tutorial

Windows App SDK

Segment Control

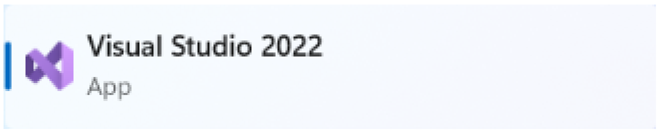
Segment Control

Segment Control shows how to create a seven-segment display using **Windows App SDK**

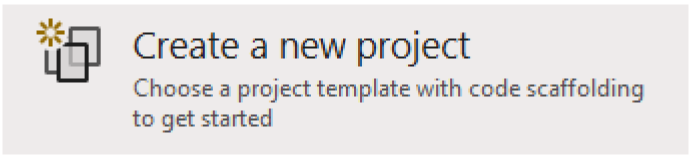
Step 1

Follow **Setup and Start** on how to get **Setup** and **Install** what you need for **Visual Studio 2022** and **Windows App SDK**.

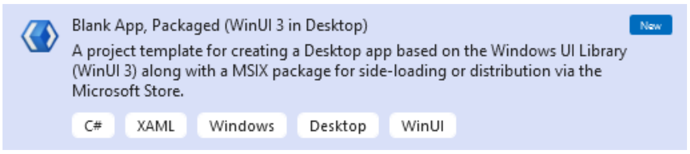
In **Windows 11** choose **Start** and then find or search for **Visual Studio 2022** and then select it.



Once **Visual Studio 2022** has started select **Create a new project**.

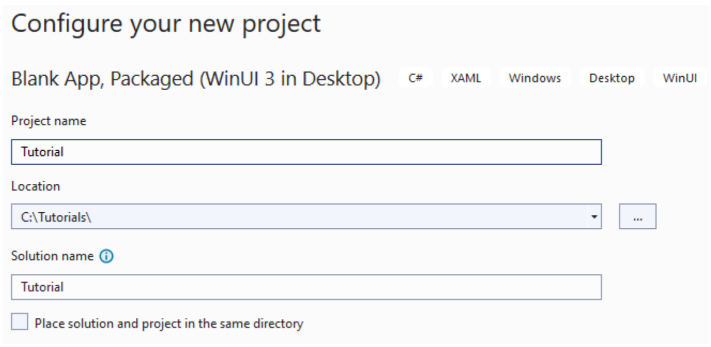

Create a new project
Choose a project template with code scaffolding to get started

Then choose the **Blank App, Packages (WinUI in Desktop)** and then select **Next**.


Blank App, Packaged (WinUI 3 in Desktop)

A project template for creating a Desktop app based on the Windows UI Library (WinUI 3) along with a MSIX package for side-loading or distribution via the Microsoft Store.

After that in **Configure your new project** type in the **Project name** as *SegmentControl*, then select a Location and then select **Create** to start a new **Solution**.


Configure your new project

Blank App, Packaged (WinUI 3 in Desktop)

Project name: Tutorial

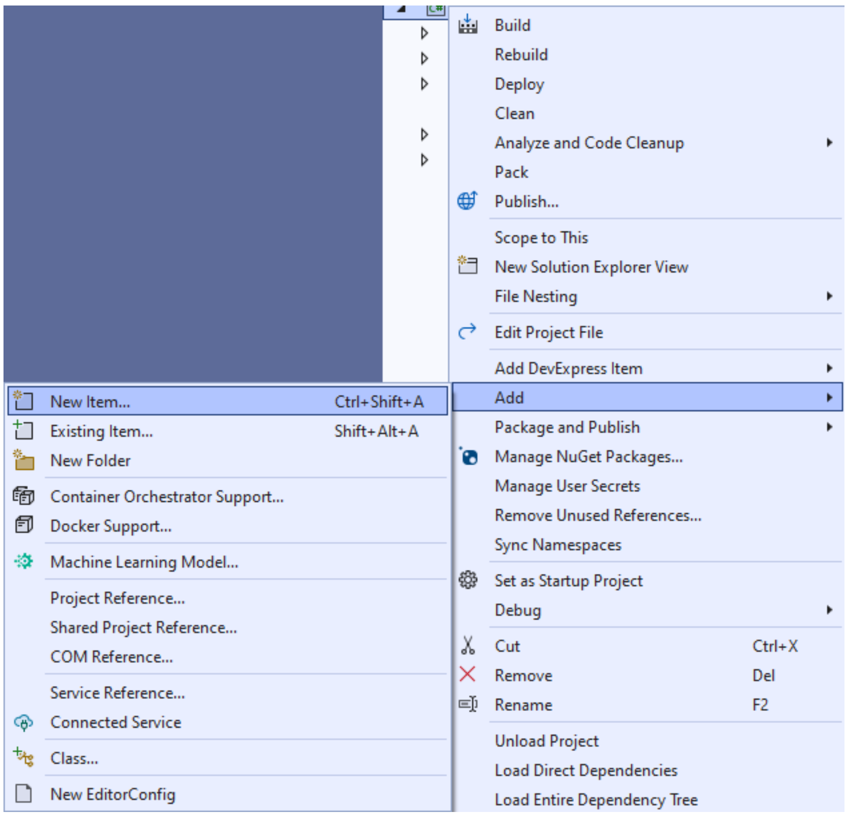
Location: C:\Tutorials\

Solution name: Tutorial

Place solution and project in the same directory

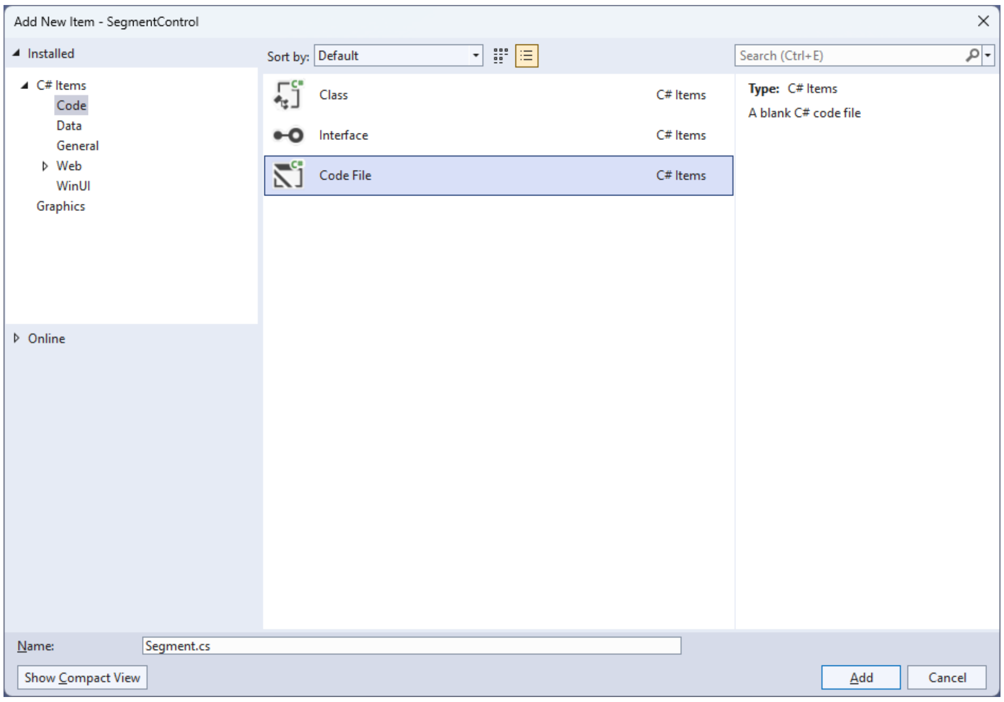
Step 2

Then in **Visual Studio** within **Solution Explorer** for the **Solution**, right click on the **Project** shown below the **Solution** and then select **Add** then **New Item…**



Step 3

Then in **Add New Item** from the **C# Items** list, select **Code** and then select **Code File** from the list next to this, then type in the name of *Segment.cs* and then **Click** on **Add**.

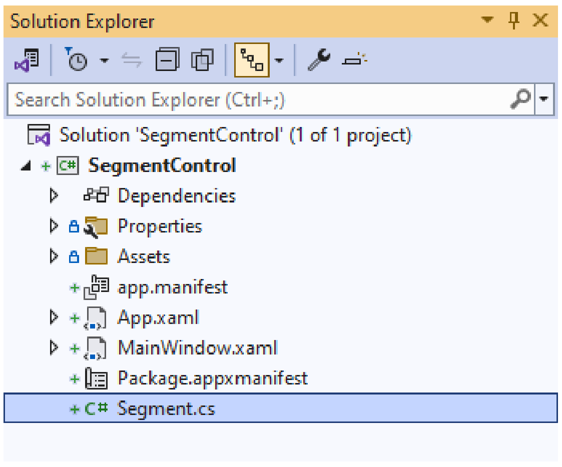


Type: C# Items
A blank C# code file

Name: Segment.cs

Step 4

Then from **Solution Explorer** for the **Solution** double-click on **Segment.cs** to see the **Code** for the **User Control**.



Step 5

You will now be in the **View** for the **Code** of *Segment.cs*, within this type in the following **Code**:

```
using Microsoft.UI;
using Microsoft.UI.Xaml;
using Microsoft.UI.Xaml.Controls;
using Microsoft.UI.Xaml.Data;
using Microsoft.UI.Xaml.Media;
using Microsoft.UI.Xaml.Shapes;
using System;
using System.Linq;

namespace SegmentControl;

public enum Sources
{
    Value, Time, Date, TimeDate
}

public class Segment : StackPanel
{
    // Constants & Members

    // Dependency Properties & Properties

    // Get Element & Add Element Methods

    // Set Segment & Add Segment Methods

    // Add Layout Method & Value Property

    // Constructor

}
```

There are **`using`** statements for the **User Control**, a **`namespace`** for **`SegmentControl`** with an **`enum`** for the **`Sources`** of the **Segment Control** along with a **`class`** of **`Segment`** that will represent the **User Control**.

Step 6

Then in the **`namespace`** of **`SegmentControl`** in the **`class`** of **`Segment`** after the **Comment** of **`// Constants & Members`** type the following **Constants** and **Members**:

```
private readonly byte[][] table =
{
    // a, b, c, d, e, f, g
    new byte[] { 1, 1, 1, 1, 1, 1, 0 }, // 0
    new byte[] { 0, 1, 1, 0, 0, 0, 0 }, // 1
    new byte[] { 1, 1, 0, 1, 1, 0, 1 }, // 2
    new byte[] { 1, 1, 1, 1, 0, 0, 1 }, // 3
    new byte[] { 0, 1, 1, 0, 0, 1, 1 }, // 4
    new byte[] { 1, 0, 1, 1, 0, 1, 1 }, // 5
    new byte[] { 1, 0, 1, 1, 1, 1, 1 }, // 6
    new byte[] { 1, 1, 1, 0, 0, 0, 0 }, // 7
    new byte[] { 1, 1, 1, 1, 1, 1, 1 }, // 8
    new byte[] { 1, 1, 1, 0, 0, 1, 1 }, // 9
    new byte[] { 0, 0, 0, 0, 0, 0, 1 }, // Minus
    new byte[] { 0, 0, 0, 0, 0, 0, 0 }, // Colon
    new byte[] { 0, 0, 0, 0, 0, 0, 0 } // Space
};
private const int width = 5;
private const int height = 25;
private const int spacing = 10;
private const int minus_pos = 10;
private const int colon_pos = 11;
private const int space_pos = 12;
private const string minus = "-";
private const string colon = ":";
private const string space = " ";
private const string time = "HH:mm:ss";
private const string date = "dd-MM-yyyy";
private const string date_time = "HH:mm:ss  dd-MM-yyyy";
private const string invalid_source = "Invalid argument";

private int _count;
private string _value;
```

The **Constants** include a two-dimensional **Array** of **`table`** that will represent the elements of the segments that will be displayed for each *Digit* or *Minus*, *Colon*, and *Space* along with **Members** for the **Segment Control**.

Step 7

While still in the **`namespace`** of **`SegmentControl`** in the **`class`** of **`Segment`** after the **Comment** of **`// Dependency Properties & Properties`** type the following **Dependency Properties** and **Properties**:

```
public static readonly DependencyProperty SourceProperty =
DependencyProperty.Register(nameof(Source), typeof(Sources),
typeof(Segment), new PropertyMetadata(Sources.Time));

public static readonly DependencyProperty ForegroundProperty =
DependencyProperty.Register(nameof(Foreground), typeof(Brush),
typeof(Segment), new PropertyMetadata(new SolidColorBrush(Colors.Black)));

public Sources Source
{
    get { return (Sources)GetValue(SourceProperty); }
    set { SetValue(SourceProperty, value); }
}

public Brush Foreground
{
    get { return (Brush)GetValue(ForegroundProperty); }
    set { SetValue(ForegroundProperty, value); }
}
```

The **Dependency Properties** or **Properties** for the **User Control** can be customised for the **Segment Control**.

Step 8

While still in the **namespace** of **SegmentControl** in the **class** of **Segment** after the **Comment** of **// Get Element & Add Element Methods** type the following **Methods**:

```
private static Rectangle GetElement(Canvas segment, string name) =>
    segment.Children.Cast<Rectangle>()
    .FirstOrDefault(f => (string)f.Tag == name);

private Rectangle AddElement(string name,
    int left, int top, int width, int height)
{
    var element = new Rectangle()
    {
        Tag = name,
        Opacity = 0,
        RadiusX = 2,
        RadiusY = 2,
        Width = width,
        Height = height,
        Margin = new Thickness(2)
    };
    element.SetBinding(Shape.FillProperty, new Binding()
    {
        Path = new PropertyPath(nameof(Foreground)),
        Mode = BindingMode.TwoWay,
        Source = this
    });
    Canvas.SetLeft(element, left);
    Canvas.SetTop(element, top);
    return element;
}
```

The **Method** of **GetElement** will be used to obtain an element to be modified and **AddElement** will create an element for part of the segments of the **Segment Control**.

Step 9

While still in the **namespace** of **`SegmentControl`** in the **`class`** of **`Segment`** after the **Comment** of **`// Set Segment & Add Segment Methods`** type the following **Methods**:

```
private void SetSegment(string name, int digit)
{
    var segment = Children.Cast<Canvas>()
        .FirstOrDefault(f => (string)f.Tag == name);
    byte[] values = table[digit];
    GetElement(segment, $"{name}.a").Opacity = values[0];
    GetElement(segment, $"{name}.b").Opacity = values[1];
    GetElement(segment, $"{name}.c").Opacity = values[2];
    GetElement(segment, $"{name}.d").Opacity = values[3];
    GetElement(segment, $"{name}.e").Opacity = values[4];
    GetElement(segment, $"{name}.f").Opacity = values[5];
    GetElement(segment, $"{name}.g").Opacity = values[6];
    GetElement(segment, $"{name}.h").Opacity = digit == colon_pos ? 1 : 0;
    GetElement(segment, $"{name}.i").Opacity = digit == colon_pos ? 1 : 0;
}

private void AddSegment(string name)
{
    var segment = new Canvas()
    {
        Tag = name,
        Width = 25,
        Height = 50,
        Margin = new Thickness(2)
    };
    segment.Children.Add(AddElement($"{name}.a",
        width, 0, height, width));
    segment.Children.Add(AddElement($"{name}.h",
        width * 3, width * 3, width, width));
    segment.Children.Add(AddElement($"{name}.f",
        0, width, width, height));
    segment.Children.Add(AddElement($"{name}.b",
        height + width, width, width, height));
    segment.Children.Add(AddElement($"{name}.g",
        width, height + width, height, width));
    segment.Children.Add(AddElement($"{name}.e",
        0, height + (width * 2), width, height));
    segment.Children.Add(AddElement($"{name}.c",
        height + width, height + width + width, width, height));
    segment.Children.Add(AddElement($"{name}.i",
        width * 3, height + (width * 4), width, width));
    segment.Children.Add(AddElement($"{name}.d",
        width, (height * 2) + (width * 2), height, width));
    Children.Add(segment);
}
```

The **Method** of **`SetSegment`** will use **`GetElement`** along with the **Array** of **`table`** to display the appropriate value by setting the **`Opacity`** and **`AddSegment`** will add the segments to the **Segment Control**.

Step 10

While still in the **namespace** of **SegmentControl** in the **class** of **Segment** after the **Comment** of **// Add Layout Method & Value Property** type the following **Method** and **Property**:

```
private void AddLayout()
{
    var array = _value.ToCharArray();
    var length = array.Length;
    var list = Enumerable.Range(0, length);
    if (_count != length)
    {
        Children.Clear();
        foreach (var item in list)
        {
            AddSegment(item.ToString());
        }
        _count = length;
    }
    foreach (int item in list)
    {
        var value = array[item].ToString();
        var digit = value switch
        {
            minus => minus_pos,
            colon => colon_pos,
            space => space_pos,
            _ => int.Parse(value),
        };
        SetSegment(item.ToString(), digit);
    }
}

public string Value
{
    get { return _value; }
    set { _value = value; AddLayout(); }
}
```

The **Method** of **AddLayout** creates the look-and-feel for the **User Control** and the **Property** of **Value** will setup the display of the **Segment Control** using the **Method** of **AddLayout**.

Step 11

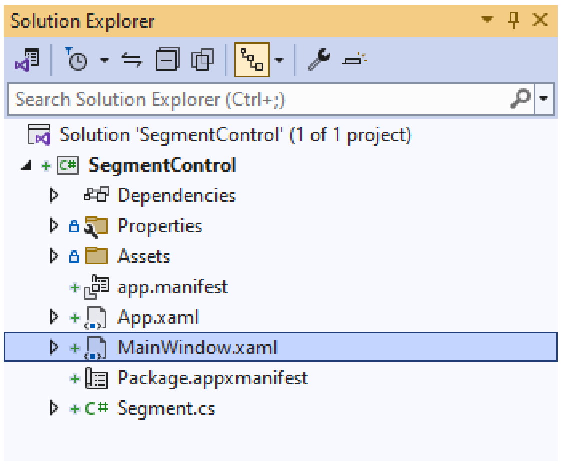
While still in the **`namespace`** of **`SegmentControl`** in the **`class`** of **`Segment`** after the **Comment** of **`// Constructor`** type the following **Constructor**:

```
public Segment()
{
    Spacing = spacing;
    Orientation = Orientation.Horizontal;
    var timer = new DispatcherTimer()
    {
        Interval = TimeSpan.FromMilliseconds(250)
    };
    timer.Tick += (object s, object args) =>
    {
        if (Source != Sources.Value)
        {
            var format = Source switch
            {
                Sources.Time => time,
                Sources.Date => date,
                Sources.TimeDate => date_time,
                _ => throw new ArgumentException(invalid_source)
            };
            Value = DateTime.Now.ToString(format);
        }
    };
    timer.Start();
}
```

The **Constructor** will setup a **`DispatcherTimer`** to be used to display the **`Value`** of the **Segment Control**.

Step 12

Within **Solution Explorer** for the **Solution** double-click on **MainWindow.xaml** to see the **XAML** for the **Main Window**.



Step 13

In the **XAML** for **MainWindow.xaml** there be some **XAML** for a **`StackPanel`**, this should be **Removed** by removing the following:

```
<StackPanel Orientation="Horizontal"
HorizontalAlignment="Center" VerticalAlignment="Center">
    <Button x:Name="myButton" Click="myButton_Click">Click Me</Button>
</StackPanel>
```

Step 14

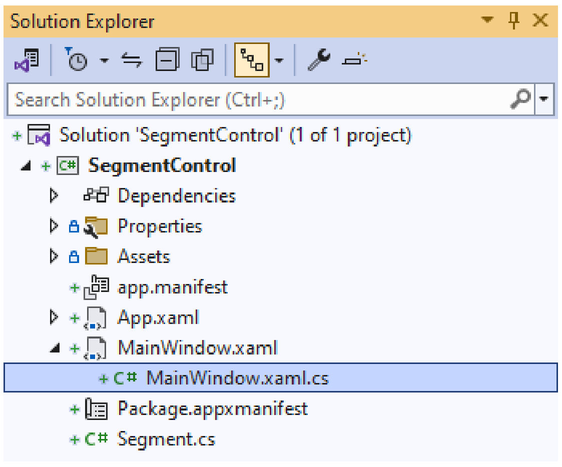
While still in the **XAML** for **MainWindow.xaml** above **`</Window>`**, type in the following **XAML**:

```
<Viewbox>
    <local:Segment Padding="50" Source="Time"
    Foreground="{ThemeResource SystemControlHighlightAccentBrush}" />
</Viewbox>
```

This **XAML** contains a **`ViewBox`** including the **User Control** of **`Segment`** with the **`Source`** set to **`Time`**.

Step 15

Then, within **Solution Explorer** for the **Solution** select the arrow next to **MainWindow.xaml** then double-click on **MainWindow.xaml.cs** to see the **Code** for the **Main Window**.



Solution 'SegmentControl' (1 of 1 project)
SegmentControl
Dependencies
Properties
Assets
app.manifest
App.xaml
MainWindow.xaml
MainWindow.xaml.cs
Package.appxmanifest
Segment.cs

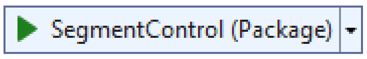
Step 16

In the **Code** for **MainWindow.xaml.cs** there be a **Method** of **`myButton_Click(...)`** this should be **Removed** by removing the following:

```
private void myButton_Click(object sender, RoutedEventArgs e)
{
    myButton.Content = "Clicked";
}
```

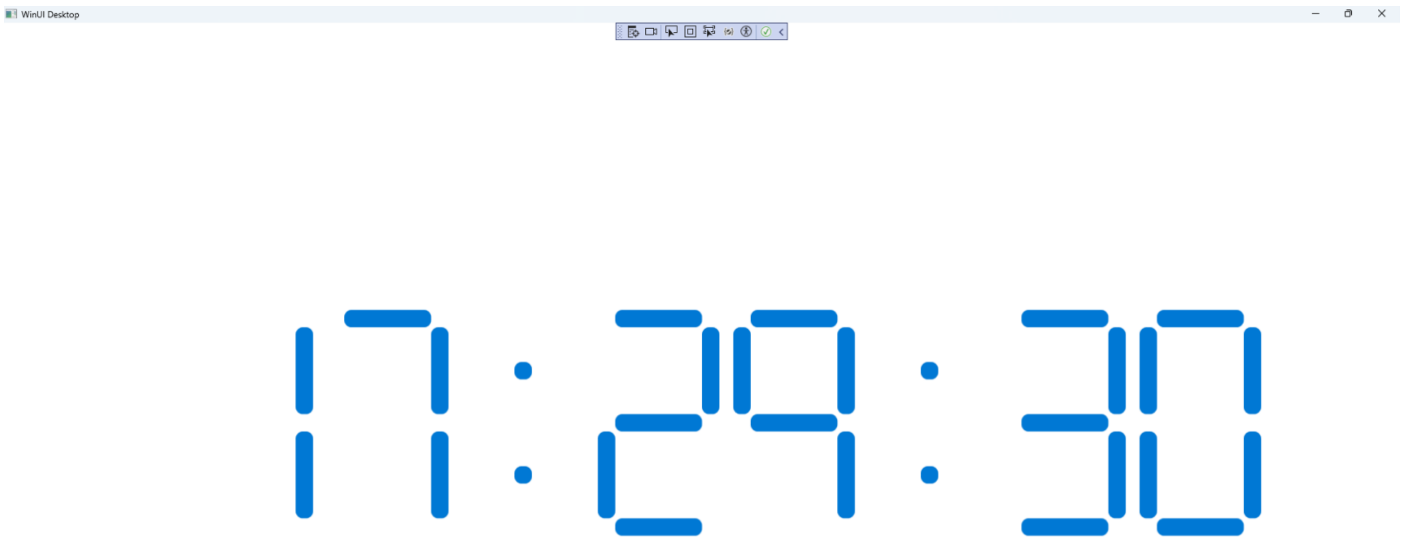
Step 17

That completes the **Windows App SDK** application. In **Visual Studio 2022** from the **Toolbar** select **SegmentControl (Package)** to **Start** the application.



Step 18

Once running you will see the **Segment Control** displaying the current *Time*.



Step 19

To **Exit** the **Windows App SDK** application, select the **Close** button from the top right of the application as that concludes this **Tutorial** for **Windows App SDK** from tutorialr.com!