.NET Conf China
2022

一个音乐爱好者的跨平台开发体验

—— Avalonia 跨平台开发，以 LINUX 平台为例

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华南师范大学 网络教育学院

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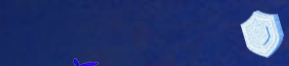
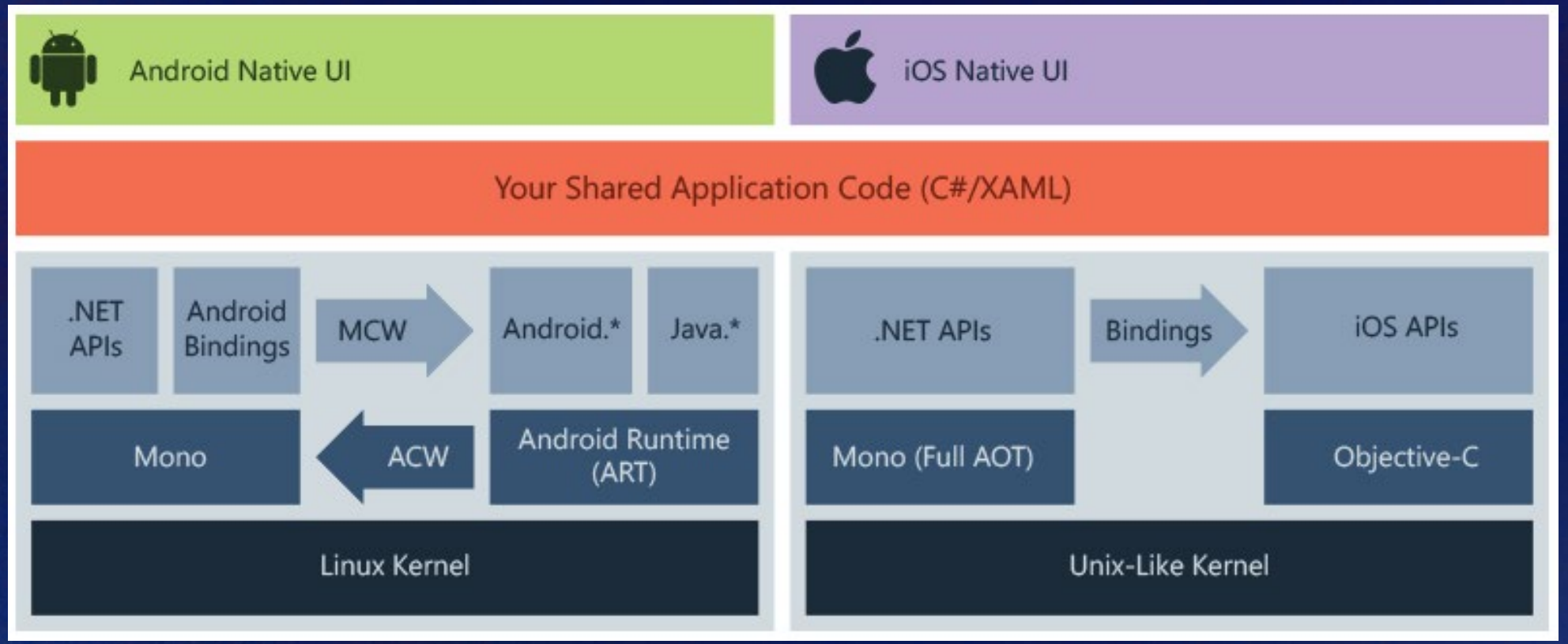
1. 跨平台开发简述



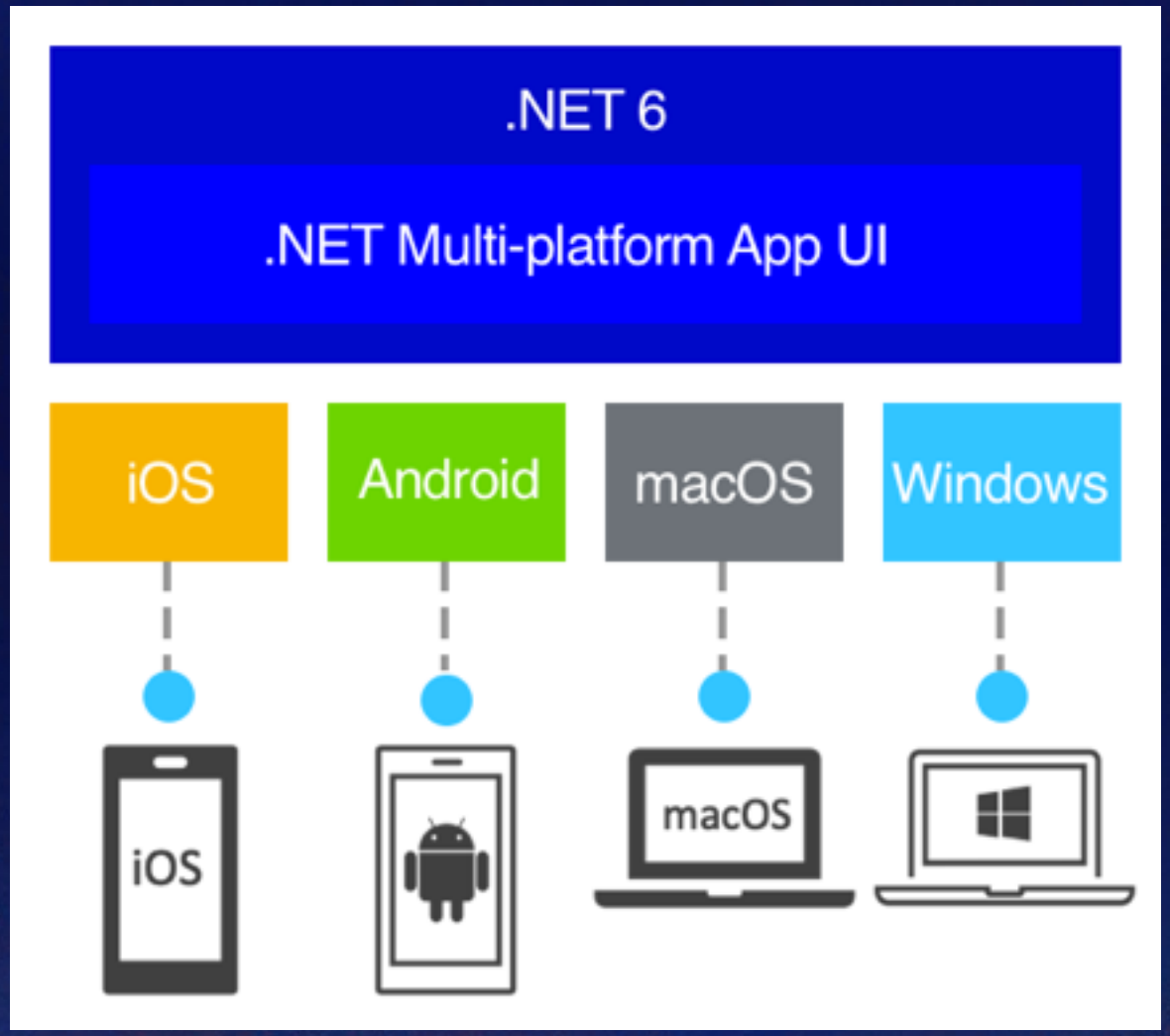
为何需要跨平台开发?

- 应用原有知识
- 减少学习成本
- 减少人力资源成本
- 易于维护
- ……

.NET Multi-platform Development -- Xamarin



.NET Multi-platform App UI（MAUI）



MAUI 唯独缺少了对 LINUX 的支持

LINUX 系统很少用户使用?

- LINUX 桌面系统的用户逐年增加
- 国家政策的原因
- 个人爱好的原因（MusicFans）

MusicFans(数年前) 用 Xamarin Forms 技术，支持

macOS/Windows UWP/iOS/Android

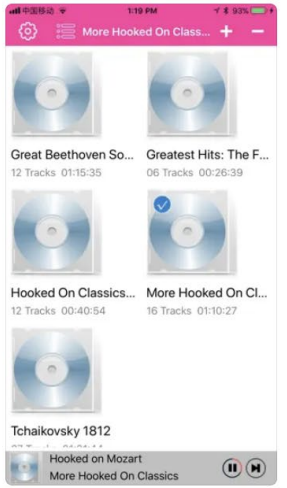
支持的音频文件格式：
wav/flac/ape/tta/wv/dsf/dff/ogg/opus/m4a/aiff/aac/mp3

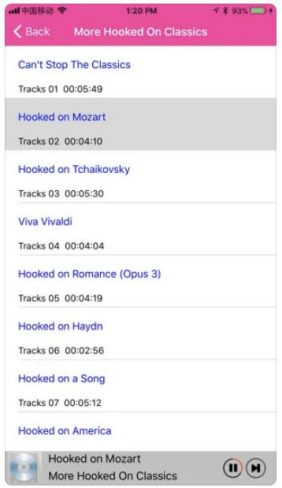
尚缺乏对 Linux 的支持

App Store Preview

MusicFans 4+
iPZS
Designed for iPad
★★★★★ 5.0 • 2 Ratings
Free

Screenshots iPad iPhone





MusicFans features:
1. Support FLAC(Free Lossless Audio Codec), APE(Monkey's Audio), PCM WAVE a
support MP3 Audio file playing.
2. Support CUE playlist
3. Support background and screenlocked playing, automatically continue after ph

What's New

This app has been updated by Apple to display the Apple Watch app icon.

Bug fix

Ratings and Reviews

5.0 out of 5

2 Ratings

C#、基于 XAML 的UI框架

Uno Platform		Avalonia
	Project	
87	@ Mentions	171
7,176	☆ Stars	15,948
2.2%	Growth	3.7%
10.0	Activity	10.0
8 days ago	Latest Commit	2 days ago
C#	<> Language	C#
GNU General Public License v3.0 or later	License	MIT License

The number of **mentions** indicates the total number of mentions that we've tracked plus the number of user suggested alternatives.
Stars - the number of stars that a project has on GitHub. **Growth** - month over month growth in stars.
Activity is a relative number indicating how actively a project is being developed. Recent commits have higher weight than older ones.
For example, an activity of **9.0** indicates that a project is amongst the top 10% of the most actively developed projects that we are tracking.

2. Avalonia 环境设置

Avalonia (Documentation: https://avaloniaui.net)

Open Source

Avalonia UI is open source, free to use and always will be. Clone the source today to dig deeper.

Visual Studio Extension

The free VS extension provides everything needed to start, including a XAML previewer.

JetBrains Rider & ReSharper

JetBrains deep understanding of Avalonia UI shines through with rich Rider and ReSharper support.

Cross Platform

Deploy to the platforms you care about with ease.

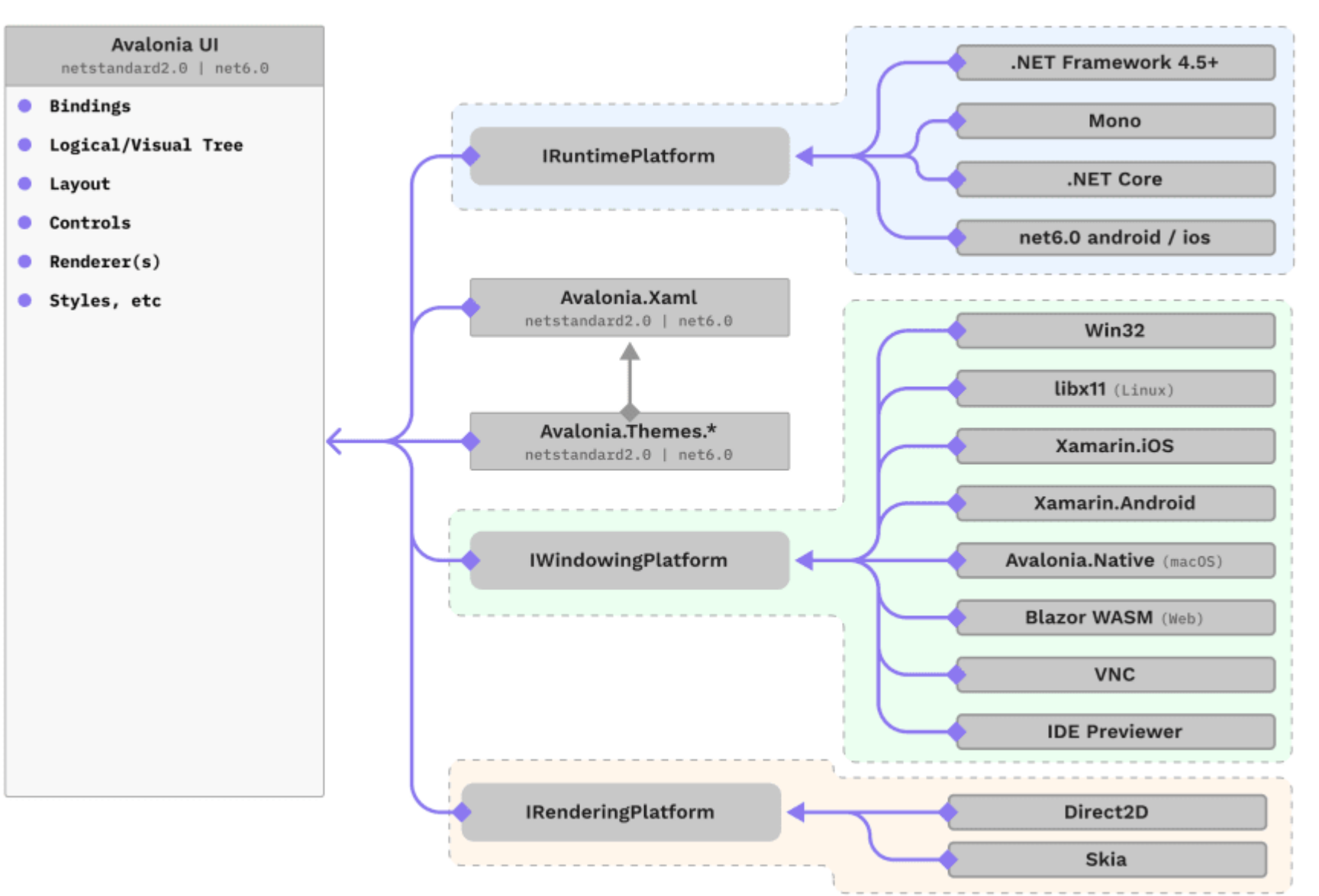
Reuse Existing Skills

Leverage existing knowledge, code and packages to kickstart your project.

Commercial Support

Get the support your project needs with one of our commercial support agreements. Help you can count on.

Avalonia Architecture



Avalonia UI

- Displaying images
- Date and time controls
- Menus

Layout

Layout controls provide ability for developer to arrange child controls according to specific rules.

Border

A control which decorates a child with a border and background.

Canvas

A panel that displays child controls at arbitrary locations.

DockPanel

A panel which arranges its children at the top, bottom, left, right or center.

Expander

A control with a header that has a collapsible content section.

Grid

A flexible grid area that consists of columns and rows.

GridSplitter

Redistributes space between columns or rows of a Grid control.

Panel

Base class for controls that can contain multiple children.

RelativePanel

Defines an area within which you can position and align child objects in relation to each other or the parent panel.

ScrollBar

Avalonia 的前景

- Avalonia 目前的版本为 0.10.18，许多功能尚待完善
- Avalonia 的下一个发行版本为 11.0
  https://github.com/AvaloniaUI/Avalonia/

Avalonia 开发环境设置(Ubuntu 22.04)

- .NET SDK 安装

  ```
  sudo apt-get update && \
  sudo apt-get install -y dotnet-sdk-6.0
  ```

  Ubuntu 20.04 需先添加 Microsoft package signing key 及 package repository

  ```
  wget https://packages.microsoft.com/config/ubuntu/20.04/packages-microsoft-prod.deb -O \
  packages-microsoft-prod.deb
  sudo dpkg -i packages-microsoft-prod.deb
  rm packages-microsoft-prod.deb
  ```

- 安装 Rider

  ```
  sudo snap install rider --classic
  ```

Avalonia 开发环境设置(Ubuntu 22.04)

安装 Rider 的 Avalonia Plugin

Add Plugin Repository: https://plugins.jetbrains.com/plugins/dev/14839

为 Rider 安装 Avalonia Templates

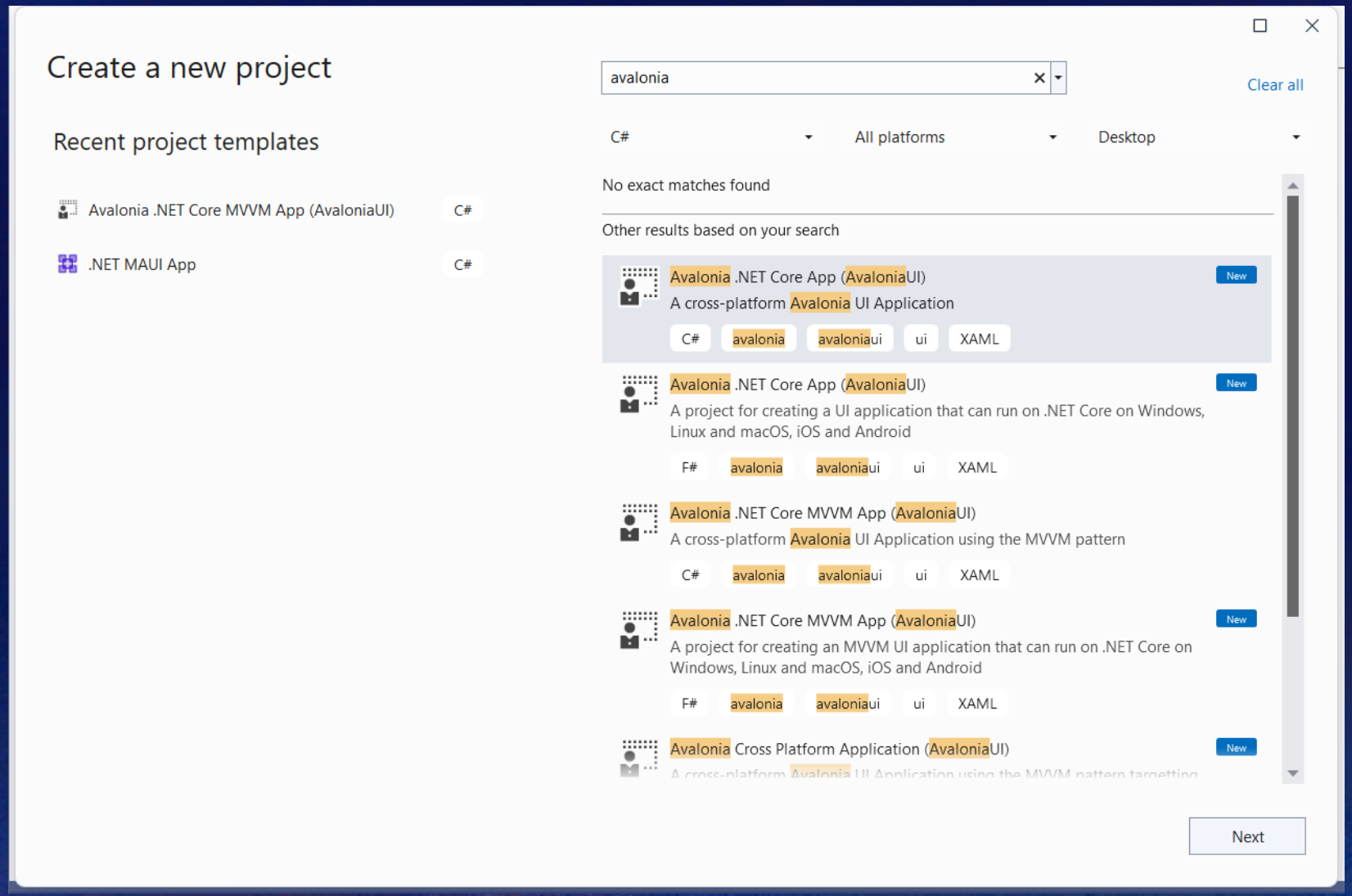
```
dotnet new --search ava
dotnet new --install Avalonia.Templates
```

Avalonia 开发环境设置(Windows 10/11)

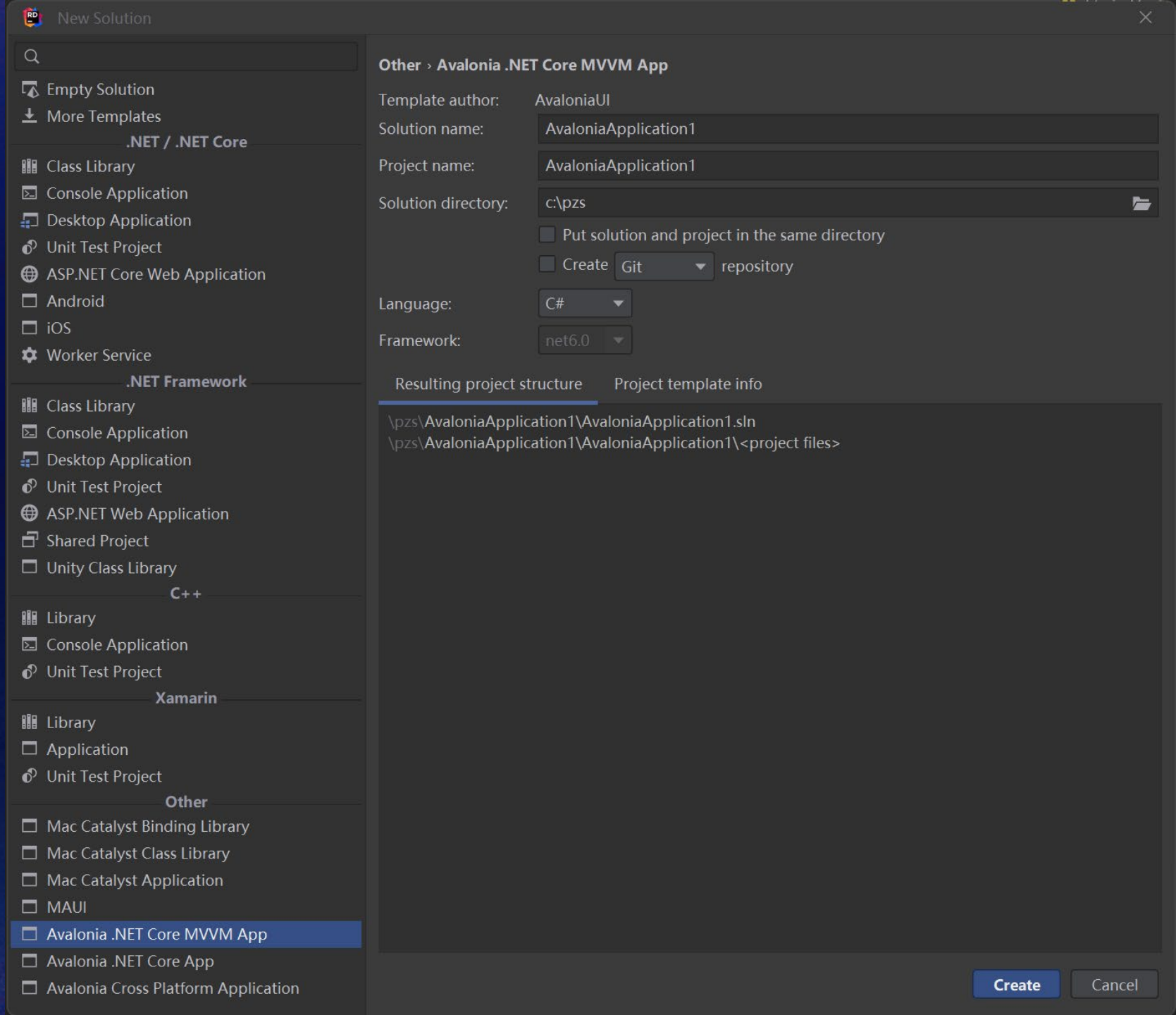
https://www.jetbrains.com 下载 exe 安装 Rider

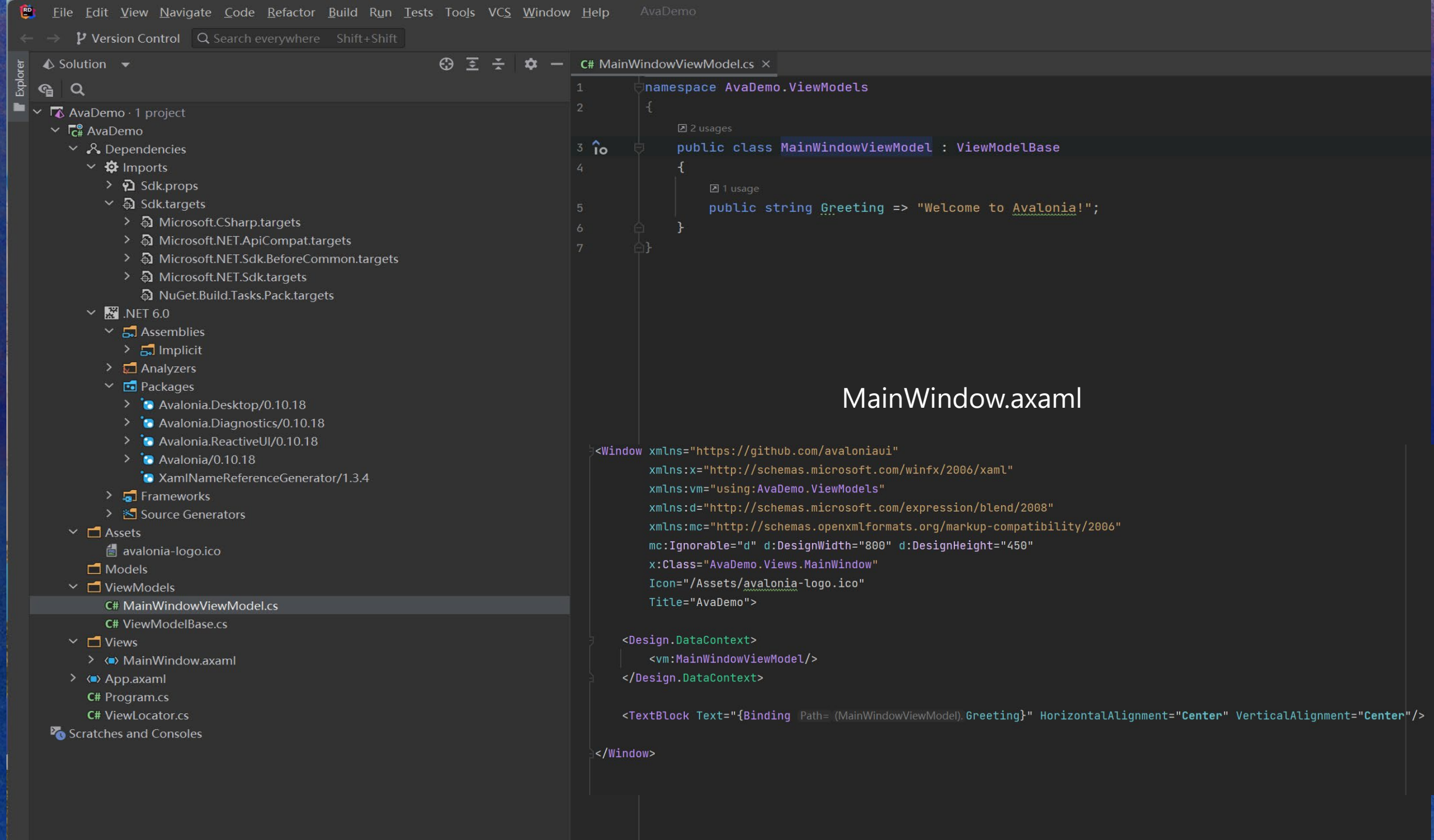
https://www.jetbrains.com 下载 Visual Studio 的 Rider .NET 开发扩展 ReSharper

Visual Studio 2022 安装 Rider 扩展 ReSharper(Windows 10/11)



Rider 的 Avalonia 应用程序模板




File Edit View Navigate Code Refactor Build Run Tests Tools VCS Window Help
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AvaDemo
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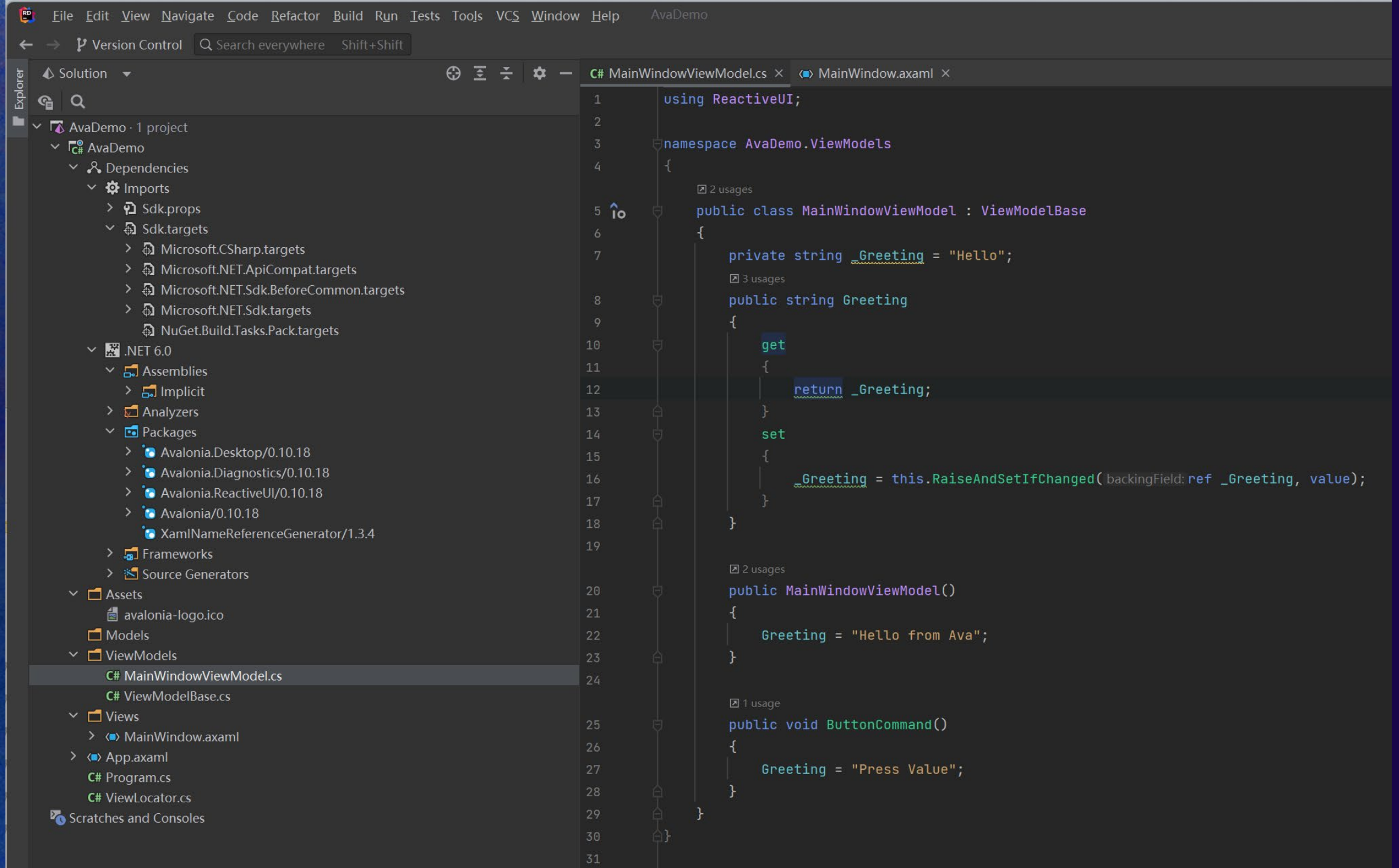
ViewModelBase.cs
Views
MainWindow.axaml
App.axaml
Program.cs
ViewLocator.cs
Scratches and Consoles
MainWindowViewModel.cs
1 namespace AvaDemo.ViewModels
2 {
2 usages
3 public class MainWindowViewModel : ViewModelBase
4 {
1 usage
5 public string Greeting => "Welcome to Avalonia!";
6 }
7 }
MainWindow.axaml
<Window xmlns="https://github.com/avaloniaui"
xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
xmlns:vm="using:AvaDemo.ViewModels"
xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
xmlns:mc="http://schemas.openxmlformats.org/markup-compatibility/2006"
mc:Ignorable="d" d:DesignWidth="800" d:DesignHeight="450"
x:Class="AvaDemo.Views.MainWindow"
Icon="/Assets/avalonia-logo.ico"
Title="AvaDemo">
<Design.DataContext>
<vm:MainWindowViewModel/>
</Design.DataContext>
<TextBlock Text="{Binding Path= (MainWindowViewModel).Greeting}" HorizontalAlignment="Center" VerticalAlignment="Center"/>
</Window>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App.axaml
Program.cs
ViewLocator.cs
Scratches and Consoles
MainWindowViewModel.cs
MainWindow.axaml
using ReactiveUI;
namespace AvaDemo.ViewModels
{
2 usages
public class MainWindowViewModel : ViewModelBase
{
private string _Greeting = "Hello";
3 usages
public string Greeting
{
get
{
return _Greeting;
}
set
{
_Greeting = this.RaiseAndSetIfChanged(backingField: ref _Greeting, value);
}
}
2 usages
public MainWindowViewModel()
{
Greeting = "Hello from Ava";
}
1 usage
public void ButtonCommand()
{
Greeting = "Press Value";
}
}
}

3. Avalonia UI 使用

Avalonia UI Data Binding

- UI 绑定的 View Model 类

```
<Design.DataContext>
  <vm:MainWindowViewModel/>
</Design.DataContext>
```

- UI 绑定 命令

```
<MenuItem Header="_Preference..." Command="{Binding
Path={MainWindowViewModel}.PreferenceCommand}" CommandParameter="menu item">
  <MenuItem.Icon>
    <Image Source="/Assets/gear.png"/>
  </MenuItem.Icon>
</MenuItem>
```

- 属性绑定：

```
<Image Name="note" Width="20" Source="{Binding Path= {AlbumnItem}.note}"
HorizontalAlignment="Left"></Image>
```

WPF(Xamarin.Forms) 绑定UI 的自动更新

自定义类派生于 INotifyPropertyChanged:

```
public class Person : INotifyPropertyChanged
```

属性定义：

```
public string PersonName
{
        get { return name; }
        set
        {
                name = value;
                // Call OnPropertyChanged whenever the property is updated
                OnPropertyChanged();
        }
}
```

Avalonia 绑定UI 的自动更新

自定义类派生于 ReactiveObject :

```
public class AlbumItem : ReactiveObject
```

属性定义：

```
private Bitmap _note = null;
public Bitmap note
{
    get => _note;
    set => this.RaiseAndSetIfChanged(ref _note, value);
}
```

4. P/Invoke(Native Interoperability)

C# Data Types Alias

C# type keyword	.NET type
bool	System.Boolean
byte	System.Byte
sbyte	System.SByte
char	System.Char
decimal	System.Decimal
double	System.Double
float	System.Single
int	System.Int32
uint	System.UInt32
nint	System.IntPtr
nuint	System.UIntPtr
long	System.Int64
ulong	System.UInt64
short	System.Int16
ushort	System.UInt16

通过 P/Invoke (Platform Invoke) 调用 C 库函数

C# 与 C/C++ 基本类型对应

C# type	C/C++ type	Bytes	Range
`bool`	`bool` (with `int` fallback)	usually 1	`true` or `false`
`char`	`wchar_t` (or `char` if necessary)	2 (1)	Unicode BMP
`byte`	`unsigned char`	1	0 to 255
`sbyte`	`char`	1	-128 to 127
`short`	`short`	2	-32,768 to 32,767
`ushort`	`unsigned short`	2	0 to 65,535
`int`	`int`	4	-2 billion to 2 billion
`uint`	`unsigned int`	4	0 to 4 billion
`long`	`__int64`	8	-9 quintillion to 9 quintillion
`ulong`	`unsigned __int64`	8	0 to 18 quintillion
`float`	`float`	4	7 significant decimal digits
`double`	`double`	8	15 significant decimal digits

通过 P/Invoke (Platform Invoke) 调用 C 库函数

- 字符串参数:

```
[DllImport("NativeLib.dll", CharSet = CharSet.Auto)]
// void do_something(char *str);
private static extern void do_something(string str);
```

- 字符串返回值：

```
[DllImport("NativeLib.dll", CharSet = CharSet.Auto)]
// string * do_something(char *str);
private static extern IntPtr do_something(string str);
```

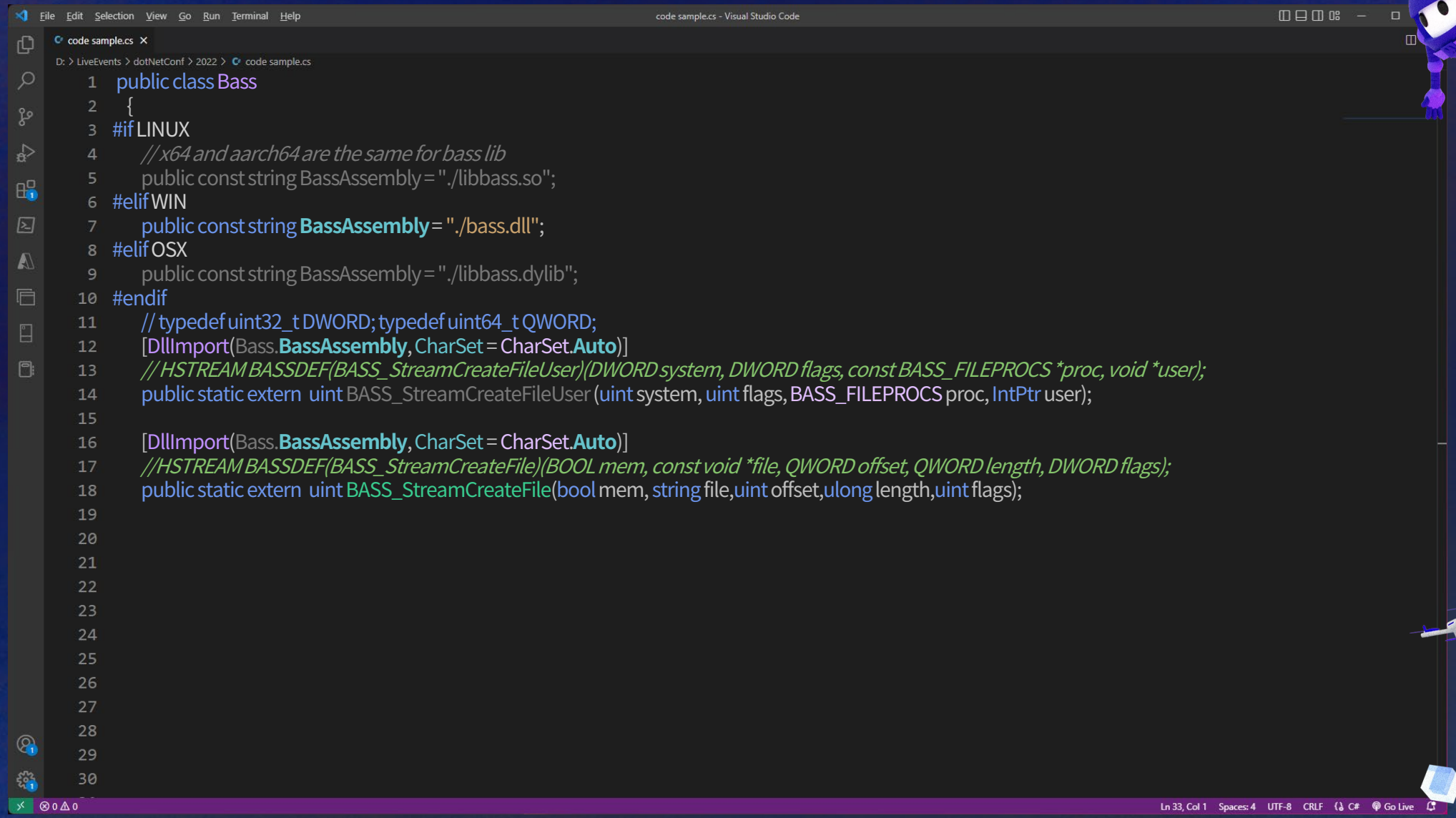
再用 Marshal.PtrToString 转换为 Managed Code 的 string

通过 P/Invoke (Platform Invoke) 调用 C 库函数

- 用户自定义类(或结构):

```
[DllImport("NativeLib.dll")]
// void do_something(MyClass data);
// 确保各成员按定义顺序保存
[StructLayout(LayoutKind.Sequential)]
class MyClass {
    uint age;
    uint grade;
    ……
}
private static extern void do_something(MyClass data);
```

通过 P/Invoke (Platform Invoke) 调用 C 库函数

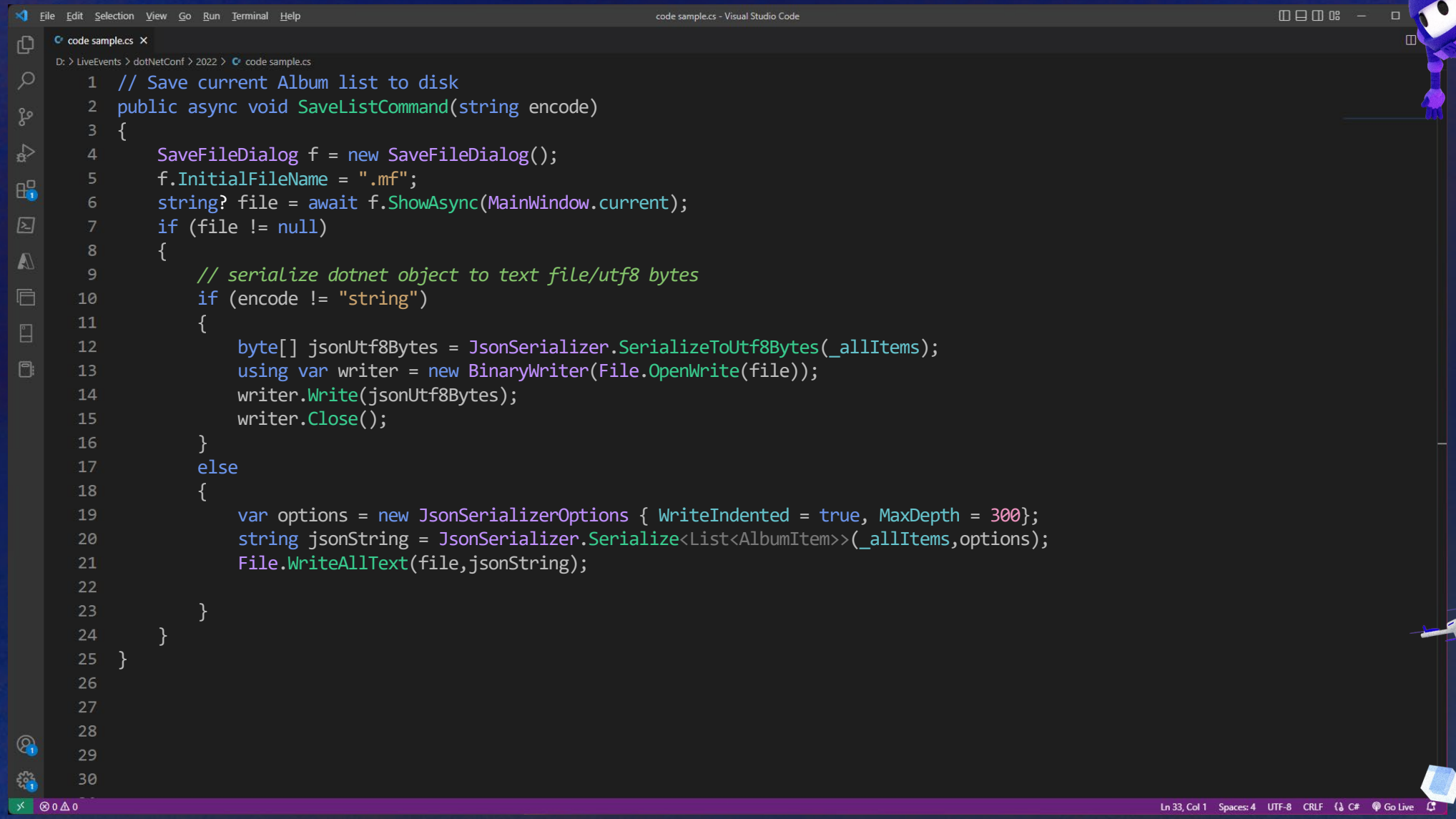


.NET 数据持久化

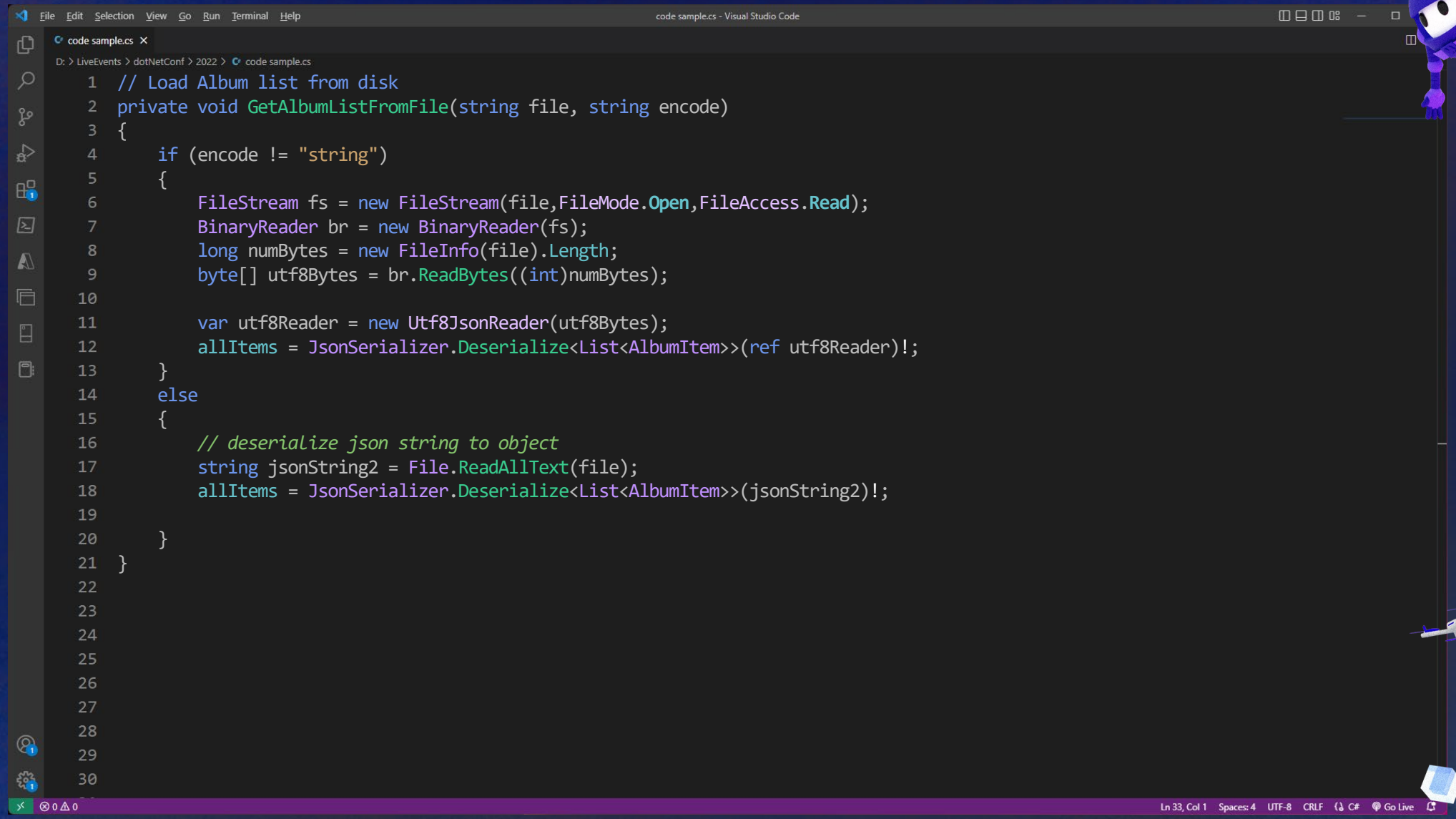
- 数据持久化到数据库
- 数据持久化为 JSON 字符串/字节

System.Text.Json.JsonSerializer:
public static string Serialize<TValue>(TValue value, JsonSerializerOptions? options = null)
public static TValue? Deserialize<TValue> (string json, System.Text.Json.JsonSerializerOptions? options = default)

.NET 对象序列化为字符串



字符串分析为 .NET 对象



Non-Windows System Drawing

Windows： System.Drawing

AvaloniaUI：Avalonia.Media.Imaging

An experimental cross-platform native graphics library: https://github.com/dotnet/Microsoft.Maui.Graphics

⊗ 注意

`System.Drawing`命名空间对某些操作系统和应用程序类型有一些限制。

- 在Windows， `System.Drawing` 依赖于GDI+操作系统附带的本机库。 某些Windows SKUS Windows Server Core 或 Windows Nano）不包含此本机库作为 OS 的一部分。 如果使用此命名空间并且无法加载库，则运行时将引发异常。
- 命名空间中的某些类型依赖于 GDI+ ，而 Windows 服务以及 ASP.NET Core 和 `System.Drawing` ASP.NET 应用不支持。 这些类型在**System.Drawing.Common** NuGet包中，并包括 **System.Drawing.Bitmap** 和 **System.Drawing.Font** 。 但是，命名空间中的基元类型（如 **System.Drawing.Color** 、、 和 **System.Drawing.Size System.Drawing.Point System.Drawing.Rectangle** ）可以在任何应用程序中使用。
- 在 .NET 5 和早期版本中，**System.Drawing.Common** NuGet 包适用于 Windows、Linux 和 macOS。 但是，存在一些平台差异。 在 Linux 和 macOS 上，GDI+功能由**libgdiplus**）库实现。 默认情况下，大多数 Linux 发行版中不会安装此库，也不支持 GDI+ 和 macOS 上Windows的所有功能。 还有一些平台，其中 libgdiplus 完全不可用。 若要在 Linux 和 macOS 上使用 System.Drawing.Common 包中的类型，必须单独安装 libgdiplus。 有关详细信息，请参阅在**Linux 上安装 .NET**或在**macOS 上安装 .NET**。
- 在 .NET 6 及更高版本中，**System.Drawing.Common** NuGet 包仅在 Windows操作系统上受支持。 有关详细信息，请参阅 仅支持**System.Drawing.Common Windows**。

如果无法与应用程序一同使用，建议的替代项包括 `System.Drawing` ImageSharp、SkiaSharp、Windows**映像组件**和 **Microsoft.Maui.Graphics** 。

5. DEMO

Thank you!

Let's build amazing apps with .NET 7

get.dot.net/7