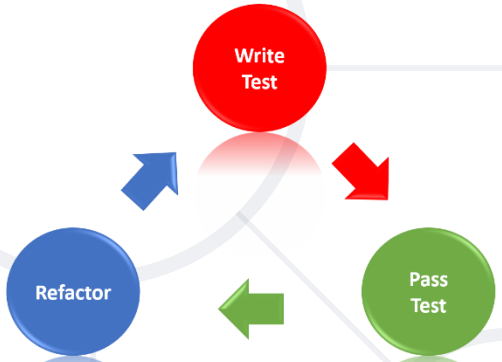
Mocking and Test-Driven Development

Learn the "Test First" Approach to Coding



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Isolating Behaviors

Dependencies

Coupling and Testing

- Consider testing the following code:
  - We want to test a **single behavior**

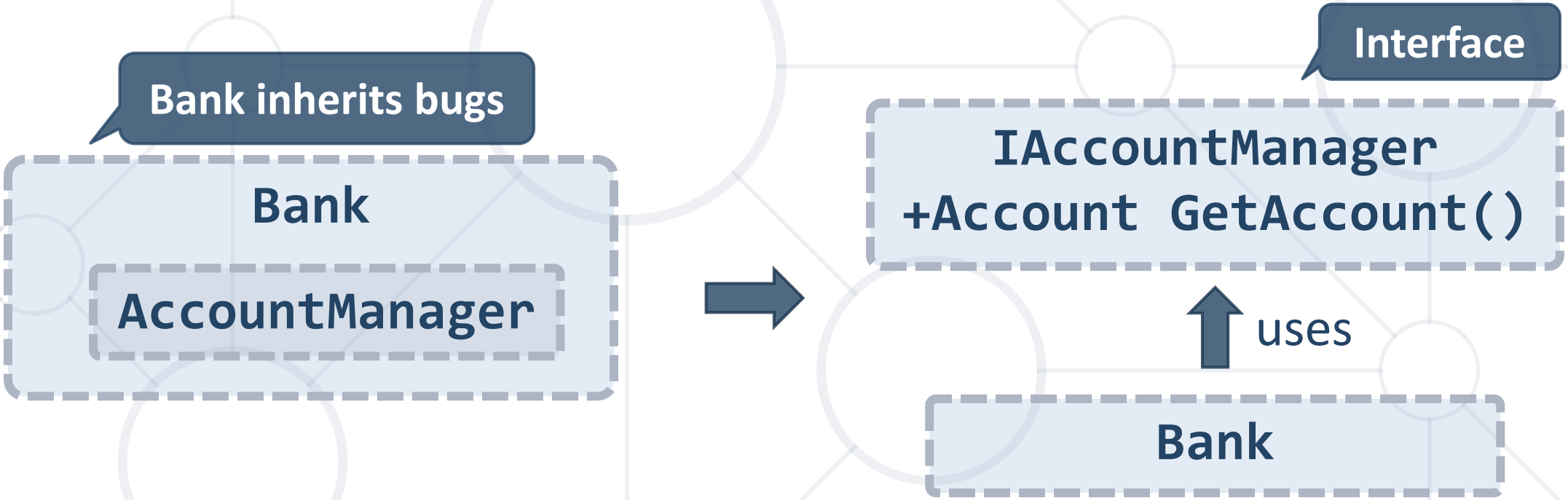
```
public class Bank {
  private AccountManager accountManager;

  public Bank()
  {
    this.AccountManager = new AccountManager();
  }

  public AccountInfo GetInfo(string id) { … }
}
```

Concrete Implementation

Bank depends on AccountManager

Coupling and Testing

- Need to find solution to **decouple classes**



Dependency Injection

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- Decouples classes and makes code testable

```
public interface IAccountManager
{
  Account Account { get; }
}
public class Bank
{
  private IAccountManager accountManager;
  public Bank(IAccountManager accountManager)
  {
    this.accountManager = accountManager;
  }
}
```

Independent from Implementation

Injecting dependencies

Fake Implementations

- Not readable, cumbersome and has too much boilerplate

```
[Test]
public void TestRequiresFakeImplementationOfBigInterface() {
  // Arrange
  Database db = new BankDatabase()
  {
    // Too many methods…
  }

  AccountManager manager = new AccountManager(db);
  // Act…
  // Assert…
}
```

Not suitable for big interfaces

Problem: Test GetGreeting

- Refactor **GetGreeting** to get the date time from outside
- Refactor **GetGreeting** to get the write location from outside
- Write tests to cover the **GetGreeting** method

```
public class GrettingProvider
{
  public string GetGreeting()
  {
    if (DateTime.Now.Hour < 12)
      Console.WriteLine("Good morning!");
    ...
  }
}
```

Mocking

Mocking

- Mock objects **simulate behavior** of real objects
  - The object supplies non-deterministic results - **Time**
  - It has states that are difficult to create or reproduce - **Network**
  - It is slow - **Database**
  - It does not yet exist or may change behavior
  - It would have to include information and methods exclusively for testing purposes (and not for its actual task)

Moq Library

- Moq provides us with an easy way of **creating mock objects**
  - Simple to use
  - Strongly typed
  - Minimalistic

```
Mock<IContainer> mockContainer = new Mock<IContainer>();
Mock<ICustomerView> mockView = new Mock<ICustomerView>();
```

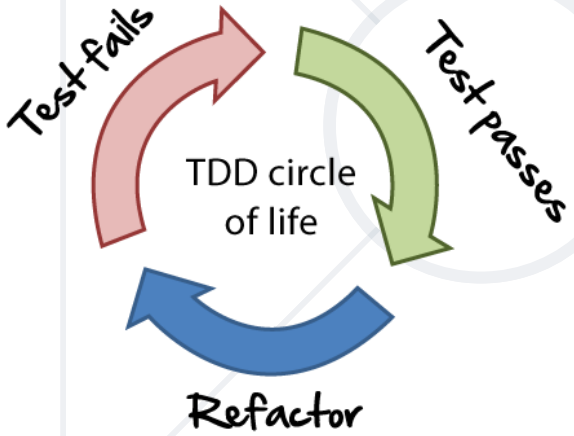
Mocking Example

```
Mock<ITarget> fakeTarget = new Mock<ITarget>();

fakeTarget
   .Setup(p => p.TakeAttack(It.IsAny<int>()))
   .Callback(() => hero.Weapon.DurabilityPoints -= 1);

fakeTarget
   .Setup(p => p.Health)
   .Returns(0);
```

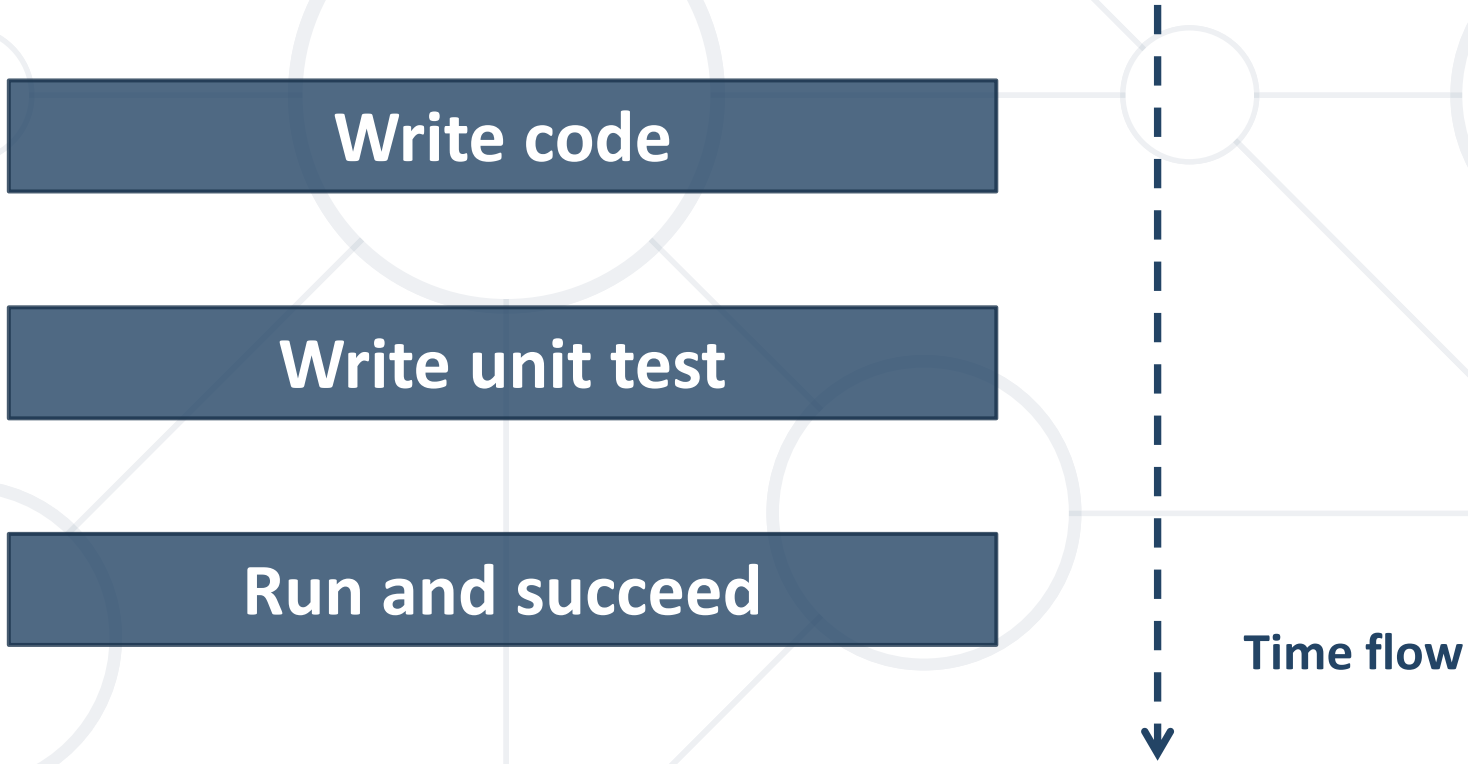
Test-Driven Development

Unit Testing Approaches

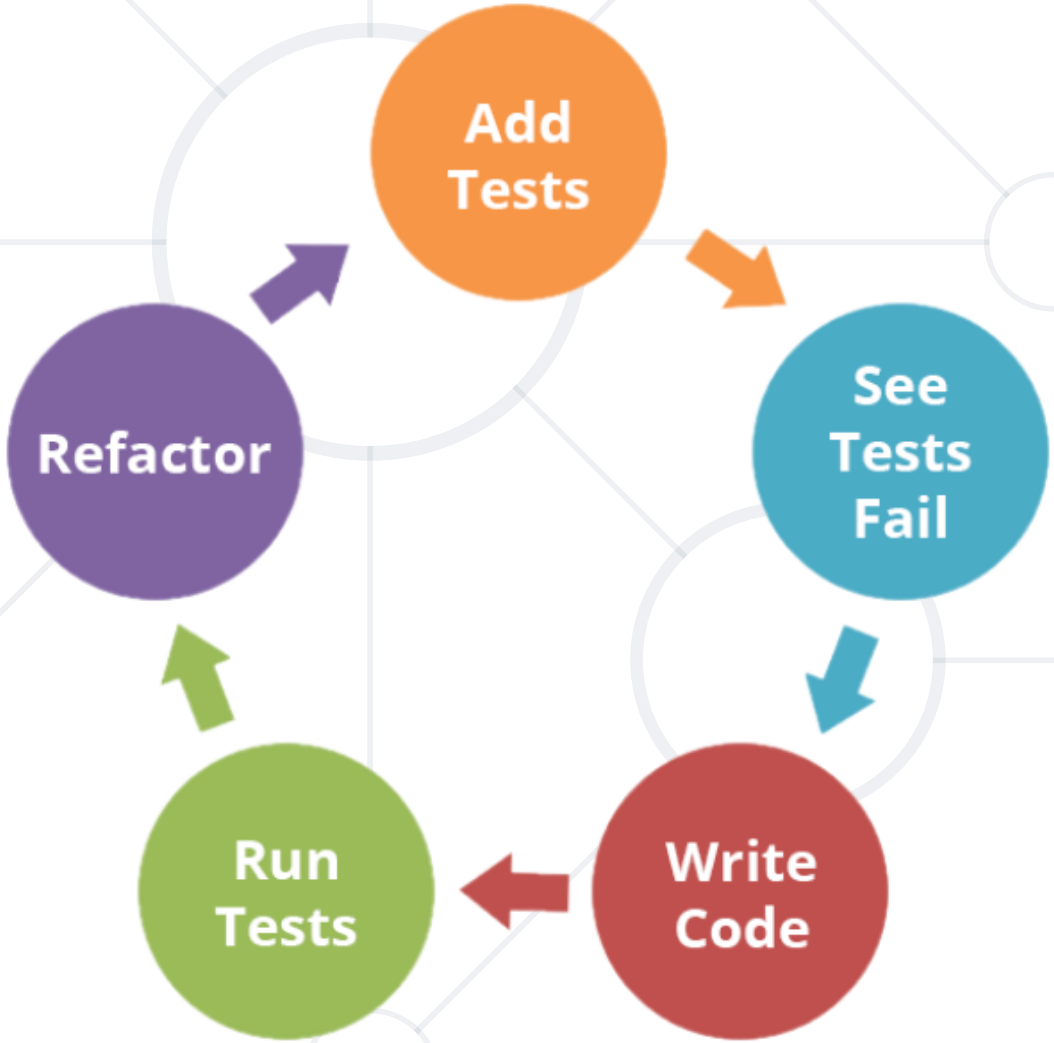
- "**Code First**" (code and test) approach
  - Classical approach
- "**Test First**" approach
  - Test-driven development (TDD)



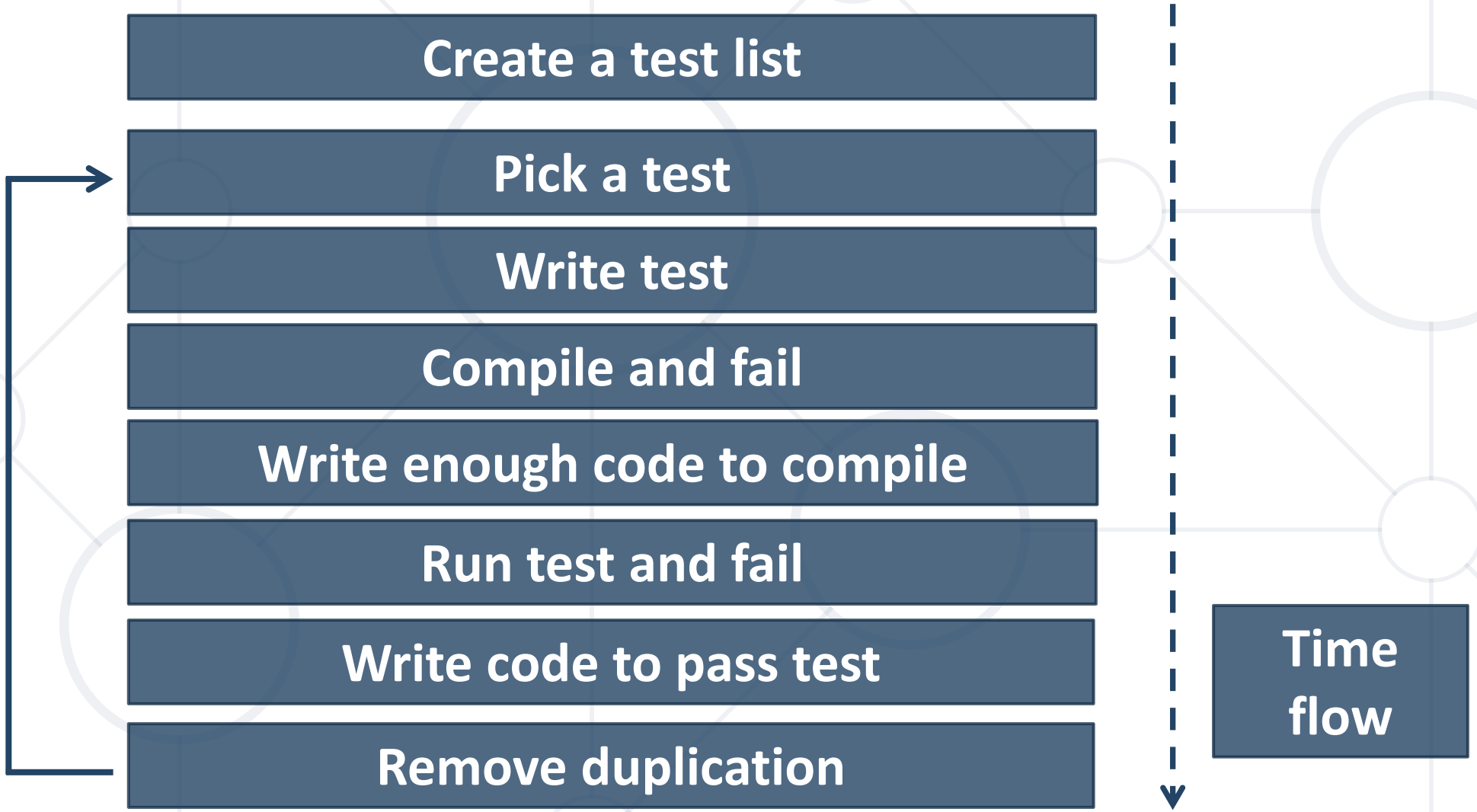
The Code and Test Approach



The Test-Driven Development Approach



Test-Driven Development (TDD)



Why TDD?

- **TDD** helps find design issues early
  - Avoids reworking
- Writing code to satisfy a test is a focused activity
  - **Less** chance of **error**
- **Tests** will be more **comprehensive** than if they are written after the code

Myths and Misconceptions

- You create a 100% regression test suite
- The unit tests form 100% of your design specification
- You only need to unit test
- TDD is sufficient for testing
- TDD doesn't scale (partially true)
  - Your test suite takes too long to run
  - Not all developers know how to test
  - Everyone might not be taking a TDD approach

Summary

- **Code and Test**
  - Write code, then test it
- **Test-Driven** Development
  - Write tests first
- Reasons to use TDD
  - Prevent some application design flaws
  - Manage complexity more easily

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