SOLID: Single Responsibility Principle

Get familiar with the single responsibility principle along with its examples.

We'll cover the following

- Introduction
- Real-life example
- Book invoice application
  - Violations
- Conclusion

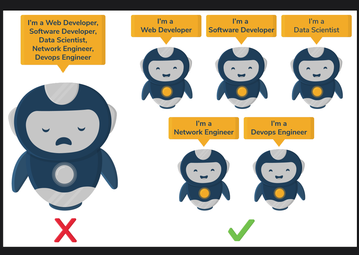
Introduction

The **Single Responsibility Principle (SRP)** is perhaps the least understood of the SOLID concepts. The term was coined by Robert C. Martin who defines the SRP in the following way, "*A class should have only one reason to change.*" This implies that any class or component in our code should only have one functionality. Everything in the class should be related to just one goal.

When programmers need to add features or new behavior, they frequently integrate everything within the current class. When something needs to be changed later, due to the complexity of the code, the update process becomes extremely time consuming and tedious. The Single Responsibility Principle helps us create simple classes that perform just one task. This helps in making modifications or adding extensions to the existing code much easier.

Real-life example

The following illustration represents how SRP is applied in real life:



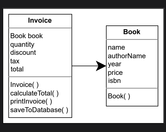
An exmaple of SRP

Book invoice application

Let's try to understand SRP with the help of an example. We have a book invoice application that has two classes: `Book` and `Invoice`. The `Book` class contains the data members related to the book. Whereas, the `Invoice` class contains the following three functionalities:

- Calculating the price of the book
- Printing the invoice
- Saving the invoice into the database

The following class diagram provides a blueprint of these classes:



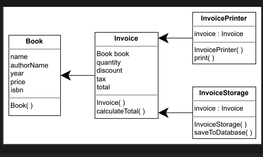
The class diagram of the book invoice application without applying the SRP rule

Violations

If we notice, the `Invoice` class violates the SRP in multiple ways:

- The `Invoice` class is about invoices, but we have added print and storage functionality inside it. This breaks the SRP rule, which states, "A class should have only one reason to change."
- If we want to change the logic of the printing or storage functionality in the future, we would need to change the class.

Instead of modifying the `Invoice` class for these uses, we can create two new classes for printing and persistence logic: `InvoicePrinter` and `InvoiceStorage`, and move the methods accordingly, as shown below.



The class diagram of the book invoice application after applying the SRP rule

Now, our class structure is in line with the SRP.

Conclusion

When a class performs one task, it contains a small number of methods and member variables that are self-explanatory. SRP achieves this goal, and due to this, our classes are more usable, and they provide easier maintenance.

In the next lesson, we will learn the Open Closed Design Principle with examples.

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SOLID: Open Closed Principle