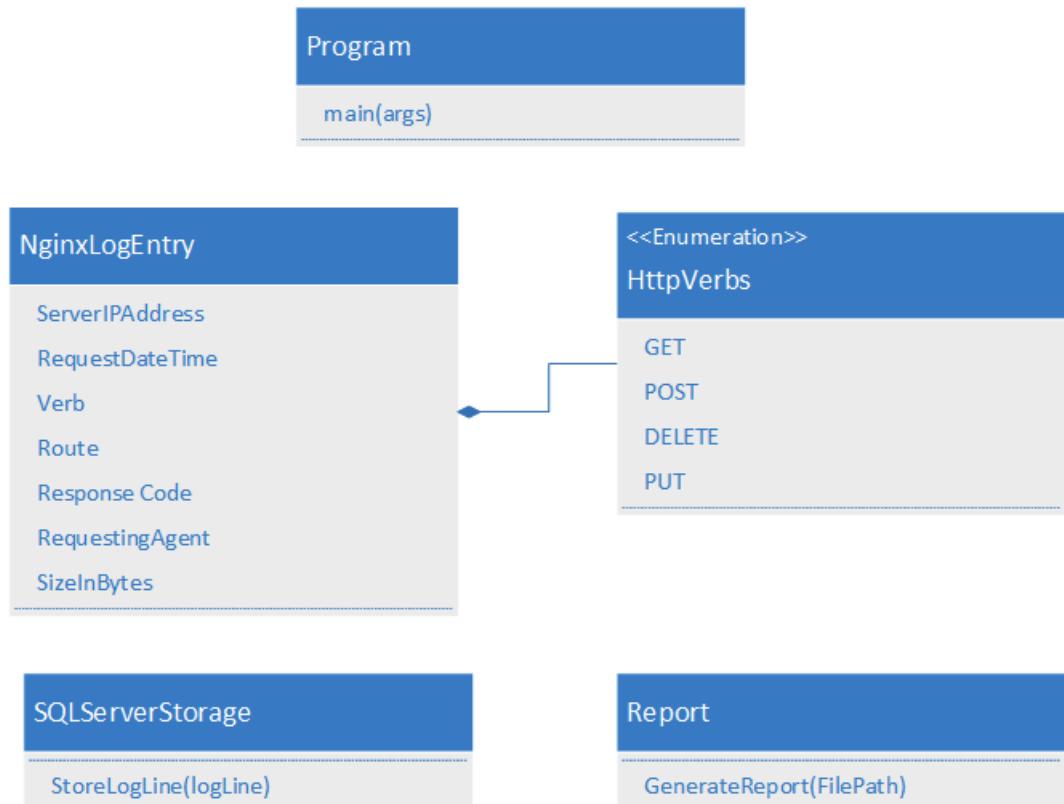


## **Chapter 1: There's a Big Ball of Mud on Your Plate of Spaghetti**





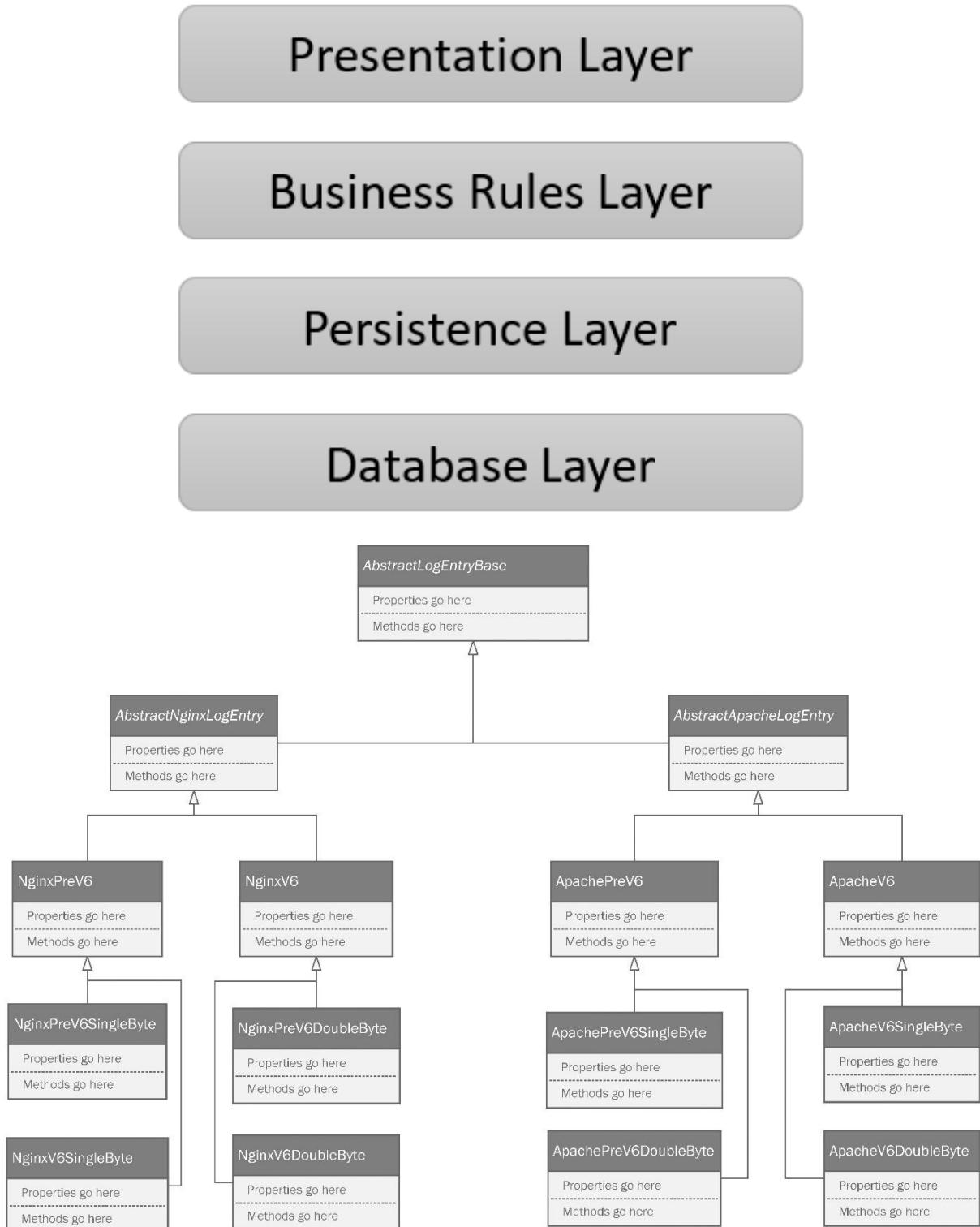
9/9

0800 Actan started  
 1000 .. stopped - actan ✓  
 1300 (032) MP-MC 1.2700 9.037 847 025  
 (033) PRO 2 2.130476415  
 const 2.130676415  
 Relays 6-2 in 033 failed special sped test  
 in relay 10.000 test -  
 Relays changed  
 1100 Started Cosine Tapc (Sine check)  
 1525 Started Multi Adder Test.

1545  Relay #70 Panel F  
 (moth) in relay.

First actual case of bug being found.  
 1630 Actan started.  
 1700 closed down.

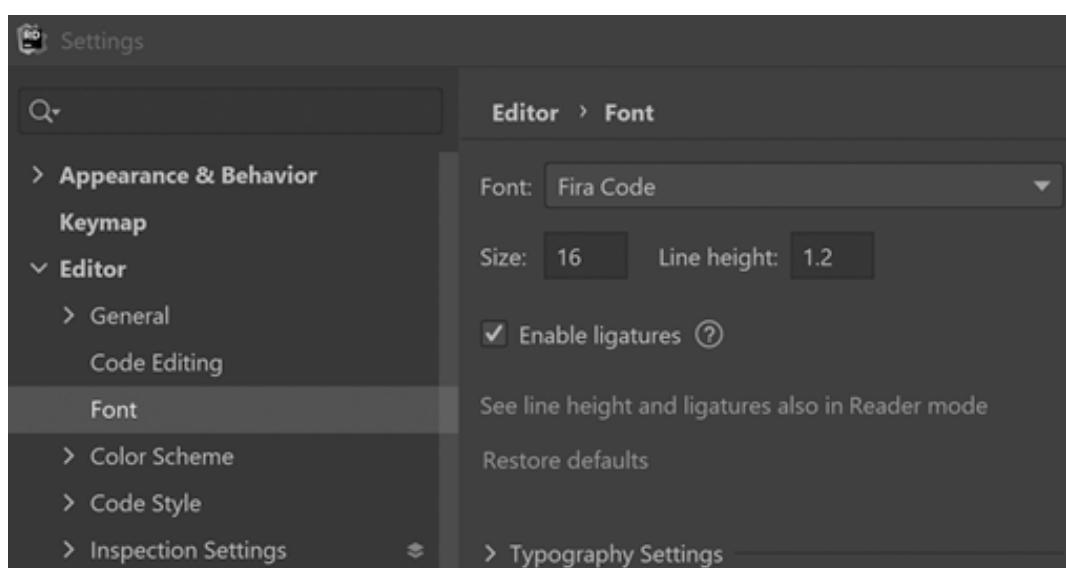
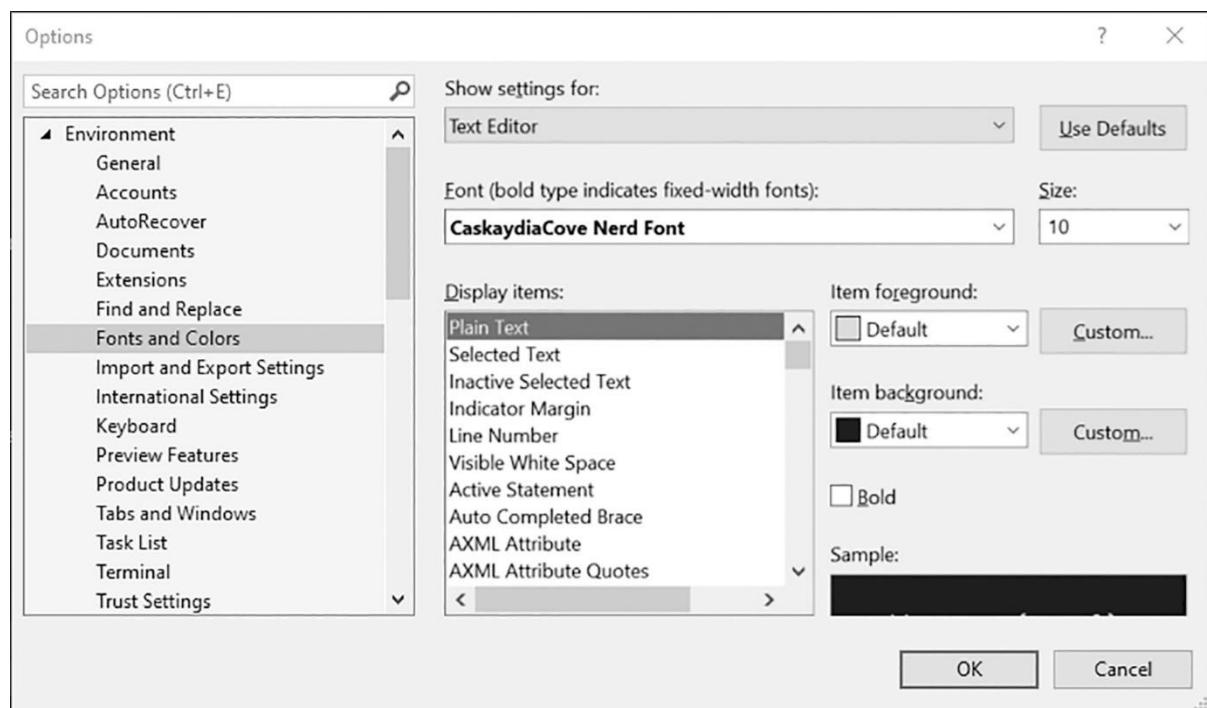
## Chapter 2: Prepping For Practical Real-World Applications of Patterns in C#

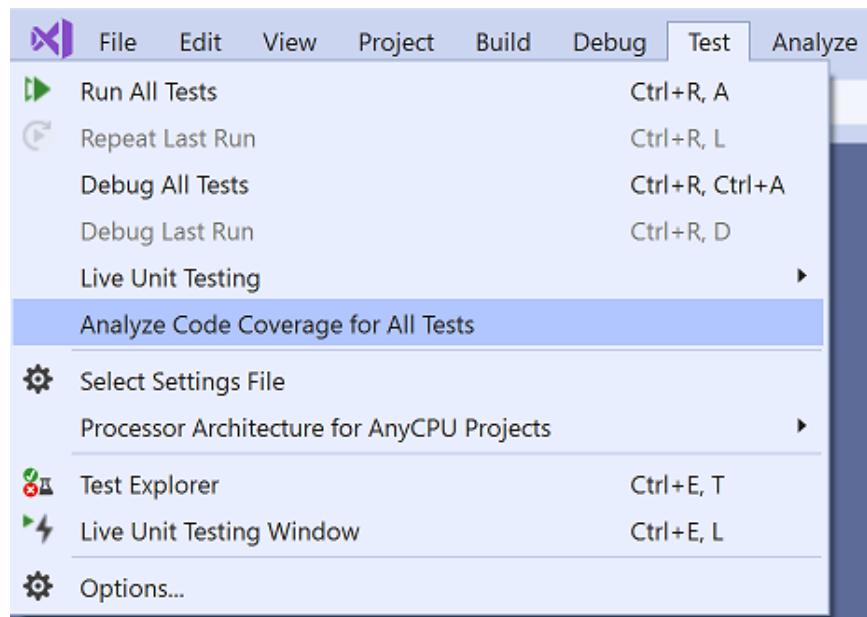


```
// See https://aka.ms/new-console-template for more information

using System;

Console.WriteLine("Hello, World!");
var firstNumber = 6;
if (firstNumber != 5)
{
    Console.WriteLine("It's not 5");
}
```

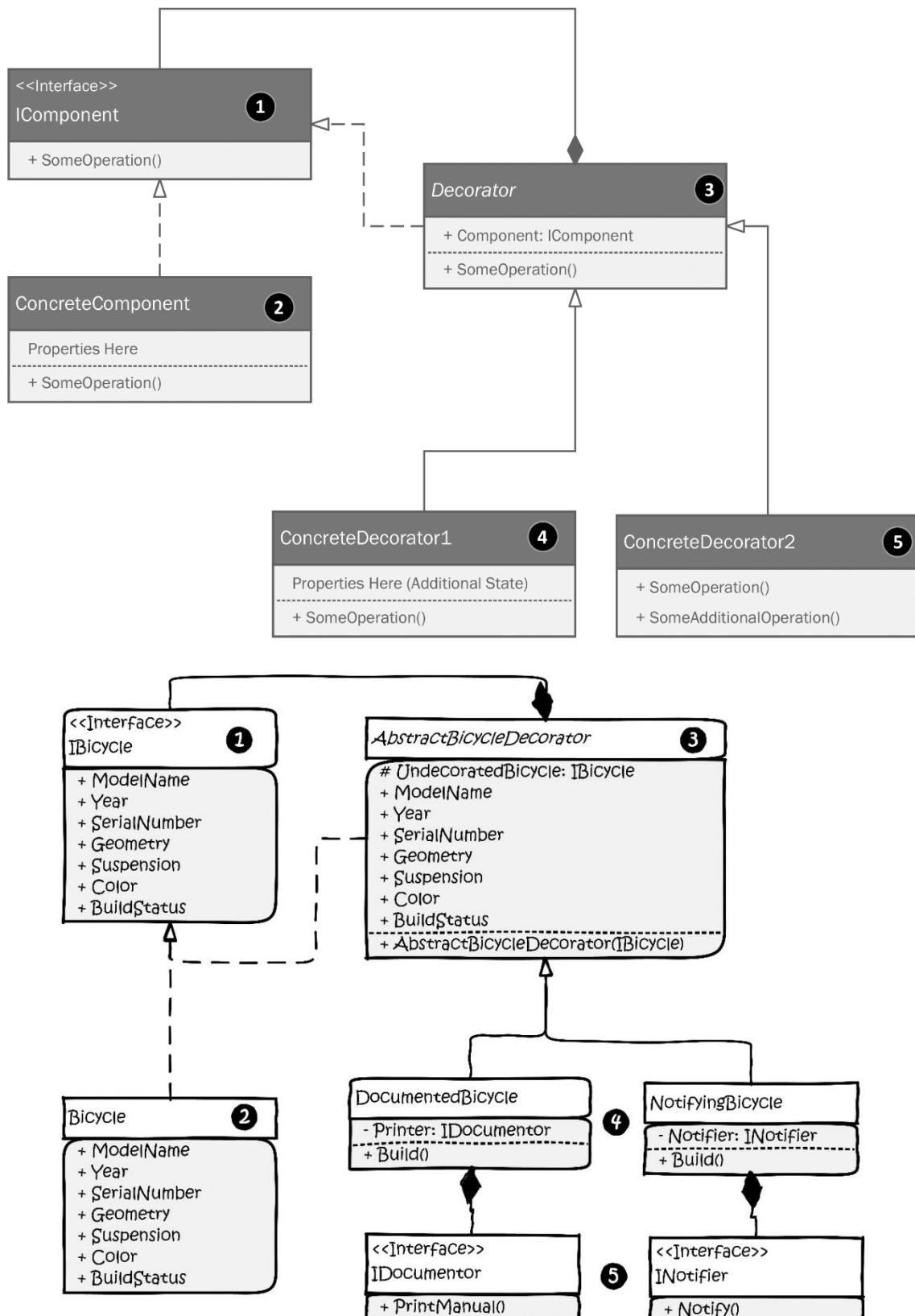




## **Chapter 3: Getting Creative with Creation Patterns**

*No images...*

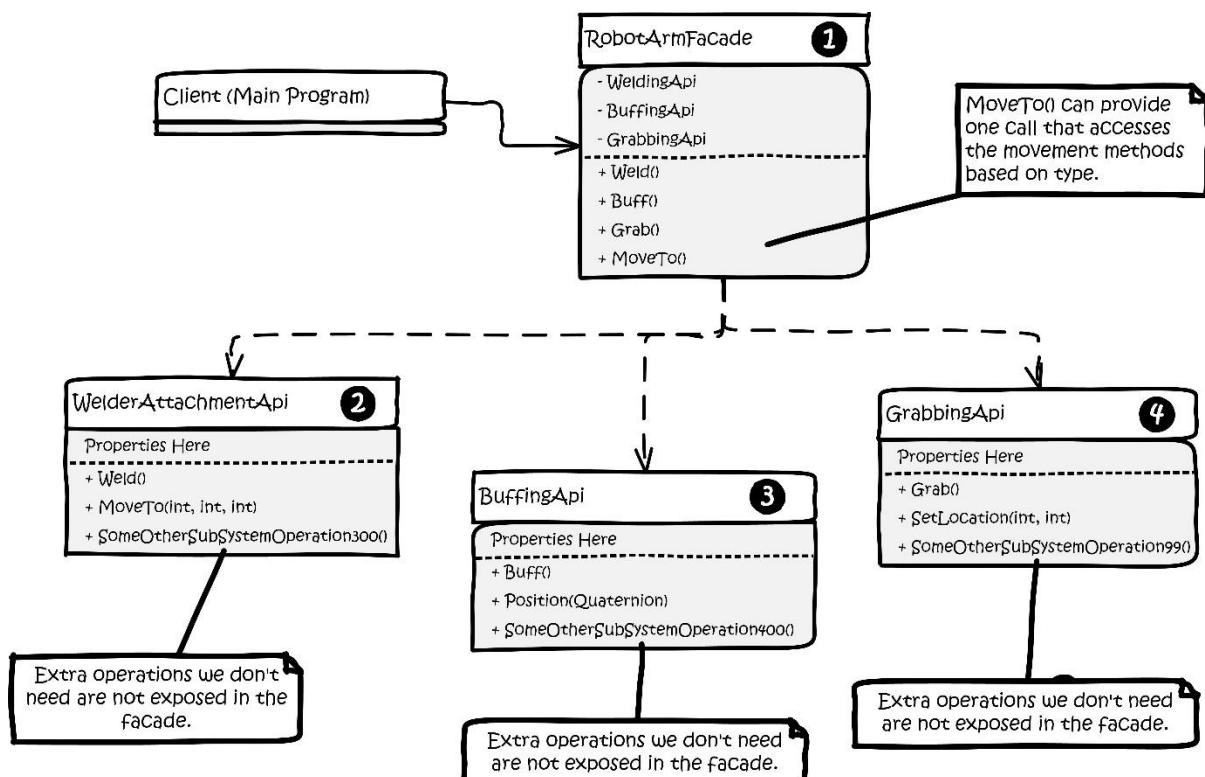
## Chapter 4: Fortify Your Code With Structural Patterns

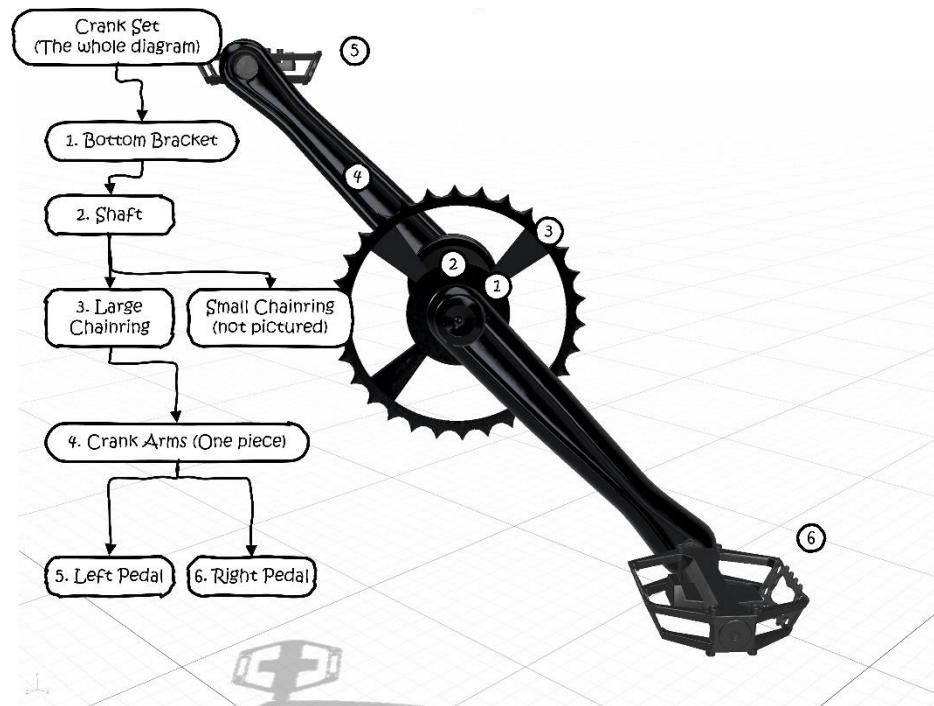
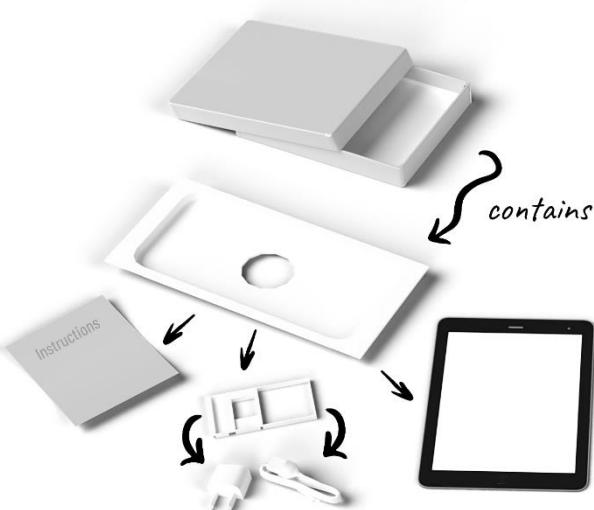


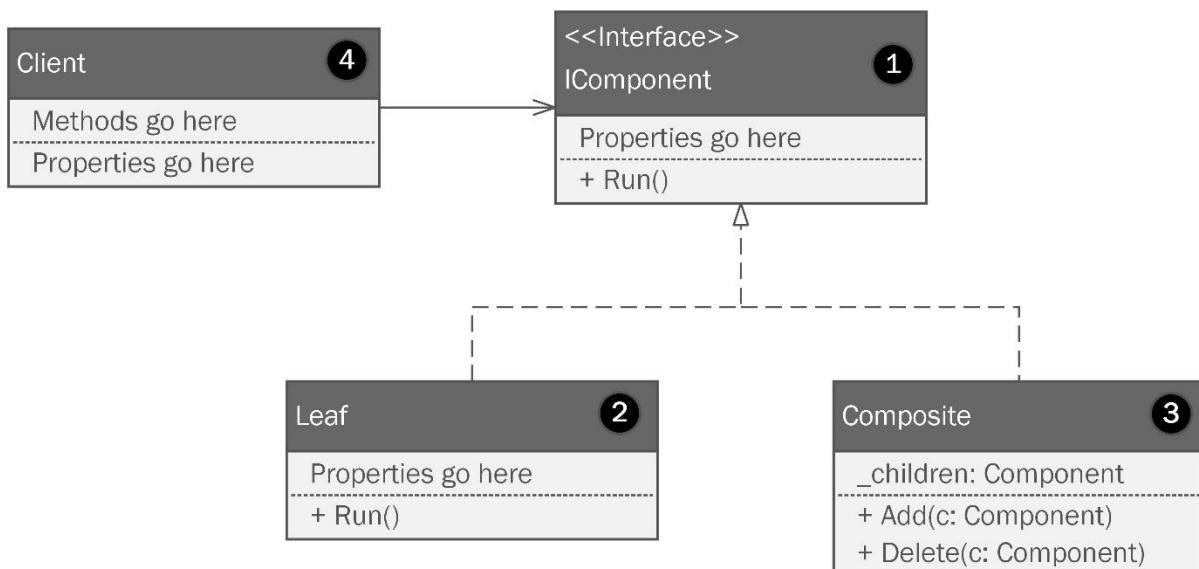
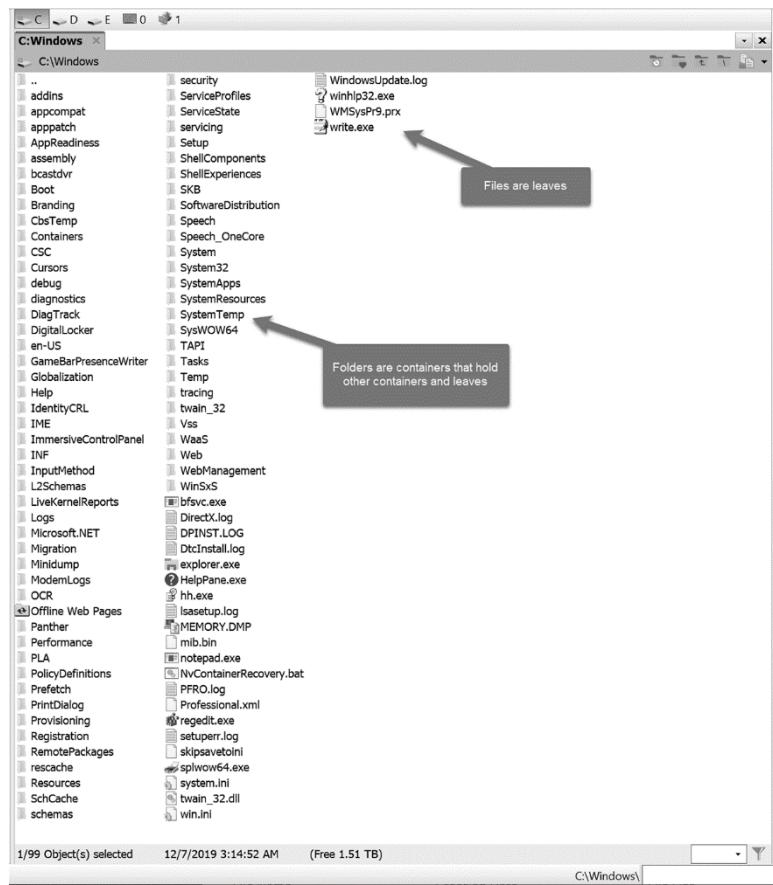
```
C:\Users\Bruce\AppData\Local\JetBrains\Toolbox\apps\Rider\ch-0\221.5591.20\plugins\dpa\DotFiles\JetBrains.DPA.Runner.exe --handle=6164 --backend-pid=253
80 --detach-event-name=dpa.detach.6164 C:/Users/Bruce/Projects/Real-World-Implementation-of-C-Design-Patterns/chapter-4/DecoratorExample/bin/Debug/net6.0/DecoratorExample.exe
Manufacturing a Upright frame...
Status: FrameManufactured
Painting the frame Blue
Status: Painted
2022 Hillcrest Bicycle serial number 0bb1f53d-3b8a-4216-adf4-ea1a7e65e4a0 manufacturing complete!
Status: Complete
The manual is printing!
+++++
Manufacturing a Upright frame...
Status: FrameManufactured
Painting the frame Blue
Status: Painted
2022 Hillcrest Bicycle serial number 0bb1f53d-3b8a-4216-adf4-ea1a7e65e4a0 manufacturing complete!
Status: Complete
The materials inventory control system has been notified regarding the manufacture of this bicycle.
+++++
Manufacturing a Upright frame...
Status: FrameManufactured
Painting the frame Blue
Status: Painted
2022 Hillcrest Bicycle serial number 0bb1f53d-3b8a-4216-adf4-ea1a7e65e4a0 manufacturing complete!
Status: Complete
The manual is printing!
The materials inventory control system has been notified regarding the manufacture of this bicycle.

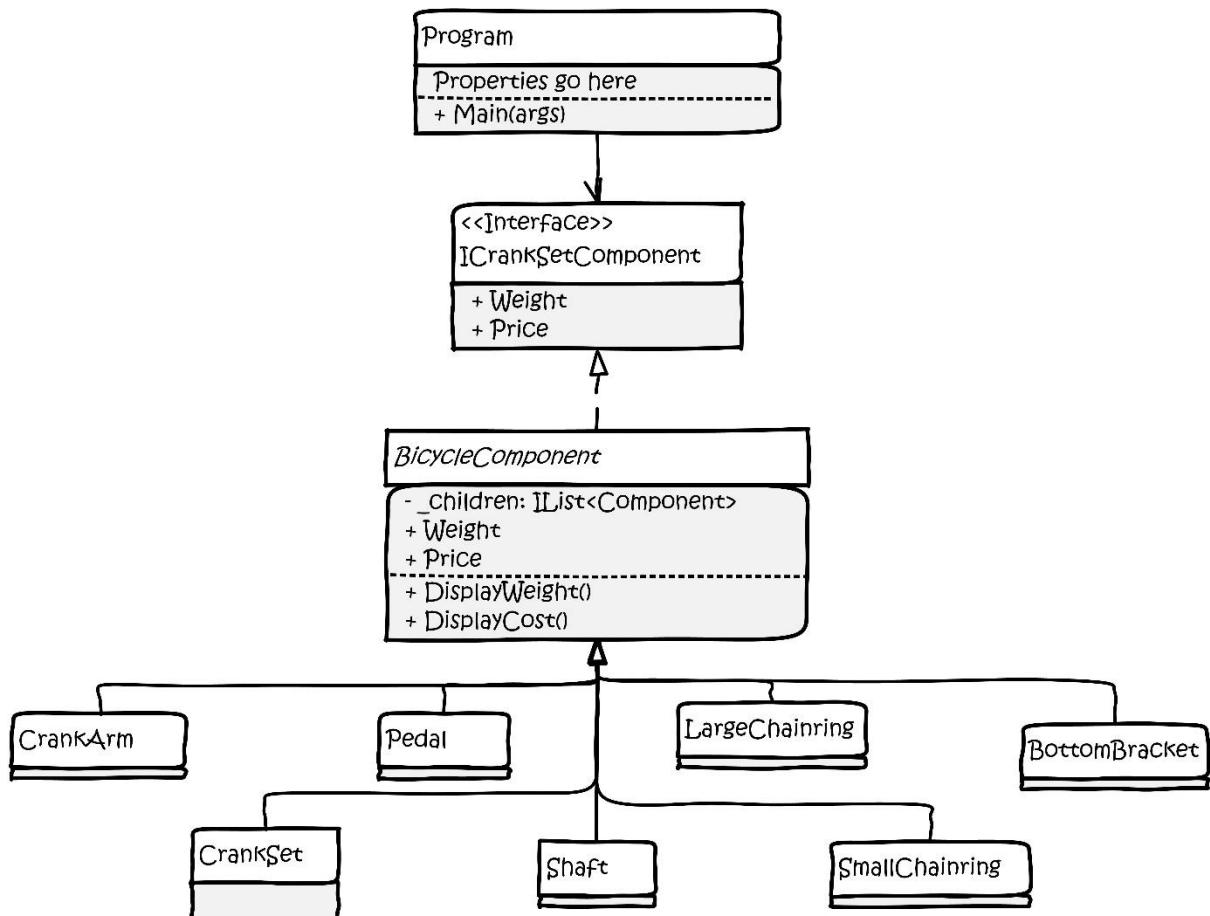
Process finished with exit code 0.
```



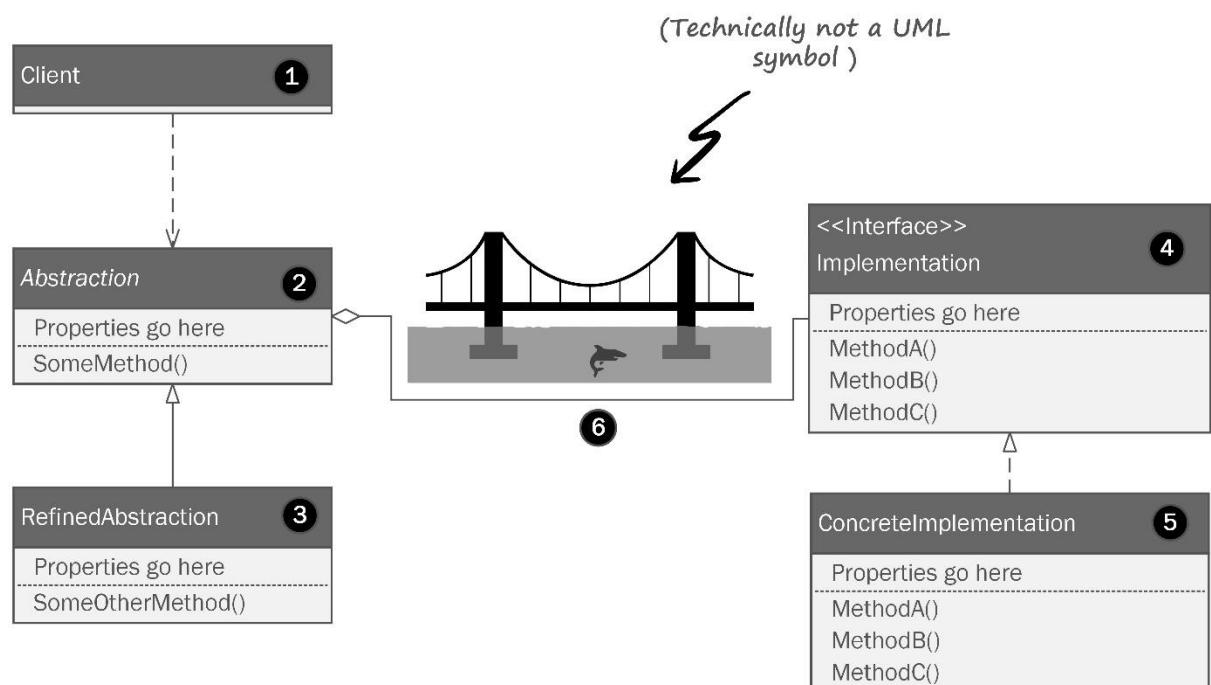
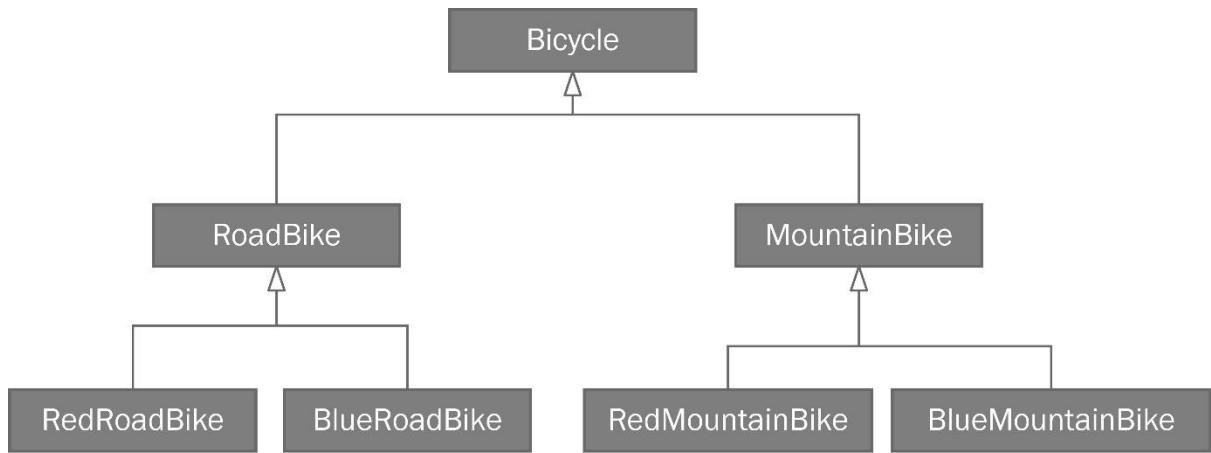


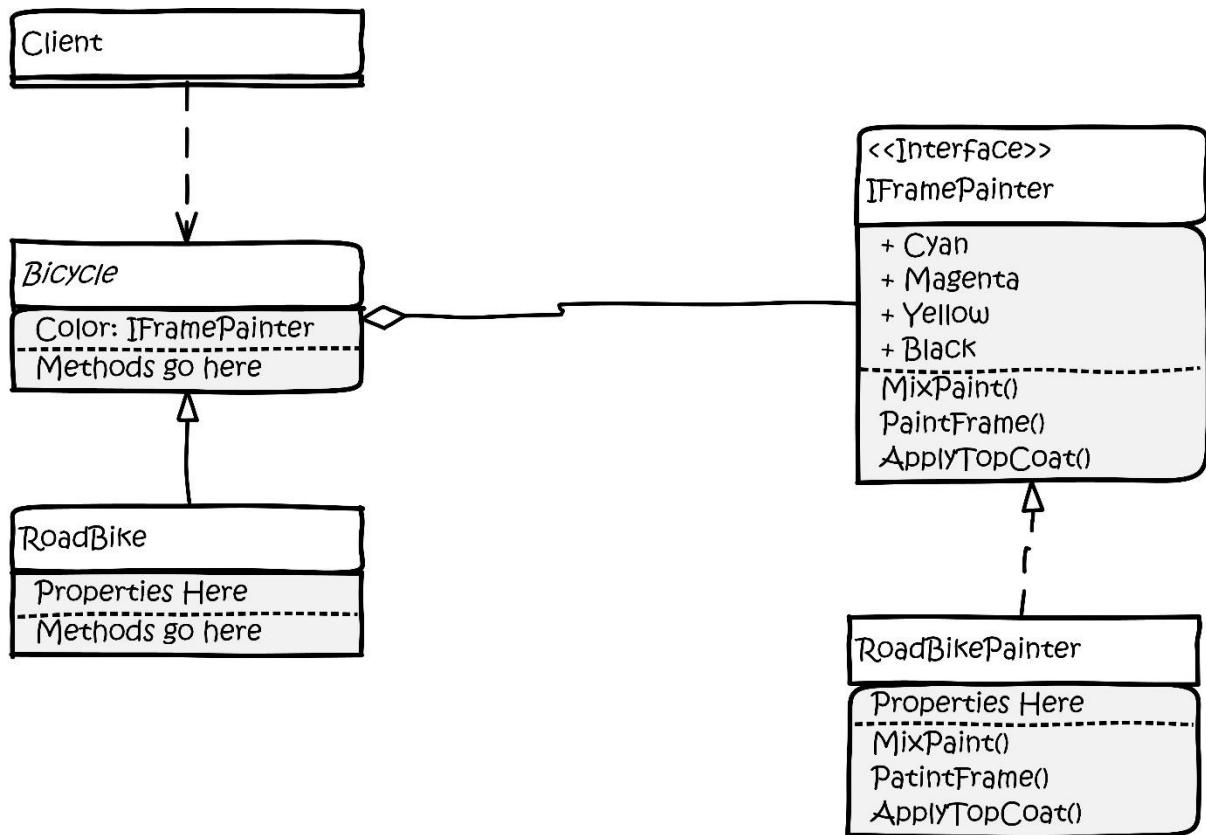




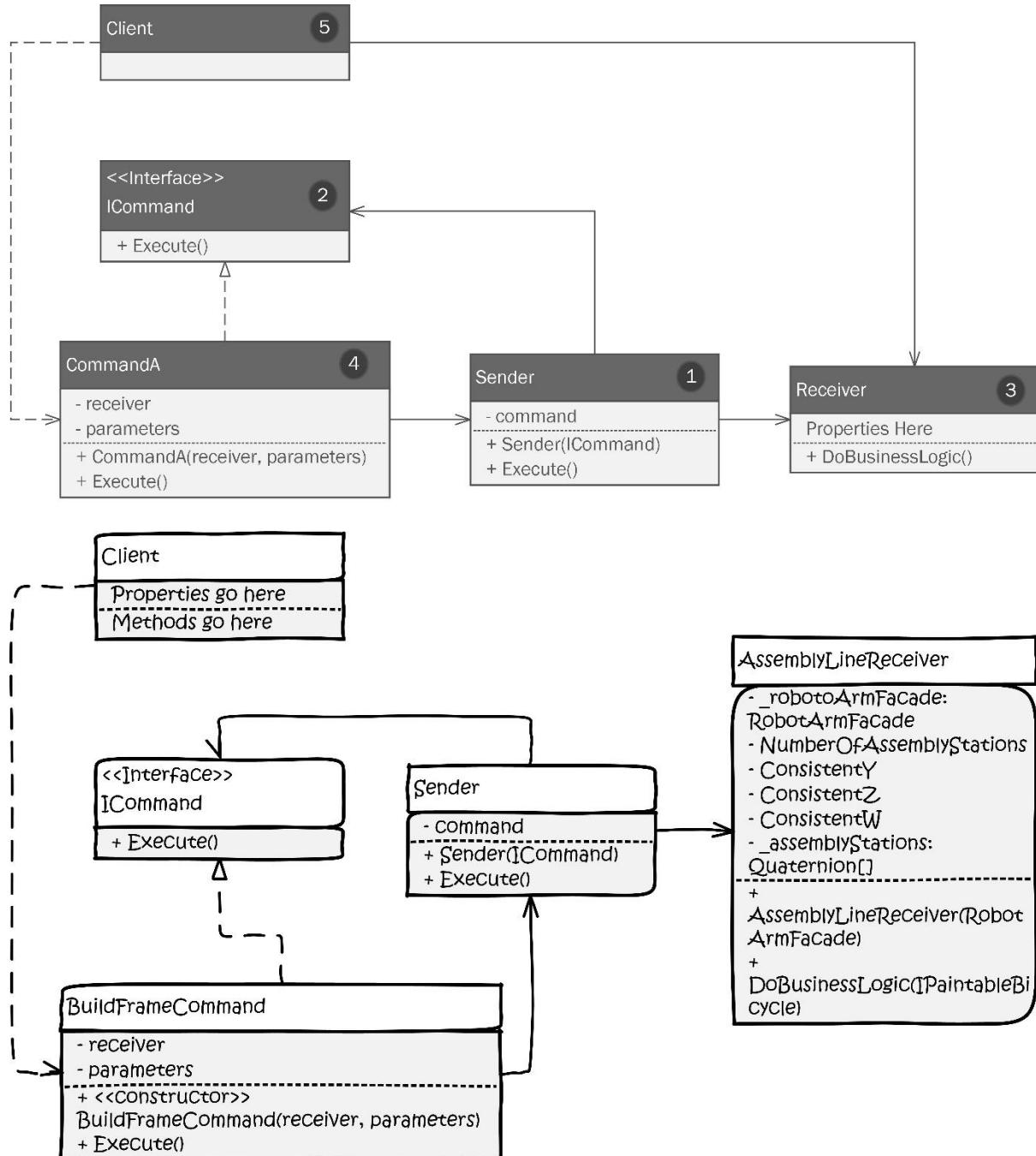


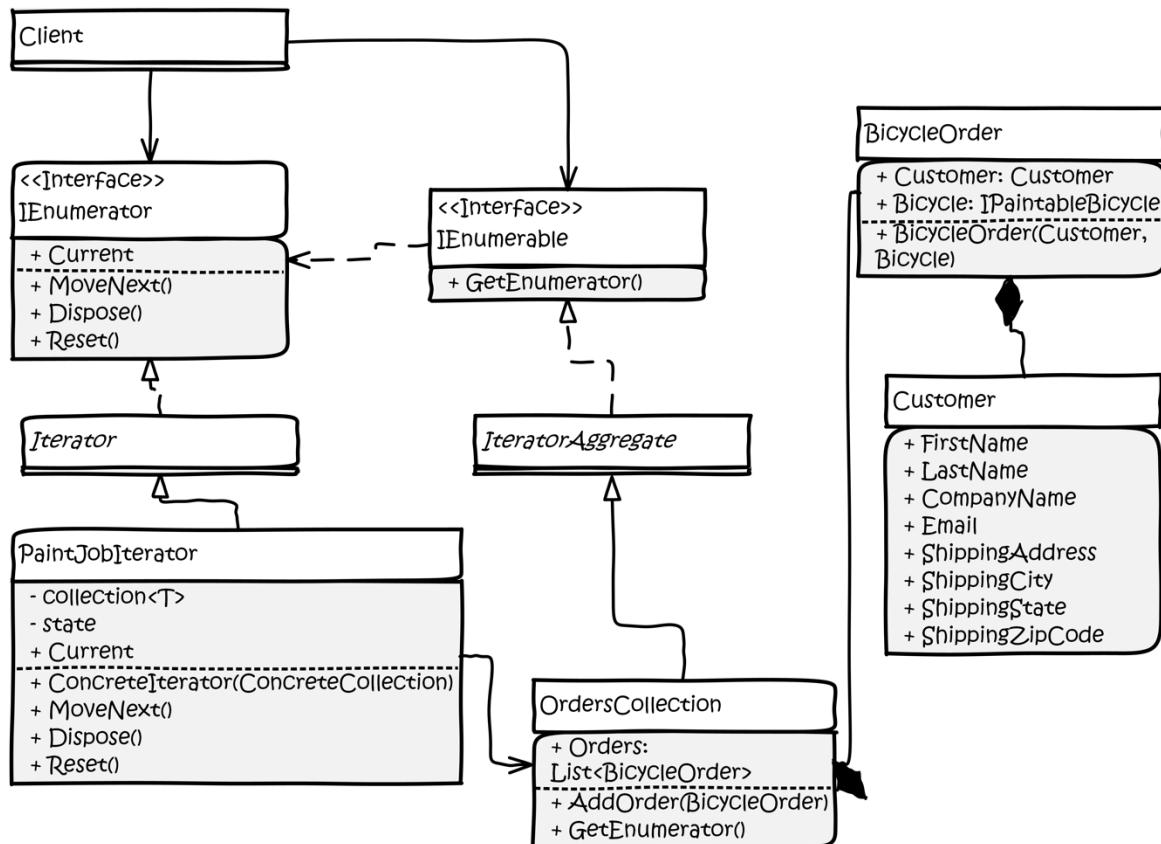
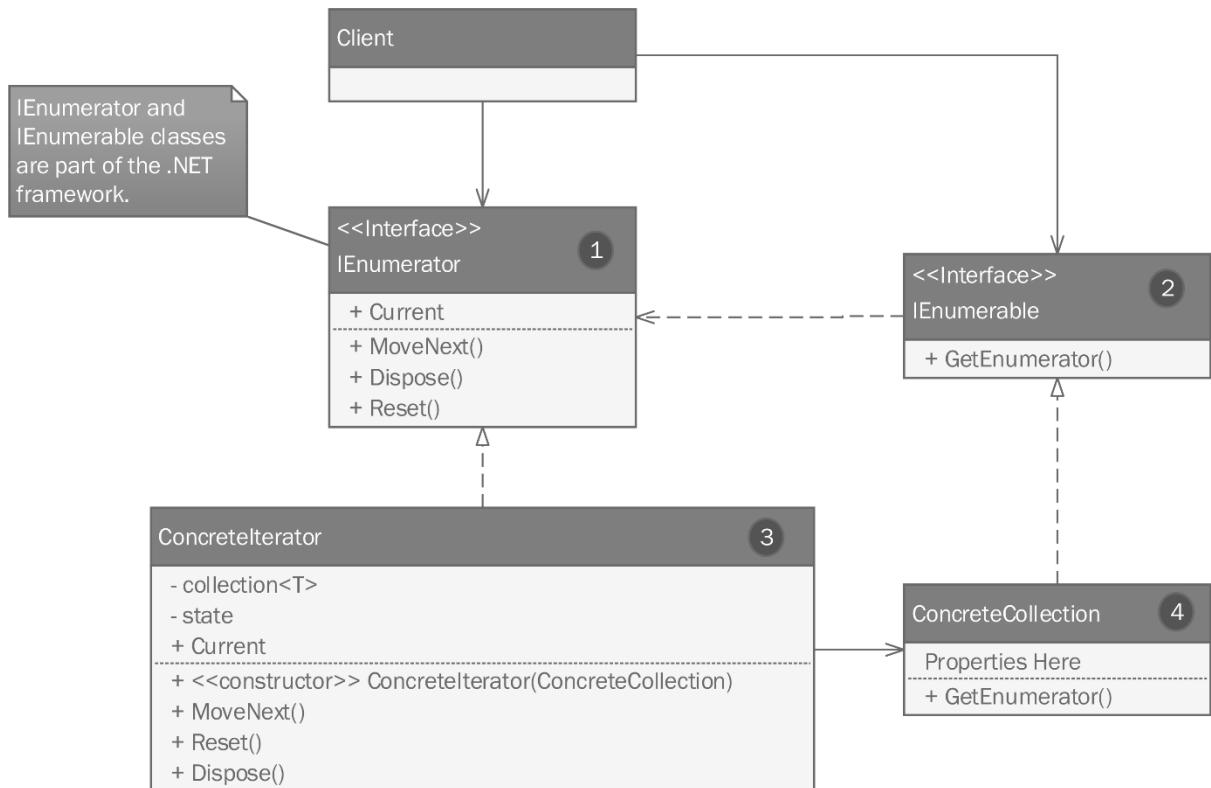
```
C:\Users\Bruce\AppData\Local\JetBrains\Toolbox\apps\Rider\ch-0\221.5591.20\plugins\dpa\DotFiles\JetBrains.DPA.Runner.exe --handle=5444 --backend-pid=25380 --detach-event-name=dpa.detach.5444 C\n:~/Users/Bruce/Projects/Real-World-Implementation-of-C-Design-Patterns/chapter-4/CompositeExample\n/bin/Debug/net6.0/CompositeExample.exe\nComposite Example\n----- Weights -----BottomBracket weighs 284.834Shaft weighs 82.03LargeChainRing weighs 57.0983SmallChainRing weighs 52.57CrankArm weighs 432.93Pedal weighs 234.14Pedal weighs 234.14\n----- Cost -----BottomBracket costs $11.51 USDShaft costs $19.55 USDLargeChainRing costs $13.53 USDSmallChainRing costs $11.33 USD\nCrankArm costs $34.32 USDPedal costs $11.32 USDPedal costs $11.32 USD
```



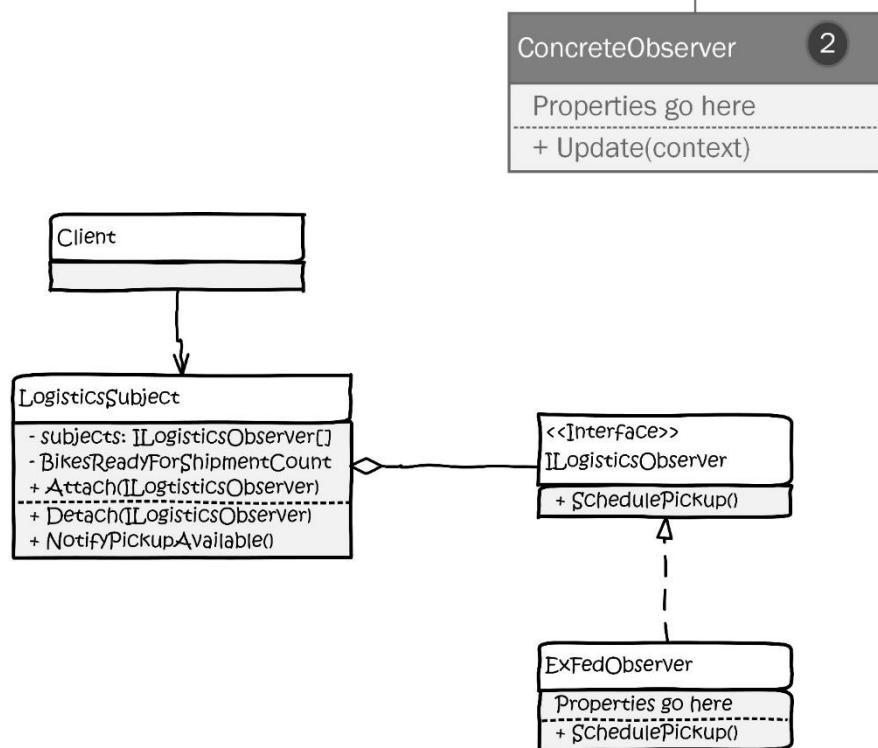
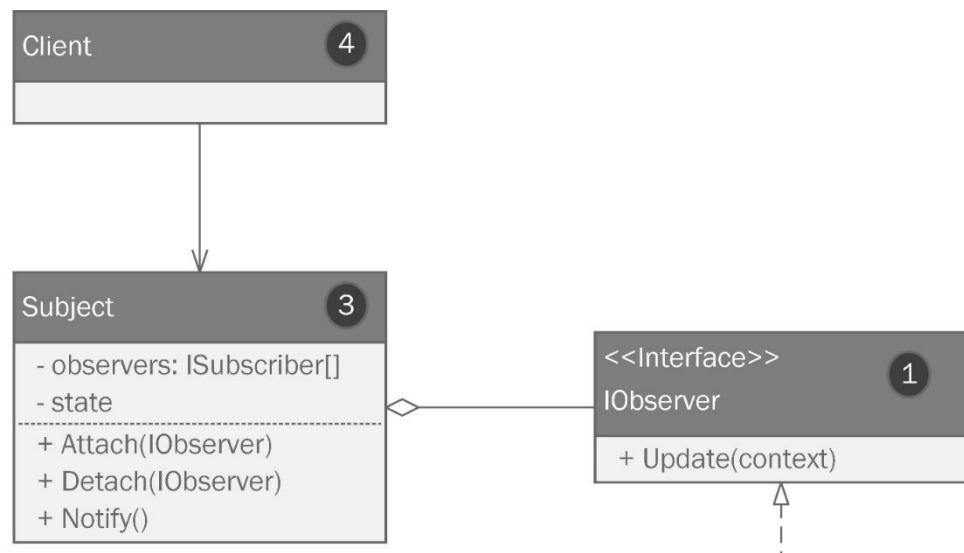


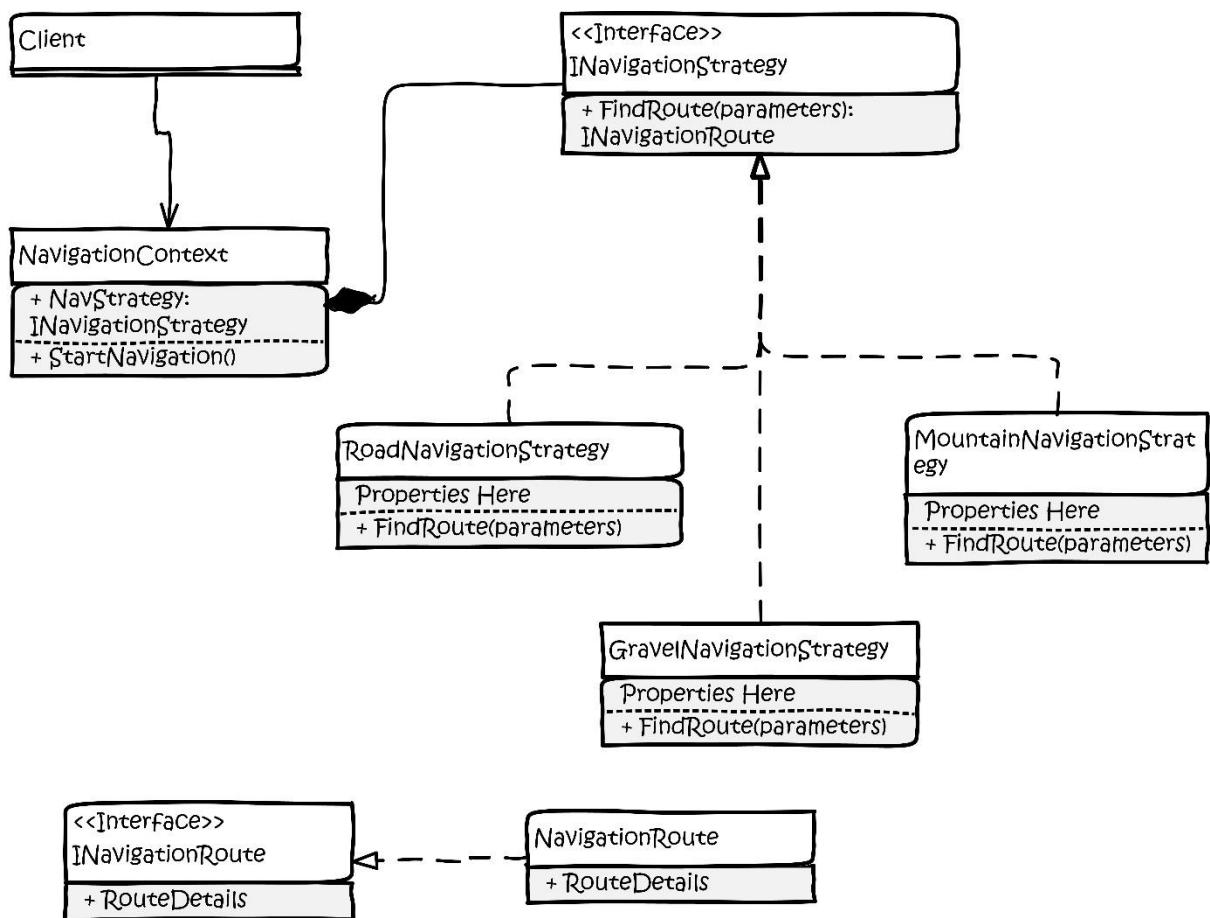
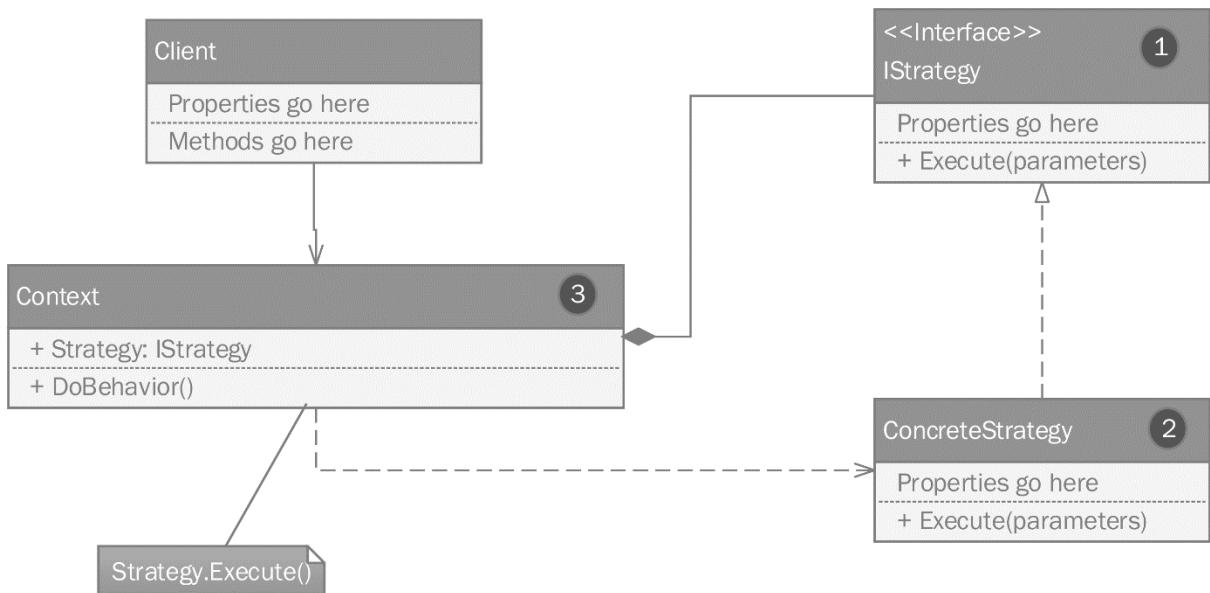
# Chapter 5: Wrangling Problem Code by Applying Behavioral Patterns



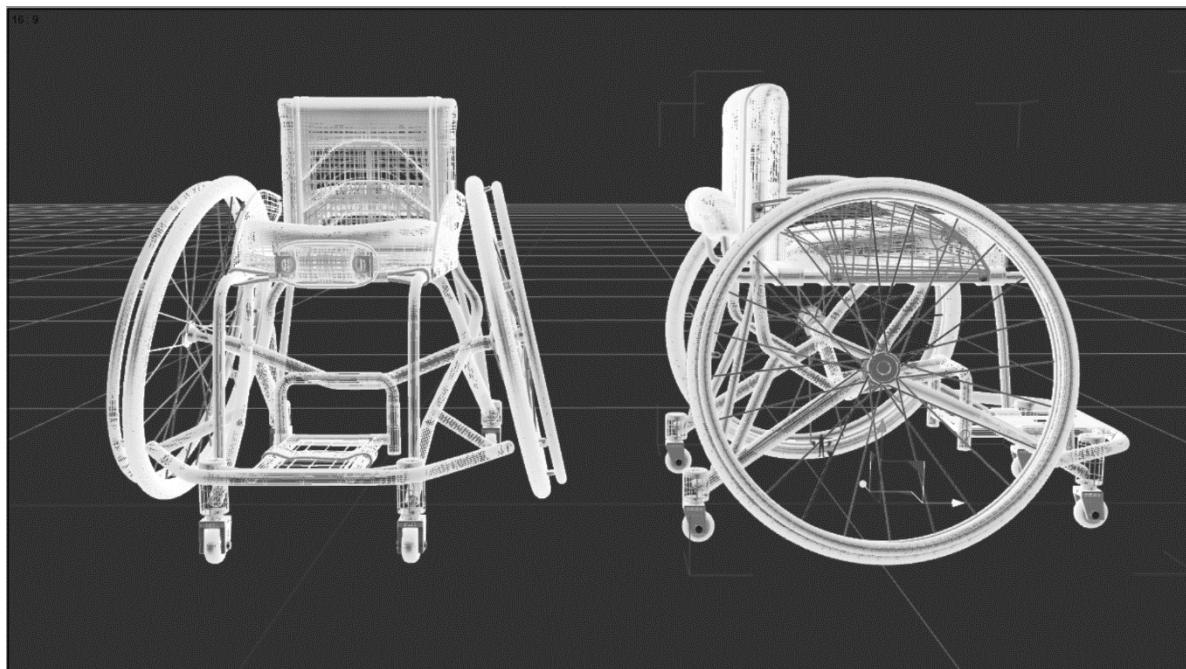
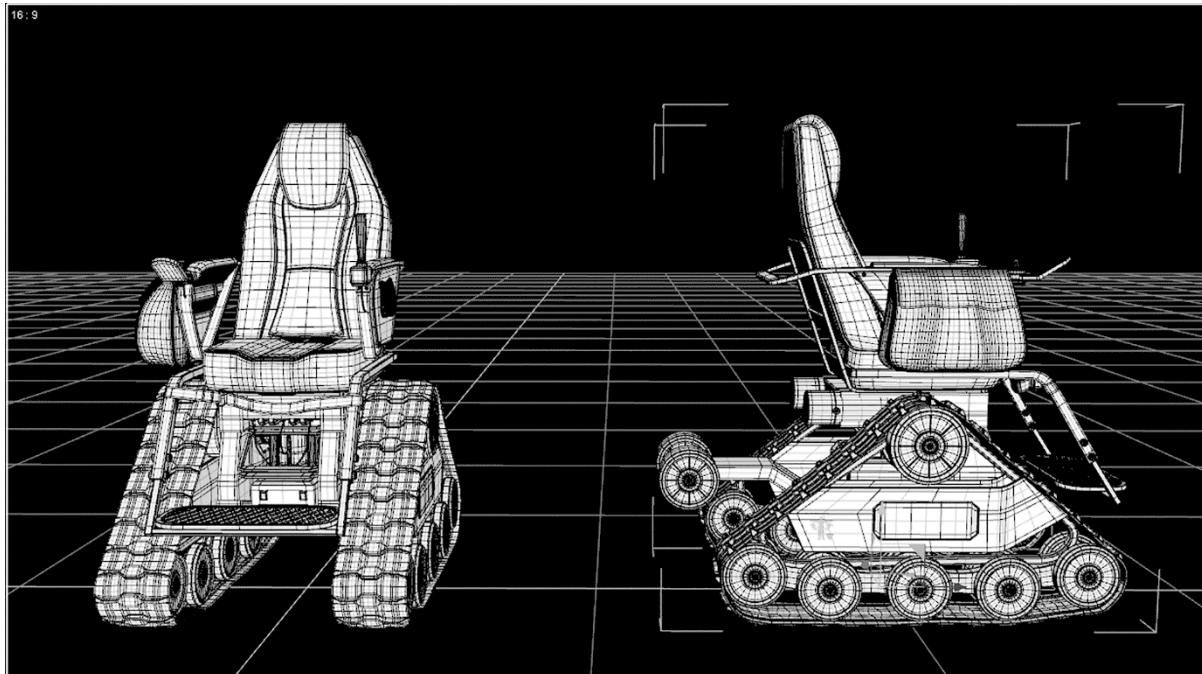


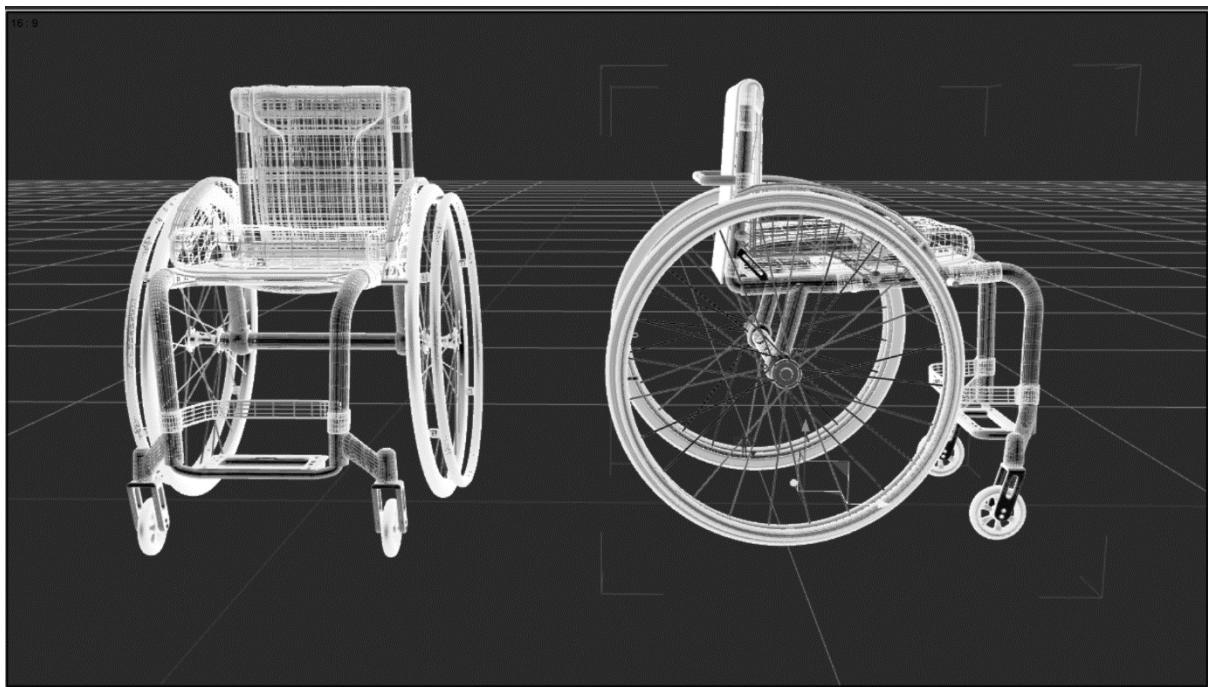
```
C:\Users\Bruce\AppData\Local\JetBrains\Toolbox\apps\Rider\ch-0\221.5787.36\plugins\dpa\DotFiles\JetBrains.DPA.Runner.exe  
entation-of-C-Design-Patterns/chapter-5/IteratorExample/bin/Debug/net6.0/IteratorExample.exe  
Texas Turquoise  
Alpine White  
Red River Shootout  
Amarillo Peacock  
Amarillo Peacock ←  
  
Process finished with exit code 0.
```





## Chapter 6: Step Away from the IDE! Designing with Patterns Before You Code



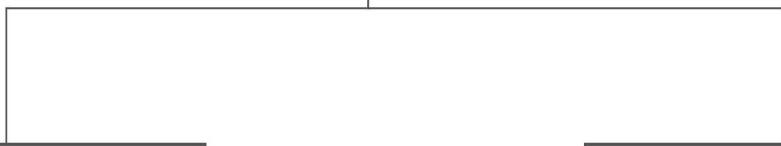


## Wheelchair

- + ModelName
- + Year
- + SerialNumber
- + Frame
- + Seat
- + Wheels [ ]

## Wheelchair

- + Seat
- + Frame
- + SerialNumber
- + Year
- + ModelName

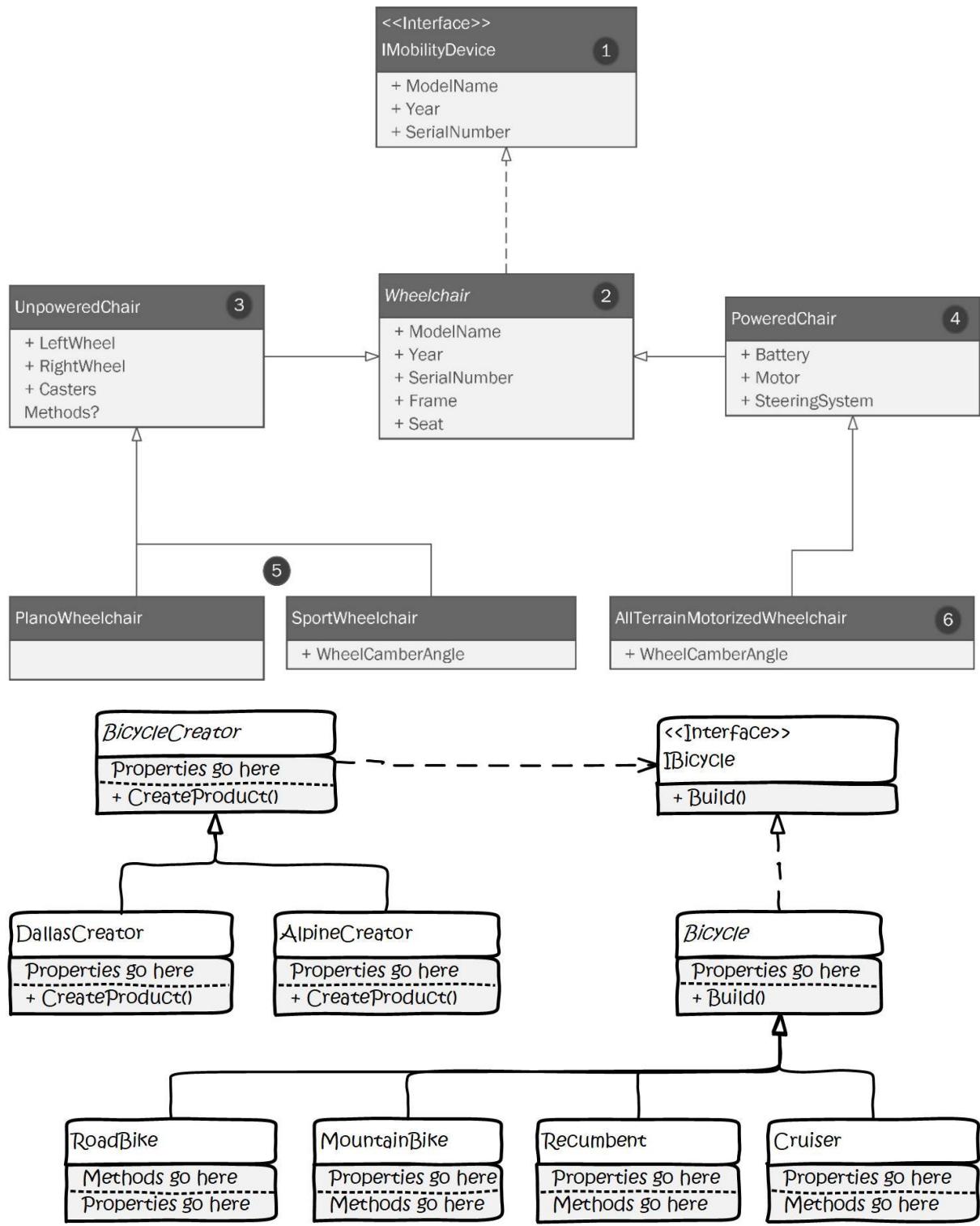


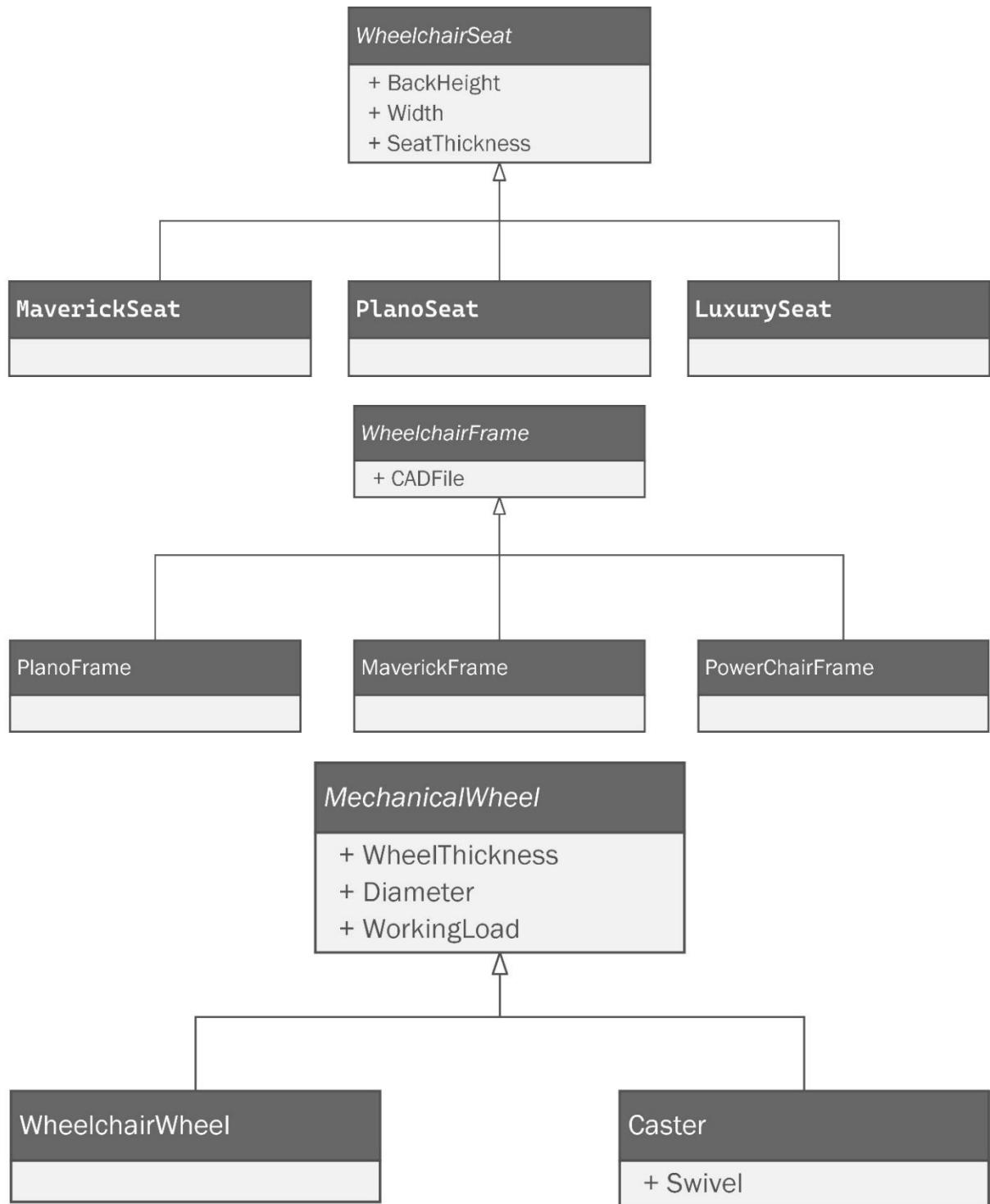
## UnpoweredChair

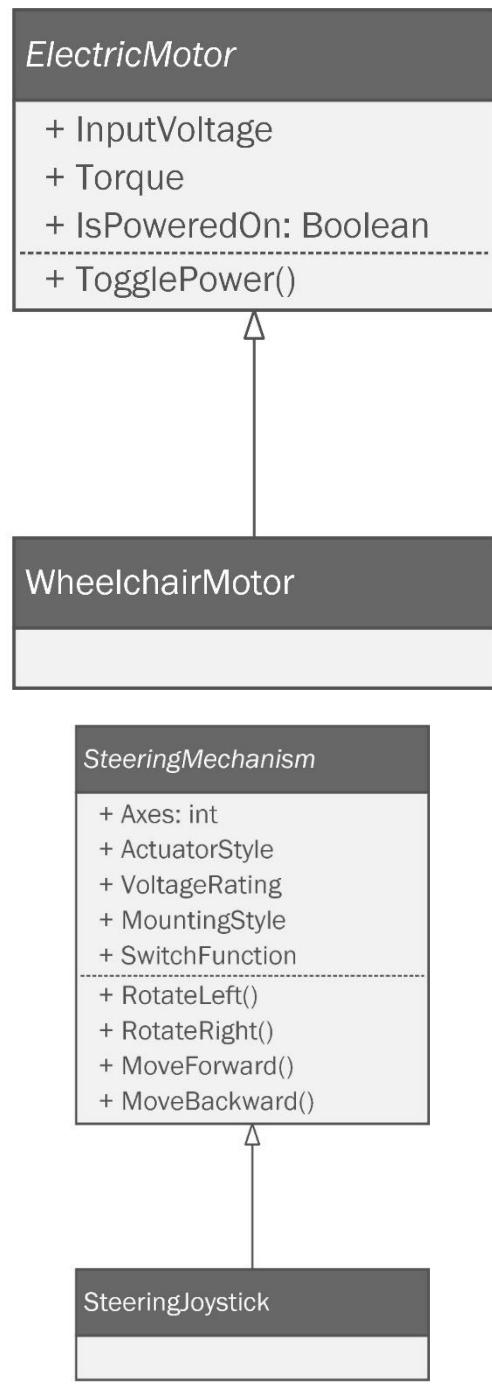
- + LeftWheel
  - + RightWheel
  - + Casters
- 
- Methods?

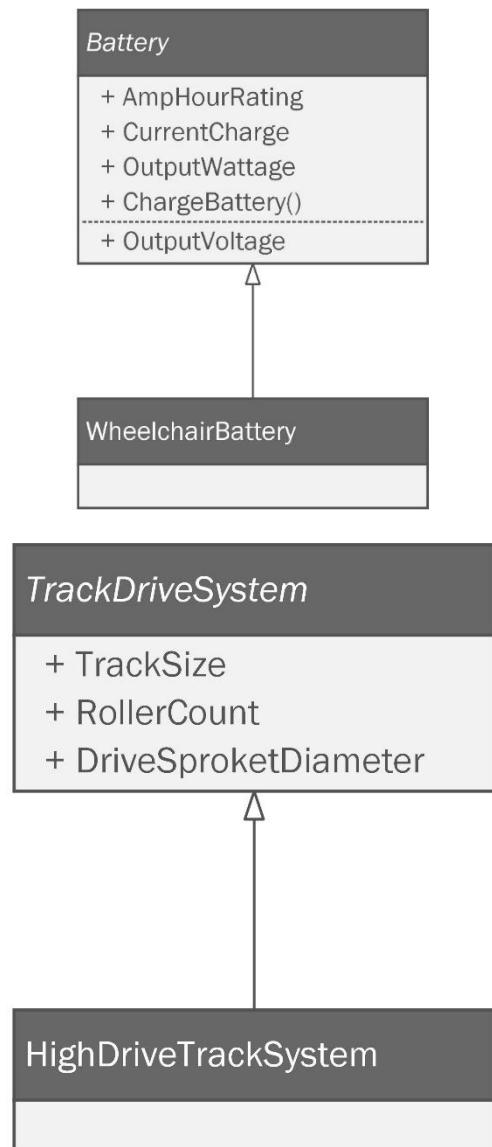
## PoweredChair

- + Battery
- + Motor
- + SteeringSystem

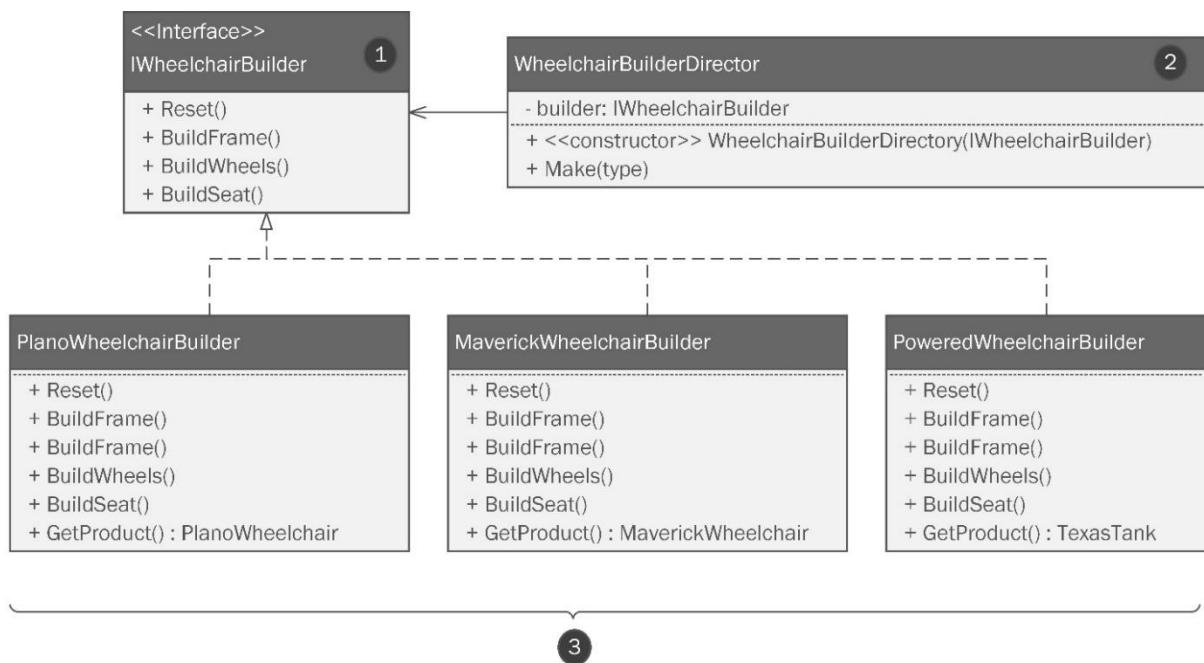


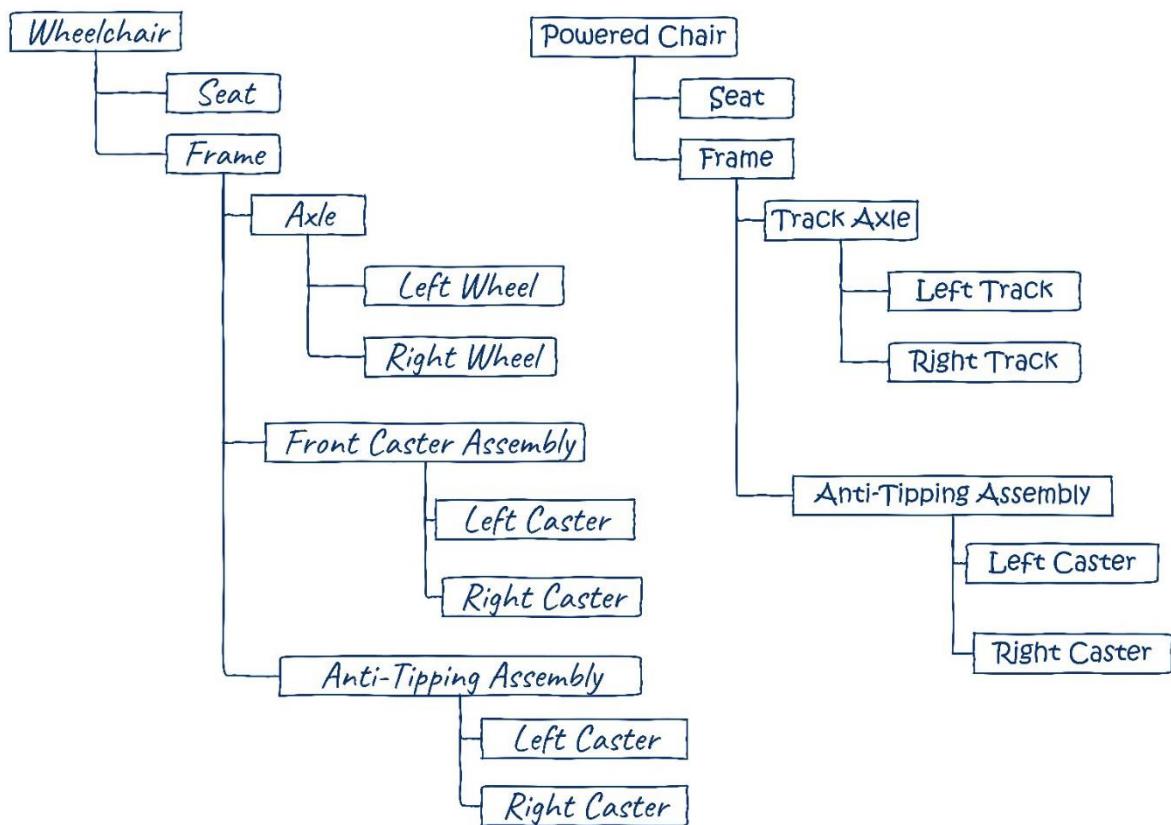
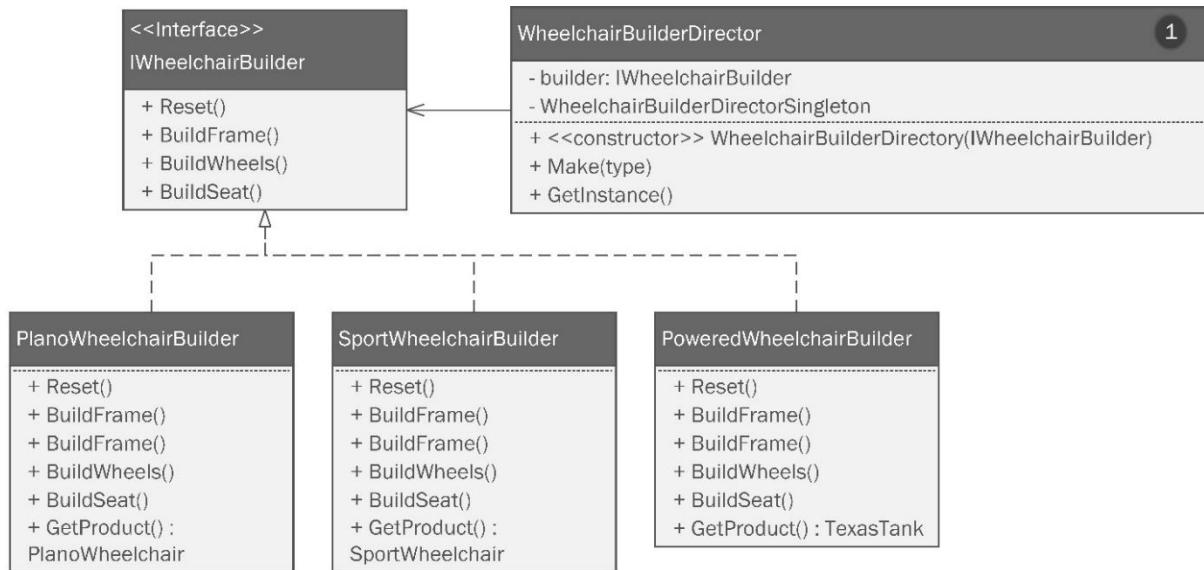


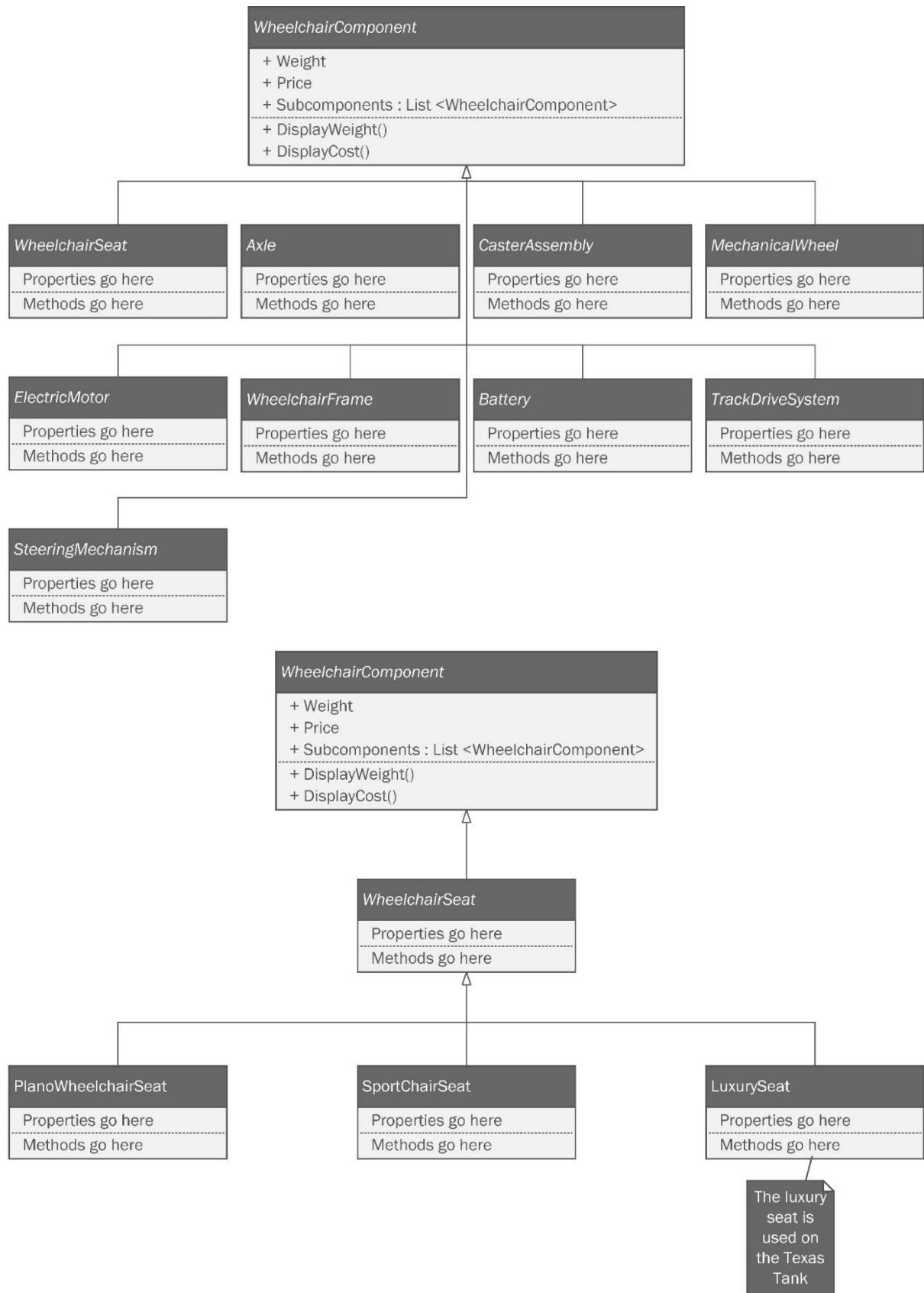


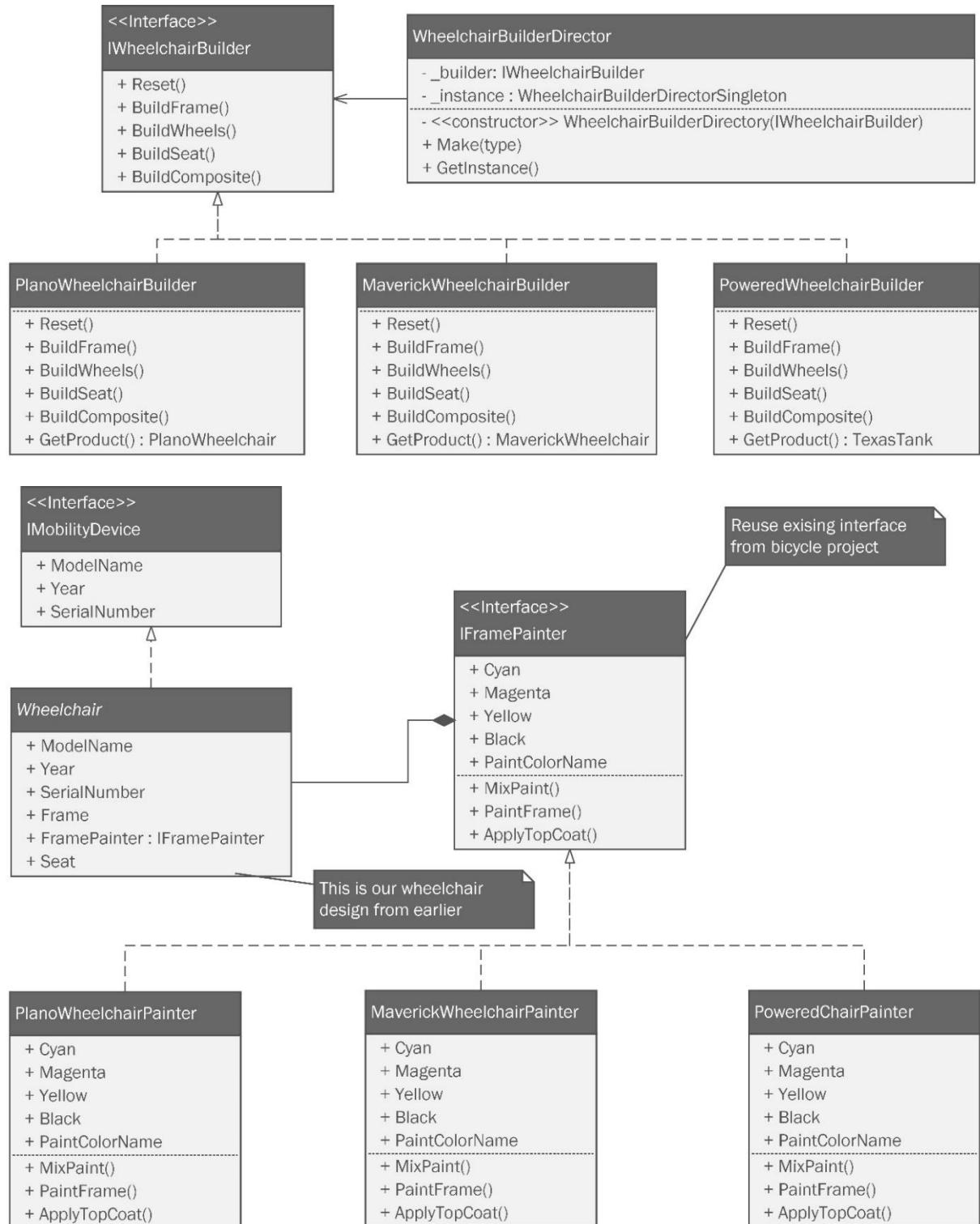


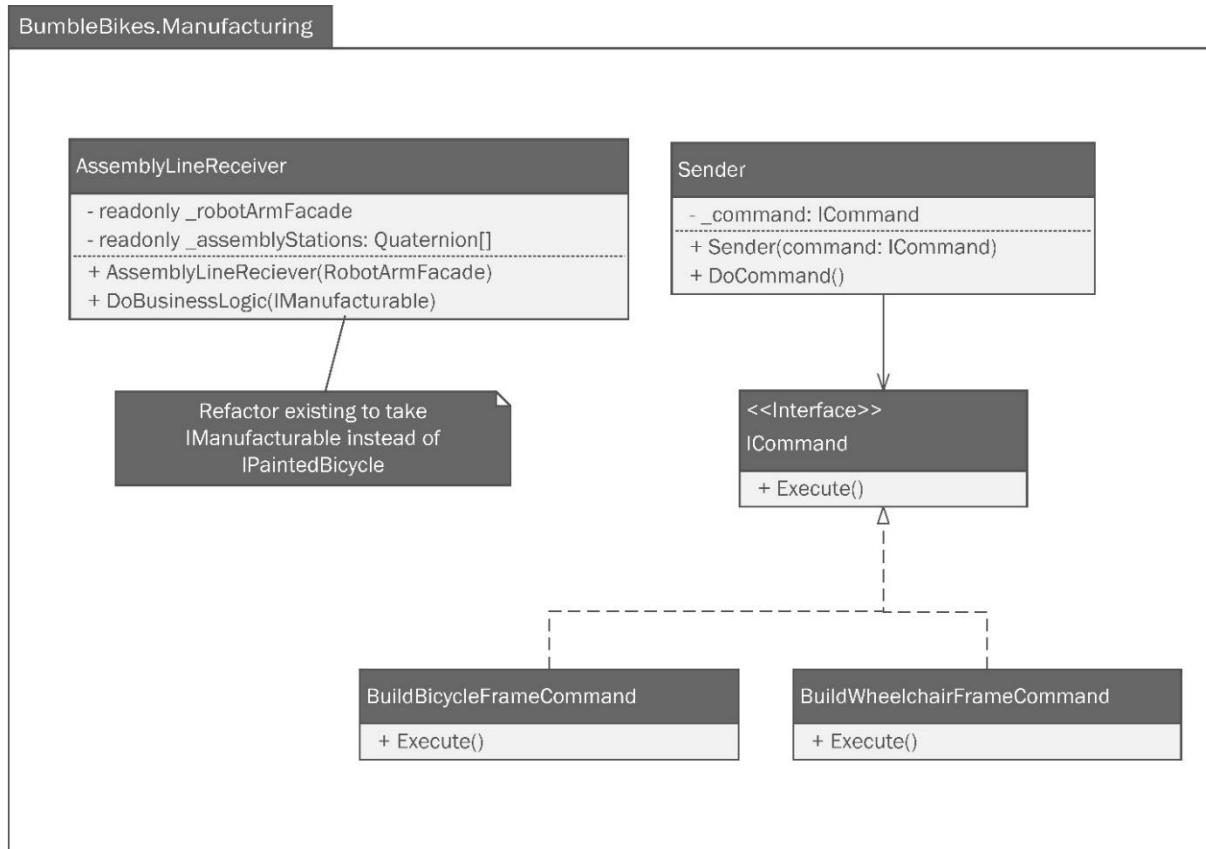
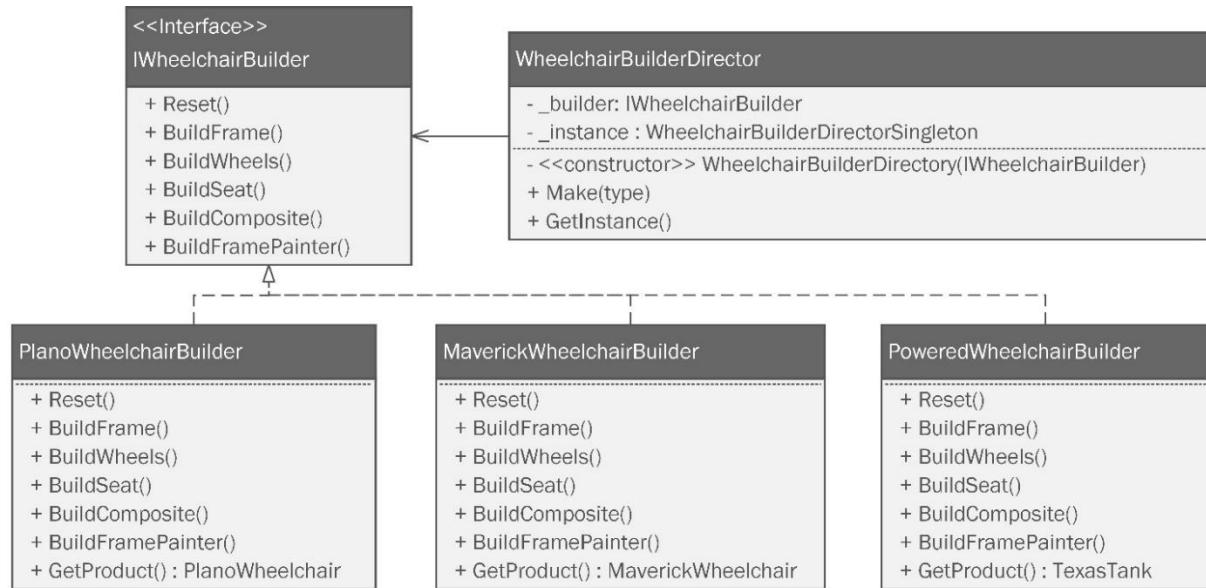
Bruce Van Horn 2022

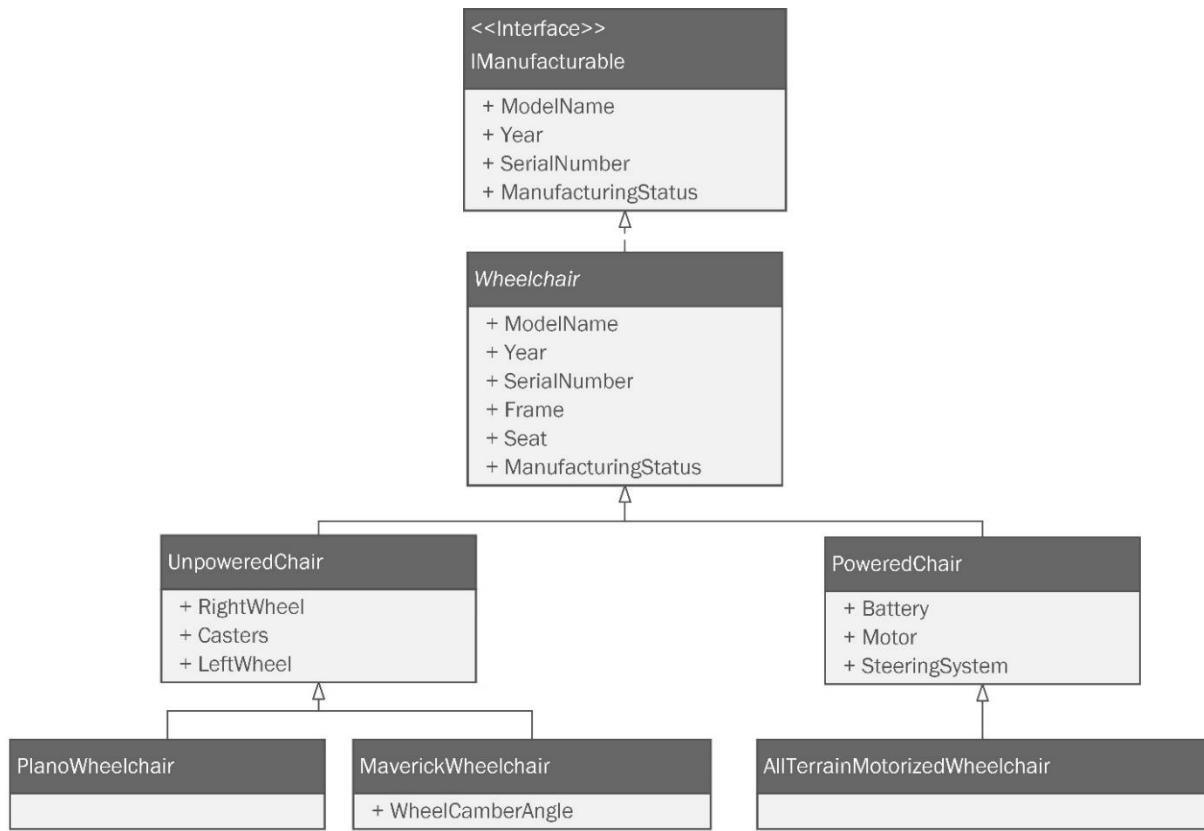




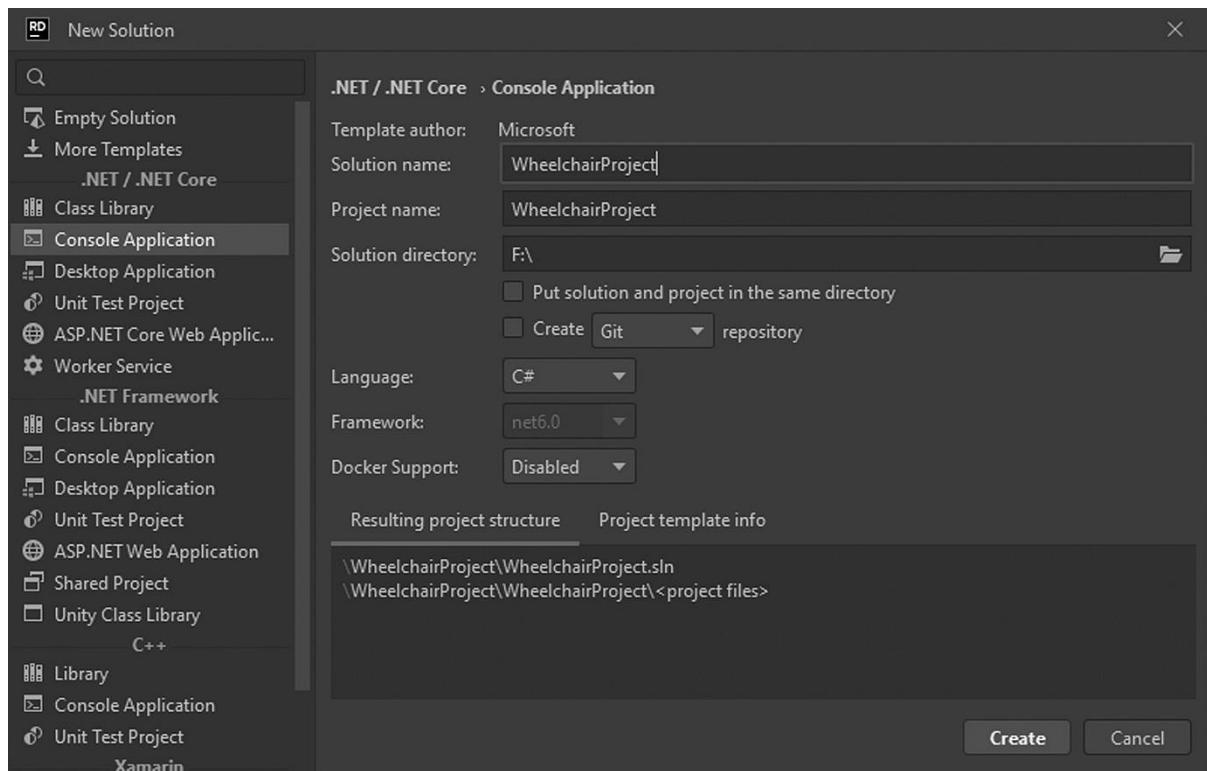
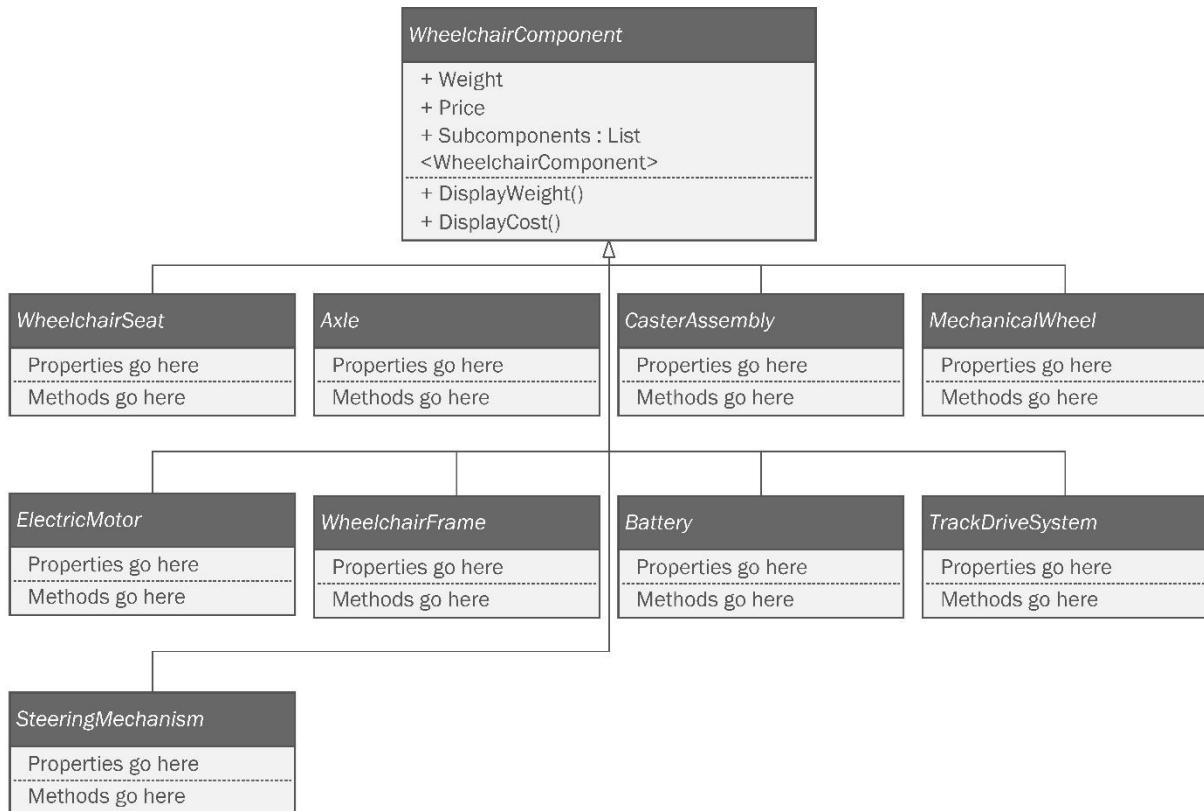


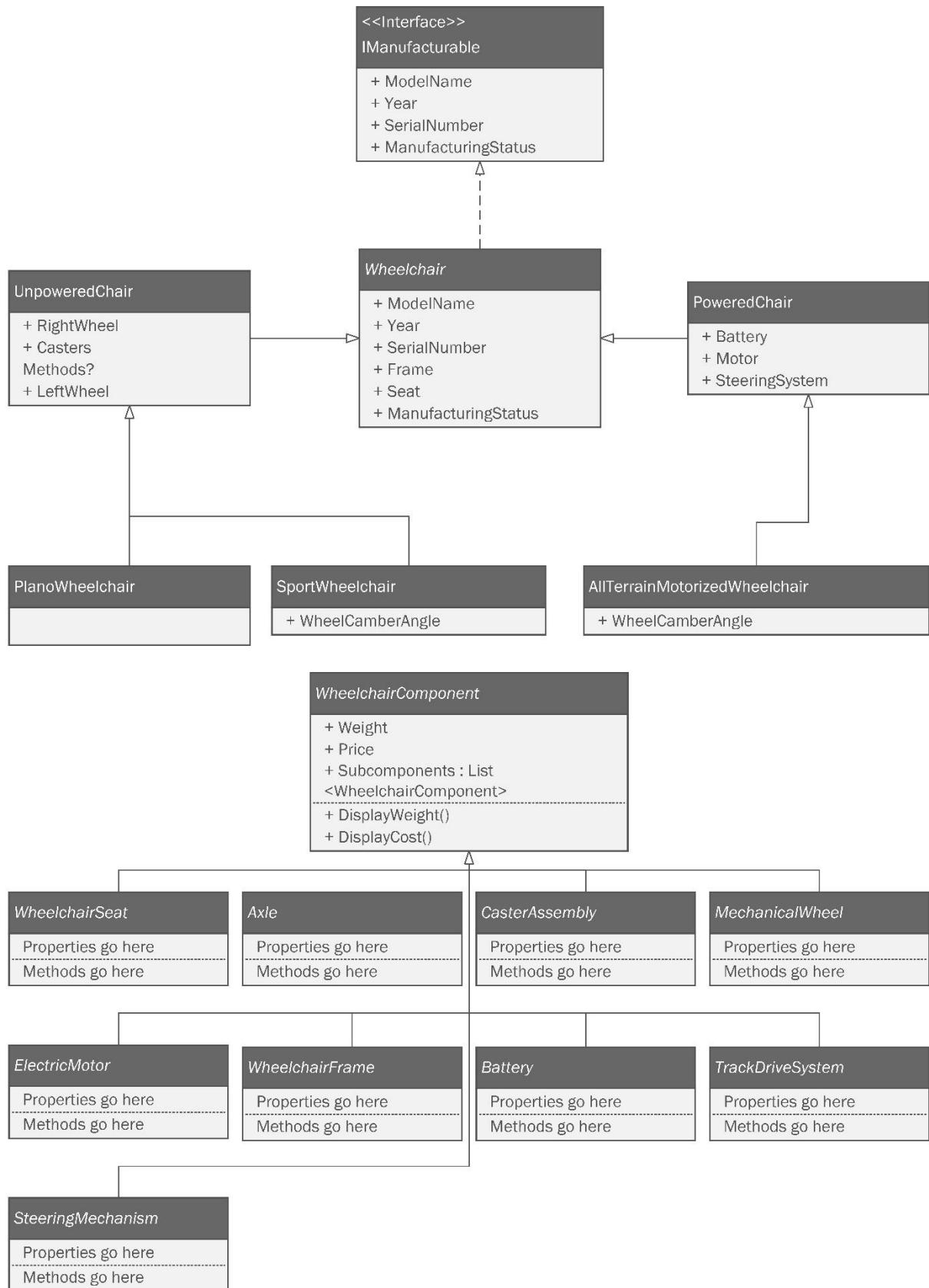


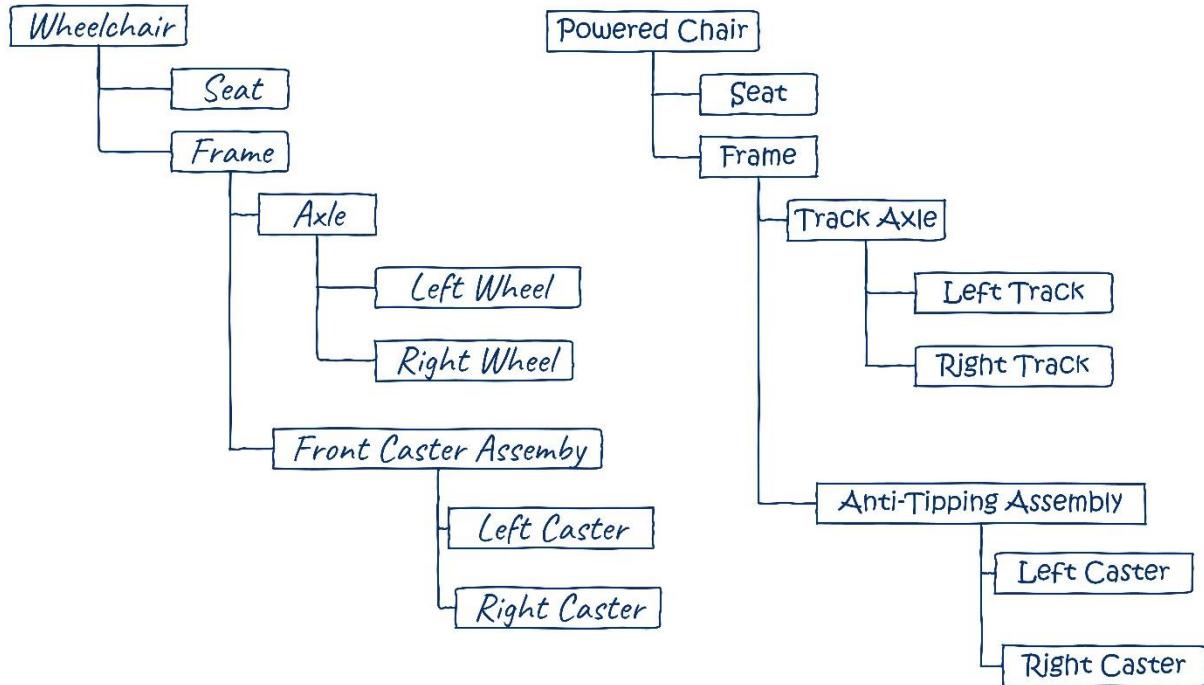




# Chapter 7: Nothing Left but the Typing: Implementing the Wheelchair Project

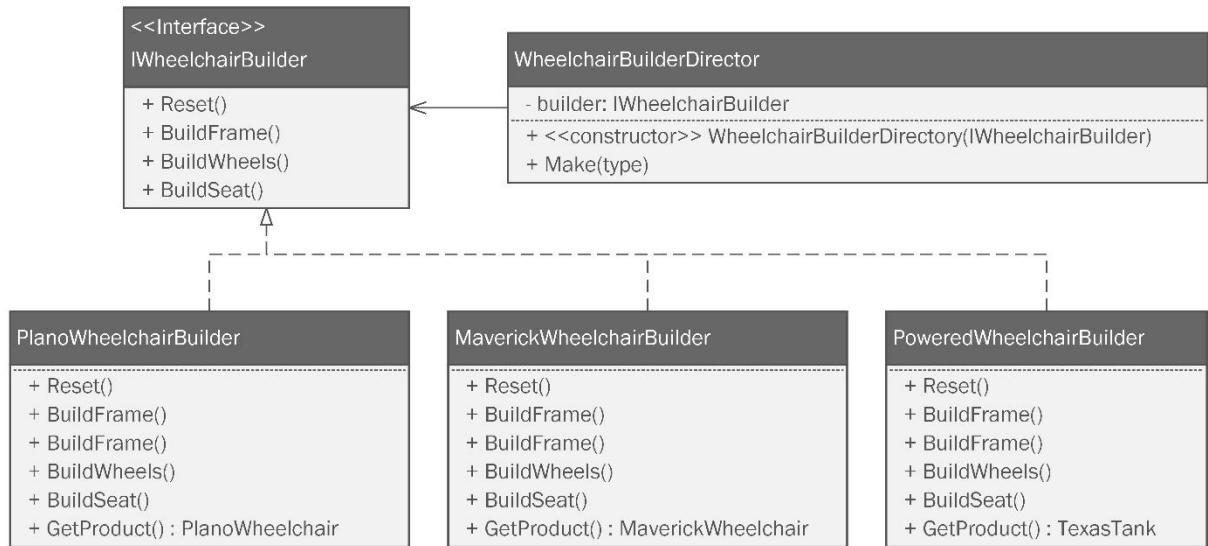






```

    ▼ C# WheelchairProject
      > ⚙ Dependencies
      ▼ ┌ WheelchairComponents
          C# Axe.cs
          C# CasterAssembly.cs
          C# MechanicalWheel.cs
          C# WheelchairComponent.cs
          C# WheelchairFrame.cs
          C# WheelchairSeat.cs
          C# IManufacturable.cs
          C# Program.cs
          C# UnpoweredChair.cs
          C# Wheelchair.cs
          C# WheelchairComponent.cs
  
```



IntelliJ IDEA code completion menu for `PlanoWheelchairBuilder`:

```

11
12 public class PlanoWheelchairBuilder : IWheelchairBuilder
13 Implement missing members
14 Delegate implementation of 'IWheelchairBuilder' to new field
15 Create derived type
16 To internal
17 Default constructor
18 Create another part of the type
19 To record
20 Add <inheritDoc />
21 Class 'PlanoWheelchairBuilder' implements interface (click to navigate)
22 Type Hierarchy
23 Navigate To... Ctrl+Alt+Shift+N
24 Refactor This... Ctrl+Shift+R
25 Inspect This... Ctrl+Alt+Shift+A
26 Generate Code... Alt+Insert
  
```

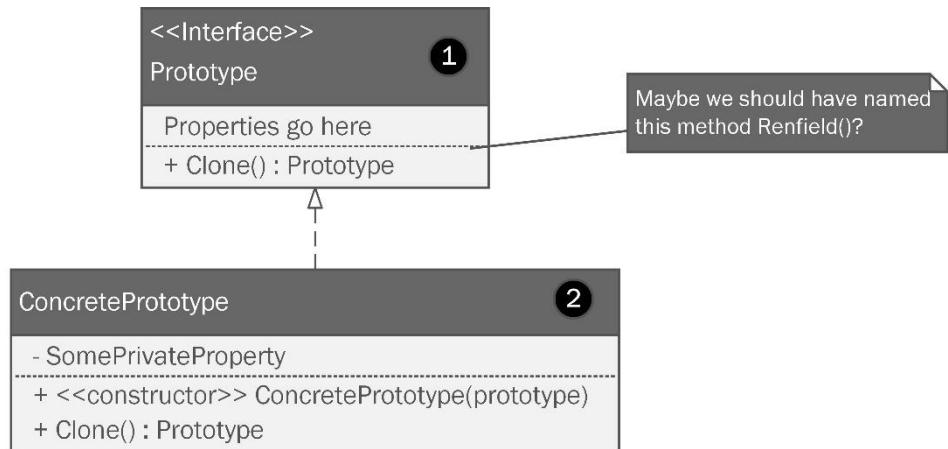
Code snippet:

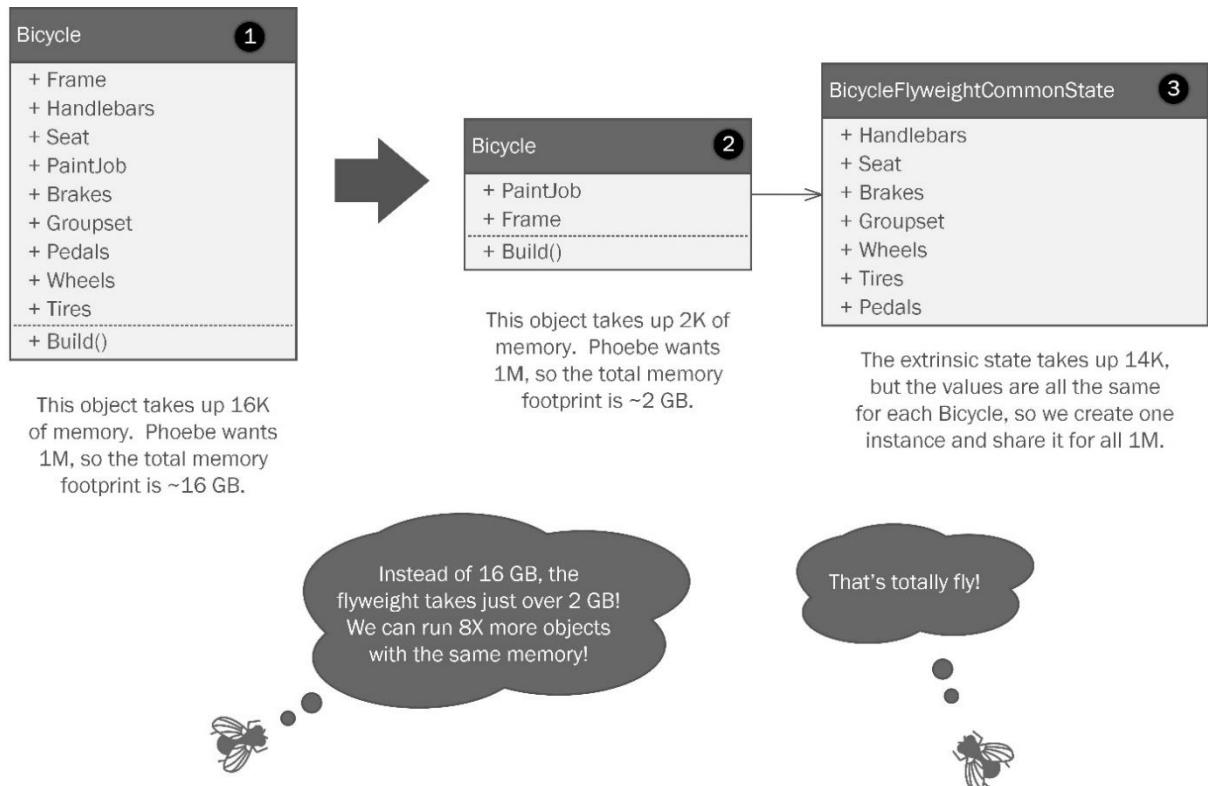
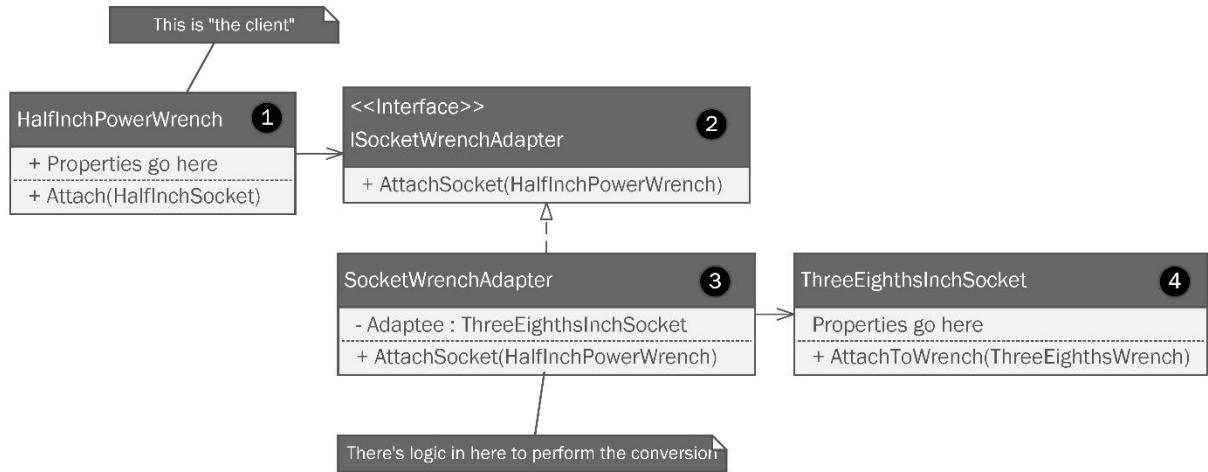
```

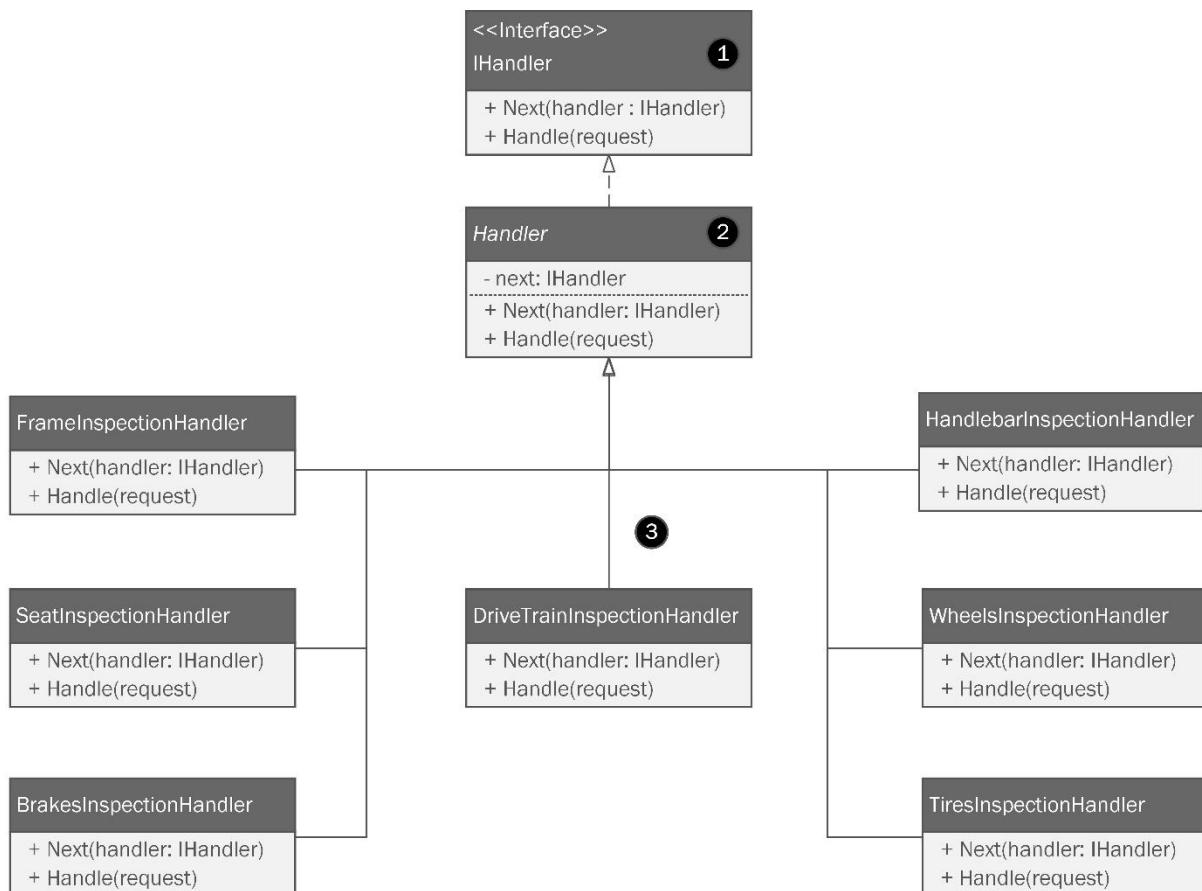
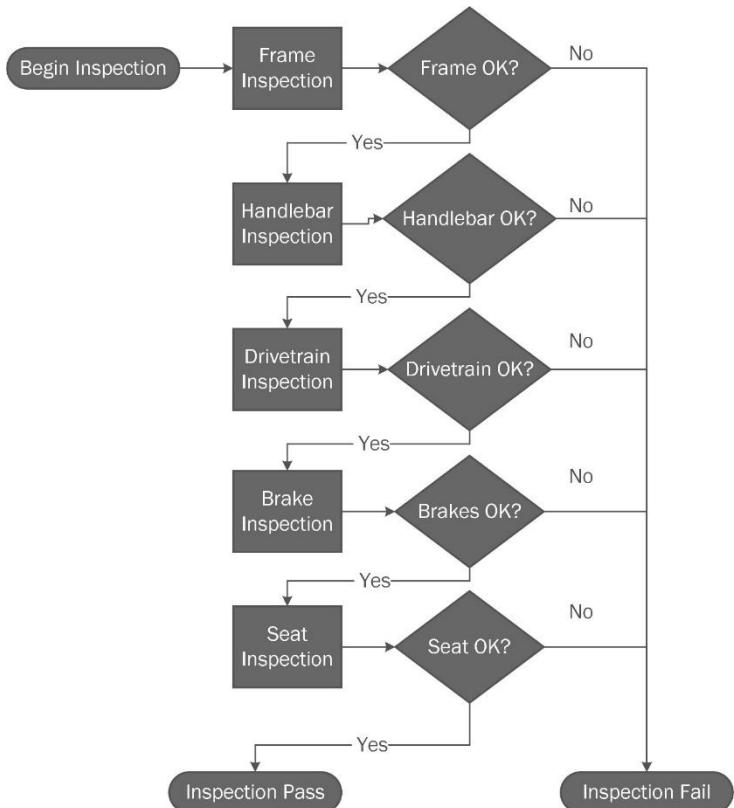
11
12 public class PlanoWheelchairBuilder : IWheelchairBuilder
13 Implement missing members
14 Delegate implementation of 'IWheelchairBuilder' to new field
15 Create derived type
16 To internal
17 Default constructor
18 Create another part of the type
19 To record
20 Add <inheritDoc />
21 Class 'PlanoWheelchairBuilder' implements interface (click to navigate)
22 Type Hierarchy
23 Navigate To... Ctrl+Alt+Shift+N
24 Refactor This... Ctrl+Shift+R
25 Inspect This... Ctrl+Alt+Shift+A
26 Generate Code... Alt+Insert
  
```

```
▼ └ Folder WheelchairComponents
    └ Folder Axles
        C# Axe.cs
        C# StandardAxe.cs
    └ Folder Casters
        C# CasterAssembly.cs
        C# PlanoCasterAssembly.cs
    └ Folder Frames
        C# PlanoWheelchairFrame.cs
        C# WheelchairFrame.cs
    └ Folder Seats
        C# PlanoSeat.cs
        C# WheelchairSeat.cs
    └ Folder Wheels
        C# CasterWheel.cs
        C# MechanicalWheel.cs
        C# StandardWheel.cs
        C# WheelchairComponent.cs
```

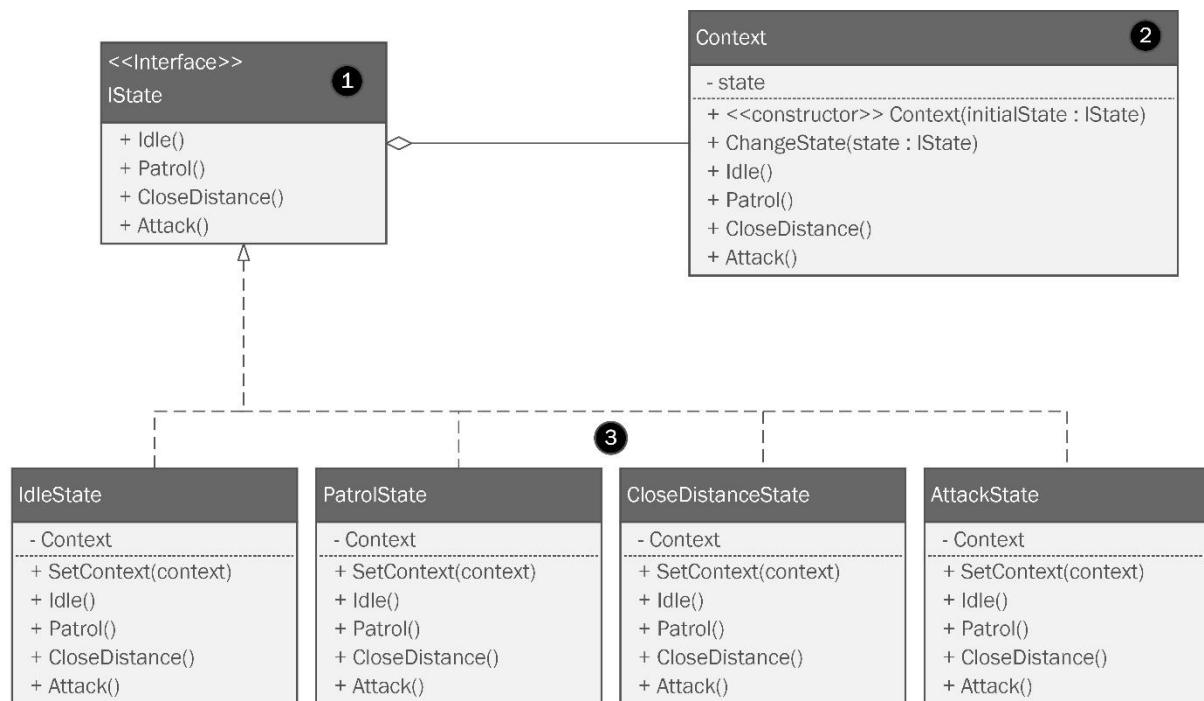
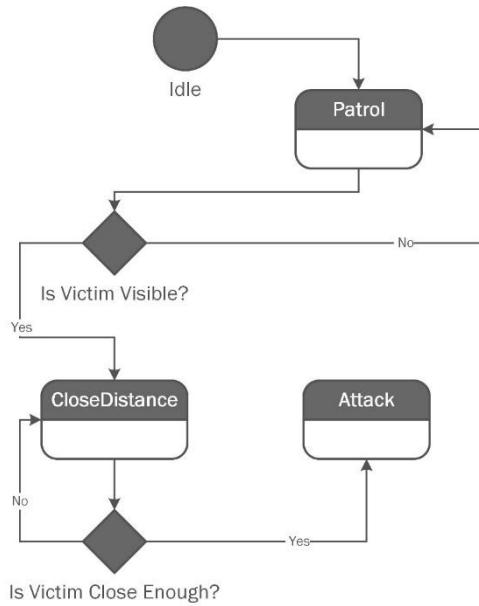
## Chapter 8: Now You Know Some Patterns. What Next?

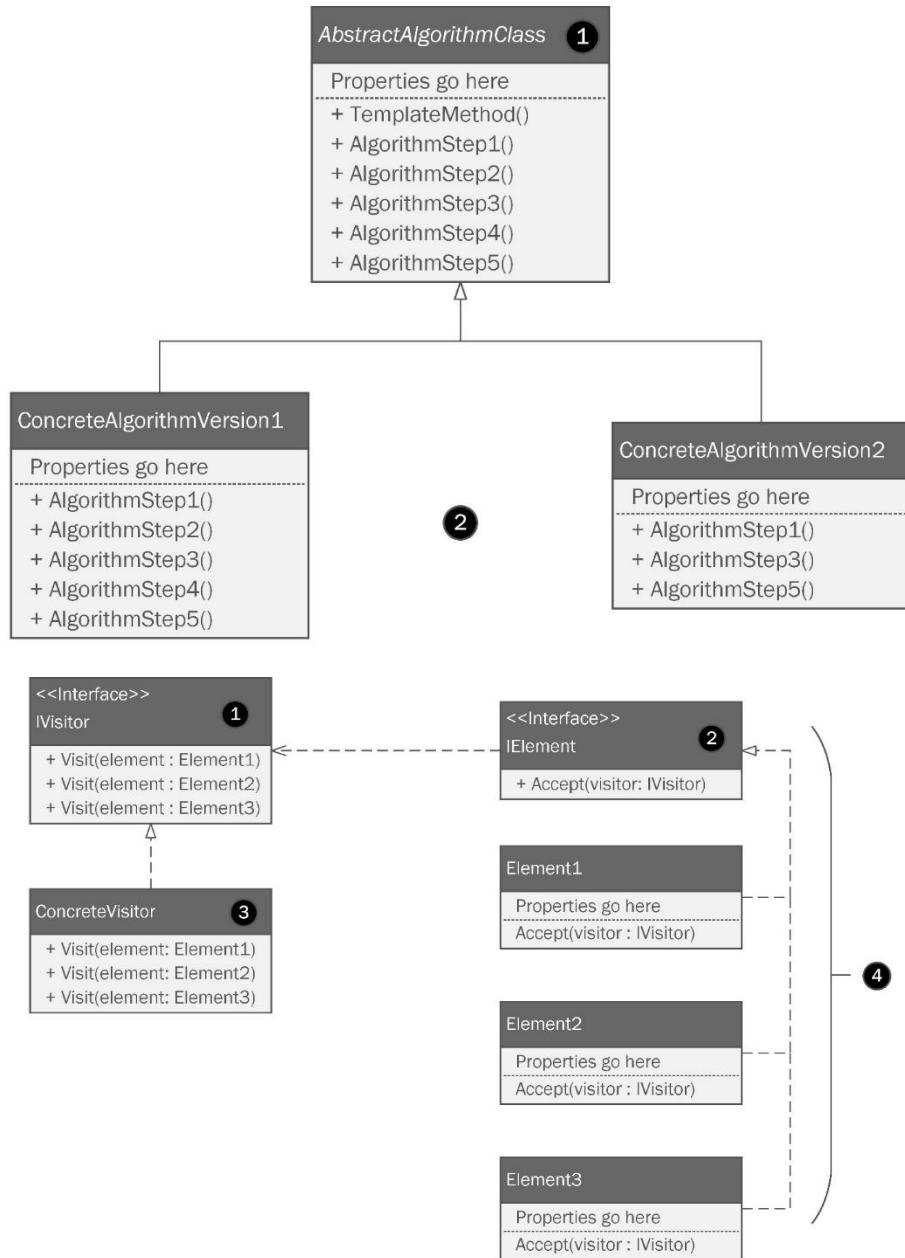




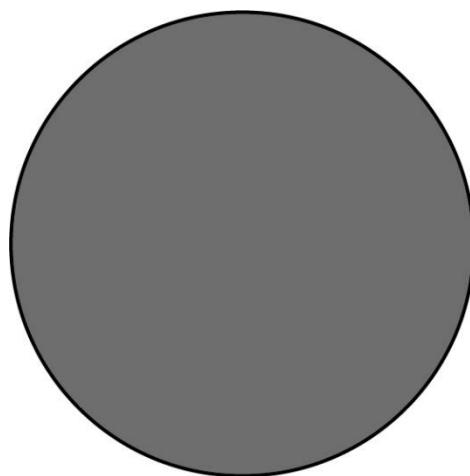
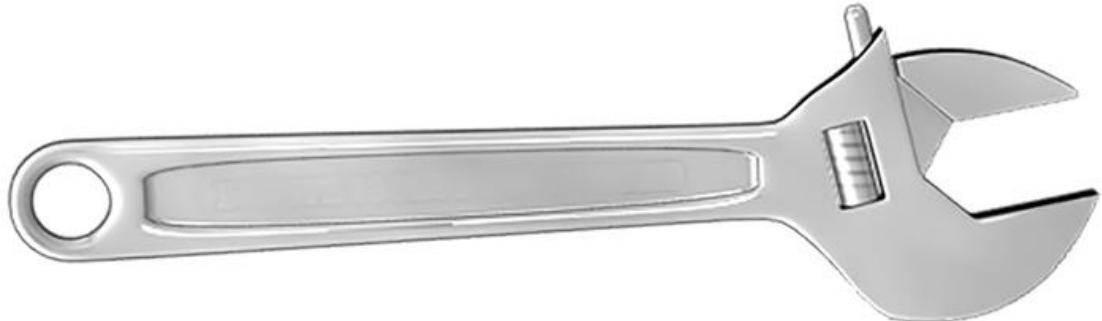








## Appendix 1: A Brief Review of OOP Principles in C#

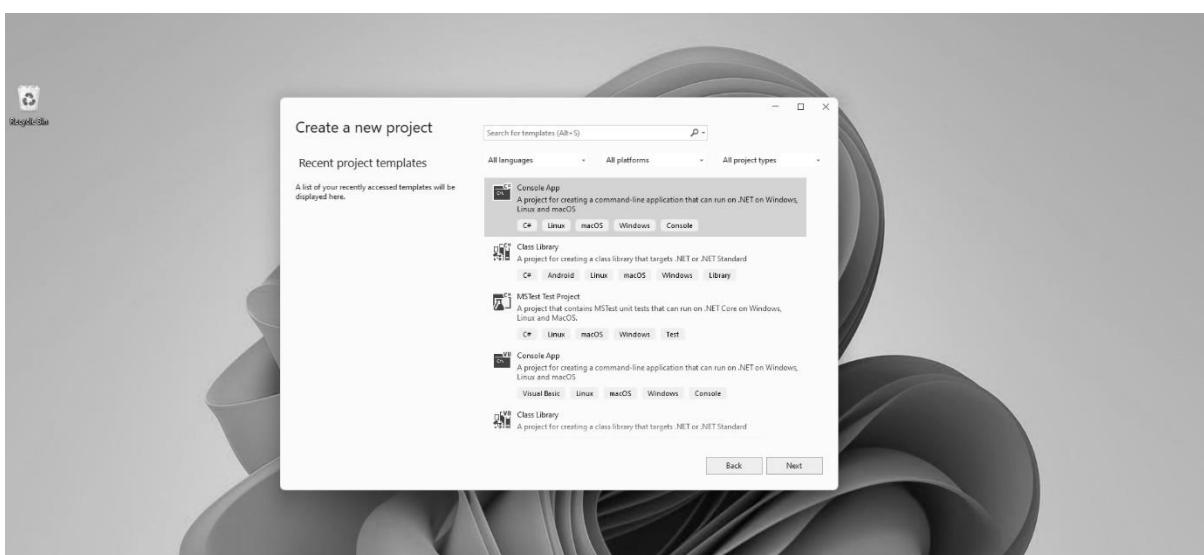
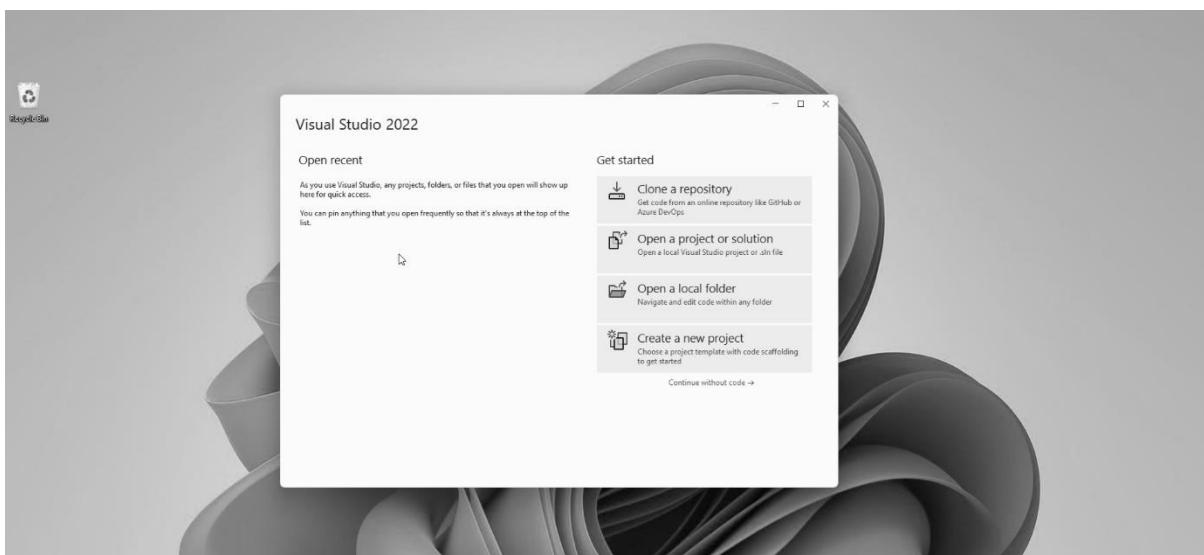


Properties:

Center: 7, 2  
Radius: 200px  
LineWidth: 1px  
Line Color: #000000  
FillColor: #231F20



Caller's Location	public	protected internal	protected	internal	private protected	private
Inside the class	✓	✓	✓	✓	✓	✓
Subclass (same assembly)	✓	✓	✓	✓	✓	✗
Different Class (same assembly)	✓	✓	✗	✓	✗	✗
Subclass (different assembly)	✓	✓	✓	✗	✗	✗
Different Class (different assembly)	✗	✗	✗	✗	✗	✗



# This is a C# console app



C# Console App

A project for creating a command-line application that can run on .NET on Windows, Linux and macOS

C#

Linux

macOS

Windows

Console

# This is a Visual Basic console app



VB Console App

A project for creating a command-line application that can run on .NET on Windows, Linux and macOS

Visual Basic

Linux

macOS

Windows

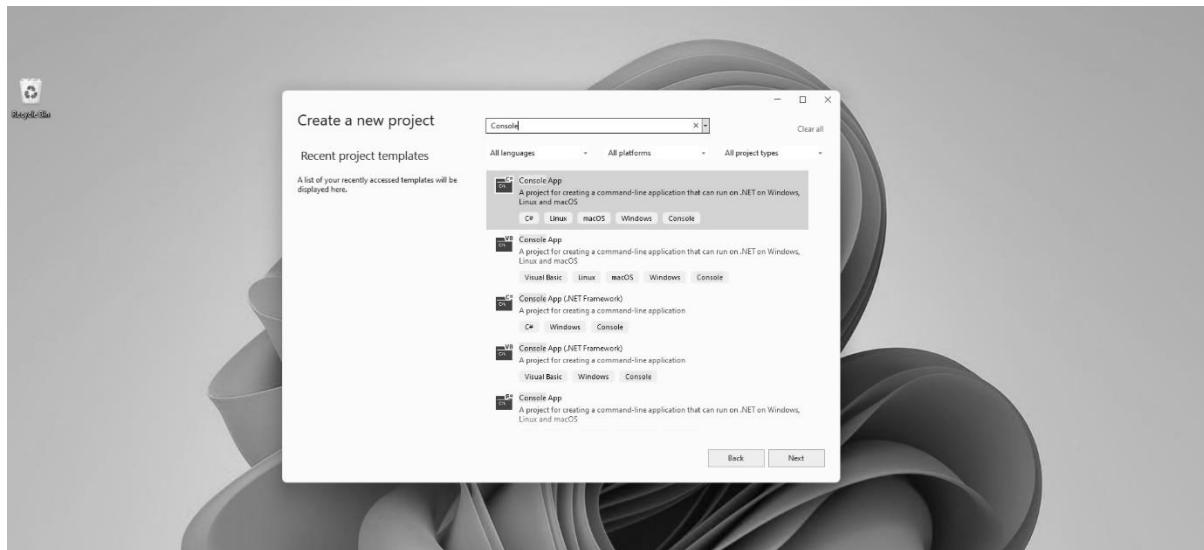
Console

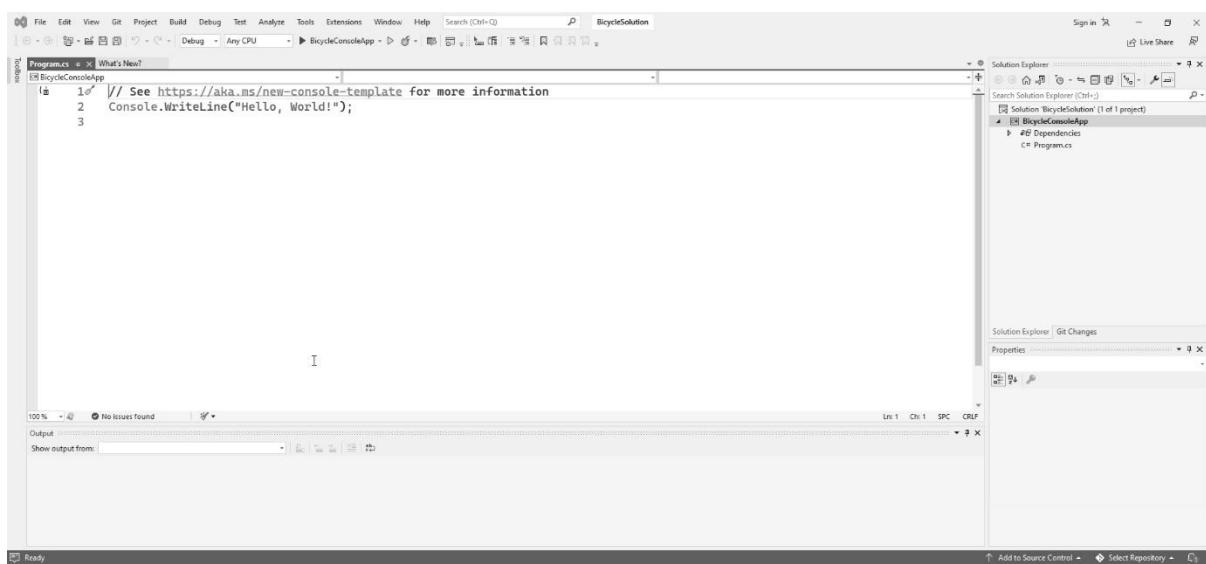
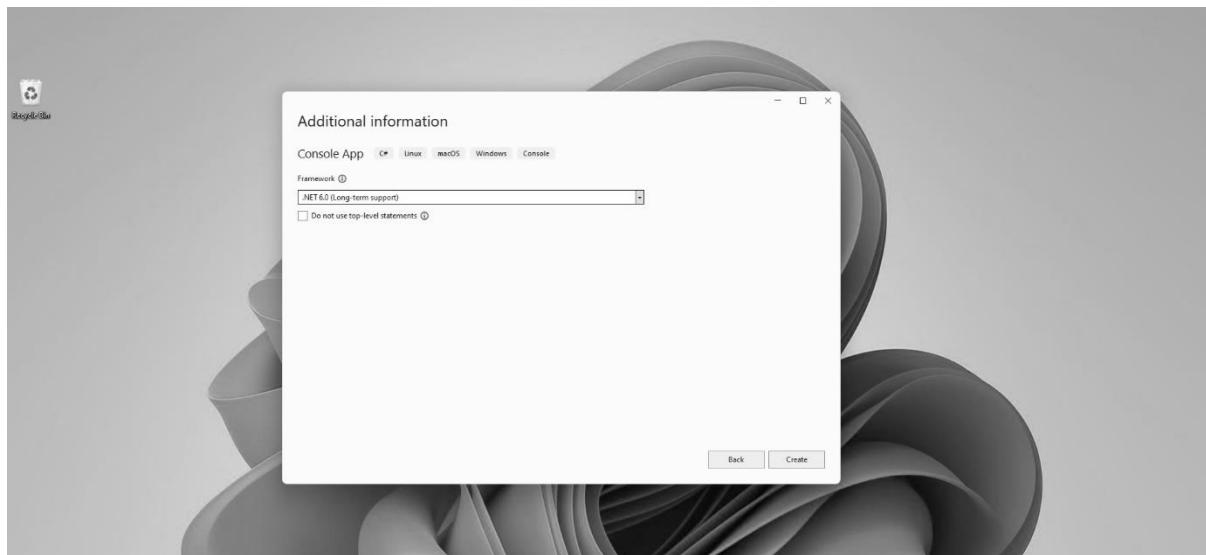
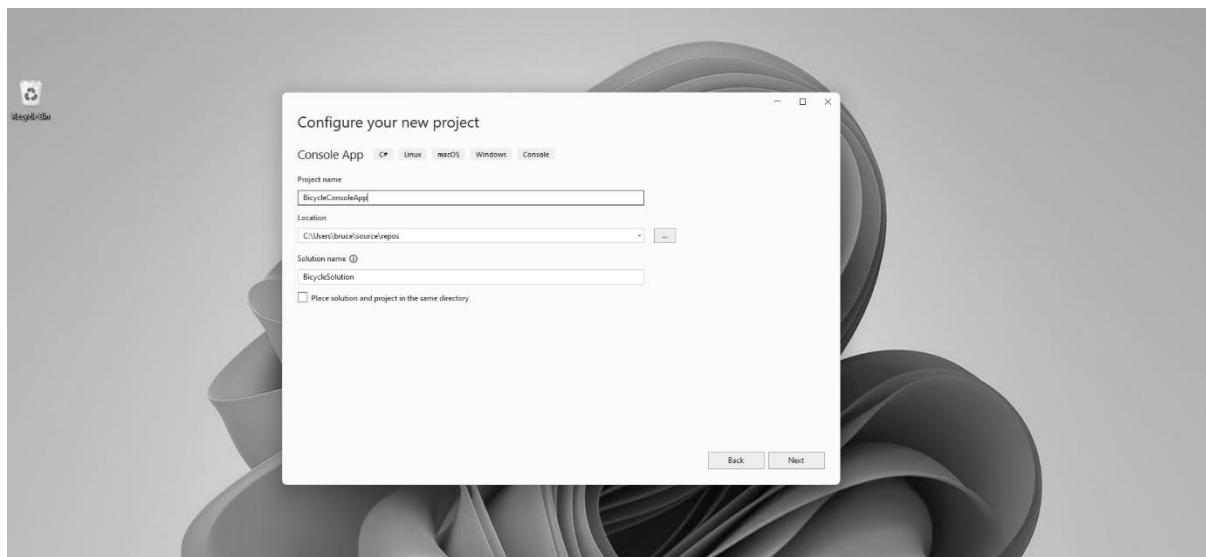
# This is a F# console app

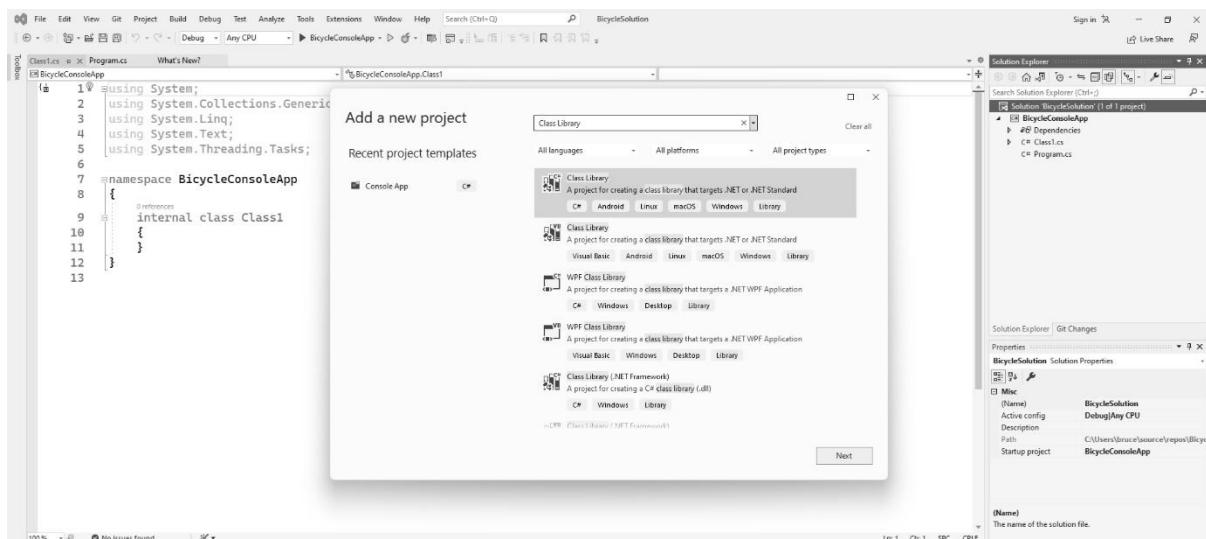
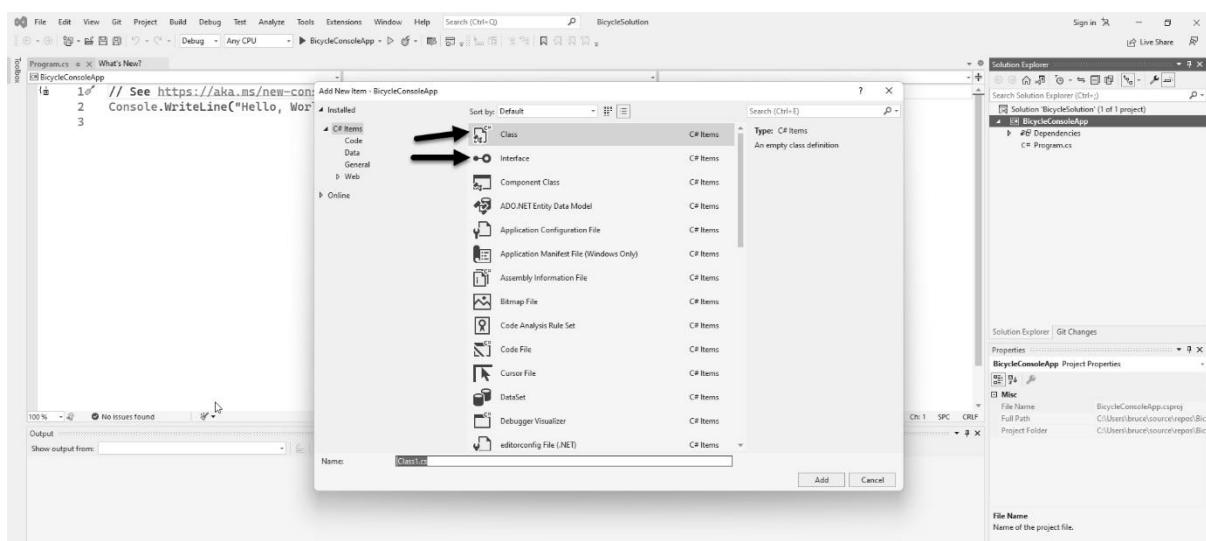
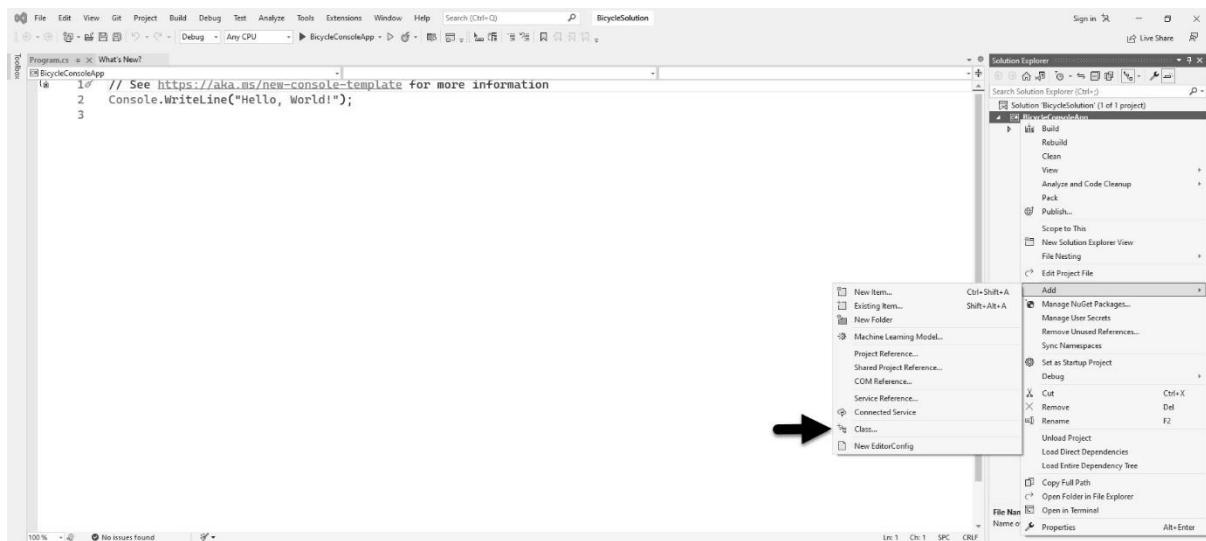


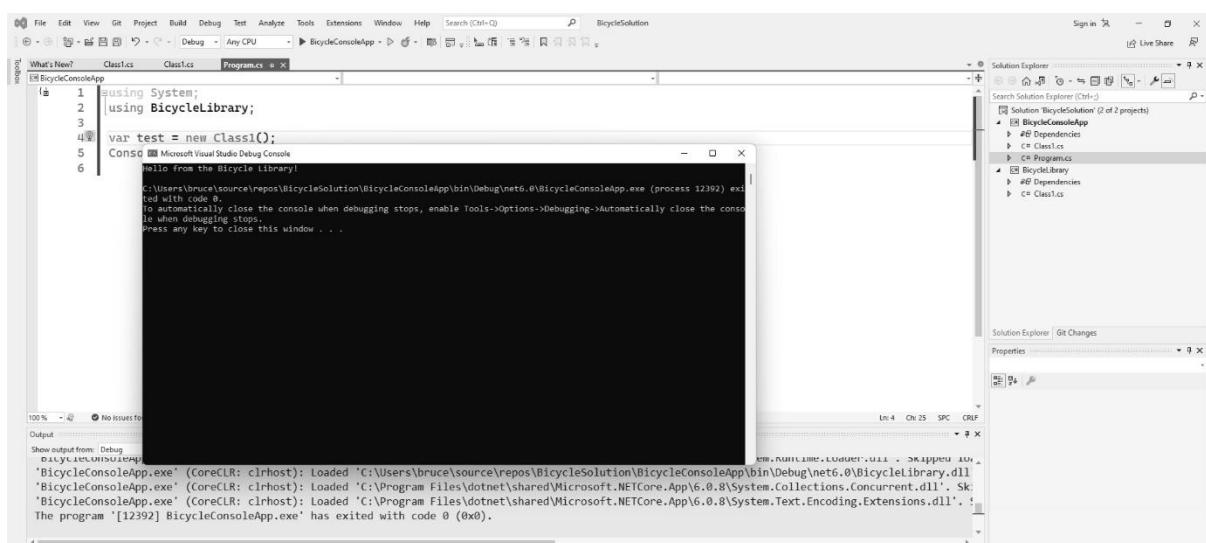
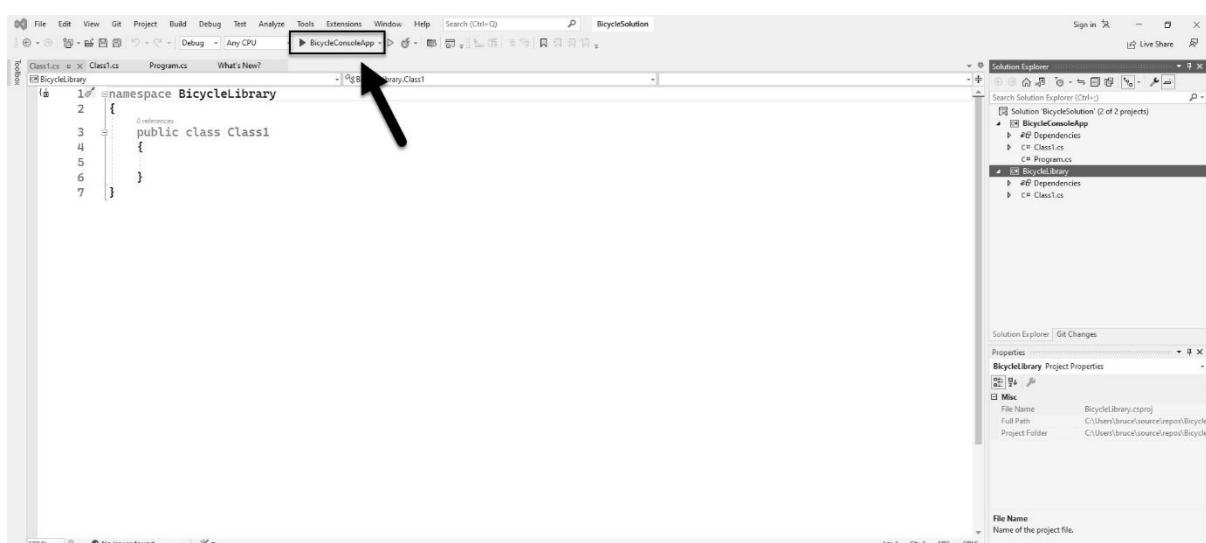
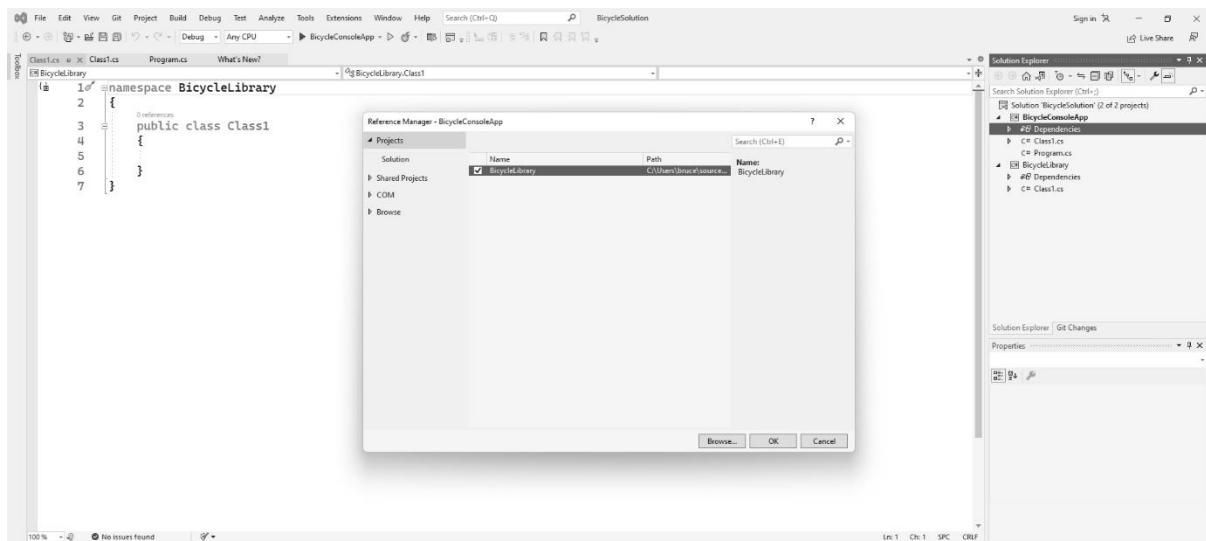
F# Console App

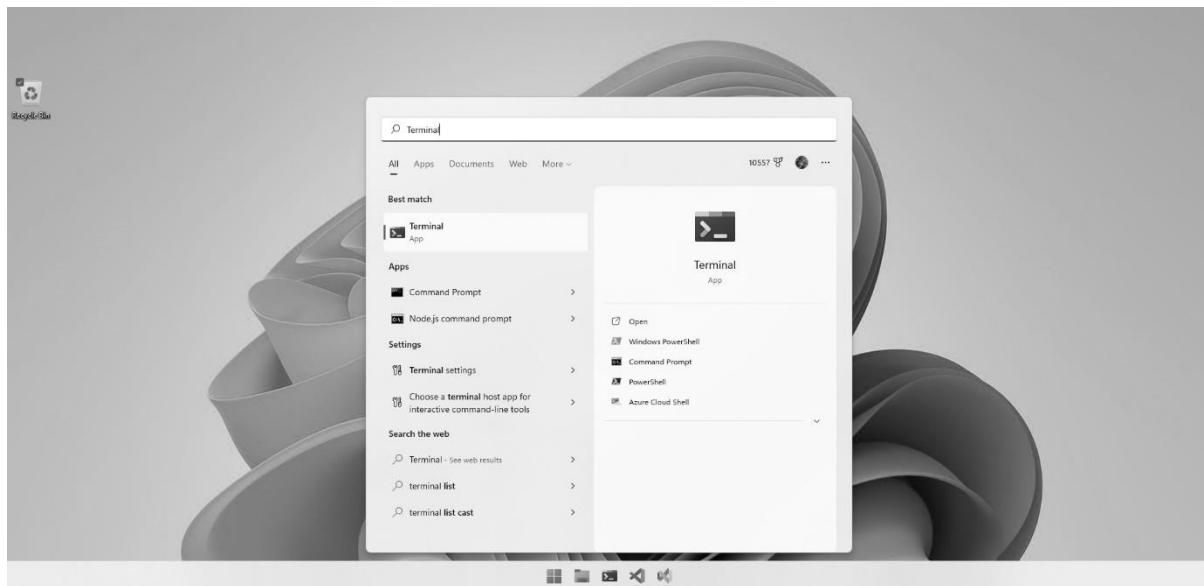
A project for creating a command-line application that can run on .NET on Windows, Linux and macOS











```
PowerShell 7.2.6
Copyright (c) Microsoft Corporation.

https://aka.ms/powershell
Type 'help' to get help.

PS C:\Users\bruce> dotnet new sln -o BicycleSolution
The template "Solution File" was created successfully.

PS C:\Users\bruce> cd .\BicycleSolution\
PS C:\Users\bruce\BicycleSolution> dir

    Directory: C:\Users\bruce\BicycleSolution

Mode                LastWriteTime         Length Name
----                -----        ----  -
-a---       9/3/2022 1:01 PM           442  BicycleSolution.sln

PS C:\Users\bruce\BicycleSolution> |
```

```
PS PowerShell X + ×
Copyright (c) Microsoft Corporation.

https://aka.ms/powershell
Type 'help' to get help.

PS C:\Users\bruce> dotnet new sln -o BicycleSolution
The template "Solution File" was created successfully.

PS C:\Users\bruce> cd .\BicycleSolution\
PS C:\Users\bruce\BicycleSolution> dir

    Directory: C:\Users\bruce\BicycleSolution

Mode           LastWriteTime      Length Name
----           -----          ---- 
-a---         9/3/2022 1:01 PM       442 BicycleSolution.sln

PS C:\Users\bruce\BicycleSolution> dotnet new console -o BicycleConsoleApp
The template "Console App" was created successfully.

Processing post-creation actions...
Running 'dotnet restore' on C:\Users\bruce\BicycleSolution\BicycleConsoleApp\BicycleConsoleApp.csproj...
Determining projects to restore...
Restored C:\Users\bruce\BicycleSolution\BicycleConsoleApp\BicycleConsoleApp.csproj (in 110 ms).
Restore succeeded.

PS C:\Users\bruce\BicycleSolution>
```

```
PS PowerShell X + ×
https://aka.ms/powershell
Type 'help' to get help.

PS C:\Users\bruce> dotnet new sln -o BicycleSolution
The template "Solution File" was created successfully.

PS C:\Users\bruce> cd .\BicycleSolution\
PS C:\Users\bruce\BicycleSolution> dir

    Directory: C:\Users\bruce\BicycleSolution

Mode           LastWriteTime      Length Name
----           -----          ---- 
-a---         9/3/2022 1:01 PM       442 BicycleSolution.sln

PS C:\Users\bruce\BicycleSolution> dotnet new console -o BicycleConsoleApp
The template "Console App" was created successfully.

Processing post-creation actions...
Running 'dotnet restore' on C:\Users\bruce\BicycleSolution\BicycleConsoleApp\BicycleConsoleApp.csproj...
Determining projects to restore...
Restored C:\Users\bruce\BicycleSolution\BicycleConsoleApp\BicycleConsoleApp.csproj (in 110 ms).
Restore succeeded.

PS C:\Users\bruce\BicycleSolution> dotnet sln add .\BicycleConsoleApp\BicycleConsoleApp.csproj
Project 'BicycleConsoleApp\BicycleConsoleApp.csproj' added to the solution.
PS C:\Users\bruce\BicycleSolution>
```

```
PS PowerShell X + ×
Determining projects to restore...
Restored C:\Users\bruce\BicycleSolution\BicycleConsoleApp\BicycleConsoleApp.csproj (in 110 ms).
Restore succeeded.

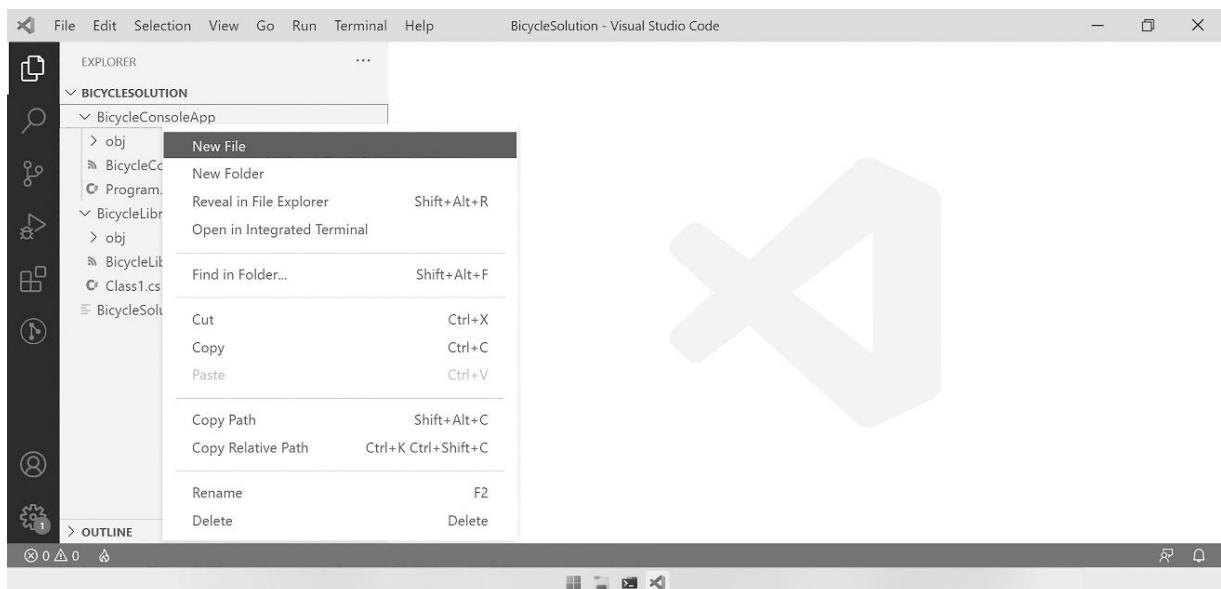
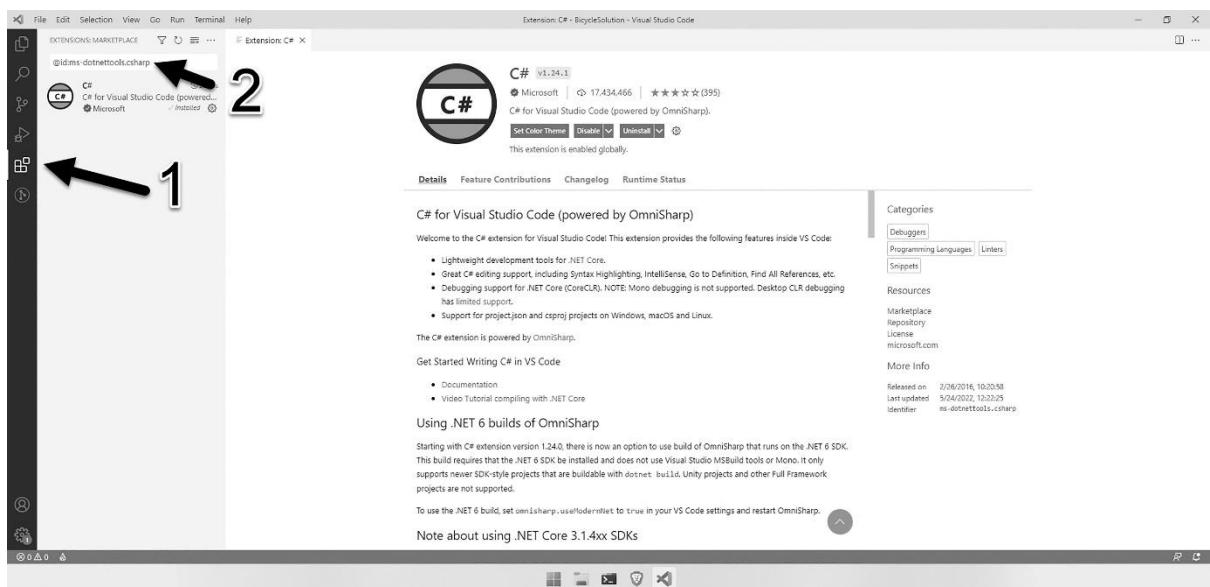
PS C:\Users\bruce\BicycleSolution> dotnet sln add .\BicycleConsoleApp\BicycleConsoleApp.csproj
Project 'BicycleConsoleApp\BicycleConsoleApp.csproj' added to the solution.
PS C:\Users\bruce\BicycleSolution> dotnet new classlib -o BicycleLibrary
The template "Class Library" was created successfully.

Processing post-creation actions...
Running 'dotnet restore' on C:\Users\bruce\BicycleSolution\BicycleLibrary\BicycleLibrary.csproj...
Determining projects to restore...
Restored C:\Users\bruce\BicycleSolution\BicycleLibrary\BicycleLibrary.csproj (in 78 ms).
Restore succeeded.

PS C:\Users\bruce\BicycleSolution> dir
    Directory: C:\Users\bruce\BicycleSolution

Mode           LastWriteTime      Length Name
----           -----          ---- 
d---         9/3/2022 1:02 PM        0 BicycleConsoleApp
d---         9/3/2022 1:04 PM        0 BicycleLibrary
-a---        9/3/2022 1:04 PM     1028 BicycleSolution.sln

PS C:\Users\bruce\BicycleSolution>
```



File Edit Selection View Go Run Terminal Help

Class1.cs - BicycleSolution - Visual Studio Code

EXPLORER

BICYCLESOLUTION

- › BicycleConsoleApp
  - > obj
  - ↳ BicycleConsoleApp.csproj
  - Class1.cs
  - Program.cs
- › BicycleLibrary
  - > obj
  - ↳ BicycleLibrary.csproj
  - Class1.cs
- ↳ BicycleSolution.sln

OUTLINE

```
1  namespace BicycleLibrary;
2  0 references
3  public class Class1
4  {
5      0 references
6      public string SayHello()
7      {
8          return "Hello from the Bicycle Library!";
9      }

```

Ln 9, Col 1 Spaces: 4 UTF-8 with BOM CRLF C# ⚙️ 🔍

File Edit Selection View Go Run Terminal Help

Program.cs - BicycleSolution - Visual Studio Code

EXPLORER

BICYCLESOLUTION

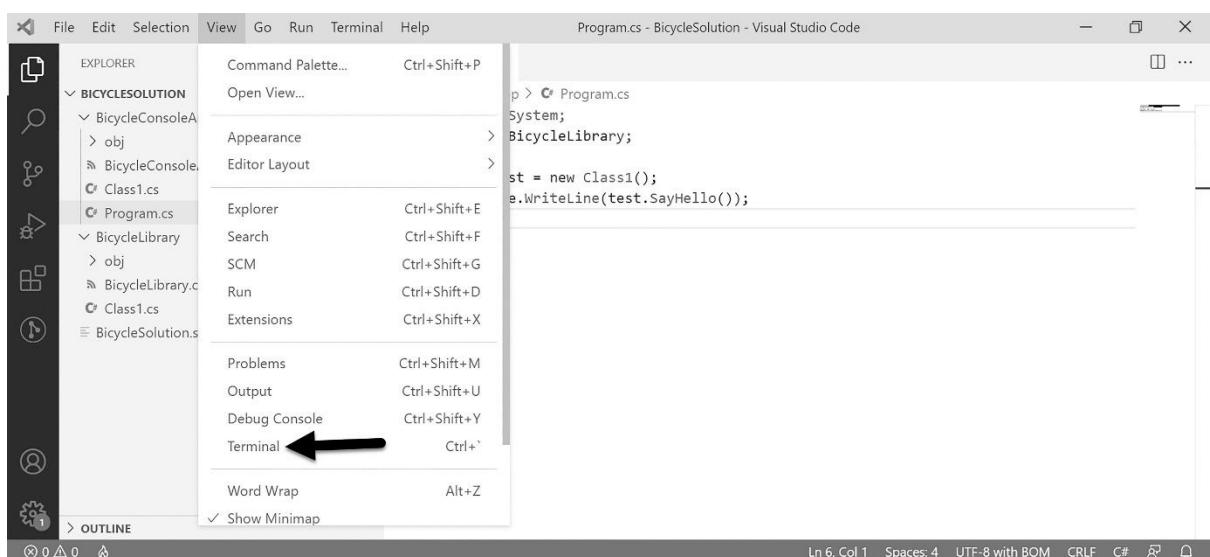
- › BicycleConsoleApp
  - > obj
  - ↳ BicycleConsoleApp.csproj
  - Class1.cs
  - Program.cs
- › BicycleLibrary
  - > obj
  - ↳ BicycleLibrary.csproj
  - Class1.cs
- ↳ BicycleSolution.sln

OUTLINE

```
1  using System;
2  using BicycleLibrary;
3
4  var test = new Class1();
5  Console.WriteLine(test.SayHello());
6

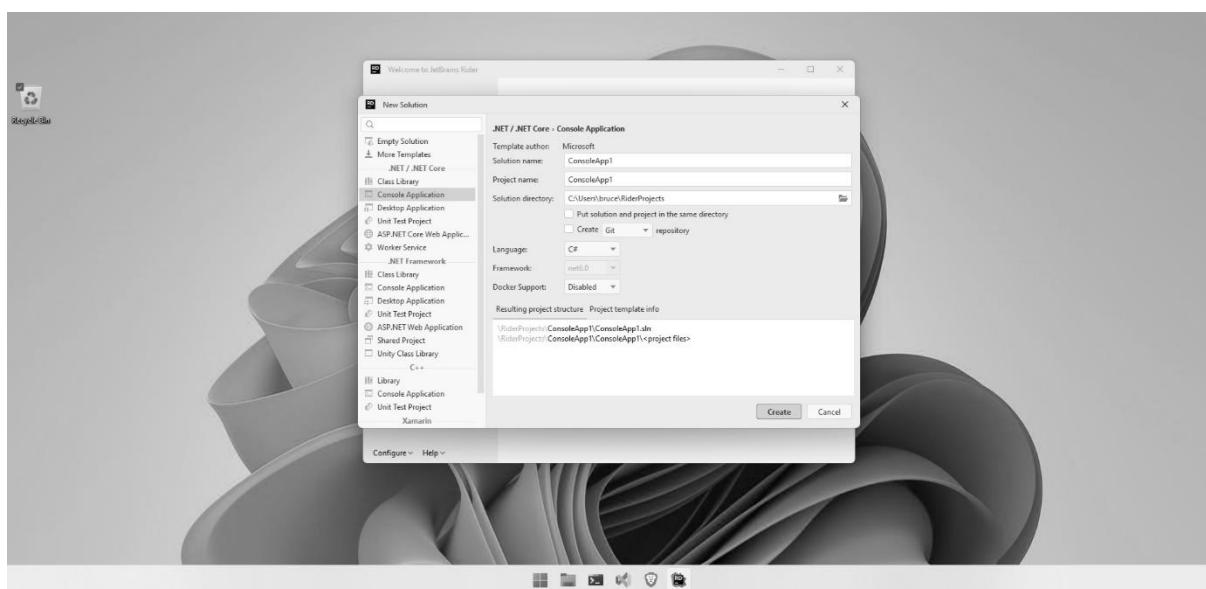
```

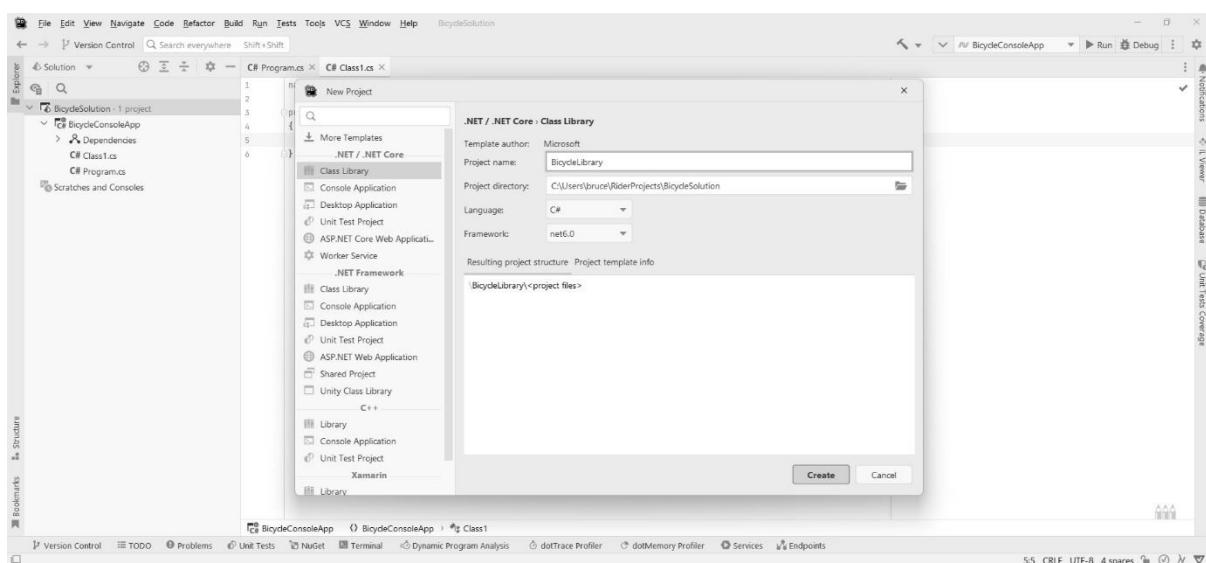
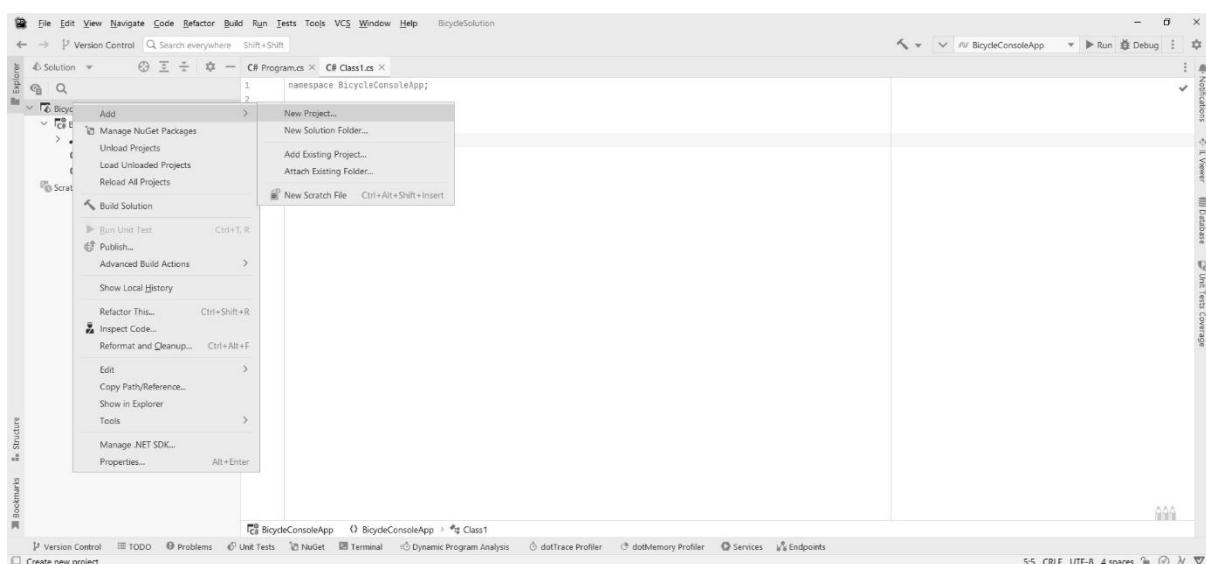
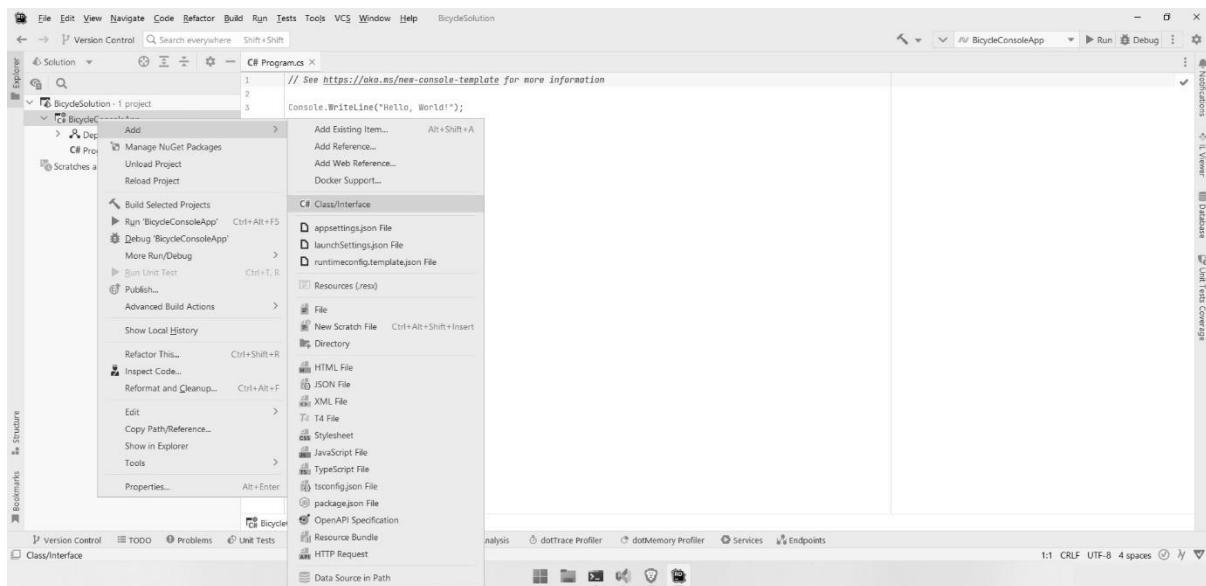
Ln 6, Col 1 Spaces: 4 UTF-8 with BOM CRLF C# ⚙️ 🔍

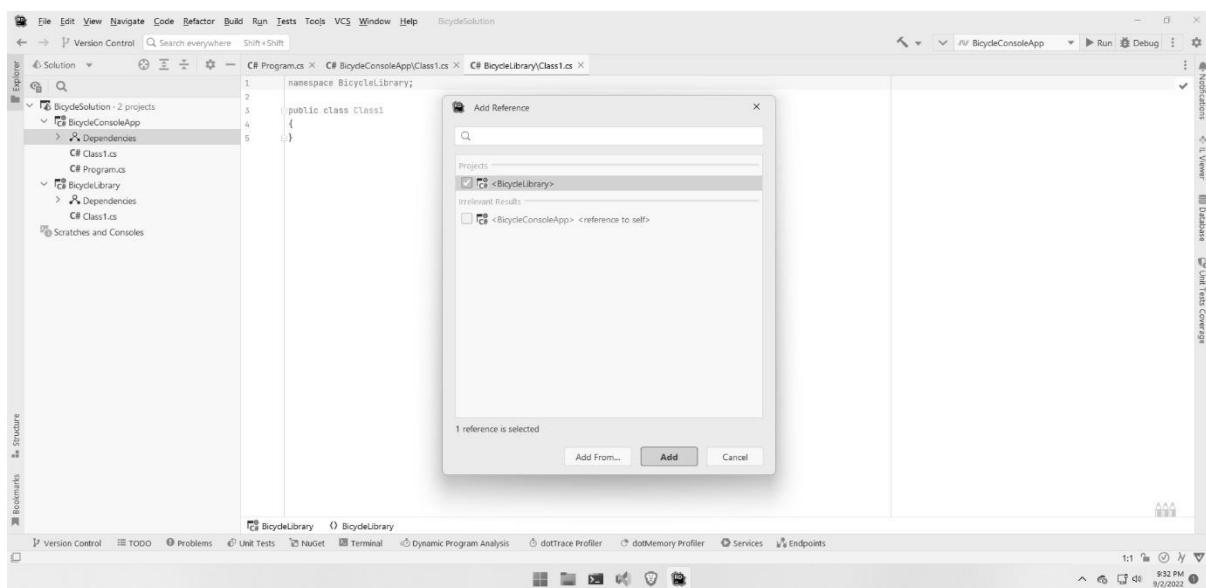
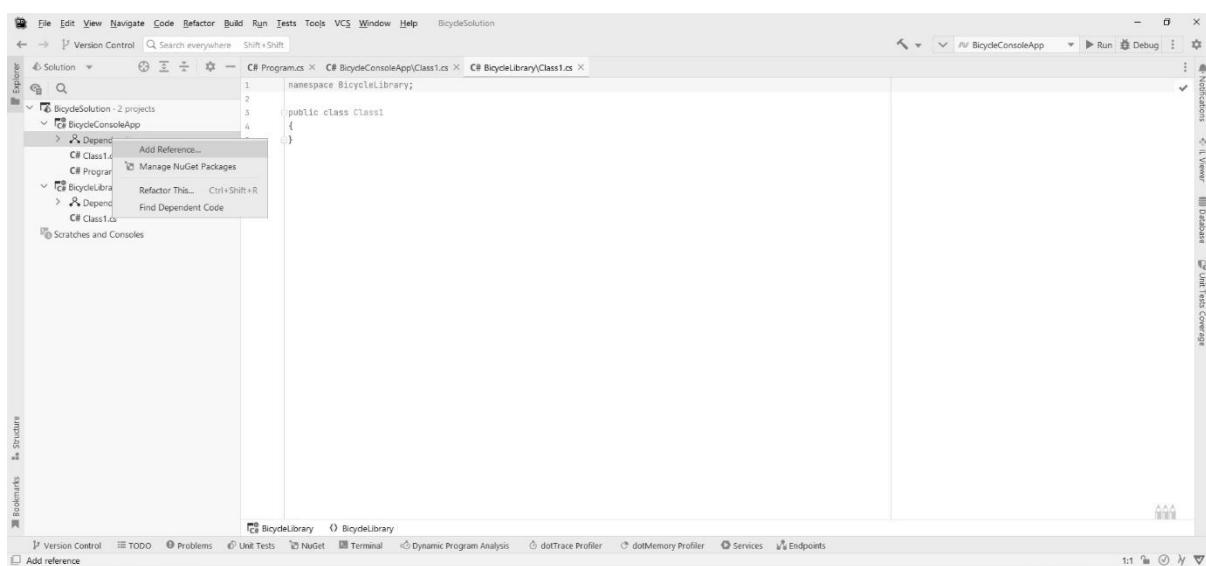
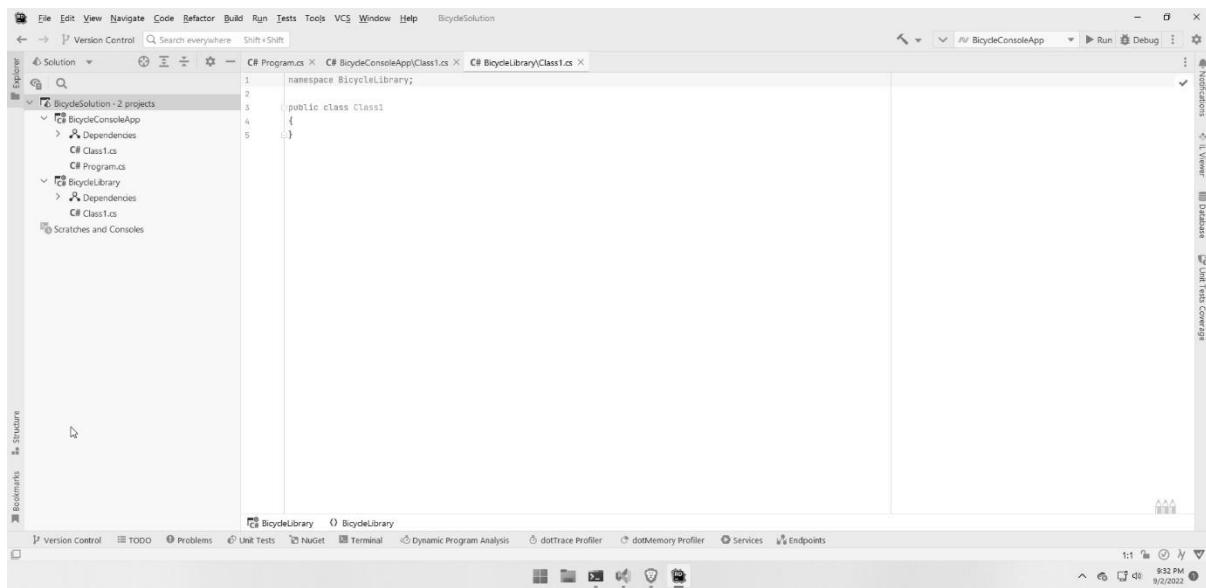


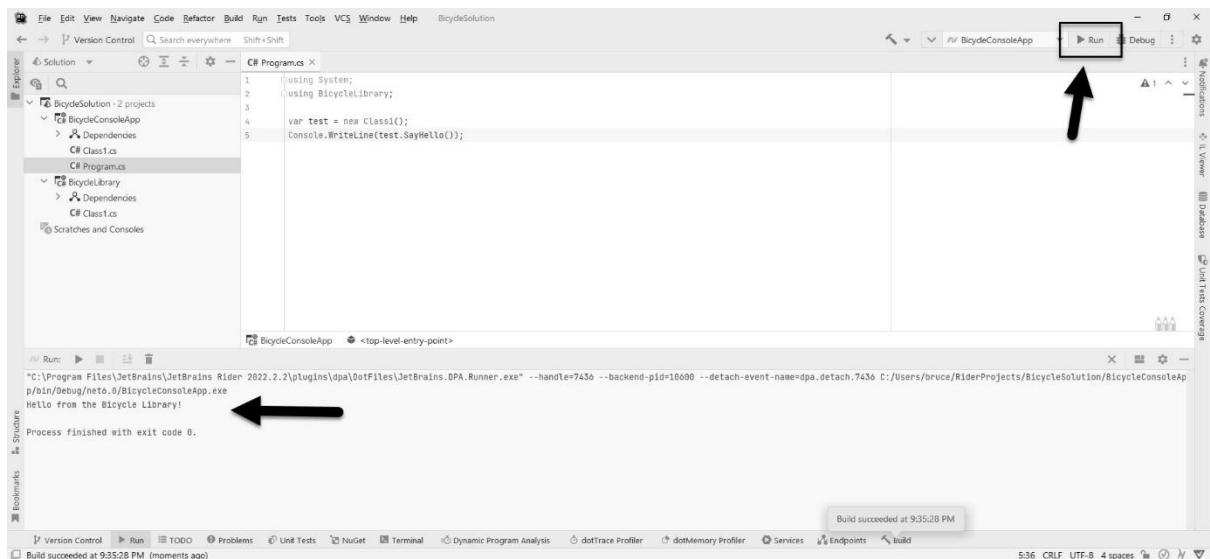
The screenshot shows the Visual Studio Code interface with the following details:

- File Bar:** File, Edit, Selection, View, Go, Run, Terminal, Help.
- Editor:** Program.cs - BicycleSolution - Visual Studio Code
- Explorer:** Shows a solution named "BICYCLESOLUTION" containing two projects:
  - BicycleConsoleApp (bin, obj, BicycleConsoleApp.csproj, Class1.cs, Program.cs)
  - BicycleLibrary (bin, obj, BicycleLibrary.csproj, Class1.cs)
- Terminal:** PowerShell 7.2.6, showing the output of running the application: "Hello from the Bicycle Library!"
- Status Bar:** Ln 6, Col 1, Spaces: 4, UTF-8 with BOM, CRLF, C#, F5, D.

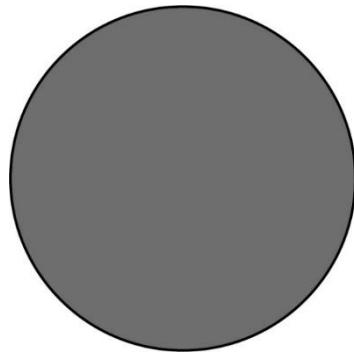








## Appendix 2: A Primer on the Unified Modeling Language (UML)



Properties:

Center: 7, 2  
Radius: 200px  
LineWidth: 1px  
Line Color: #000000  
FillColor: #231F20

