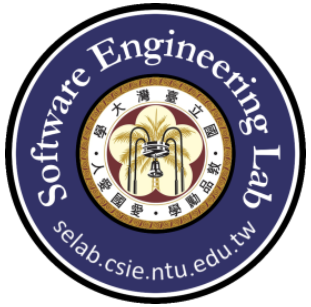

Recurrent Problem

- When an abstraction can have one of several possible implementations, the usual way to accommodate them is to use inheritance.
- An abstract class or interface defines the interface to the abstraction, and concrete subclasses implement it in different ways.
- But this approach isn't always flexible enough. Inheritance binds an implementation to the abstraction permanently, which makes it difficult to modify, extend, and reuse abstractions and implementations independently.

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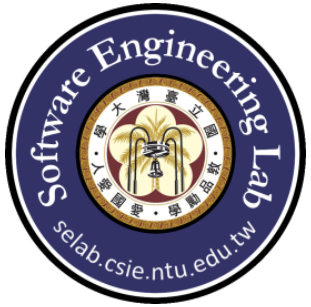

Intent

- Decouple an abstraction from its implementation so that the two can vary independently.

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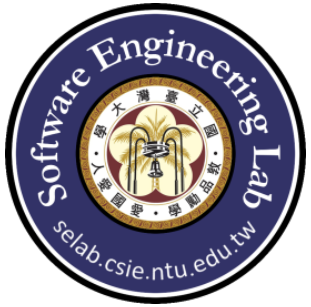

Reference Model as Abstraction

- Bridge pattern can be best used for implementing reference model, because with a reference model that serves as an abstraction, we can have different ways to implement the model as long as the reference is well-modeled as its corresponding abstraction.

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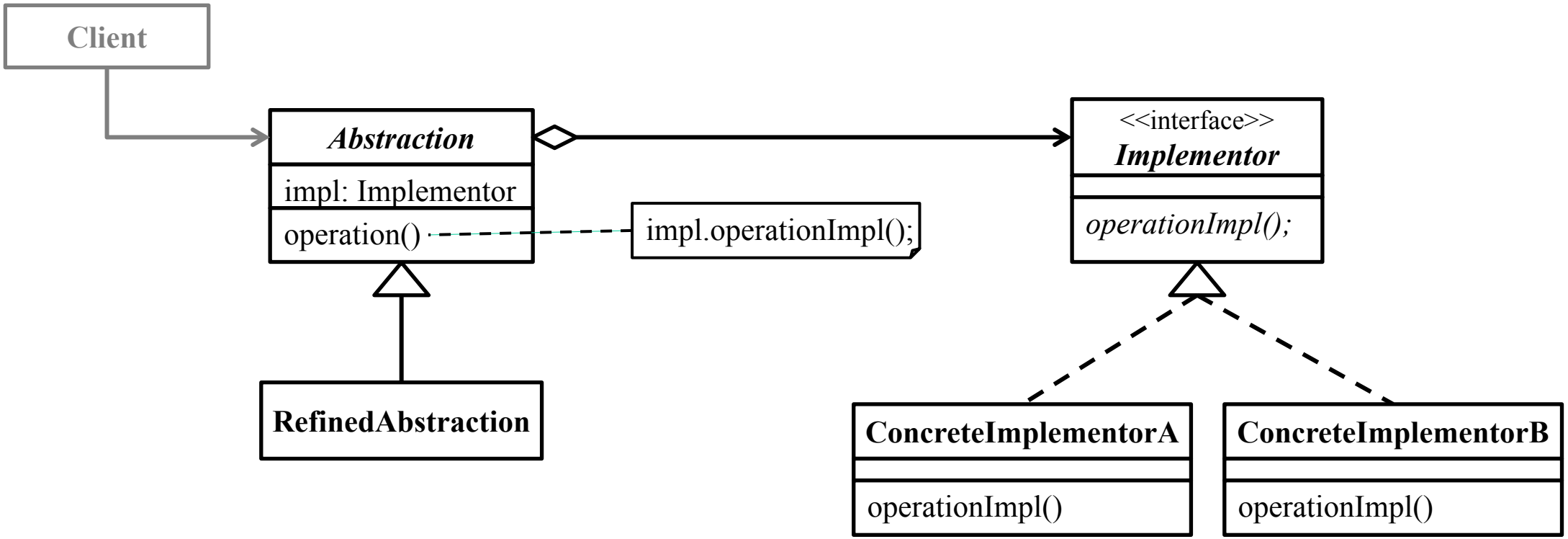
Bridge Pattern Structure$_1$



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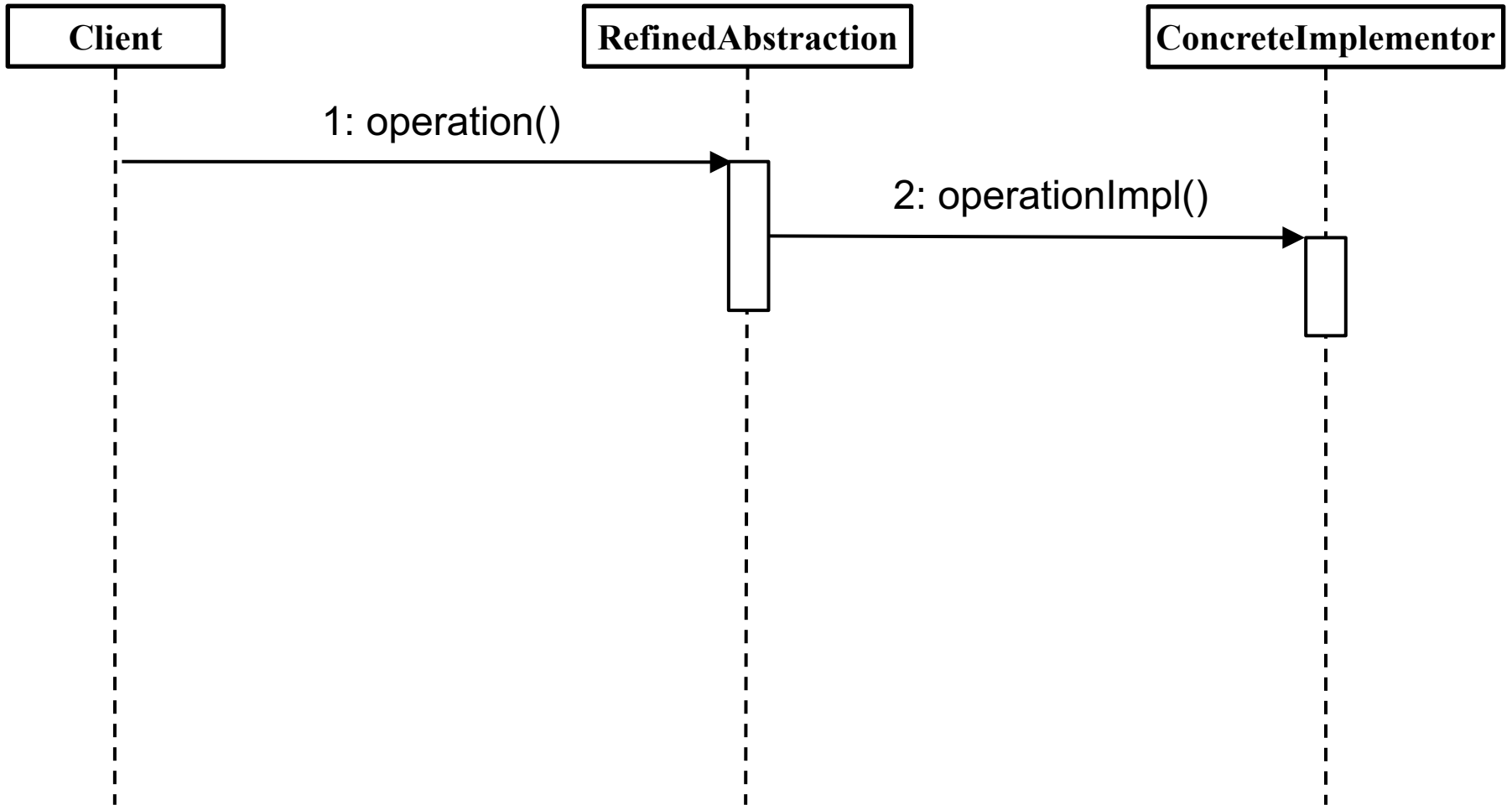
Bridge Pattern Structure$_2$



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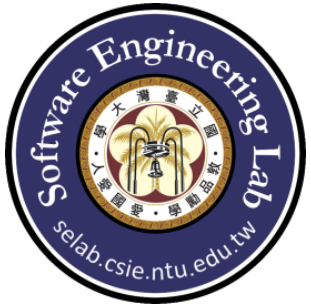

Bridge Pattern Structure$_3$

	Instantiation	Use	Termination
Abstraction	X	Client invokes the defined operation of Abstraction to accomplish its task.	X
RefinedAbstraction	Don't Care	Client invokes the defined operation of RefinedAbstraction through polymorphism.	Don't Care
Implementor	X	When the operation of Abstraction is invoked, Abstraction delegates to Implementor by invoking its implemented operation.	X
ConcreteImplementor	Client	Abstraction delegates the operation to ConcreteImplementor through polymorphism.	ConcreteImplementor is destroyed along with Abstraction.

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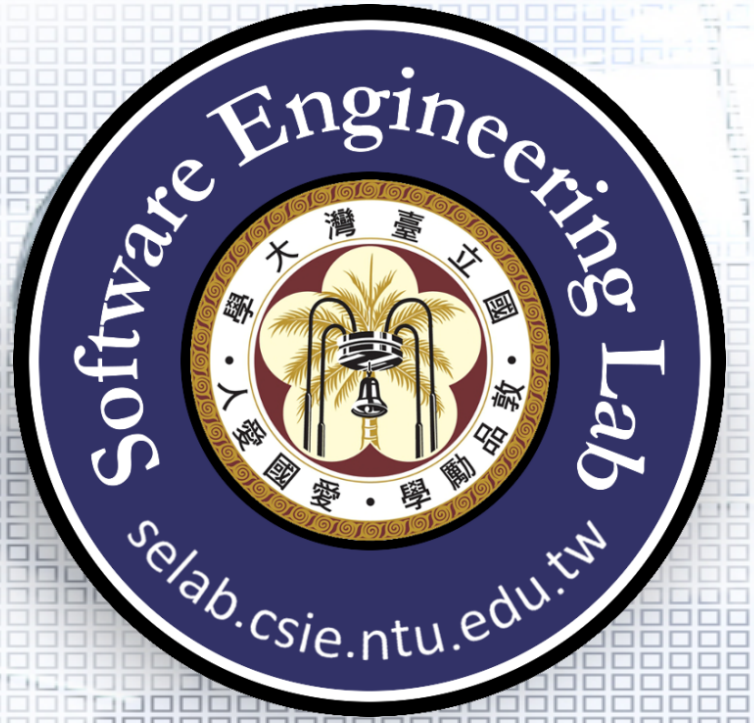
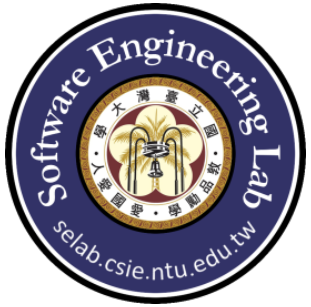


TV Remote Control

Prof. Jonathan Lee (李允中)

Department of Computer Science and Information Engineering
National Taiwan University



Requirements Statements

- A TV remote control has three basic controls, **turn on**, **turn off** and **set channel**.
- It is welcome to extend the functionalities of the remote control based on basic controls, for example, **next channel** and **previous channel**.
- However, according to different TV vendors, such as RCA and SONY, there are different ways to implement the remote controls.

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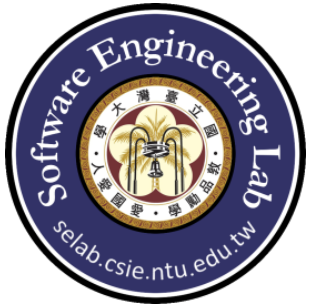

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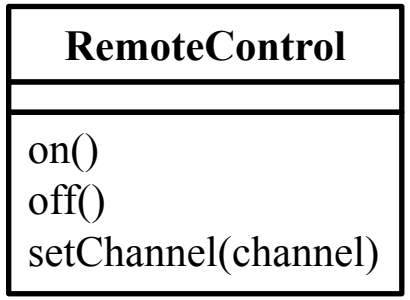

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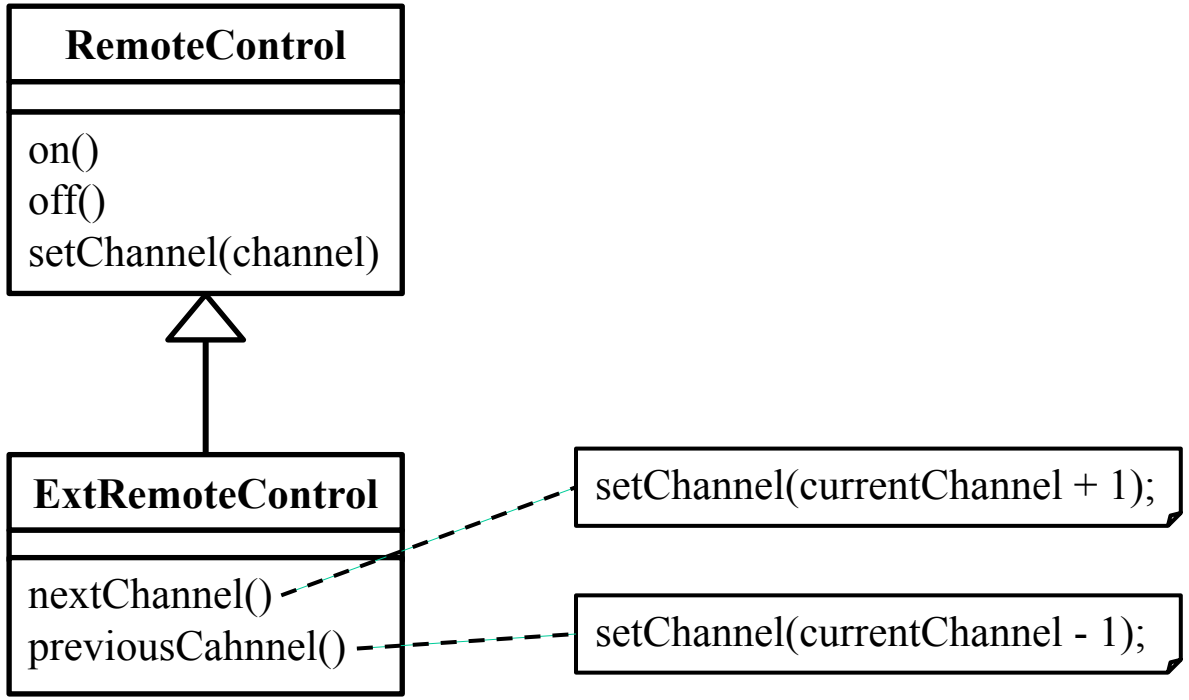

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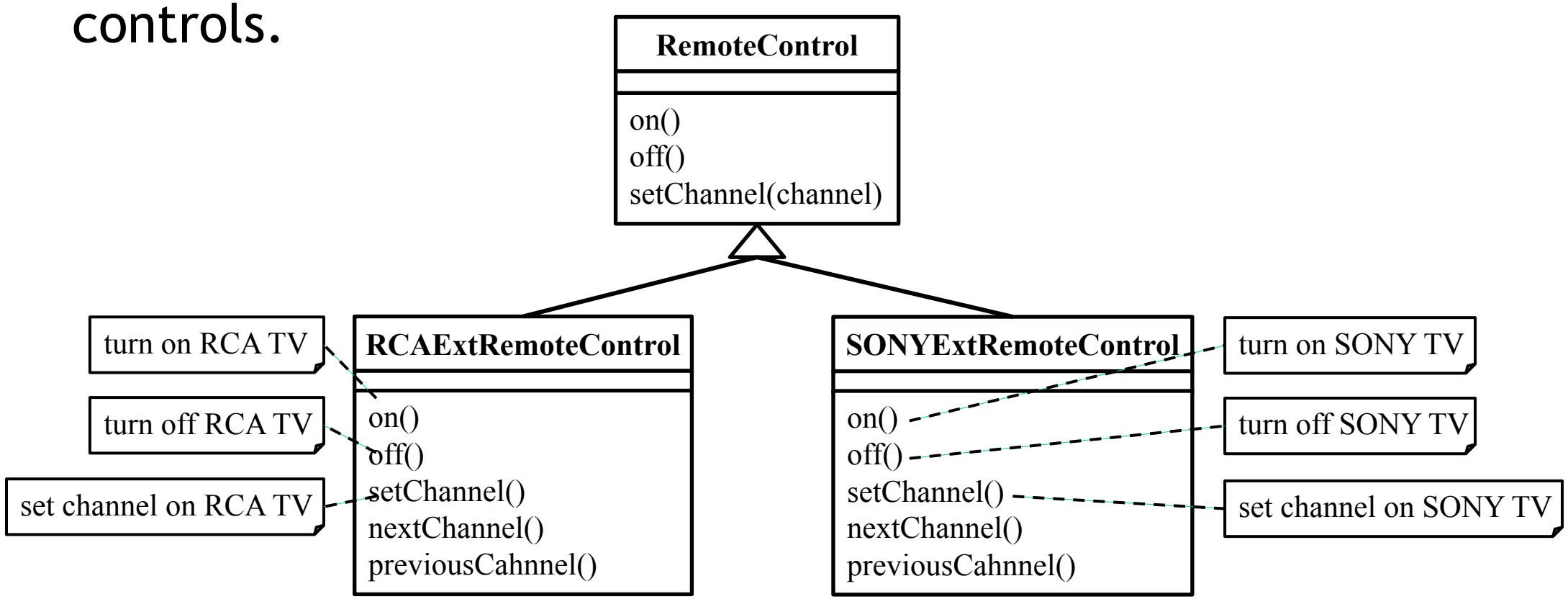

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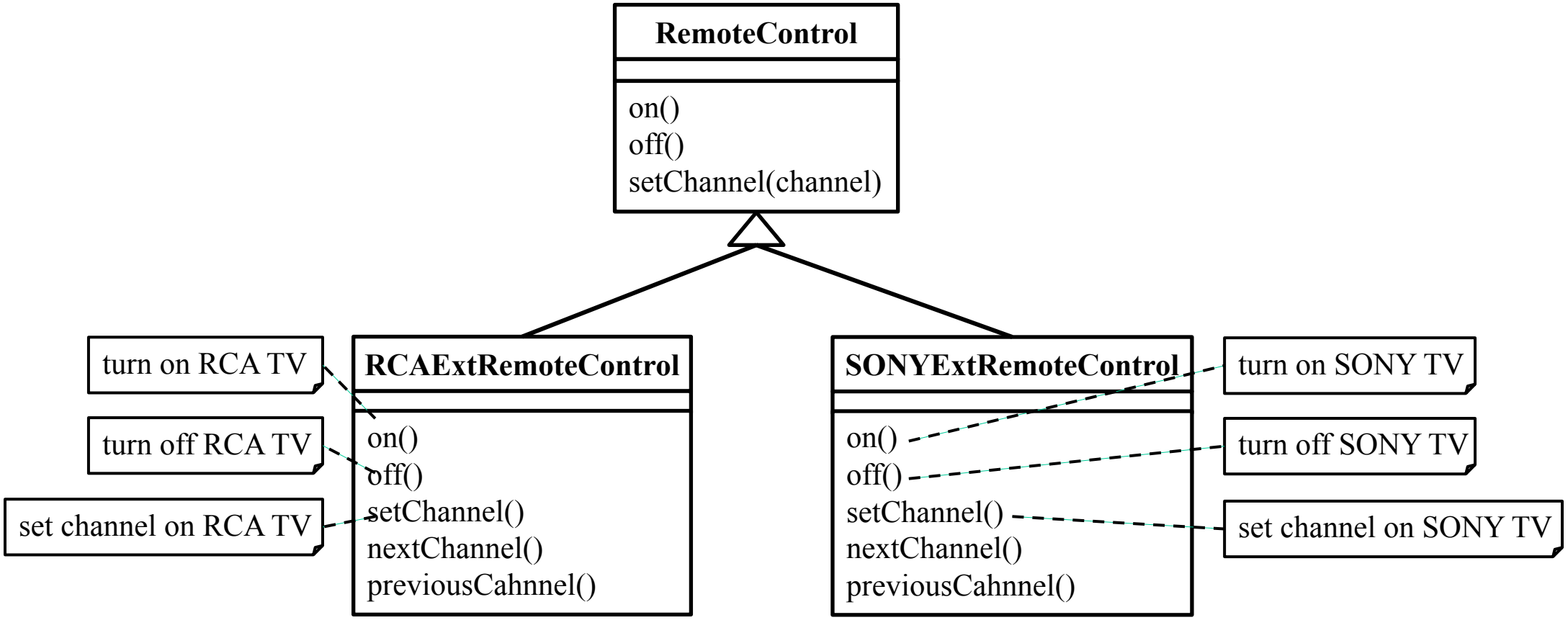

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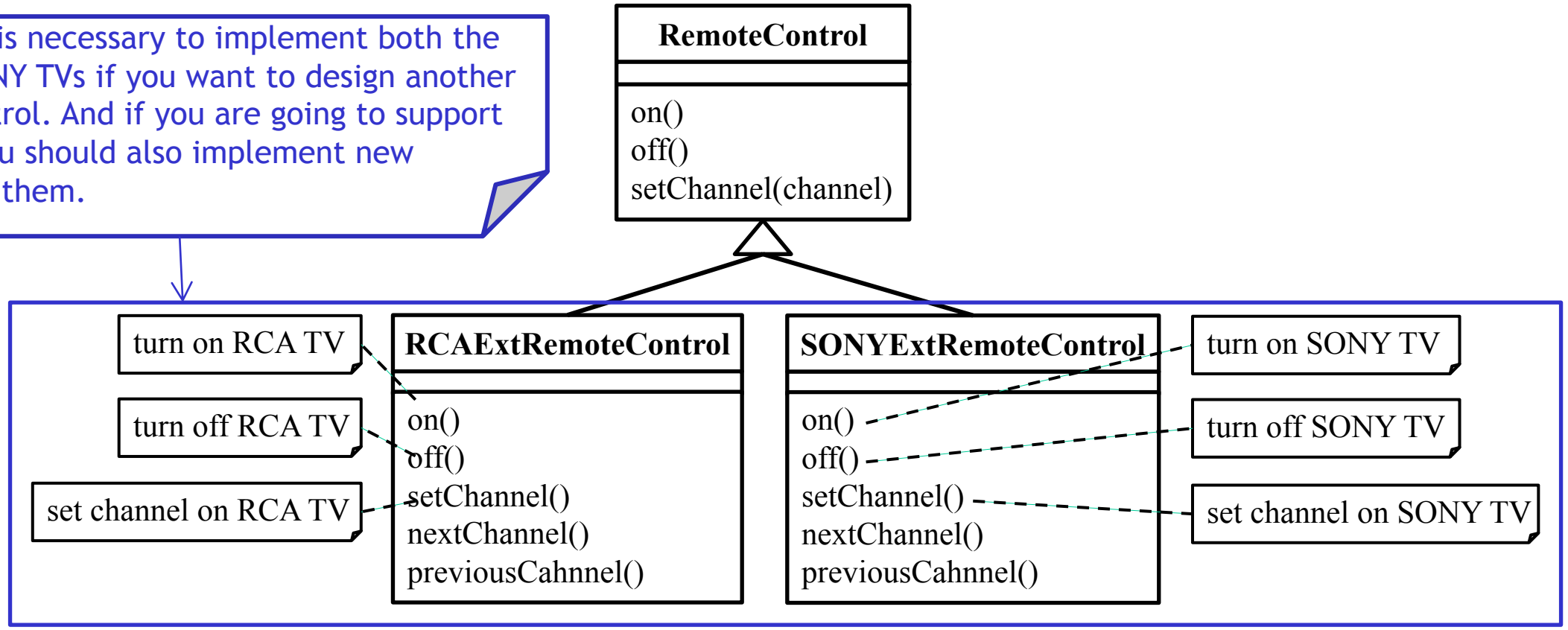
The Problem with the Initial Design

Problem: It is necessary to implement both the RCA and SONY TVs if you want to design another remote control. And if you are going to support new TVs, you should also implement new controls for them.



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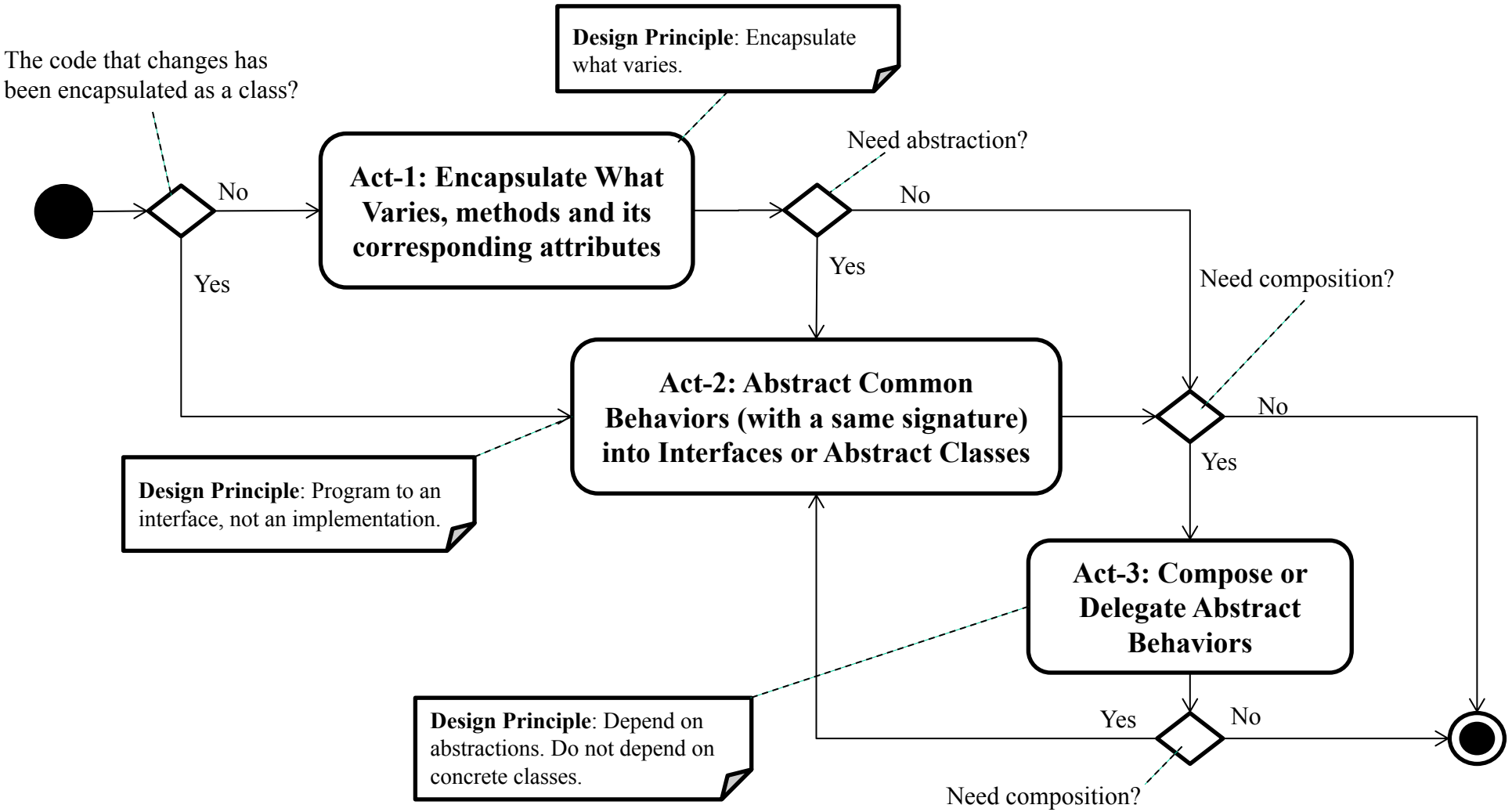
Design Process for Change



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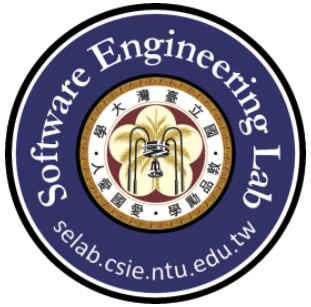

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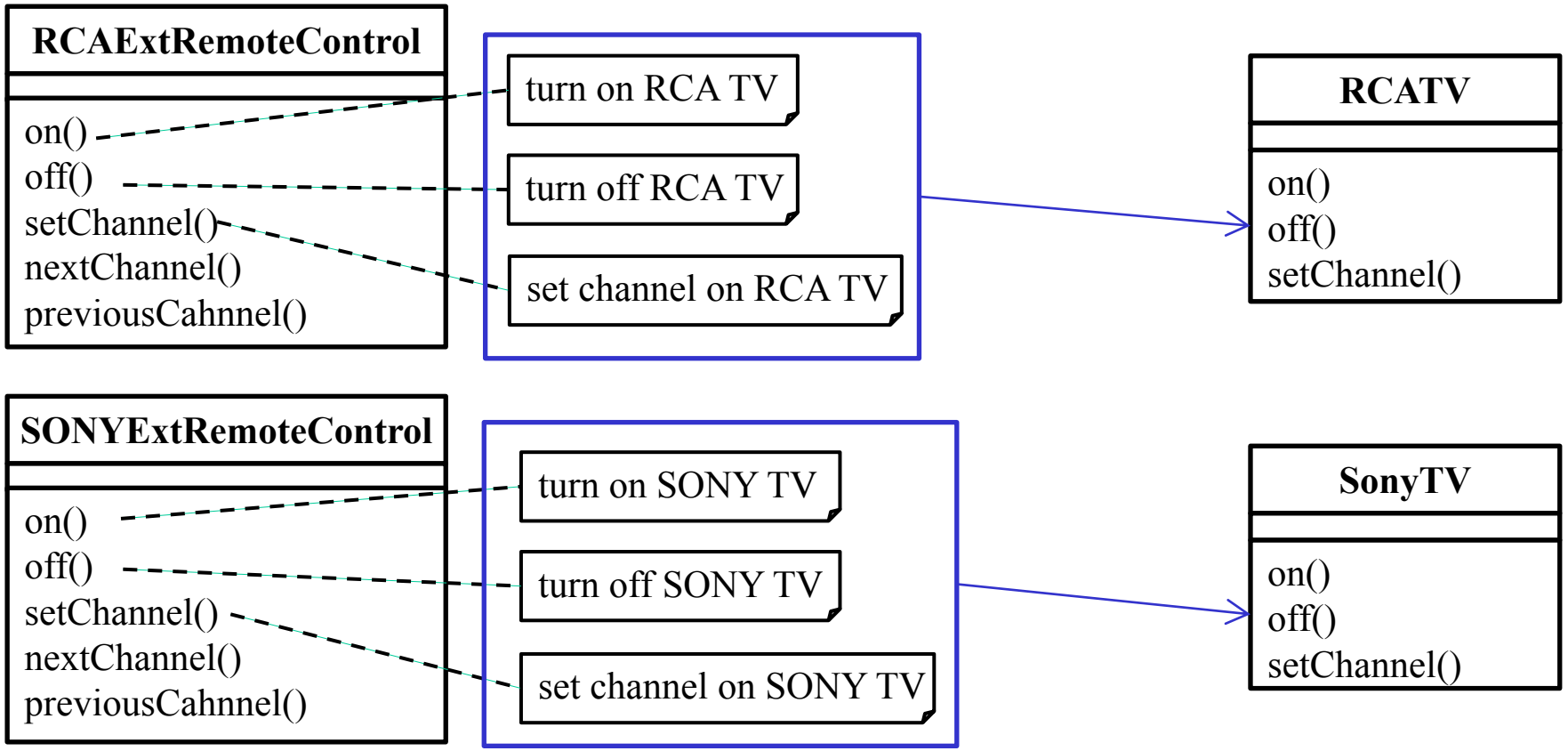

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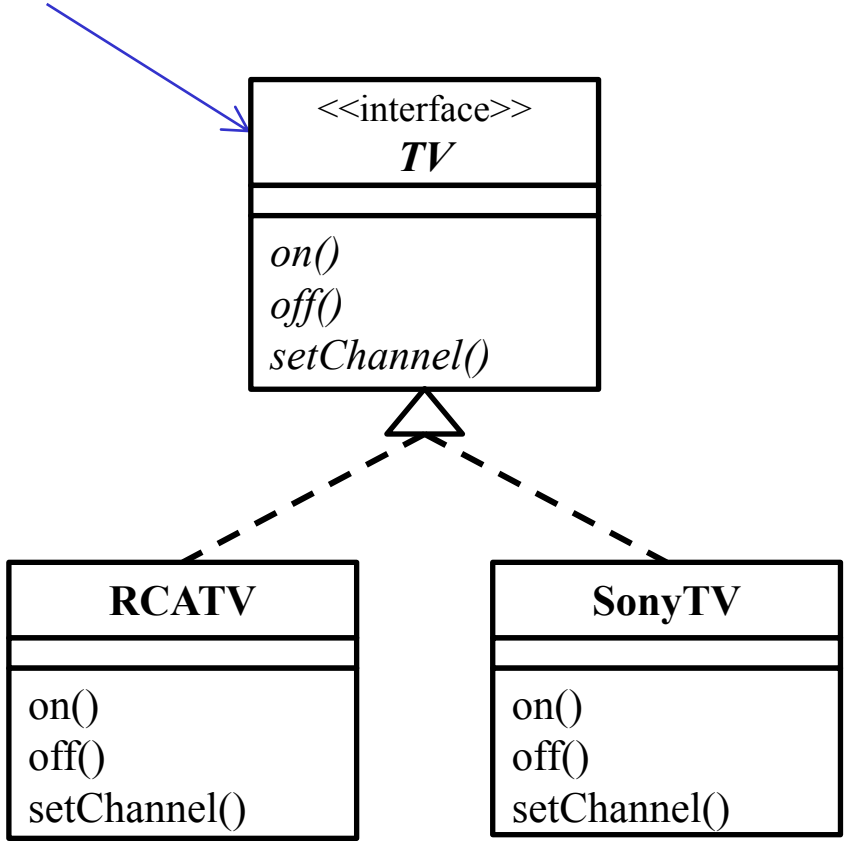

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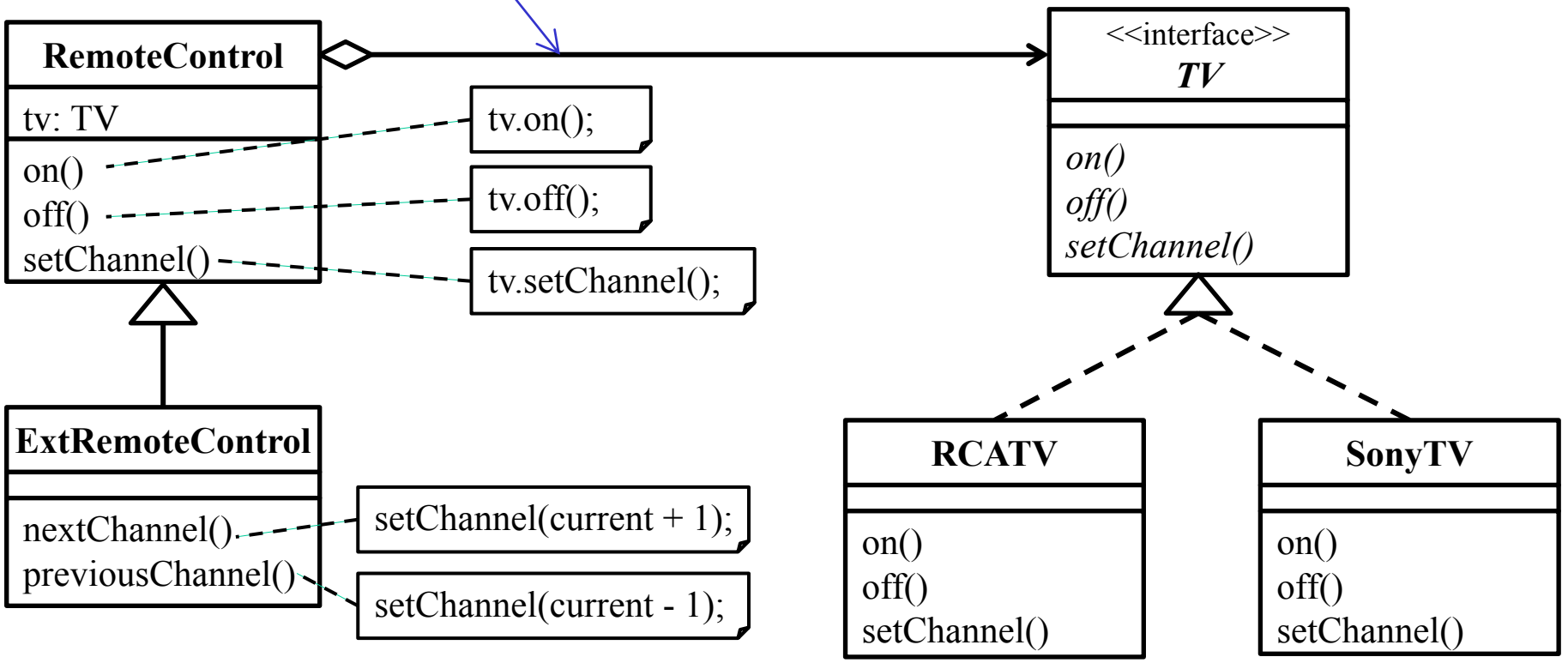

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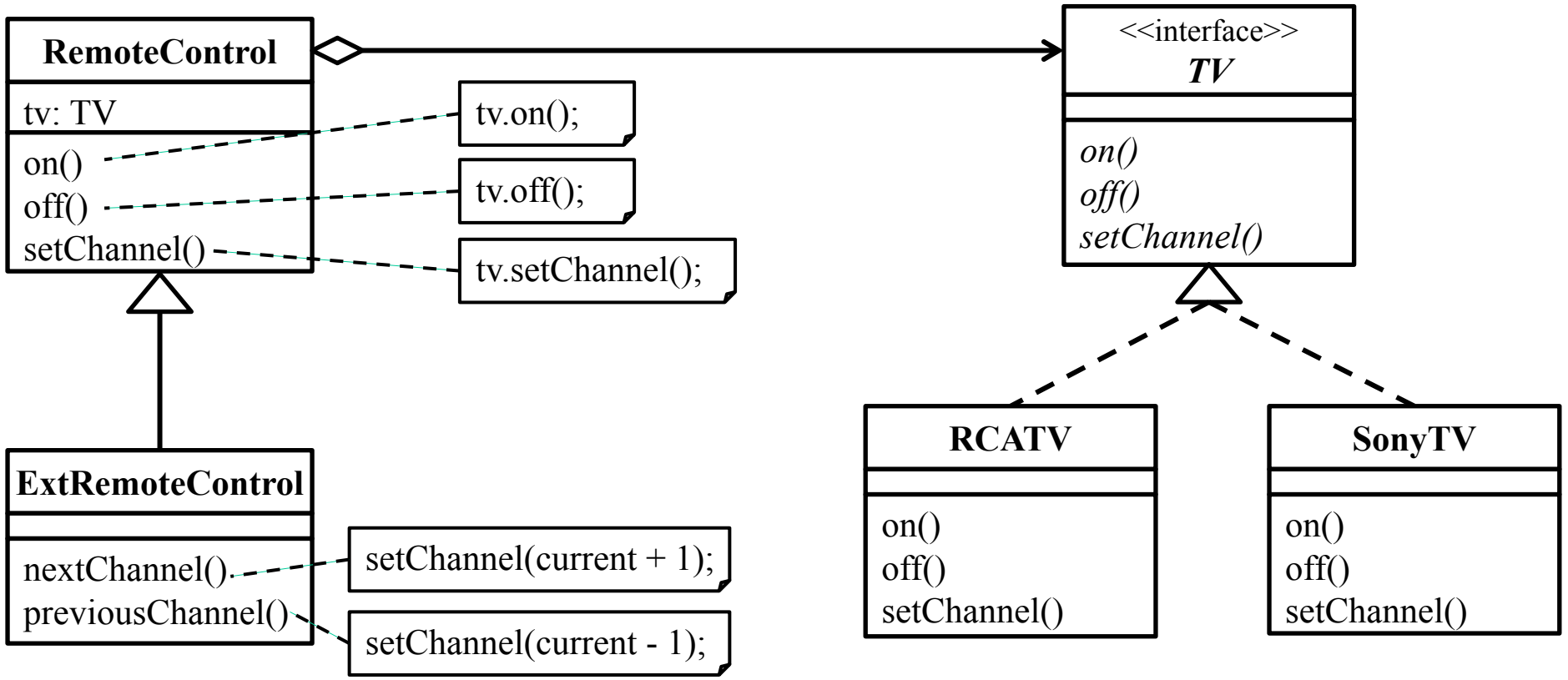
Refactored Design after Design Process



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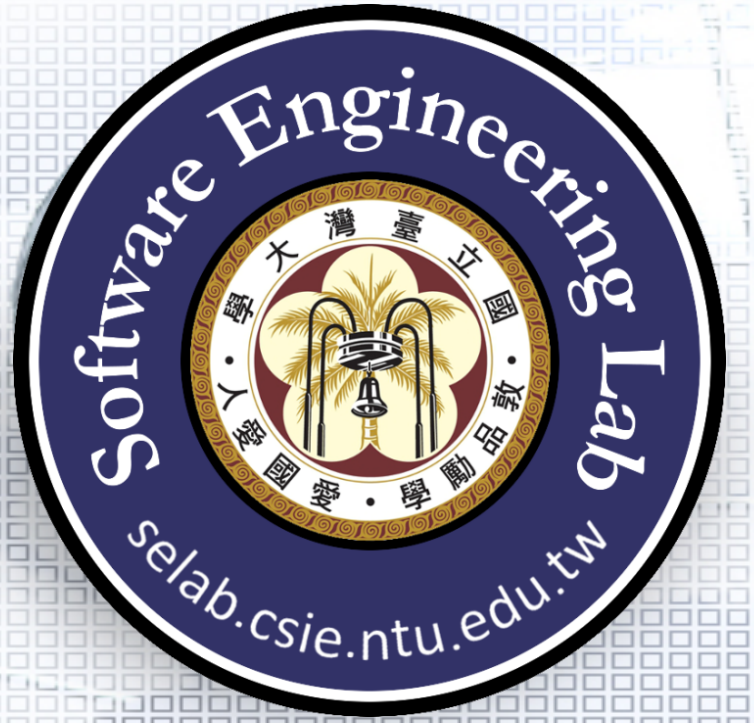
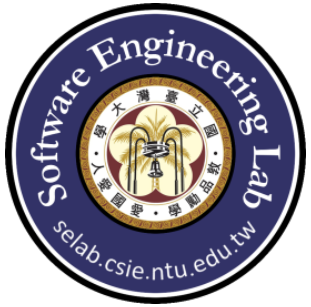


A Message Logging System

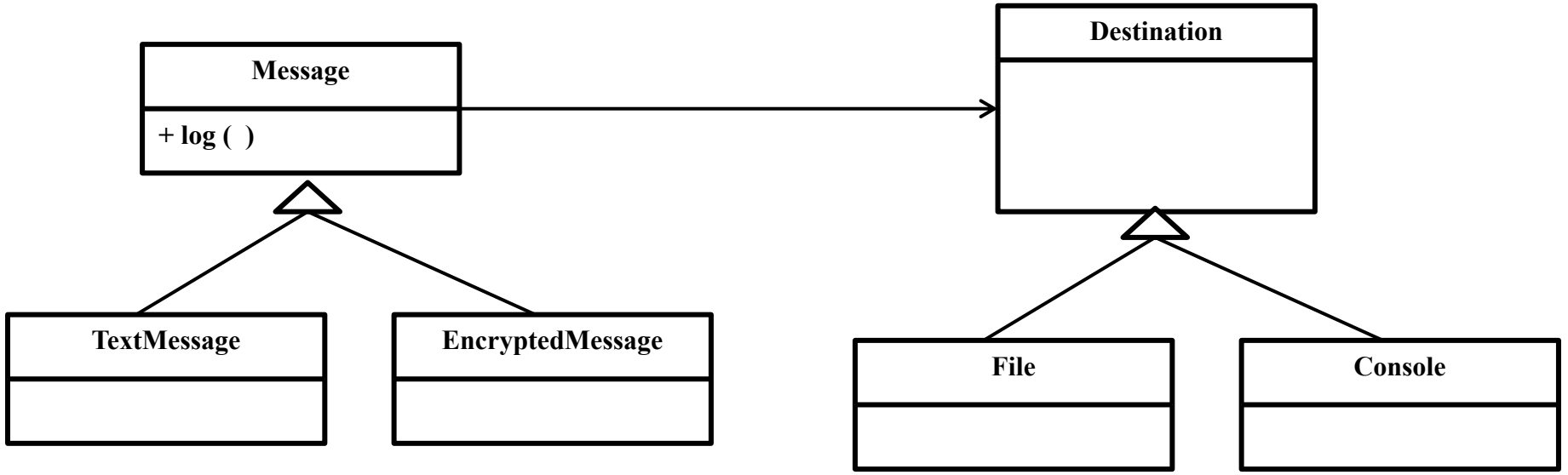
Prof. Jonathan Lee (李允中)

Department of Computer Science and Information Engineering
National Taiwan University



Requirements Statements$_1$

- There are different types of message, such as text message, encrypted message, or other type of message. A message can be logged to different types of destinations such as a file, console and others.



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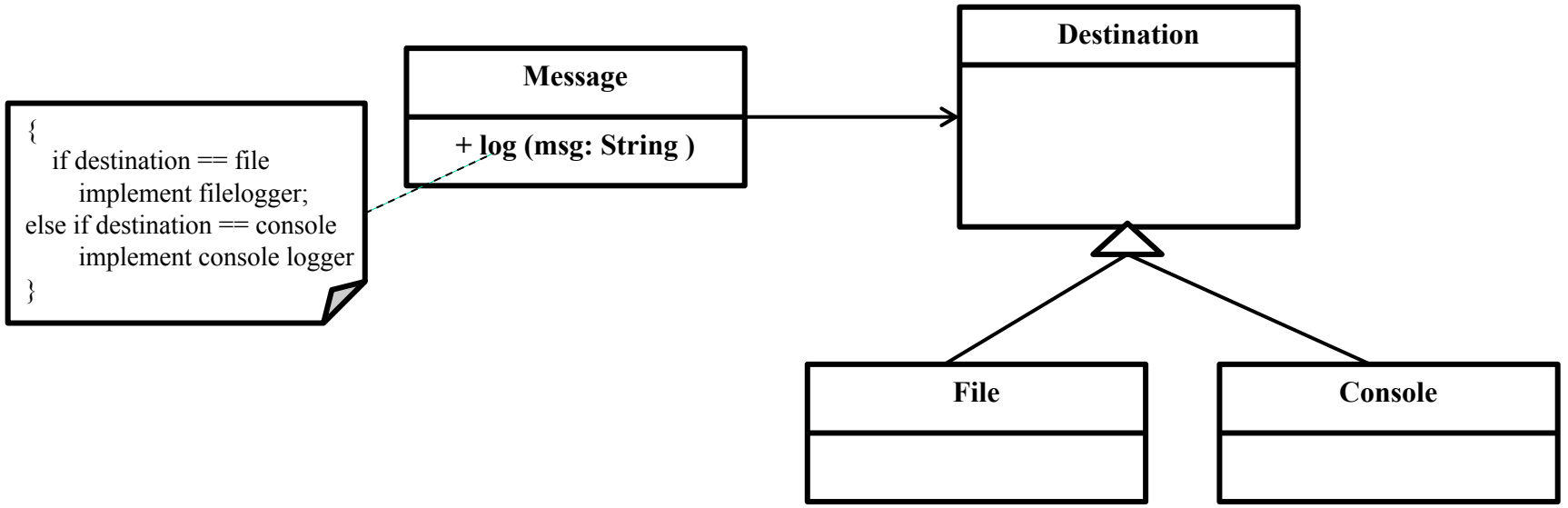
Requirements Statements$_2$

- Depending on the destination type, a different implementation of the logger abstraction is needed.



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