Chapter 5. .NET Overview

Almost all of the capabilities of the .NET 8 runtime are exposed via a vast set of managed types. These types are organized into hierarchical namespaces and packaged into a set of assemblies.

Some of the .NET types are used directly by the CLR and are essential for the managed hosting environment. These types reside in an assembly called *System.Private.CoreLib.dll* (*mscorlib.dll* in .NET Framework) and include C#'s built-in types as well as the basic collection classes, and types for stream processing, serialization, reflection, threading, and native interoperability.

At a level above this are additional types that "flesh out" the CLR-level functionality, providing features such as XML, JSON, networking, and Language-Integrated Query. These comprise the Base Class Library (BCL). Sitting above this are *application layers*, which provide APIs for developing particular kinds of applications such as web or rich client.

In this chapter, we provide the following:

- An overview of the BCL (which we cover in the rest of the book)
- A high-level summary of the application layers

WHAT'S NEW IN .NET 7 AND .NET 8

The Base Class Libraries in .NET 7 and .NET 8 include numerous new features and performance improvements. In particular:

- The Tar archive format, popular on Unix systems, is now supported via types in the new `System.Formats.Tar` namespace (see "Working with Tar Files"). The `ZipFile` class has also been enhanced to allow folders of files to be zipped directly into or from a stream.
- The `Stream` class now exposes `ReadExactly` and `ReadAtLeast` methods to simplify reading from streams (see "Reading and Writing").
- There's now support for working with Unix file permissions (see "Unix file security").
- Support for `Span<T>` and `ReadOnlySpan<T>` has been extended. In particular, numeric and other simple types now support UTF-8 formatting and parsing directly into `Span<byte>` via new `IUtf8SpanFormattable` and `IUtf8SpanParsable<TSelf>` interfaces, and the `MemoryExtensions` class contains additional extension methods to help with searching for values within spans (see "Searching in Spans").
- The `Random` class now includes a `GetItems` method to pick random items from a collection, and a `Shuffle` method to randomly shuffle items (see "Random").
- .NET's date and time types now expose `Microsecond` and `Nanosecond` properties.
- The `JsonNode` class has a number of new methods, including `GetValueKind`, `DeepEquals`, `DeepClone`, and `ReplaceWith` (see "JsonNode").