Module 9

”Data Binding [Deeper Dive]”

TEKNOLOGISK
INSTITUT

TEKNOLOGISK
INSTITUT

Agenda

- **Data Binding Properties in Details**
- Data Conversion
- Validation
- Data Binding Collections in Details

The `Binding` Class

- `Binding`
  - `ElementName`, `Source`, `RelativeSource`
  - `Path`
  - `XPath` — XML sources
  - `Mode`
  - `Delay`
  - `NotifyOnSourceUpdated` — `SourceUpdated` event
  - `NotifyOnTargetUpdated` — `TargetUpdated` event
  - `FallbackValue + TargetNullValue`
- Binding can be set
  - Declaratively in XAML
    - Full syntax or markup extension syntax "`{}`"
  - Programmatically in code
- Bindings can be cleared (in code) via `BindingOperations.ClearBinding()`

Binding Mode

- The binding mode specifies the direction of the binding

- `Binding`
  - `Mode`
    - `Default` determined by the target property
    - `OneTime`
    - `OneWay`
    - `OneWayToSource`
    - `TwoWay`
  - `UpdateSourceTrigger`
    - `Default` determined by the target property
    - `Explicit` when `BindingExpression.UpdateSource()` is called
    - `LostFocus`
    - `PropertyChanged`

Small, Important Features… ☺

- Bindings can be delayed
  - New feature in .NET 4.5

```
<Slider Name="slider"
        Value="{Binding ElementName=textbox,
                Path=Text,
                Mode=TwoWay,
                Delay=500}" />
```

- Applies for updates from target to source in two-way bindings
  - The delay does not apply for both directions!

- Data binding can be set up ”visually” through Visual Studio

TEKNOLOGISK
INSTITUT

Agenda

- Data Binding Properties in Details
- **Data Conversion**
- Validation
- Data Binding Collections in Details

IValueConverter

- Value converters
  - Convert, format, localize, combine data
    - Conditionally or unconditionally
  - Usually applied with Data Binding
- `IValueConverter`
  - `Convert()` Source -> Target
  - `ConvertBack()` Target -> Source
- Localization proceeds through the `culture` parameter
  - Defaults to `xml:lang`
- `ValueConversionAttribute`
  - Only conveys the intended meaning to tools
  - Has no semantic meaning!

`IMultiValueConverter`

- Multi-value converters
  - Performs similar conversion, but combines multiple values
- **`IMultiValueConverter`**
  - `Convert()`
    - Accepts **`object[]`** instead of just **`object`**
  - `ConvertBack()`
    - Returns **`object[]`** instead of just **`object`**
- Must use **`MultiBinding`** to apply multi-value converter!
- Side note:
  - There is also a **`PriorityBinding`** for use with asynchronous data binding. We will investigate that in Module 13

Data Binding Special Cases

- Converters can return special values when conversions are not possible (or not wanted)

- `Binding.`
  - `FallbackValue`
  - `DoNothing` — Ignore update

- `DependencyProperty.`
  - `UnsetValue` — “Errorneous” update

Agenda

- Data Binding Properties in Details
- Data Conversion
- **Validation**
- Data Binding Collections in Details

TEKNOLOGISK INSTITUT

Validation Rules

- Data bindings are subjected to a set of validation rules
  - Exceptions are by default not thrown

- **`ValidationRule`**
  - **`ExceptionValidationRule`** built-in

- Setting **`Binding.ValidatesOnExceptions`** to true
  - is equivalent to adding **`ExceptionValidationRule`**

- Custom validation rules
  - Override **`ValidationRule.Validate()`**
  - **`ValidationResult`** signals success or failure

Handling Validation Errors

- `Validation.`
  - `HasErrors`
  - `Errors` `ValidationError` collection
  - `Error` event
    - Raised if `Binding.NotifyOnValidationError == true`

- `ValidationErrorEventArgs`
  - `Action`
    - `Added`
    - `Removed`
  - `Error`
    - `ErrorContent`
    - `Exception`
    - `RuleInError`
    - `BindingInError`

Validation Error Templates

- Controls can set attached `Validation.ErrorTemplate` property

- Note:
  - This is a `ControlTemplate` (not a `DataTemplate`)
  - `AdornedElementPlaceholder` refers back to control being validated!

IDataErrorInfo

- `IDataErrorInfo` in `System.ComponentModel`

```
public interface IDataErrorInfo
{
   string Error { get; }
   string this[ string columnName ] { get; }
}
```

- `DataErrorValidationRule`
  - Checks for errors raised by classes implementing **`IDataErrorInfo`**
- Setting **`Binding.ValidatesOnDataErrors`** to true
  - is equivalent to adding **`DataErrorValidationRule`**
- WPF 4.5 adds **`INotifyDataErrorInfo`** for more advanced uses
  - There is a similar **`Binding.ValidatesOnNotifyDataErrors`**

Agenda

- Data Binding Properties in Details
- Data Conversion
- Validation
- **Data Binding Collections in Details**

Design-time Data

- XAML allows setting specific properties applying only to design-time

```
<Window ...
   xmlns:d="http://schemas.microsoft.com/expression/blend/2008"
   xmlns:mc="http://schemas.openxmlformats.org/markup-
compatibility/2006"
   mc:Ignorable="d">
   <d:Window.DataContext>
      <clr:Participants>
         <clr:Participant FirstName="Jesper"
                          LastName="Gulmann Henriksen"
                          Company="Wincubate ApS" />
        </clr:Participants>
    </d:Window.DataContext>
   ...
</Window>
```

Hierarchical Data Templates

- `HierarchicalDataTemplate`
  - Excellent for hierarchical data
    - e.g. file system etc.

- Use
  - `HierarchicalDataTemplate` for internal nodes
  - "regular" DataTemplate for leaf nodes

- Note:
  - A "non-recursive" example is supplied in Lab 3.3

Sorting

- Bound data can be sorted through **`ICollectionView`**

- `ICollectionView`
  - `SortDescriptions`
    - `SortDescription` collection

- Specifically for **`ListCollectionView`**
  - `CustomSort`
    - `IComparer` implementation

- Note
  - The **`SortDescription`** class is defined in the `System.ComponentModel` namespace in **`WindowsBase.dll`**.

Grouping

- Bound data can be grouped through **`ICollectionView`**
- `ICollectionView`
  - `GroupDescriptions`
    - `PropertyGroupDescription` collection
- `ItemsControl`
  - `GroupStyle`
    - `HeaderTemplate`, `HeaderTemplateSelector`
    - `ContainerStyle`, `ContainerStyleSelector`
    - `Panel`
- Custom Grouping
  - Can be performed by implementing **`IValueConverter`** appropriately

Filtering

- Bound data can be filtered though `ICollectionView`

- `ICollectionView`
  - `Filter`
    - should be set to filtering predicate (of **`object`**!) in code

- This approach does not work for ADO.NET objects
  - These views are **`BindingListCollectionView`**
    - `CustomFilter = ”`*`ColumnName Operator Value`*`”`

CollectionViewSource

- Collection views can similarly be created in XAML
  - Define a **CollectionViewSource** instance bound to data
  - Bind ItemsControl to the **CollectionViewSource** instance

```
<Window.Resources>
    <clr:Participants x:Key="participants" />
    <CollectionViewSource x:Key="cvs"
       Source="{Binding Source={StaticResource participants}}" />
</Window.Resources>
```

```
<ListBox ItemsSource="{Binding Source={StaticResource cvs}}"
         DisplayMemberPath="FullName"/>
```

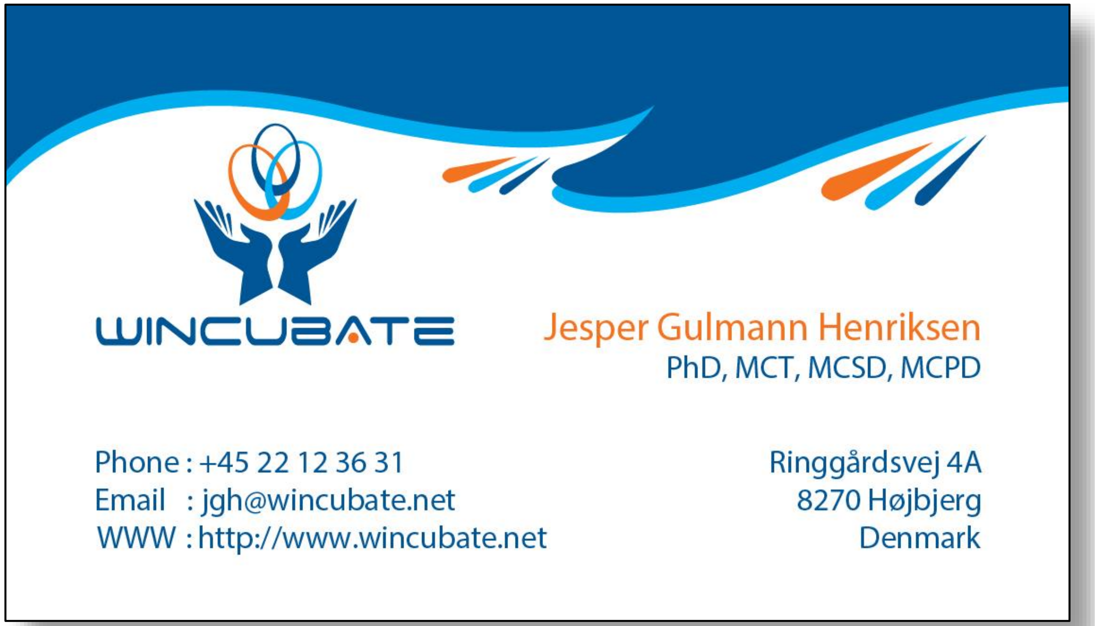
- Sorting can also be applied in XAML

TEKNOLOGISK INSTITUT

Summary

- Data Binding Properties in Details
- Data Conversion
- Validation
- Data Binding Collections in Details

TEKNOLOGISK
INSTITUT



WINCUBATE

Jesper Gulmann Henriksen
PhD, MCT, MCSD, MCPD

Phone : +45 22 12 36 31
Email : jgh@wincubate.net
WWW : http://www.wincubate.net

Ringgårdsvej 4A
8270 Højbjerg
Denmark