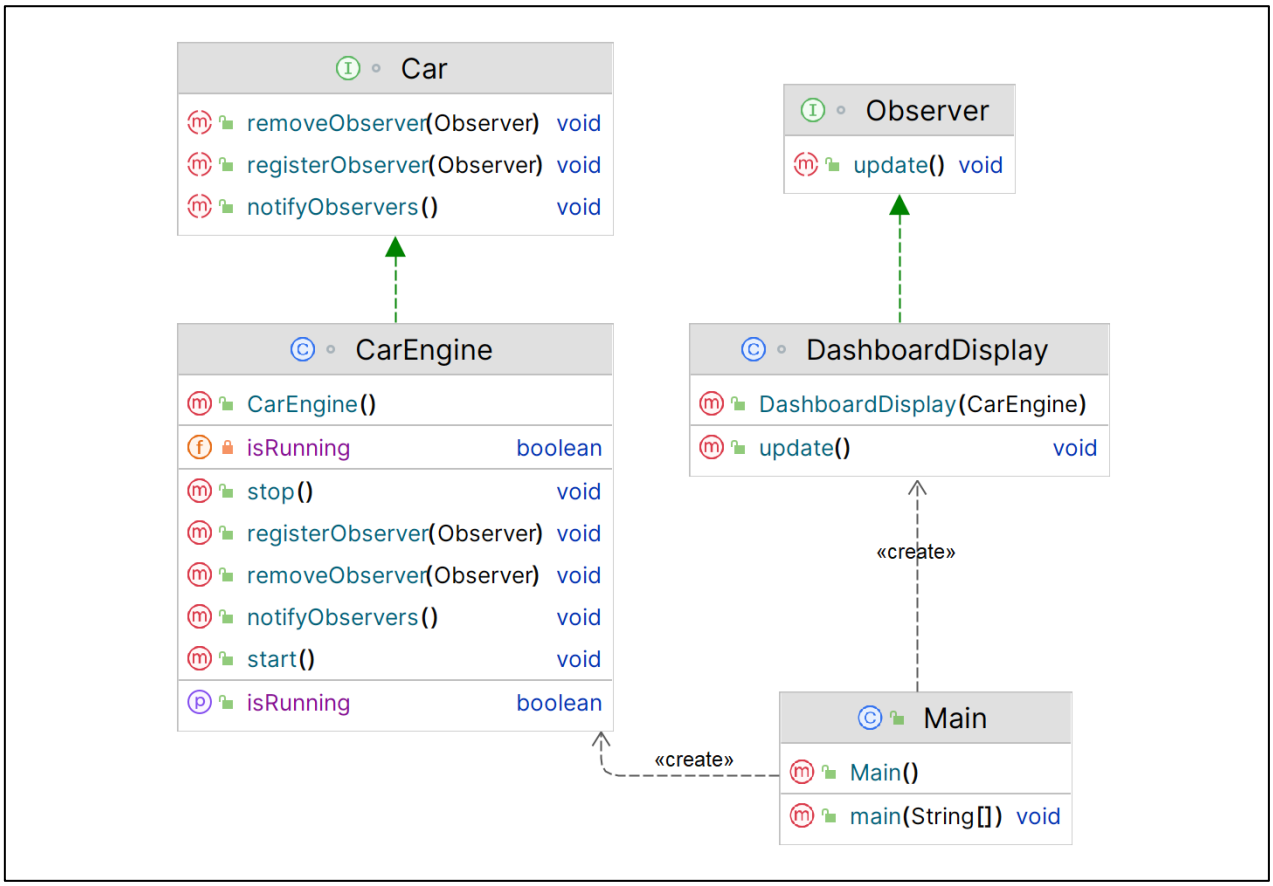
Assignment 15: Observer Design Pattern

What is Observer Design Pattern?

Observer is a **behavioural** design pattern that lets you define a **subscription mechanism** to **notify** multiple objects about any events that happen to the object they're **observing**.

Structure (Class Diagram)



Implementation (Code)

```
import java.util.ArrayList;
import java.util.List;

// Define the Subject interface
interface Car {
    void registerObserver(Observer observer);
    void removeObserver(Observer observer);
    void notifyObservers();
}

// Define the Observer interface
interface Observer {
    void update();
}
```

```
// Define the concrete Subject class
class CarEngine implements Car {
    private List<Observer> observers = new ArrayList<>();
    private boolean isRunning = false;
    public void registerObserver(Observer observer) {
        observers.add(observer);
    }
    public void removeObserver(Observer observer) {
        observers.remove(observer);
    }
    public void notifyObservers() {
        for (Observer observer : observers) {
            observer.update();
        }
    }

    // This method is called to start the car engine
    public void start() {
        System.out.println("Starting the car engine.");
        isRunning = true;
        notifyObservers();
    }
    // This method is called to stop the car engine
    public void stop() {
        System.out.println("Stopping the car engine.");
        isRunning = false;
        notifyObservers();
    }
    // This method is called to check if the car engine is running
    public boolean isRunning() {
        return isRunning;
    }
}

// Define the concrete Observer class
class DashboardDisplay implements Observer {
    private CarEngine carEngine;

    public DashboardDisplay(CarEngine carEngine) {
        this.carEngine = carEngine;
    }
    public void update() {
        if (carEngine.isRunning()) {
            System.out.println("Displaying current speed.");
        } else {
            System.out.println("Displaying engine warning light.");
        }
    }
}
```

```
// Usage example
public class Main {
    public static void main(String[] args) {
        // Create the subject (car engine)
        CarEngine carEngine = new CarEngine();

        // Create some observers (dashboard displays)
        DashboardDisplay display1 = new DashboardDisplay(carEngine);
        DashboardDisplay display2 = new DashboardDisplay(carEngine);

        // Register the observers with the subject
        carEngine.registerObserver(display1);
        carEngine.registerObserver(display2);

        // Start the car engine
        carEngine.start();

        // Stop the car engine
        carEngine.stop();
    }
}
```

Output

```
Starting the car engine.
Displaying current speed.
Displaying current speed.
Stopping the car engine.
Displaying engine warning light.
Displaying engine warning light.
```

Applicability

1. Use the **Observer** pattern when changes to the state of one object may **require changing other objects**, and the actual set of objects is unknown beforehand or **changes dynamically**.
2. Use the pattern when some objects in your app must **observe others**, but only for a **limited time** or in specific cases.