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Data-binding

In Windows Universal Applications

Apps for Windows Phone & Windows Store

Telerik Software Academy
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Why We Need Data Binding?

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Why We Need Data Binding?

- The purpose of most applications is to:
  - Display data to users
  - Let them edit that data
- Developers' job is:
  - Bring the data from a variety of sources
  - Expose the data in object, hierarchical, or relational format
- With the XAML data binding engine, you get more features with less code

Why We Need Data Binding? (2)

- Data binding is pulling information out of an object into another object or property
  - Data binding means automatically change the value of a property when the value of another property is changed
- Many Windows applications are all about data
- Data binding is a top concern in a user interface technologies like Windows Phone and Windows Store
- Windows Universal and XAML provide very powerful data binding mechanisms

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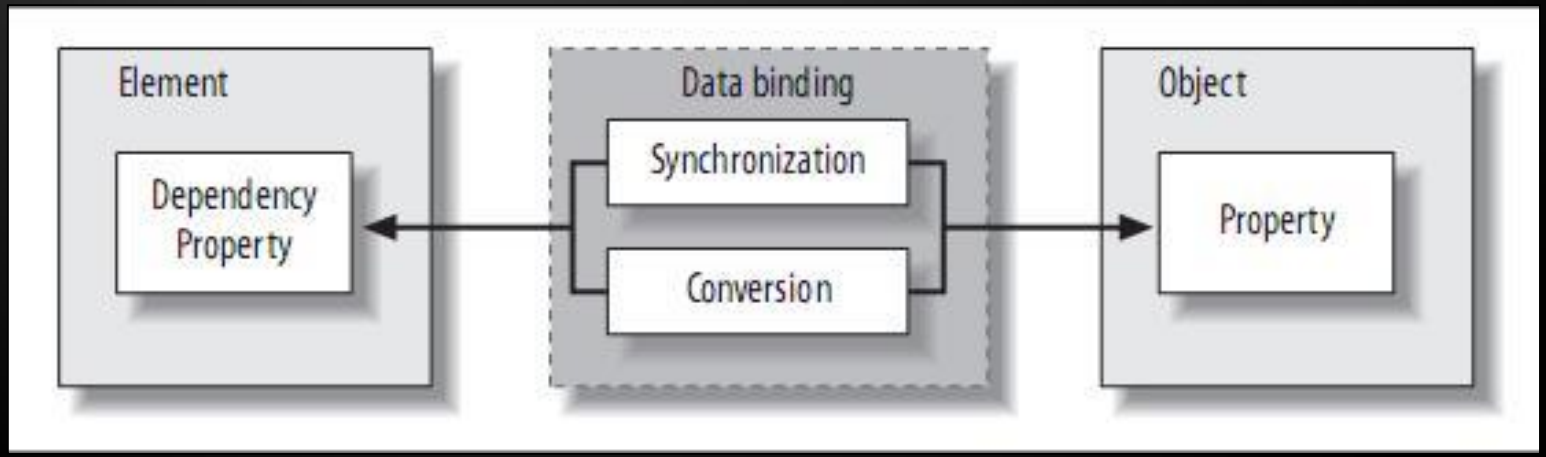
Simple Binding

Simple Binding

- Binding in XAML is the act of registering two properties with the data binding engine
  - Letting the engine keep them synchronized
- The synchronization and conversion are duties of the data binding engine



Simple Binding (2)

- Binding a property to a data source property:

```
<TextBox ...>
  <TextBox.Text>
    <Binding Path="SomeName" />
  </TextBox.Text>
</TextBox>
```

- The shorthand binding syntax:

```
<TextBox Text="{Binding Path=SomeName}" />
```

- Binding between the `Text` property of the `TextBox` and an object called `SomeName`
  - `SomeName` is a property of some object to be named later

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Data Contexts

Data Contexts

- In XAML every `FrameworkElement` and every `FrameworkContentElement` has a `DataContext` property
  - `DataContext` is an object used as data source during the binding, addressed by binding `Path`
- If you don't specify a `Source` property
  - The XAML binding engine goes up the element tree in searching of a DataContext

Data Contexts (2)

- Two controls with the same logical parent can bind to the same data source

```
<!-- DataContextWindow.xaml -->
<Grid Name="GridMain">
  …
  <TextBlock …>Name: </TextBlock>
  <TextBox Text="{Binding Path=Name}" … />
  <TextBlock …>Age:</TextBlock>
  <TextBox Text="{Binding Path=Age}" … />
  <Button Name="ButtonBirthday Content="Birthday!" … />
</Grid>
```

- Providing a `DataContext` value for both of the text box controls

Data Contexts (3)

- Setting an object as a value of the grid's `DataContext` property in the `MainWindow` constructor:

```
public partial class MainWindow : Window
{
  Person person = new Person("Tom", 11);

  public MainWindow()
  {
    InitializeComponent();
    GridMain.DataContext = person;
  }
  …
}
```

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Data Contexts

Live Demo

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Binding to Other Controls

Binding to Other Controls

- XAML provides binding of one element's property to another element's property

```
<TextBox Name="ageTextBox" Foreground="Red" … />
<Button …
  Foreground="{Binding ElementName=ageTextBox,
  Path=Foreground}" Content="Birthday" />
```

- The button's foreground brush will always follow foreground brush's color of the age TextBox

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Binding to Other Controls

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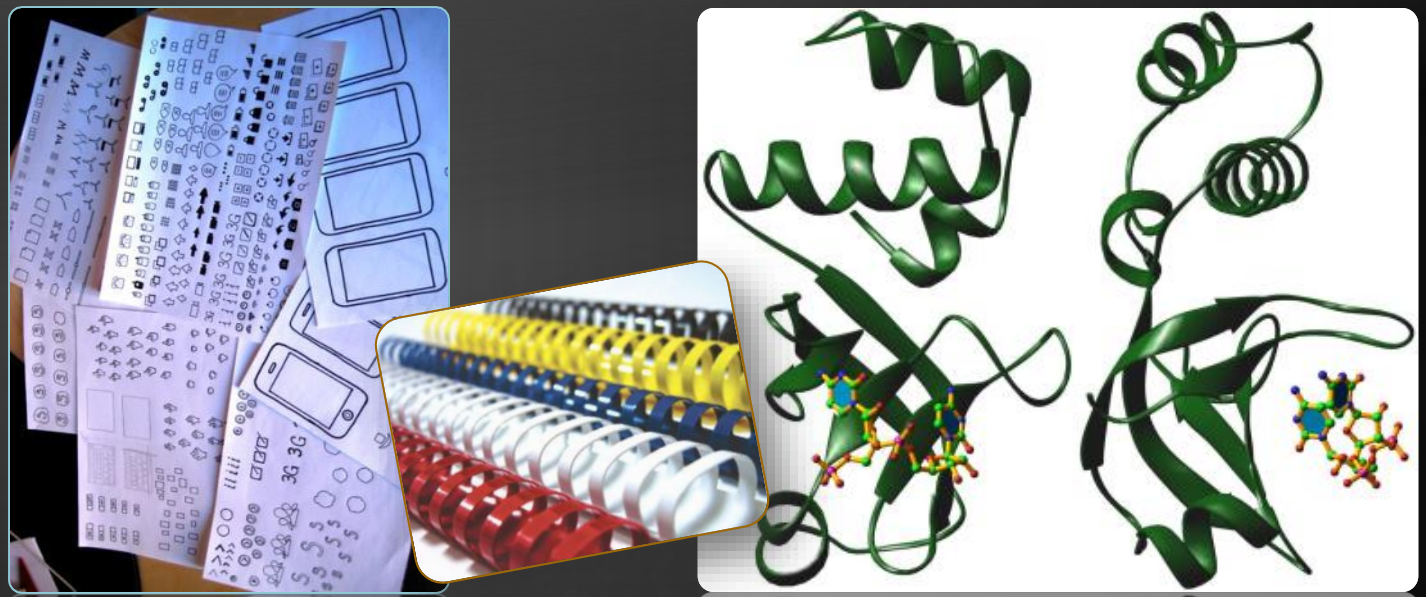


The Binding Class and Its Properties

Binding Class

- A more full-featured binding example

```
<TextBox x:Name="TextBoxPerson"
    Foreground="{Binding Path=Age, Mode=OneWay,
    Source={StaticResource Tom},
    Converter={StaticResource ageConverter}}" />
```

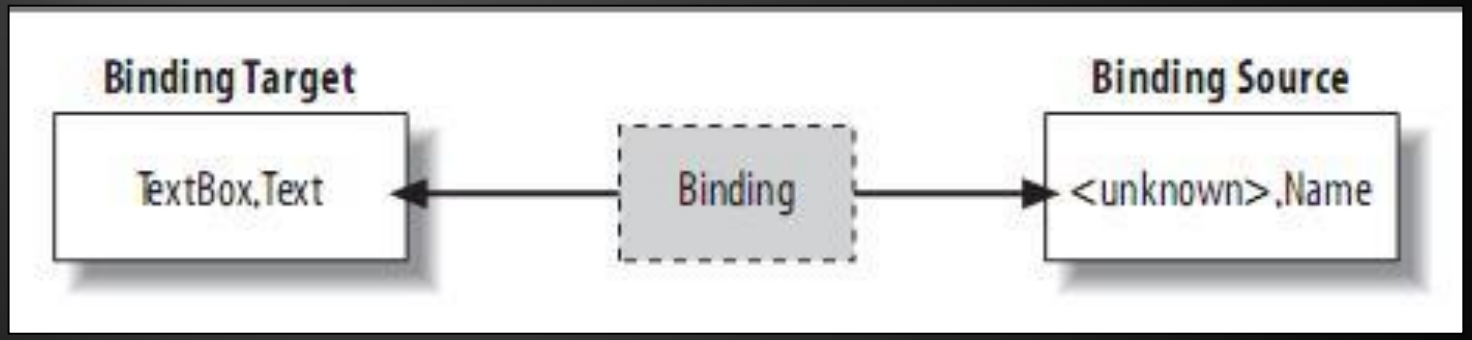
- This features are represent in `Binding` class
  - `Converter` – convert values back and forth from the data source
  - `ConverterParameter` – parameter passed to the `IValueConverter` methods during the conversion

Binding Class (2)

- More Binding class properties
  - ElementName – used when the source of the data is a UI element as well as the target
  - Mode – one of the BindingMode values TwoWay, OneWay, OneTime, OneWayToSource, or Default
  - Path – path to the data in the data source object
  - Source – a reference to the data source

Binding Class (3)

- The binding target can be any XAML element
  - Only allowed to bind to the element's dependency properties



- The TextBox control is the binding target
- Object that provides the data is the binding source

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Value Conversion

Value Conversion

- In the previous example we might decide that anyone over age 25 is hot
  - Should be marked in the UI as red
- Binding to a non-Text property

```
<TextBox
  Text="{Binding Path=Age}"
  Foreground="{Binding Path=Age, …}" … />
```

- Bound the age text box's `Text` property to the `Person` object's `Age` property

Value Conversion (2)

- How to bind the `Foreground` property of the text box to `Age` property on the `Person` object?
  - The `Age` is of type `Int32` and `Foreground` is of type `Brush`
  - Mapping from `Int32` to `Brush` needs to be applied to the data binding from `Age` to `Foreground`
  - That's the job of a `ValueConverter`

Value Conversion (3)

- A value converter is an implementation of the `IValueConverter` interface
  - `Convert()` – converting from the source data to the target UI data
  - `ConvertBack()` – convert back from the UI data to the source data

Value Conversion (4)

- Converter Int32 → Brush

```
public class AgeToForegroundConverter : IValueConverter
{
  public object Convert(object value,
    Type targetType, …)
  {
    if (targetType != typeof(Brush))
    {
      return null;
    }
    int age = int.Parse(value.ToString());
    return (age > 25 ? Brushes.Red : Brushes.Black);
  }
  …
}
```

Value Conversion (4)

- Creating an instance of the converter class in the XAML:

```
<Window … xmlns:local="clr-namespace:WithBinding">
  <Window.Resources>
    <local:Person x:Key="Tom" … />
    <local:AgeToForegroundConverter x:Key="ageConverter"/>
  </Window.Resources>
  <Grid DataContext="{StaticResource Tom}"> …
    <TextBox
      Text="{Binding Path=Age}"
      Foreground="{Binding Path=Age,
      Converter={StaticResource ageConverter}}" … /> …
    <Button … Foreground="{Binding Path=Foreground,
      ElementName=ageTextBox}">Birthday</Button>
  </Grid>
</Window>
```

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Value Conversion

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Binding Path Syntax

Binding Path Syntax

- When you use `Path=Something` in a `Binding` statement, the `Something` can be in a number of formats
  - `Path=Property` – bind to the property of the current object (`Path=Age`)
  - `Path=(OwnerType.AttachedProperty)` – bind to an attached dependency property (`Path=(Validation.HasError)`)
  - `Path=Property.SubProperty` – bind to a subproperty (`Path=Name.Length`)

Binding Path Syntax (2)

- Other formats
  - `Path=Property[n]` – bind to an indexer (`Path=Names[0]`)
  - `Path=Property/Property` – master-detail binding (`Path=Customers/Orders`)
  - `Path=(OwnerType.AttachedProperty)[n].SubProperty` – bind to a mixture of properties, subproperties, and indexers
    - `Path=(Validation.Errors)[0].ErrorContent`)

Update Source Triggers

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Update Source Triggers

- Binding can happen immediately when the control state changes
  - Using the `UpdateSourceTrigger` property on the `Binding` object

```
<TextBox …>
  <TextBox.Text>
    <Binding Path="Age"
      UpdateSourceTrigger="PropertyChanged"> …
    </Binding>
  </TextBox.Text>
</TextBox>
```

Update Source Triggers

- `UpdateSourceTrigger` values
  - `Default` – updates "naturally" based on the target control
  - `PropertyChanged` – updates the source immediately
  - `Explicit` – when `BindingExpression.UpdateSource()` is explicitly called

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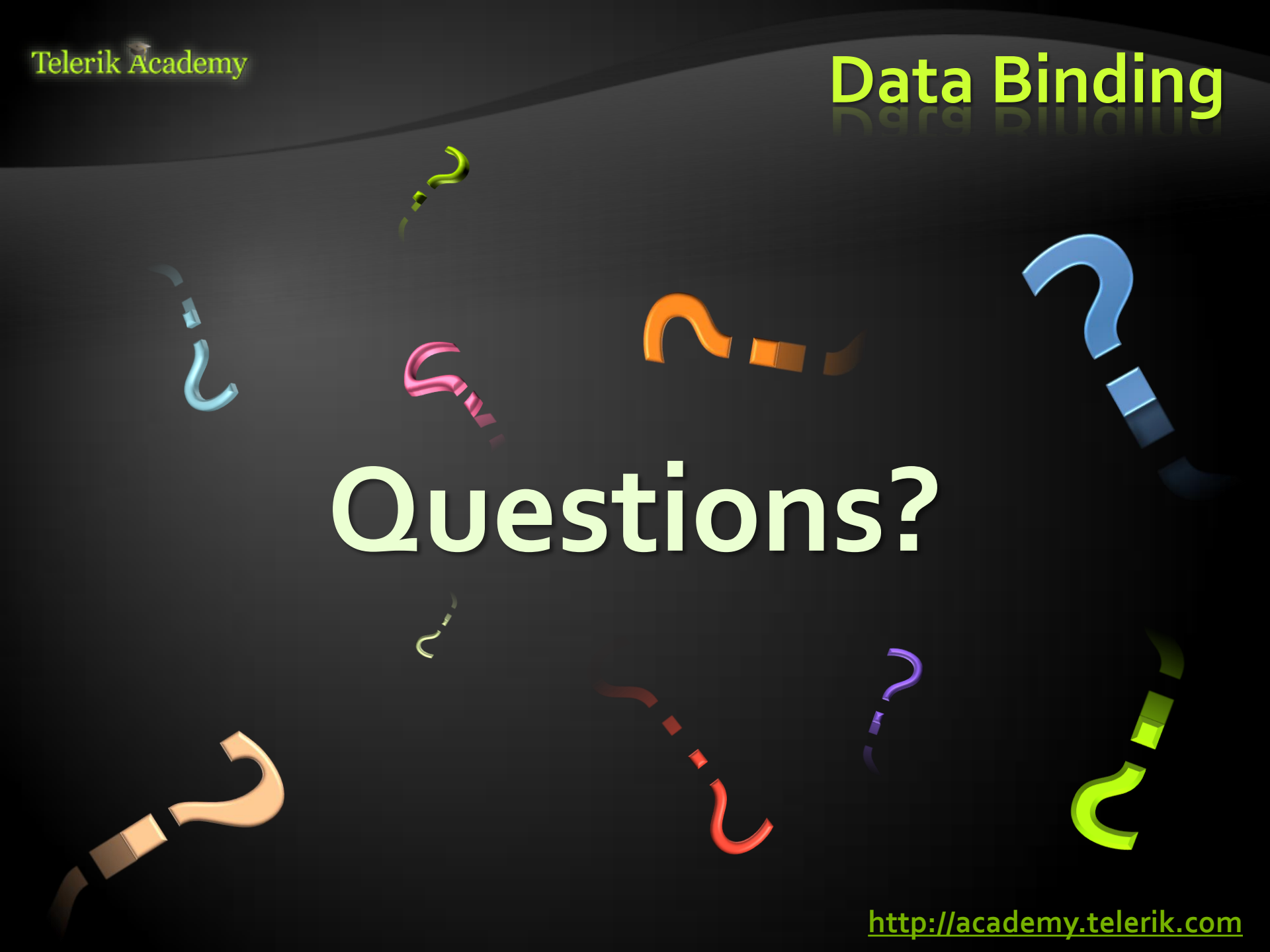
Data Binding



Questions?

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Exercises

1. Write a program that show a simple window, it contains two controls a `Slider` and a `TextBlock` with a single line of text. If you pull the thumb in the slider to the right, the font size of the text is increased immediately. Add a label that shows the current font size. Use data binding.
2. Add to the previous exercise few buttons each of which applies a preset value to the slider. When you click the "Set to Large" button the code in `Click` event sets the value of the slider, which in turn forces a change to the font size of the text through data binding.

Exercises (2)

3. Write a program that shows a simple window, which contains a `TextBlock` and setup the `TextBlock` to draw its text from a `TextBox` and its current foreground and background colors from separate lists of colors.