

Native Desktop Applications with .NET 8

*Build cross-platform apps using
.NET MAUI, Blazor Hybrid, and Native UI*

Sai Kumar Kona



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Kup ksi k

Dedicated to

My beloved parents:

Vijay Kumar Koona and Narmada

My wife Sowmya

and

*My son **Jatin Koona***

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I'd like to thank BPB Publications for their guidance and expertise in bringing this book to fruition. It was a long journey of revising this book, with valuable participation and collaboration of reviewers, technical experts, and editors.

Finally, I would like to thank all the readers who have taken an interest in my book and for their support in making it a reality. Your encouragement has been invaluable.

Preface

The goal of this book is to give readers a thorough understanding of the .NET ecosystem and the evolution of desktop frameworks since the platform's inception in the early 2000s.

Throughout the book, you will learn about various native-desktop application frameworks available in the .NET ecosystem like WinForms, Windows presentation framework (WPF), Multi-platform App UI (.NET MAUI), Windows App SDK, and Blazor.

This book also serves as a thorough guide for senior engineers and application architects who need a solid foundation to understand numerous architectural principles. It offers a list of best practices for all programmers to follow while developing logic.

With this book, you will gain the knowledge and skills to become a proficient developer in the field of native-desktop application development using C# and .NET.

Chapter 1: Introduction to .NET 8 - In this chapter, we will cover the evolution of .NET Technology from its inception and the issues with the existing .NET Framework, which led to the introduction of .NET Core. Later, we'll look at the obstacles that .NET Core faced and how they were overcome. Next, the versioning strategy of the .NET platform will be discussed. After that, there will be a brief introduction to the Command Line Interface (CLI). Then, there will be an overview of the many supported Desktop-based UI Frameworks.

Chapter 2: Exploring .NET 8's Features - In this chapter, we will cover the most recent .NET version is .NET 8, and since it is a Long-Term Support (LTS) version, support will be available for the next three years or beyond. Thus, this chapter's main goal is to give readers a thorough grasp of the most important features that came with the .NET 8 release.

Chapter 3: Working with Command Line Interface - In this chapter, we will cover the explanation of Command Line Interface (CLI). The most popular commands for creating, building, publishing, and testing any installed.NET application template on the workstation will then be discussed, along with knowing where to find it and how to utilize it.

Chapter 4: Working with Windows Forms - In this chapter, we will cover how the .NET Framework was first published in 2002 when WinForms was the sole platform available for developing desktop applications. This chapter will provide a detailed introduction to the framework and walk through how to develop a form using its unique visual form designer.

It will also cover the fundamental setups needed to support multi-screen environments. After that, we'll go over the basic and widely used controls found in Windows Forms applications. Lastly, to have a deeper grasp of the platform, we will construct a basic application and explore its deployment possibilities.

Chapter 5: Working with Windows Presentation Foundation - In this chapter, we will cover how the **Windows Presentation Foundation (WPF)** is another GUI framework from Microsoft that comes along with .NET Framework 3.0, and we'll look at how it differs from WinForms. We will then go over an overview of XAML, or Extended Application Markup Language, which is a markup language used to design the WPF application's user interface. Next, we will learn how the binding framework functions. Afterward, we will discuss the main controls that are frequently utilized in WPF applications. To have a better knowledge of the subject, we will conclude with a simple application creation using the WPF framework.

Chapter 6: Working with Multi-platform App UI - In this chapter, we will cover Multi-platform App UI (MAUI), the most modern cross-platform framework for developing desktop and mobile applications in C# and XAML. This chapter will walk you through the steps necessary to understand how the framework works. Next, the project structure for the MAUI application will be discussed, along with the newly added controls. We'll go into more detail later about the widely used Model–View–ViewModel (MVVM) paradigm and how it improves the MAUI application. To further grasp the new and popular platform, we'll conclude with a basic application creation using the MVVM architectural pattern and an MAUI application.

Chapter 7: Working with Windows App SDK - In this chapter, we will cover how the Windows App SDK is a set of components and APIs that aid in the development of applications running on Windows 10 and later operating systems. Next, a thorough explanation of WinUI's evolution will also be explored. Later, we'll look at the project structure and functionality of the WinUI 3.0 application. Using this development kit, we will design a basic application and learn how to package it so that it can run on any version of Windows 10 or later.

Chapter 8: Working with Blazor - In this chapter, we will cover that Microsoft has released a new Web framework called Blazor for developing web-based apps. We shall gain more knowledge about this framework and its types of hosting. We'll talk about the Razor components later, where they'll be utilized to build the application's user interface. This is essentially a web framework, but we can also use Blazor Hybrid apps—which we will go into detail about—to combine this application with WinForms and MAUI applications. Afterward, we'll build a simple application with this framework to see how Blazor Hybrid

apps function, particularly with MAUI, which eliminates the requirement for specialized XAML knowledge if you come from the web to create desktop or mobile apps.

Chapter 9: Application Architecture - In this chapter, we will cover the various architectural concepts, including monolithic and microservices, as well as their benefits and drawbacks. Next, using simple use cases, we will learn about some software design patterns and SOLID principles. Afterwards, will delve deeply into the new gRPC platform, which is mostly used for service-to-service communication, particularly in Microservices design, and then will learn about the Docker tool. This chapter is dedicated to senior engineers or application architects.

Chapter 10: Best Practices - This chapter covers the best practices for building code using entity frameworks, asynchronous programming, and so on. Every time a developer writes code, they should adhere to some industry best practices.

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Table of Contents

1. Introduction to .NET 8.....	1
Introduction.....	1
Structure.....	2
Objectives	2
Understanding the .NET ecosystem.....	2
<i>Exploring .NET platforms</i>	<i>3</i>
<i>Understanding .NET Core.....</i>	<i>4</i>
Understanding One .NET vision: A unified development platform	5
Support tracks and release cycles	6
Supported operating systems.....	7
Command-line interface.....	9
Development with native desktop applications.....	12
<i>Evolution of desktop technologies with .NET</i>	<i>13</i>
<i>Importance of .NET Core-based desktop applications.....</i>	<i>15</i>
<i>Universal Windows Platform</i>	<i>15</i>
Windows UI library.....	17
<i>.NET Multi-platform App UI.....</i>	<i>19</i>
Conclusion.....	20
 2. Exploring .NET 8's Features	 21
Introduction.....	21
Structure.....	21
Objectives	22
JIT performance improvements	22
<i>Tiered compilation</i>	<i>23</i>
Profile-guided optimization.....	24
Native AOT support	24
<i>OptimizationPreference.....</i>	<i>27</i>
<i>StackTraceSupport.....</i>	<i>28</i>

Garbage collection with DATAS feature	29
Methods for working with randomness	30
<i>GetItems<T>()</i>	30
<i>Suffle<T>()</i>	31
Performance focused types.....	31
<i>System.Collections.Frozen</i> namespace	31
<i>Buffers.IndexOfAnyValues</i>	32
<i>System.Text.CompositeFormat</i>	32
New hash types.....	32
Cryptography.....	32
HTTPS proxy support.....	33
Blazor improvements.....	33
New data validation attributes.....	33
Stream-based ZipFile methods.....	34
Serialization improvements	35
New features in C# 12	35
Primary constructors	36
Collection expressions	38
Default lambda parameters	39
Alias any type.....	40
Aliasing tuple types.....	40
Experimental attribute	41
Inline arrays	42
Interceptors.....	43
Conclusion.....	46
3. Working with Command Line Interface.....	47
Introduction.....	47
Structure.....	47
Objectives	48
Installation steps for command line interface tool	48
List of basic commands	50
Understanding when and why to use CLI	51

Working with dotnet new command	54
<TEMPLATE>	54
Working with dotnet restore command	58
--no-restore	59
Configure private package sources.....	61
Working with dotnet build command.....	62
Working with dotnet publish command.....	64
Single file deployment.....	65
Working with dotnet run command.....	68
Conclusion.....	69
 4. Working with Windows Forms.....	71
Introduction.....	71
Structure.....	71
Objectives	72
Exploring Native apps' optimal framework	72
Gaining insights into Windows Forms functionality	73
Windows Forms application project structure.....	74
[STAThread]	76
Initialize.....	77
EnableVisualStyles	78
SetCompatibleTextRenderingDefault.....	78
SetHighDpiMode	78
Run	83
Windows Forms Designer on Visual Studio.....	84
Toolbox window	84
Designer	85
Properties window	87
Exploring various Windows Forms controls	88
Frequently used controls	89
Binding list control to data.....	92
Windows Forms user control	94
Developing Windows Forms application	100

<i>Creating installation file</i>	107
Conclusion.....	113
5. Working with Windows Presentation Foundation	115
Introduction.....	115
Structure.....	115
Objectives	116
Understanding WPF framework.....	116
WPF application project structure	117
<i>App.xaml</i>	119
<i>AssemblyInfo.cs</i>	121
<i>Understanding XAML layout</i>	121
<i>Events</i>	123
<i>WPF visual designer on Visual Studio</i>	124
Basic WPF controls.....	125
<i>Label</i>	125
<i>TextBlock</i>	127
<i>TextBox</i>	130
<i>PasswordBox</i>	133
<i>Button</i>	134
<i>CheckBox</i>	137
WPF Panels.....	138
<i>Canvas control</i>	138
<i>WrapPanel control</i>	140
<i>StackPanel control</i>	142
<i>DockPanel control</i>	143
<i>Grid control</i>	146
Understanding data binding	149
<i>DataContext</i>	150
ObservableCollection.....	153
<i>INotifyPropertyChanged</i>	155
Creating user controls.....	157
<i>Step 1: Create LabeledTextboxControl user control project</i>	158

<i>Step 2: Developing LabeledTextboxControl</i>	159
<i>Step 3: Integrate LabeledTextboxControl</i>	162
Conclusion.....	164
6. Working with Multi-platform App UI.....	165
Introduction.....	165
<i>Structure</i>	165
Objectives	166
Understanding MAUI framework.....	166
MAUI prerequisites.....	168
MAUI application project structure.....	172
<i>Platforms</i>	174
<i>Resources</i>	175
MAUI controls	175
<i>Pages</i>	175
<i>ContentPage</i>	176
<i>FlyoutPage</i>	177
<i>NavigationPage</i>	180
<i>TabbedPage</i>	182
<i>Layouts</i>	184
<i>AbsoluteLayout</i>	184
<i>FlexLayout</i>	187
<i>Direction</i>	187
<i>Wrap</i>	189
<i>JustifyContent</i>	189
<i>Views</i>	190
<i>Entry</i>	190
<i>Editor</i>	191
<i>Frame</i>	192
<i>ScrollView</i>	193
<i>BoxView</i>	195
<i>SwipeView</i>	196
<i>WebView</i>	199

Understanding resources	201
<i>StaticResources vs. DynamicResources</i>	202
<i>ResourceDictionary</i>	204
Exploring Model View View Model	205
<i>Commands</i>	206
<i>.NET MAUI application using MVVM</i>	208
<i>Conclusion</i>	215
7. Working with Windows App SDK	217
Introduction	217
Structure	217
Objectives	218
Understanding Windows App SDK and WinUI	218
Configuration for creating new Windows App SDK	221
WinUI 3.0 templates and app project structure	224
<i>Using Windows Application Packaging project</i>	230
Windows App SDK features	231
Creating the first Windows App SDK application	231
<i>Data Binding in WinUI</i>	233
Application packaging using MSIX SDK	236
Add SDK support to existing application	239
<i>Distribution through packaged app</i>	241
<i>Distribution through unpackaged app</i>	242
Conclusion	244
8. Working with Blazor	245
Introduction	245
Structure	245
Objectives	246
Understanding Blazor and its hosting models	246
<i>Blazor hosting models</i>	247
<i>Blazor WebAssembly</i>	247
<i>Blazor Server</i>	249

<i>Blazor Hybrid</i>	250
Blazor WebAssembly standalone app.....	251
Blazor Progressive Web App	253
<i>Standalone WebAssembly project structure</i>	256
<i>Program.cs</i>	257
<i>App.razor</i>	258
<i>_Imports.razor</i>	258
<i>wwwroot</i> folder.....	259
<i>Layout</i> folder.....	260
<i>Pages</i> folder.....	260
Blazor Web app.....	260
<i>New Render Modes in .NET 8</i>	262
<i>Static server rendering</i>	263
<i>Interactive Server rendering</i>	264
<i>Interactive WebAssembly rendering</i>	266
<i>Interactive Auto</i>	268
<i>Interactive location</i>	269
Understanding interactive server-side app	269
Understanding Razor components.....	271
<i>Create a Razor component</i>	271
Directives	273
HTML templates.....	275
<i>CSS Style</i>	275
<i>Streaming rendering</i>	276
Communication between Razor components	277
Razor component lifecycle events.....	279
Developing end-to-end Blazor app	280
Blazor Hybrid app with .NET MAUI.....	289
Blazor Hybrid app with Windows Forms	294
Conclusion.....	298

9. Application Architecture	299
Introduction.....	299
Structure.....	299
Objectives	300
Understanding application architecture	300
<i>Client-server model</i>	301
<i>Application programming interface</i>	301
Architectural Patterns.....	302
<i>Monolithic architectural pattern</i>	303
<i>Microservices architectural pattern</i>	305
Application Load Balancer.....	309
Backend for frontend pattern	310
Design patterns.....	311
<i>Creational design patterns</i>	311
<i>Structural design patterns</i>	312
<i>Behavioral design patterns</i>	313
SOLID design principles	314
<i>Single Responsibility Principle</i>	314
<i>Open–Closed Principle</i>	316
<i>Liskov Substitution Principle</i>	318
<i>Interface Segregation Principle</i>	321
<i>Dependency Inversion Principle</i>	323
Working with gRPC platform.....	326
<i>Protocol Buffers</i>	327
<i>Building application using gRPC and .NET</i>	328
<i>gRPC client application</i>	333
Understanding Docker	334
<i>Dockerfile</i>	336
<i>Docker image</i>	338
Docker container	339
Conclusion.....	341

10. Best Practices	343
Introduction	343
Structure	343
Objectives	343
C# programming best practices	344
Code quality	344
Readability	344
Indentation and formatting	346
Maintainability	347
Exception handling	348
Throw statement	350
Defensive coding	351
Dispose unmanaged objects	353
Disposing objects by using block	355
Microservices best practices	355
Micro frontend	355
Single responsible services	357
Microservice level data store	357
Containerization, deployment, and maintenance	357
Stateless microservices	358
Asynchronous programming with async / await	358
Limiting concurrent operations	358
Use ConfigureAwait(false) method	360
EF Core best practices	360
Register DbContext object from the data layer	361
Maintain single DbContext instance	362
Updating data efficiently	362
Loading data efficiently	363
Conclusion	365
Index	367-374

CHAPTER 1

Introduction to .NET 8

Introduction

This chapter aims to introduce the overview of the evolution of .NET Technology since it launched in the early 2000s and understand the problems with the existing .NET Framework, which led to the development of a new platform called .NET Core from scratch. The next part of this chapter is to understand the challenges faced by .NET Core, which leads to thinking of building a new ecosystem to achieve a unified development platform, meaning how it brings a bunch of separate .NET-based technologies together under one umbrella.

Next, we will introduce the **command-line interface (CLI)**, a powerful tool packed with .NET Core. As this chapter is to give some introduction, we will walk through the basic commands.

If you are new to .NET-based desktop applications or an experienced developer, this introduction section on *Development with native desktop application* will provide you the complete details on the evaluation of desktop frameworks since the launch of .NET Framework and understanding how these applications give more advantage when compared with web-based applications.

Later, we will discuss various supported desktop-based UI Frameworks from WinForms, WPF, UWP, and WinUI to .NET MAUI and their features.

Structure

In this chapter, we will cover the following topics:

- Understanding the .NET ecosystem
- Understanding one .NET vision – A unified development platform
- Support tracks and release cycles
- Supported operating systems
- Command-line interface
- Development with native desktop applications
- Universal windows platform
- Windows UI library
- .NET Multi-platform App UI (.NET MAUI)

Objectives

By the end of this chapter, the reader will understand the evolution of .NET Technology, .NET Core, a unified development platform, and desktop technologies on .NET Framework and .NET (core).

Understanding the .NET ecosystem

Microsoft started developing the .NET Framework in the late 1990s, and the first version of the .NET Framework was released on 13th February 2002. Before the .NET Framework, many technologies and frameworks were used to develop Windows software applications. For example, **Component Object Model (COM)**, **Distributed COM (DCOM)**, and **COM+** are the technologies used to communicate between the components, performing transactions, and messaging services. Every new version of Windows extends the existing API by introducing new features or functions. So, there will always be an issue with backward compatibility when using software on different versions of Windows.

Microsoft identified that it needs to upgrade the development tools and languages whenever a new feature is added. It is becoming more and more complex down the line to maintain. So, Microsoft decided to build a new platform from scratch to provide a simple and sophisticated set of languages, environments, and tools by which developers can write neat code to develop software that supports backward compatibility.

Now all the existing software will still work, and .NET was designed to communicate with these legacy programs as on Windows, communication between software programs will happen using COM. Considering this, .NET can have a wrapper around the existing COM components to communicate with .NET components.

.NET Framework is a software development framework for building and running applications on Windows.

Many changes and features are added to every version of the .NET Framework; the latest version is .NET Framework 4.8.1 while writing this chapter. This framework is a Windows-only development platform for desktop and web application development.

Exploring .NET platforms

.NET platform is used for the development of desktop and web applications. Similarly, the Xamarin platform is used to develop the mobile-based application, which uses the .NET framework's cross-platform mono implementations. The Xamarin framework is an alternative platform for building applications targeting mobile OS like Windows, Android, and iOS.

These two .NET platforms, .NET Framework and Xamarin Framework, are separate. Also, these two platforms have components with almost similar API implementations. Each platform has its own set of libraries; some of them contain base classes, and others are specific to supported app models, as shown in *Figure 1.1*:

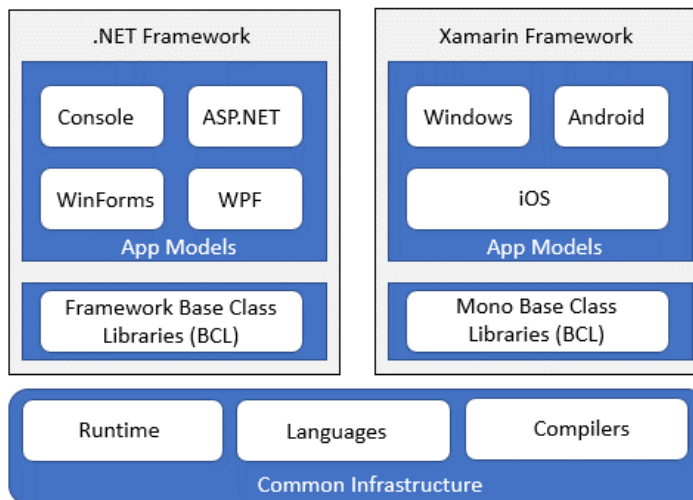


Figure 1.1: Comparing .NET Framework and Xamarin with layers

The above figure shows a stack of three layers on each platform, and the top layer contains libraries specific to their supporting app models. For example, the .NET Framework supports developing various app models such as console, desktop, web, and **Windows Presentation Foundation (WPF)**. On the other end, the Xamarin Framework contains libraries that can be used to develop mobile applications for Windows, Android, and iOS. However, we cannot create a console-based application using the Xamarin platform, and similarly, we cannot develop an Android-based application using the .NET Framework.

The next layer on the stack is a **Base Class Library (BCL)** for the .NET Framework, and the Xamarin platform contains a BCL with mono implementations. These BCLs contain fundamental .NET types such as *int*, *string*, streams, accessing files, and other APIs. Even

though these BCLs contain similar APIs, fundamentally, both are different; that is, we cannot guarantee the given type, method, or property will be contained on both platforms.

The bottom layer consists of compilers, languages, and **common language runtime (CLR)**; without this tooling, we cannot build or deploy our applications on any .NET-based platforms. Here we compared only a couple of .NET-based platforms. Still, we have many other frameworks, such as **Universal Windows Platform (UWP)**, Unity for gaming applications, IoT, etc., where we see the same BCLs specific to their platforms having many similar APIs.

Till now, everything looks good as each platform has a separate set of app model development life cycles. But the real problem is the BCLs of each platform, as they are not fundamentally interoperable, that is, we cannot share or use the libraries built on one platform and want to use them on another .NET-based platform. To do this, the developer should know the platform APIs and change the code slightly with specific API methods or properties to support the targeting platform. Another problem Microsoft identified is that the present software development has rapidly changed by developing small, lightweight, and cloud-support web applications such that they can be deployed in a cross-platform environment. But the current .NET Framework is tightly coupled with Windows and does not suit modern cloud-native web application developments.

Microsoft wanted to start building a new framework from scratch that supported all these scenarios and started a project with the internal name *Project K* during development. Later it was officially named *.NET Core*.

Understanding .NET Core

.NET Core is a cross-platform, high-performance, and open-source framework for building modern, cloud-based applications. This platform has its own cross-platform BCL libraries called **CoreFX** as it contains types for file systems, collections, JSON, XML, and many more, and cross-platform runtime called *CoreCLR* includes the garbage collector, JIT compiler, and other low-level classes which are used to execute .NET core applications.

This platform is bundled with its own CLI tooling, with which we can create and manage the .NET Core-based applications without any rich IDE support. It also has rich ASP.NET Core and EF Core libraries by which we can build cloud-based native Web applications with high performance. This highly modular platform can deploy side-by-side with other .NET Core version installations. Another feature of this platform is that it is self-contained. During deployment, we can opt to have complete .NET Core libraries distributed along with the application. With this feature, the target system does not need .NET installed in advance, and the application will work independently.

With the introduction of the .NET Core platform, we overcame one of the abovementioned problems: Developing modern, cloud-based applications supporting deployment on cross-platform environments. But another problem still exists: sharing the libraries across different platforms in the .NET ecosystem. .NET Core is another new platform introduced

along with other existing platforms, as discussed in previous sections, with its own set of BCLs and runtime. Microsoft introduced .NET Standard to solve this library sharing across the platforms (*Figure 1.2*):

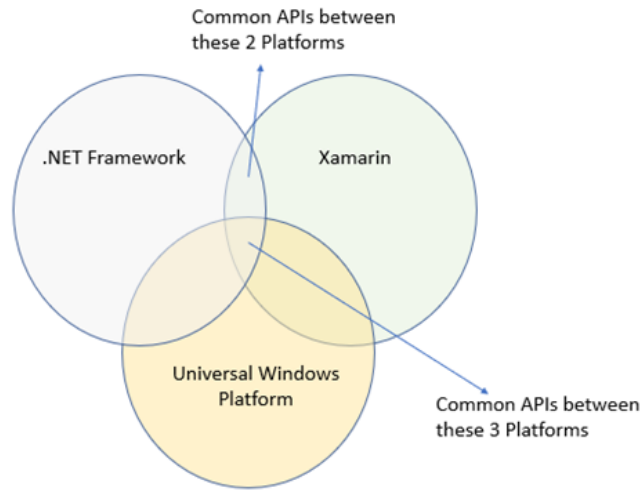


Figure 1.2: Overlapping common APIs between .NET platforms

The .NET Standard, the name itself, suggests that it ensures a standard set of APIs is available on every .NET platform, as shown in *Figure 1.2*. The developer does not need to know the other platform APIs, and the logic built using the .NET Standard can be re-used on other platforms. For example, write a logic to send an email and build a library using the .NET Standard without any changes. We can use the same library with .NET Framework, .NET Core, Xamarin, and Silverlight platform.

Still, we are left with the fundamental issue of managing multiple platforms. Each platform has its source code, and Microsoft needs to manage it separately, even though most are fundamentally identical in most areas. Also, Microsoft is quickly introducing new features to the .NET Core platform and new C# language versions to make more productive development with high performance. But unfortunately, none of the other platforms are taking advantage of these without doing additional work. Microsoft wants to handle this by introducing a *One .NET*.

Understanding One .NET vision: A unified development platform

To develop a desktop application, you need to use the .NET Framework. Similarly, suppose you want to develop a Windows, Android, and iOS mobile application. In that case, you need to use Xamarin Framework, and if you want to develop cross-platform web applications, you need to use .NET Core. Here, each app model is tightly bound to its BCL platform.