ERGOSIGN

WPF CUSTOM CONTROL DEVELOPMENT UNCHAINED

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Ergosign GmbH

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UIDeveloper

Datagraph 11

ChangeStyle

Load

62

- Bubble 18
  0, 20
- Bubble 19
  10, 15
- Bubble 20
  20, **62**
- Bubble 21
  30, 10
- Bubble 22
  40, 27
- Bubble 23
  50, 77
- Bubble 24
  60, 73
- Bubble 25
  70, 90
- Bubble 26
  80, 33

Auf der Suche nach Custom Controls ;)

Abstraktes Vorgehen

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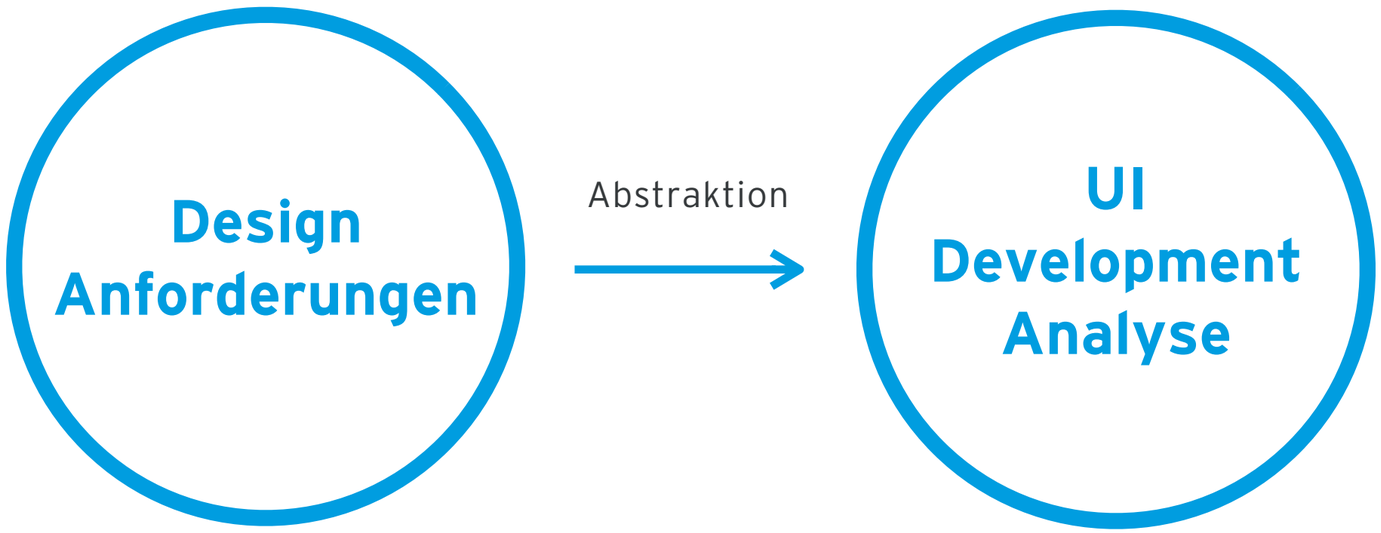

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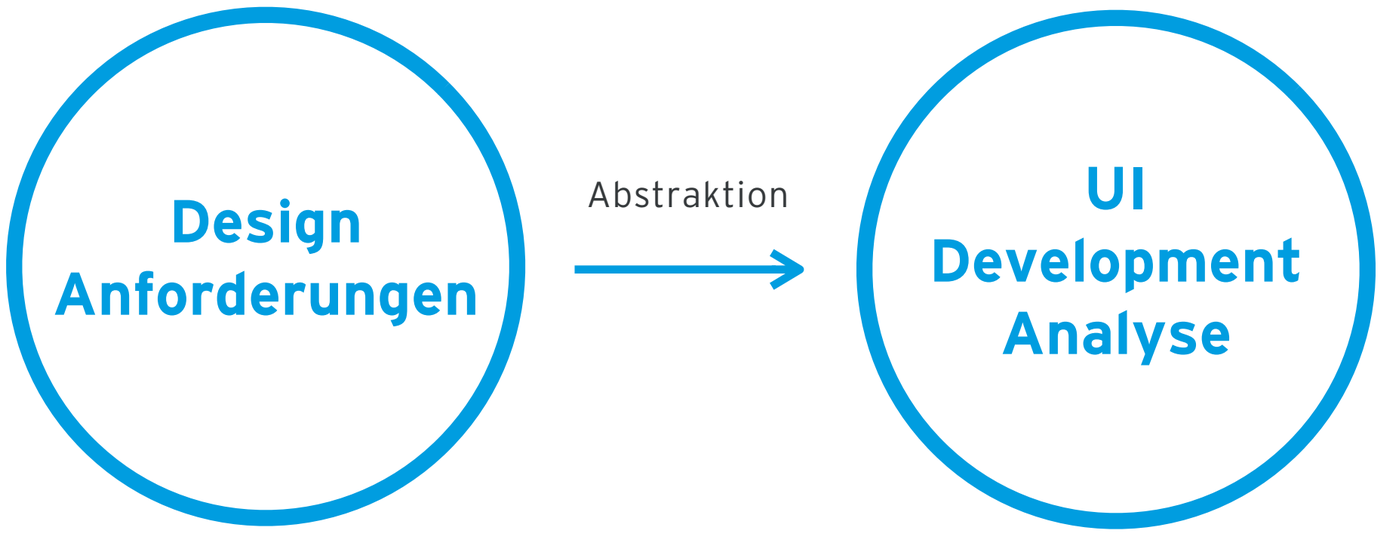

Identifikation

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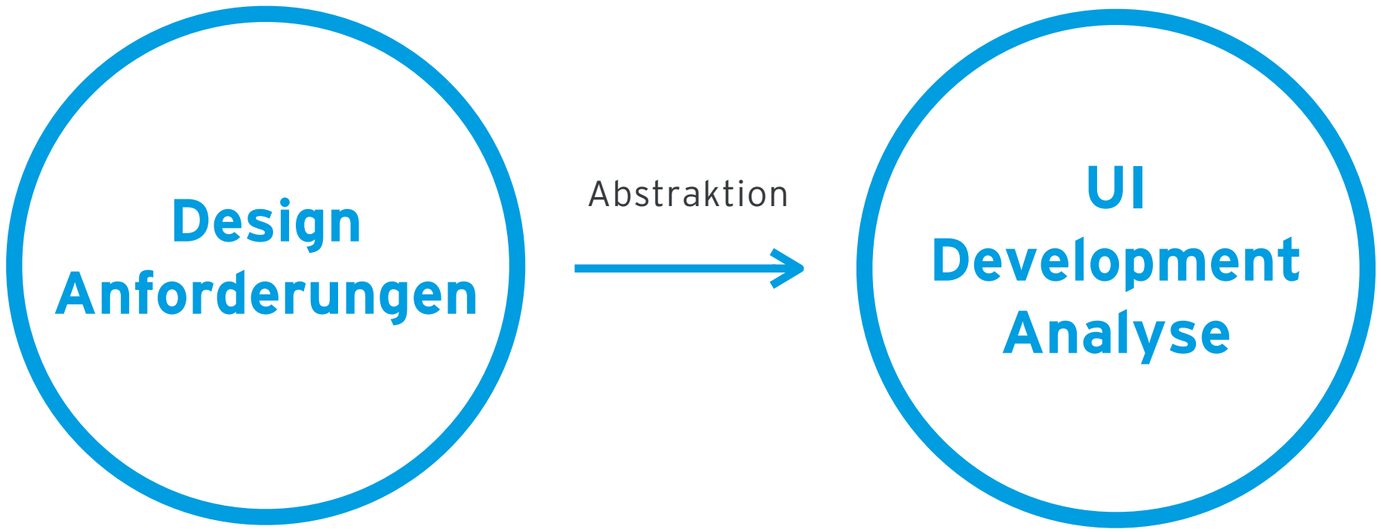

Identifikation

- Standard UI Elemente

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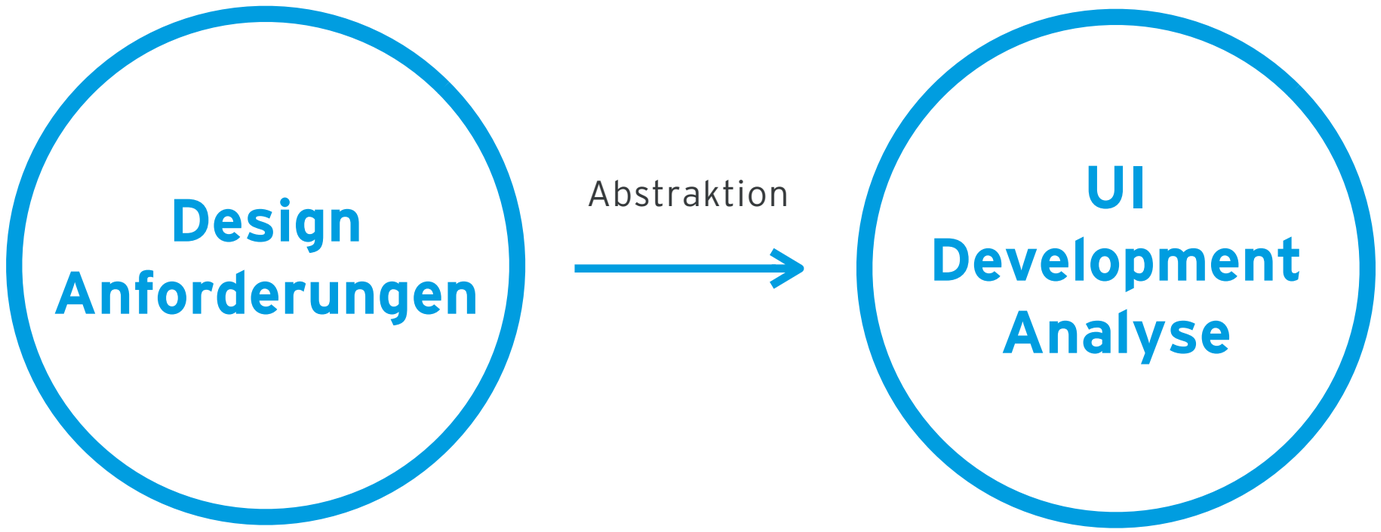

Identifikation

- Standard UI Elemente
- Custom Controls

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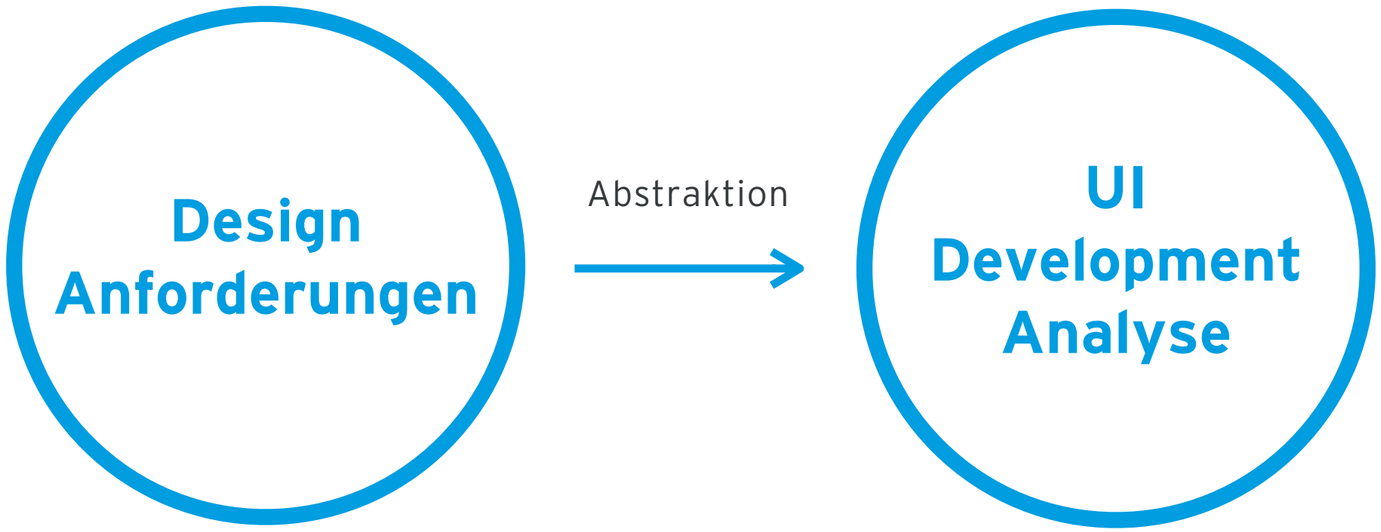

Identifikation

- Standard UI Elemente
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  - Anforderungsanalyse pro Custom Control

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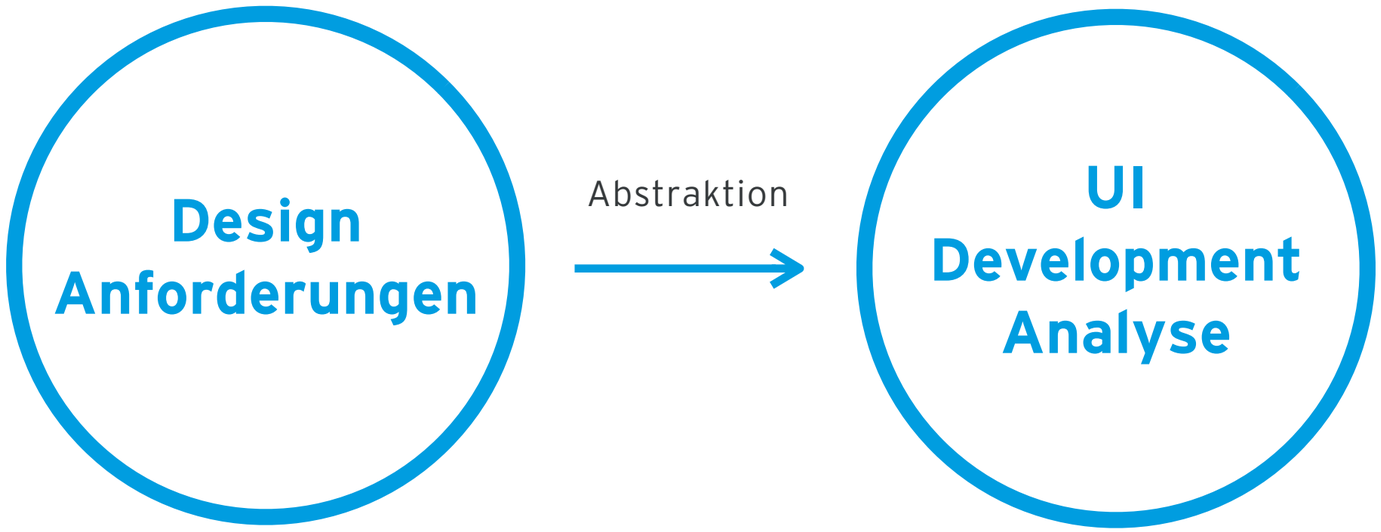

Identifikation

- Standard UI Elemente
- Custom Controls
  - Anforderungsanalyse pro Custom Control
  - Funktionale Anforderungen, Properties, Events, ...

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CUSTOM CONTROLS?

Eigentlich “nur”

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- Ableitung von einer konkreten **Klasse != UserControl**

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- Styling- und Template- Möglichkeiten

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- Default Style möglich Generic.xaml

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- Ableitung von einer konkreten **Klasse != UserControl**
- Styling- und Template- Möglichkeiten
- Visueller Aufbau im Control Template
- Default Style möglich Generic.xaml
- Zusammenfassung in einer Control Library möglich

Custom Control Library

Custom Control Library

- Besteht i.d.R aus Klasse, Style, Template

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  - Kann beliebe Custom Controls & Ressourcen enthalten
  - DefaultStyle wird nach Konvention in “Themes/Generic.xaml” deklariert
    - Mapping im statischen Konstruktor des Controls (*DefaultStyleKeyProperty.OverrideMetadata*)

SQL TOOLS TEST INFRAGISTICS ANALYZE DEVEXPRESS WINDOW HELP

Quick Launch (Ctrl+Q)

Solution Explorer

Search Solution Explorer (Ctrl+ü)

Solution 'WPFApplication' (1 project)

WPFApplication

Properties

References

App.xaml

MainWindow.xaml

- Build Solution F6
- Rebuild Solution
- Clean Solution
- Run Code Analysis on Solution Alt+F11
- Batch Build...
- Configuration Manager...
- Manage NuGet Packages for Solution...
- Enable NuGet Package Restore
- New Solution Explorer View
- Calculate Code Metrics
- Add DevExpress Item

- New Project...
- Existing Project...
- New Web Site...
- Existing Web Site...
- New Item... Ctrl+Shift+A
- Existing Item... Shift+Alt+A
- New Solution Folder

- Add
- Set StartUp Projects...
- Add Solution to Subversion...
- Add Selected Projects to Subversion...
- Subversion
- Paste Ctrl+V
- Rename
- Open Folder in File Explorer
- Properties Alt+Enter

n Explorer | Team Explorer | Class View

ties

pplication Solution Properties

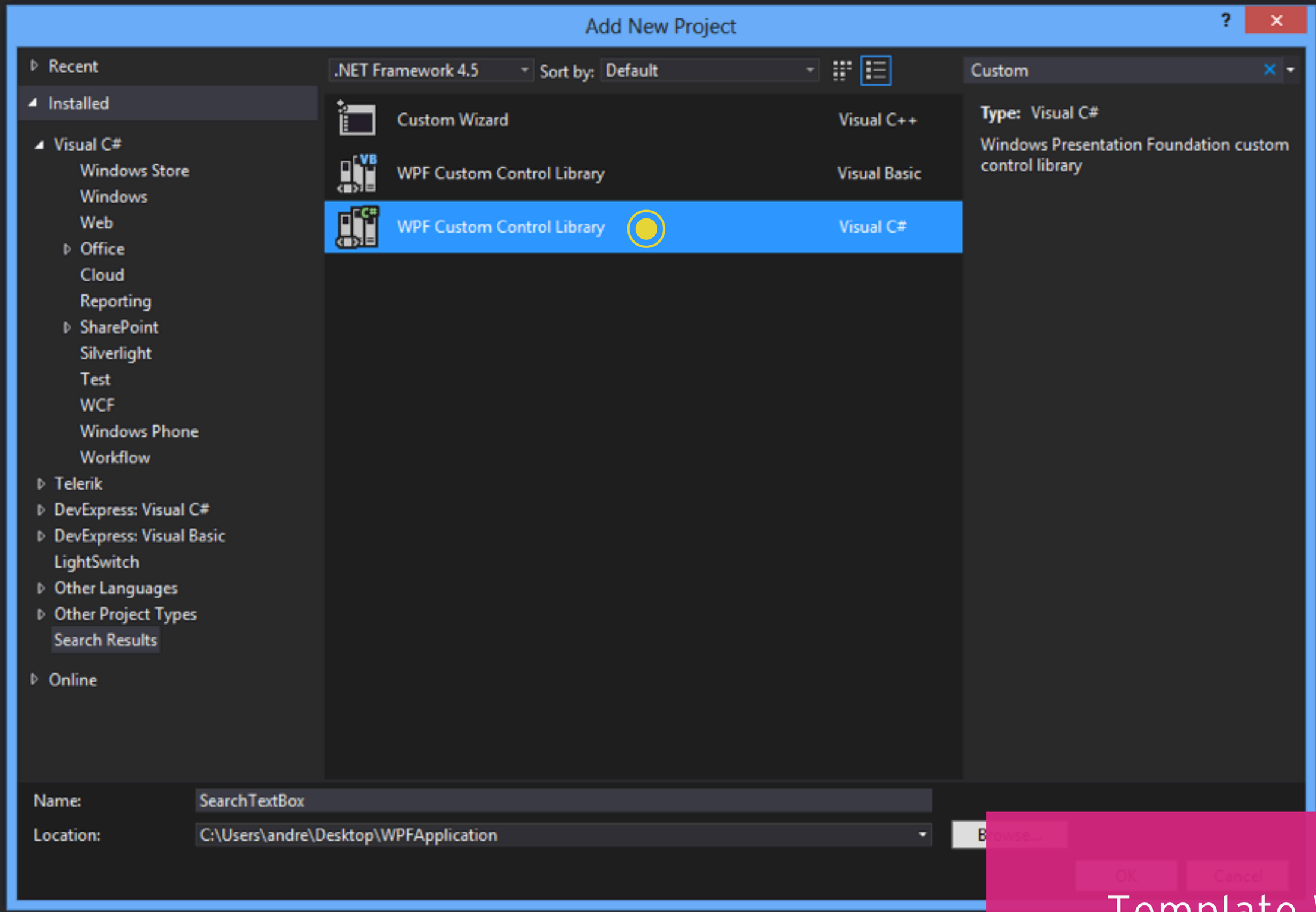
(Name) WPFApplication

Active config Debug|x86

Description

Path C:\Users\Sandra\Desktop\WPF

Neues Projekt erstellen



Template WPF Custom Control Library wählen

CustomControl1()

```
ML file.

e current project.
ile where it is


different project.
ile where it is


extBox"

e the XAML file lives
```

```
new FrameworkPropertyMetadata(typeof(CustomControl1)));
```

Solution Explorer

Search Solution Explorer (Ctrl+ü)

- Solution 'WPFApplication' (2 projects)
  - SearchTextBox
    - Properties
    - References
    - Themes
      - Generic.xaml
    - CustomControl1.cs
  - **WPFApplication**
    - Properties
    - References
    - App.xaml
    - MainWindow.xaml

Solution Explorer | Team Explorer | Class View

Properties

SearchTextBox Project Properties

Project File SearchTextBox.csproj

Project Folder C:\Users\Andrea\Desktop\WPFAp

Das wars schon ;)

CustomControl1.cs

```
using System.Windows.Documents;
using System.Windows.Input;
using System.Windows.Media;
using System.Windows.Media.Imaging;
using System.Windows.Navigation;
using System.Windows.Shapes;

namespace SearchTextBox
{
    /// <summary>
    /// Follow steps 1a or 1b and then 2 to use this custom control in a XAML file.
    ///
    /// Step 1a) Using this custom control in a XAML file that exists in the current projec
    /// Add this XmlNamespace attribute to the root element of the markup file where it is
    /// to be used:
    ///
    ///     xmlns:MyNamespace="clr-namespace:SearchTextBox"
    ///
    ///
    /// Step 1b) Using this custom control in a XAML file that exists in a different project.
    /// Add this XmlNamespace attribute to the root element of the markup file where it is
    /// to be used:
    ///
    ///     xmlns:MyNamespace="clr-namespace:SearchTextBox;assembly=SearchTextBox"
    ///
    /// You will also need to add a project reference from the project where the XAML file lives
    /// to this project and Rebuild to avoid compilation errors:
    ///
    ///     Right click on the target project in the Solution Explorer and
    ///     "Add Reference"->"Projects"->[Select this project]
    ///
    ///
    /// Step 2)
    /// Go ahead and use your control in the XAML file.
    ///
    ///     <MyNamespace:CustomControl1/>
    ///
    /// </summary>
    public class CustomControl1 : Control
    {
        static CustomControl1()
        {
            DefaultStyleKeyProperty.OverrideMetadata(typeof(CustomControl1), new FrameworkPropertyMetadata(typeof(CustomControl1)));
        }
    }
}
```

Generic.xaml

```
<ResourceDictionary
xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
xmlns:local="clr-namespace:SearchTextBox">
    <Style TargetType="{x:Type local:CustomControl1}">
        <Setter Property="Template">
            <Setter.Value>
                <ControlTemplate TargetType="{x:Type local:CustomControl1}">
                    <Border Background="{TemplateBinding Background}"
                            BorderBrush="{TemplateBinding BorderBrush}"
                            BorderThickness="{TemplateBinding BorderThickness}">

                    </Border>
                </ControlTemplate>
            </Setter.Value>
        </Setter>
    </Style>
</ResourceDictionary>
```

```
public class SearchTextBox : TextBox
{
    Members

    DependencyProperties

    PropertyChangedCallbacks

    Events

    Commands

    Handlers

    #region Ctor

    /// <summary> ...
    static SearchTextBox()
    {
        DefaultStyleKeyProperty.OverrideMetadata(
            typeof(SearchTextBox),
            new FrameworkPropertyMetadata(typeof(SearchTextBox)));

        CommandManager.RegisterClassCommandBinding(
            typeof(SearchTextBox),
            new CommandBinding(ClearTextCommand, ExecuteClearTextCommand, CanExecuteClearCommand));
    }

    #endregion

    Init/Cleanup

    #region OverrideMethods

    /// <summary> ...
    protected override void OnTextChanged(TextChangedEventArgs e)...

    /// <summary> ...
    protected override void OnKeyDown(KeyEventArgs e)...
```

SearchTextBox.cs

```
<Style x:Key="{ComponentResourceKey TypeInTargetAssembly={x:Type local:SearchTextBox}, ResourceId=SearchTextBox
```

```
<Style TargetType="{x:Type local:SearchTextBox}">
    <Setter Property="Foreground" Value="Black" />
    <Setter Property="Background" Value="White" />
    <Setter Property="BorderBrush" Value="Black" />
    <Setter Property="BorderThickness" Value="1" />
    <Setter Property="Padding" Value="1" />
    <Setter Property="AllowDrop" Value="true" />
    <Setter Property="ScrollViewer.PanningMode" Value="VerticalFirst" />
    <Setter Property="Stylus.IsFlicksEnabled" Value="False" />
    <Setter Property="WatermarkFontStyle" Value="Italic" />
    <Setter Property="Template">
        <Setter.Value>
            <ControlTemplate TargetType="{x:Type local:SearchTextBox}">
                <Border x:Name="Bd"
                        Background="{TemplateBinding Background}"
                        BorderBrush="{TemplateBinding BorderBrush}"
                        BorderThickness="{TemplateBinding BorderThickness}"
                        SnapsToDevicePixels="true">
                    <Grid>
                        <Grid.ColumnDefinitions>
                            <ColumnDefinition />
                            <ColumnDefinition Width="auto" />
                        </Grid.ColumnDefinitions>
                        <Grid x:Name="TextContainer">
                            <TextBlock x:Name="Watermark"
                                       Margin="{TemplateBinding Padding}"
                                       FontStyle="{TemplateBinding WatermarkFontStyle}"
                                       Opacity=".5"
                                       Text="{TemplateBinding Watermark}"
                                       Visibility="Hidden" />
                            <ScrollViewer x:Name="PART_ContentHost" SnapsToDevicePixels="{TemplateBinding Snaps
                        </Grid>
                        <Button Grid.Column="1"
```

Generic.xaml

WANN IST EIN CUSTOM CONTROL SINNVOLL?

WPF Standard Control?

WPF Standard Control?

WPF Standard Controls gruppieren?

WPF Standard Control?

WPF Standard Controls gruppieren?

Styling & Templating?

WPF Standard Control?

WPF Standard Controls gruppieren?

Styling & Templating?

ValueConverter/Markup Extensions?

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Styling & Templating?

ValueConverter/Markup Extensions?

Attached Properties/Behaviors?

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WPF Standard Controls gruppieren?

Styling & Templating?

ValueConverter/Markup Extensions?

Attached Properties/Behaviors?

Drittanbieter?

WPF Standard Control?

WPF Standard Controls gruppieren?

Styling & Templating?

ValueConverter/Markup Extensions?

Attached Properties/Behaviors?

Drittanbieter?

vs.

My Custom Control

Allgemeine Überlegungen

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- Wartbarkeit

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- Kommunikation

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- “Optimale” Lösung für das Problem, nicht mehr und nicht weniger ;)

Allgemeine Überlegungen

- Wartbarkeit
- Kommunikation
- Wiederverwendbarkeit
- Produktivität bei großen Projekten
- Konsistenz in User Interface
- “Optimale” Lösung für das Problem, nicht mehr und nicht weniger ;)

- Jedoch ist es **nicht** immer notwendig ein CustomControl zu erstellen (siehe Alternativen & Prototyp vs. Produktiv Code)

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Datagraph 11

ChangeStyle

Load

62

- Bubble 18
  0, 20
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PointChart

SearchTextBox

Die Ausrüstung!

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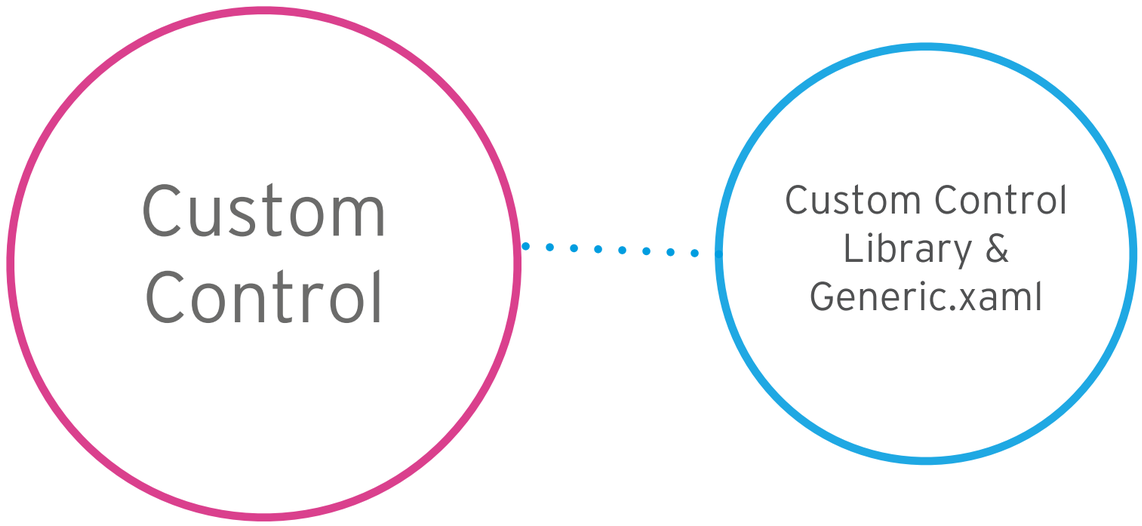

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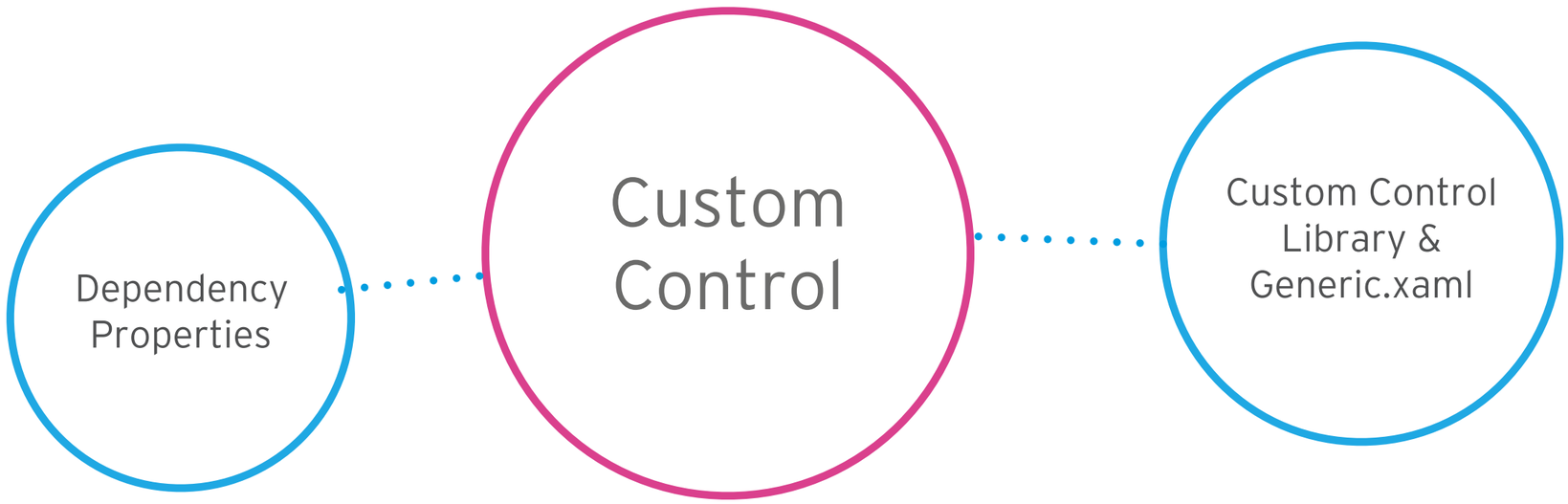

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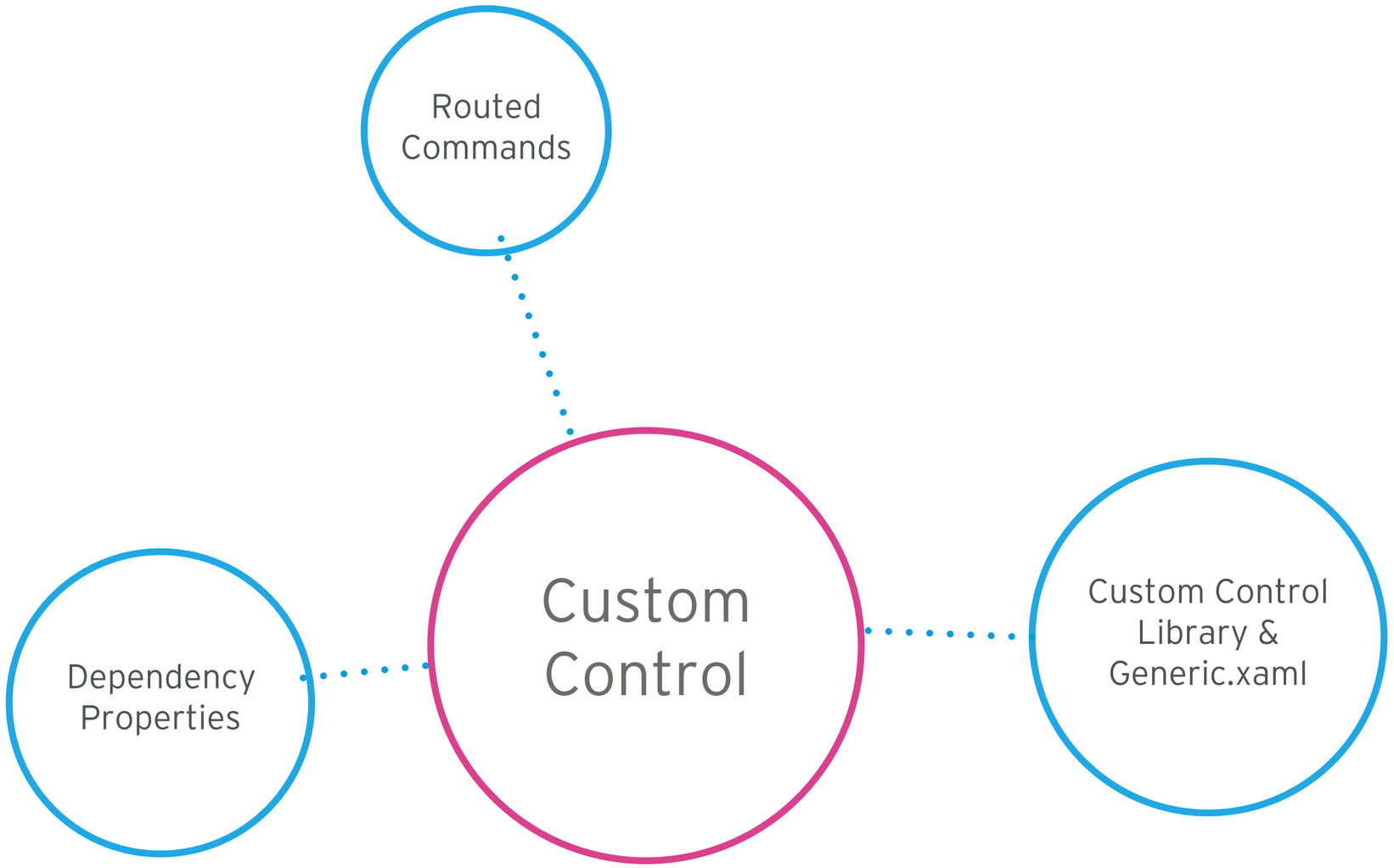

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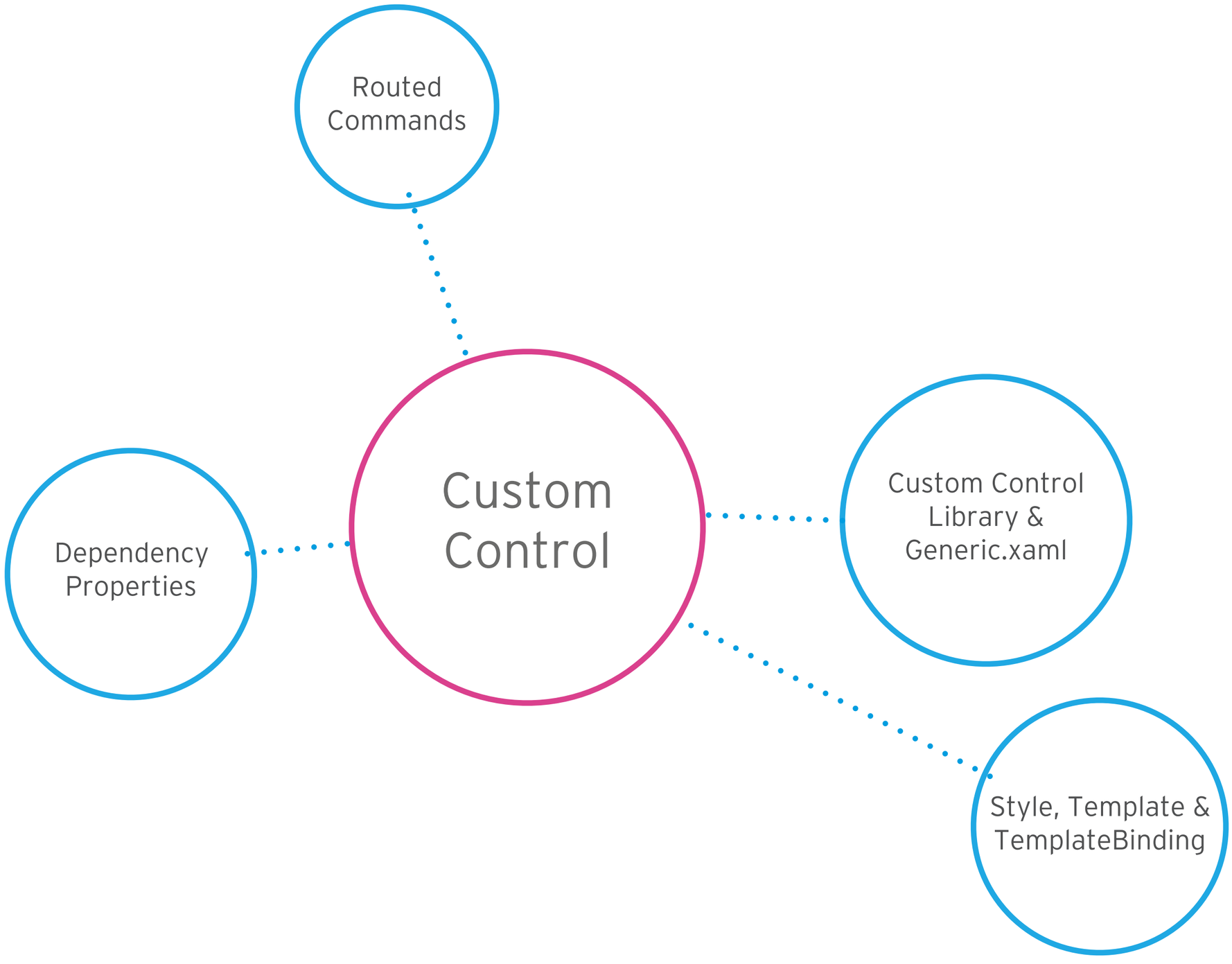

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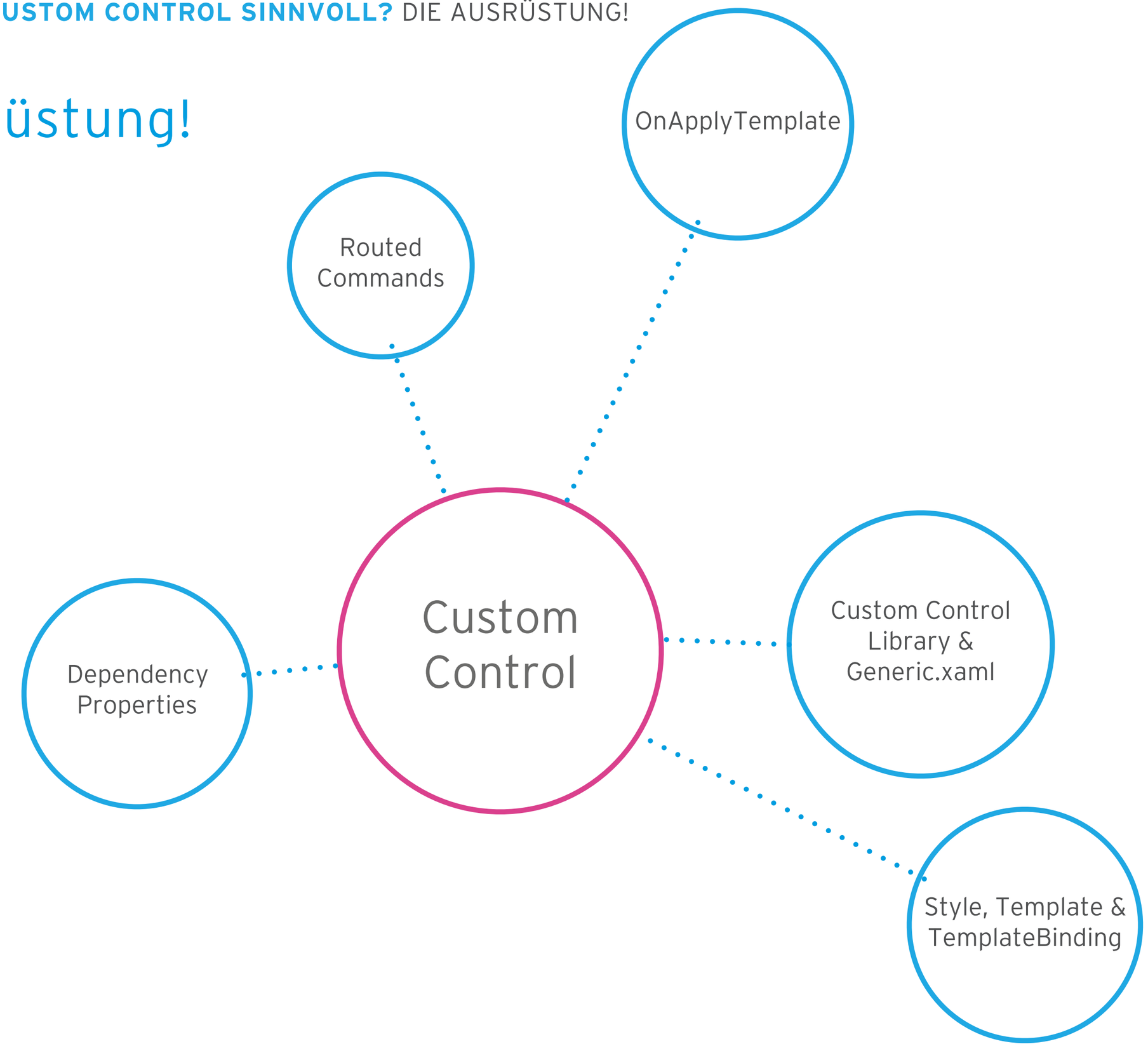

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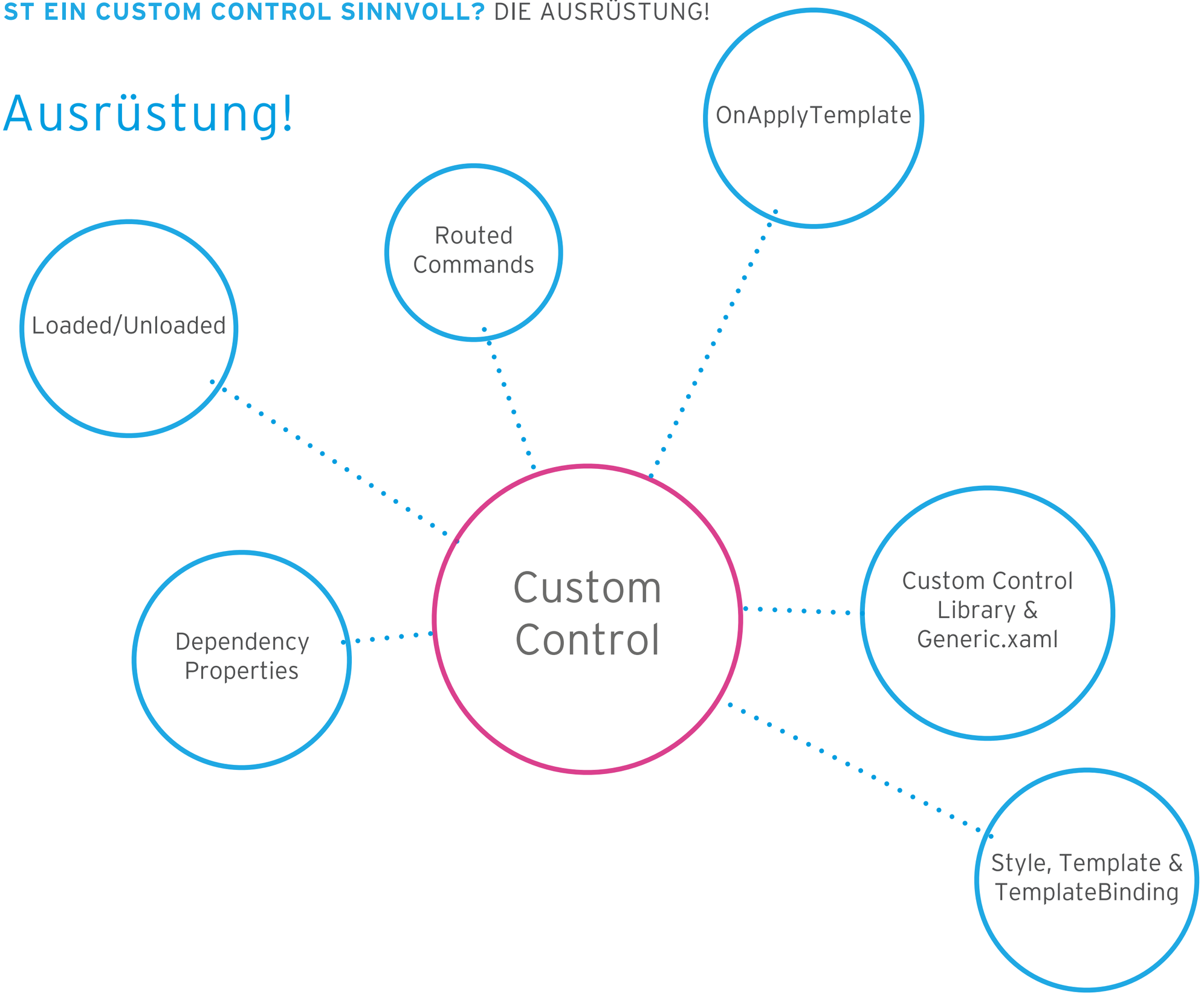

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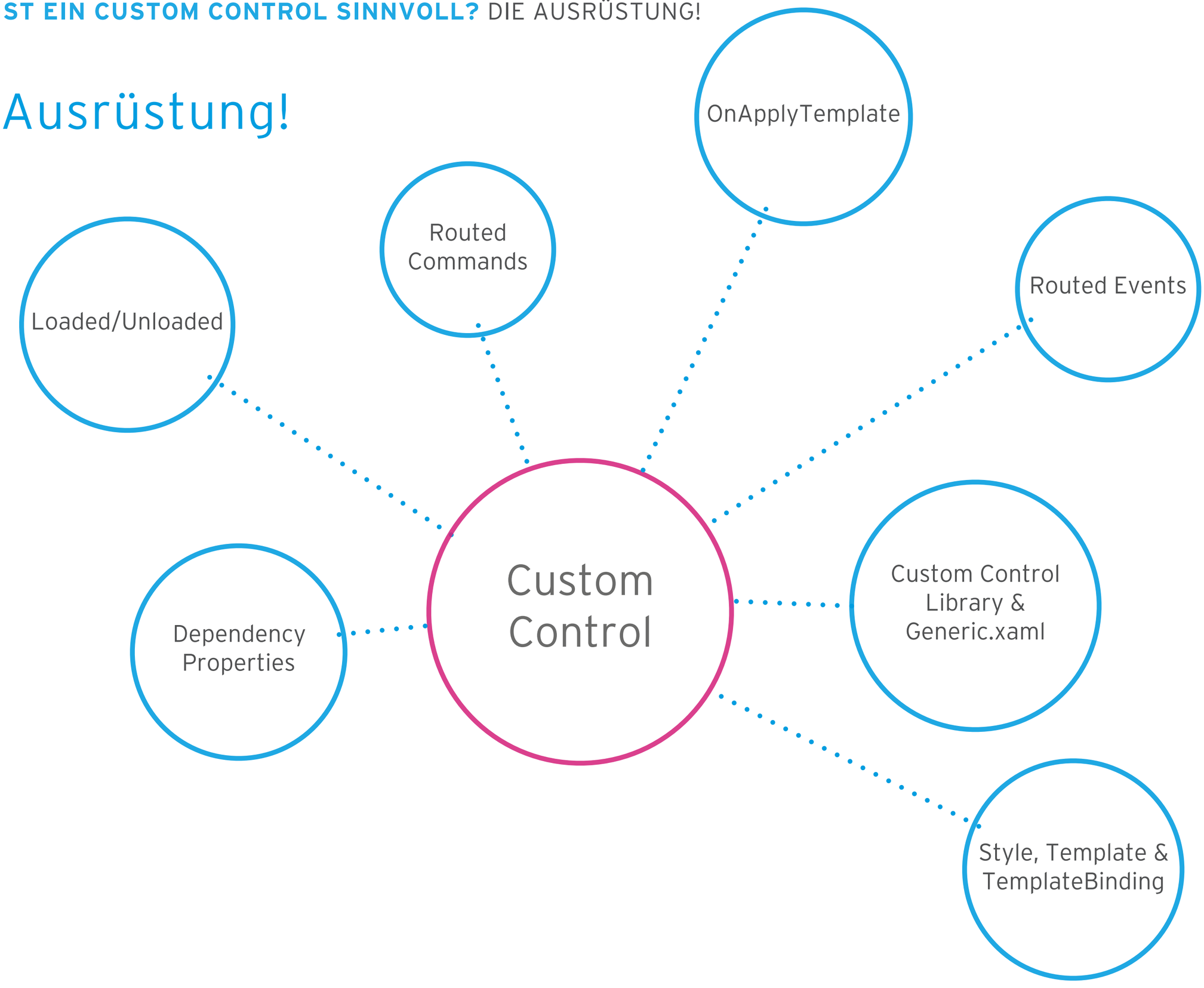

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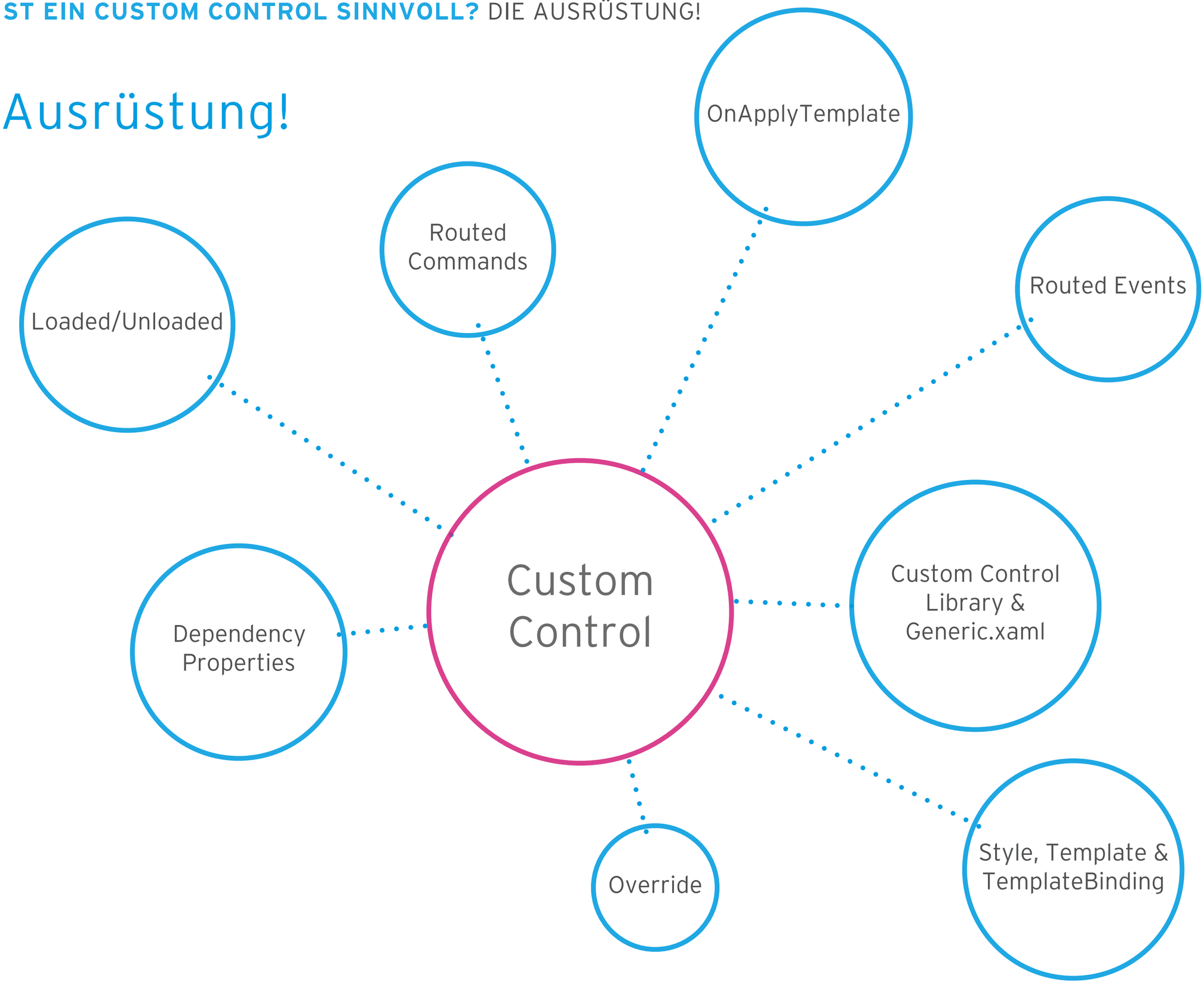

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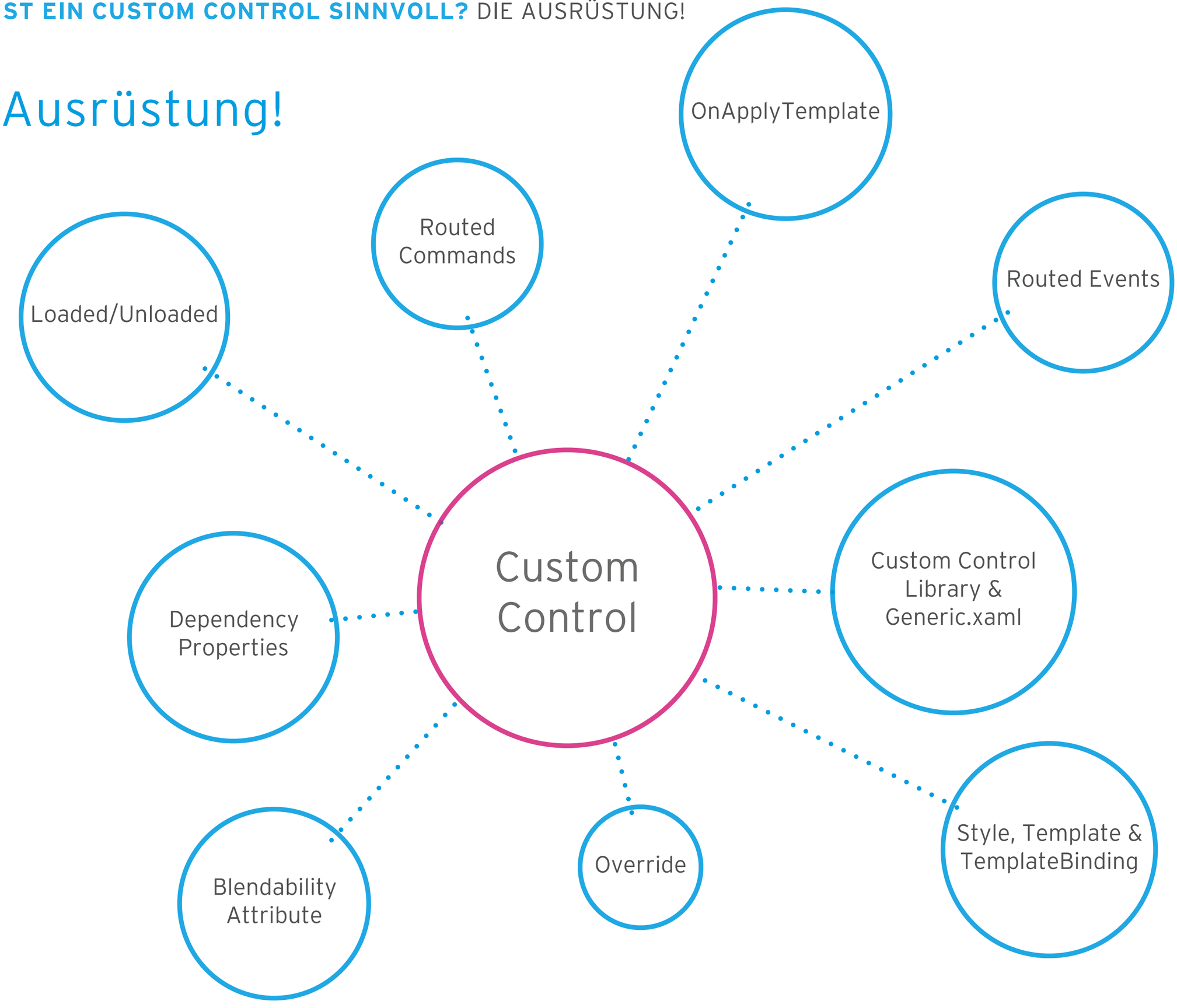

SEARCHTEXTBOX

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SearchTextBox

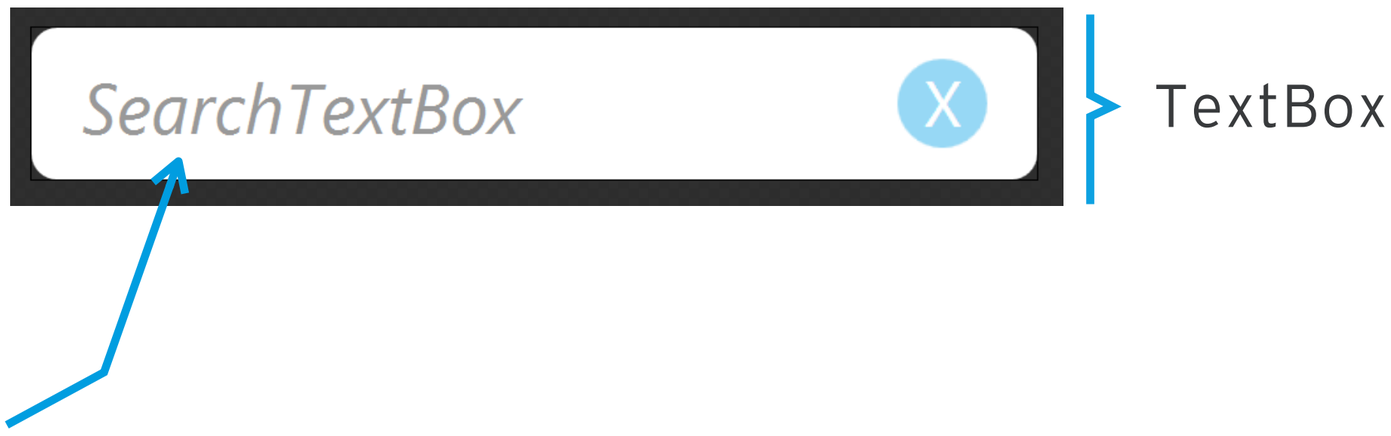
ANALYSE

View Model

View Model

View Model

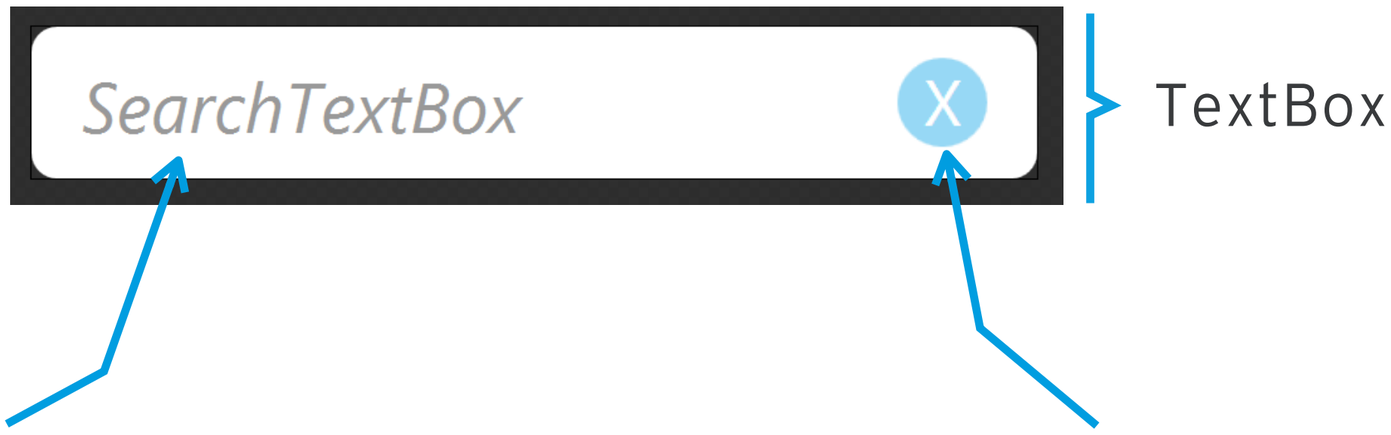
View Model



View Model

- Watermark
- WatermarkFontStyle
- WatermarkFontWeight
- WatermarkForeground

View Model



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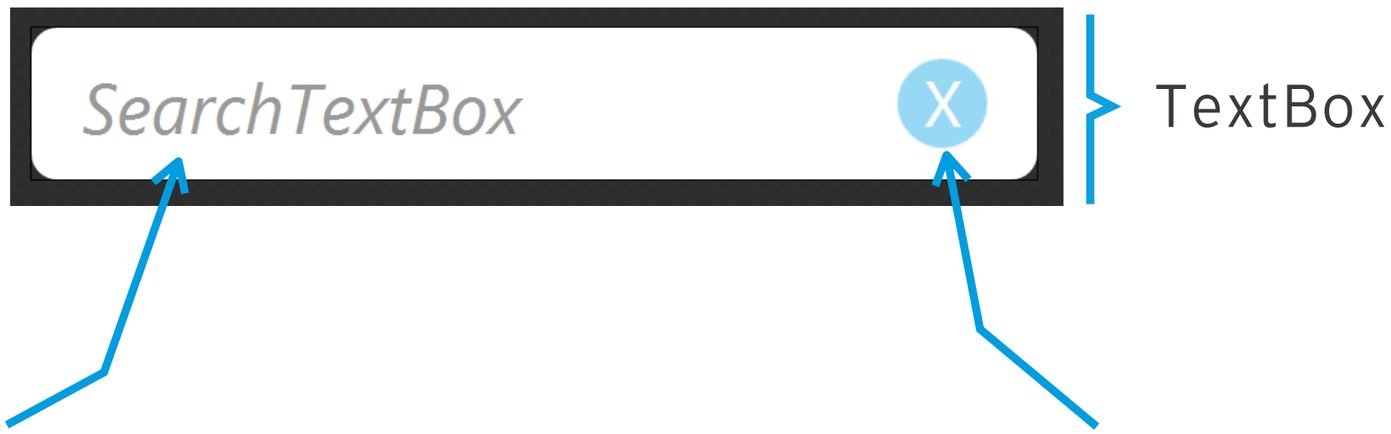

- Watermark
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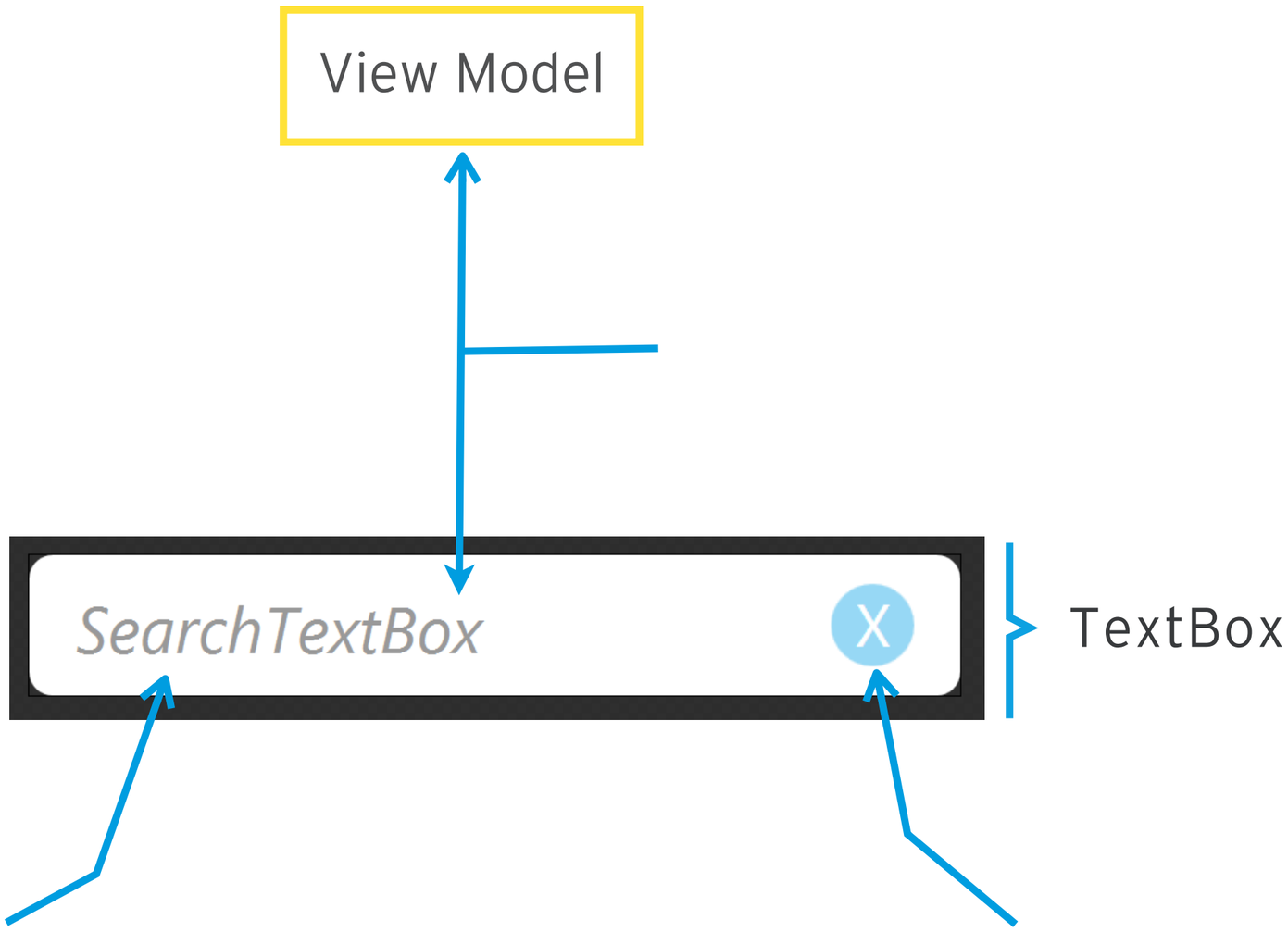
ClearCommand

(Rucksetzen des Texts)



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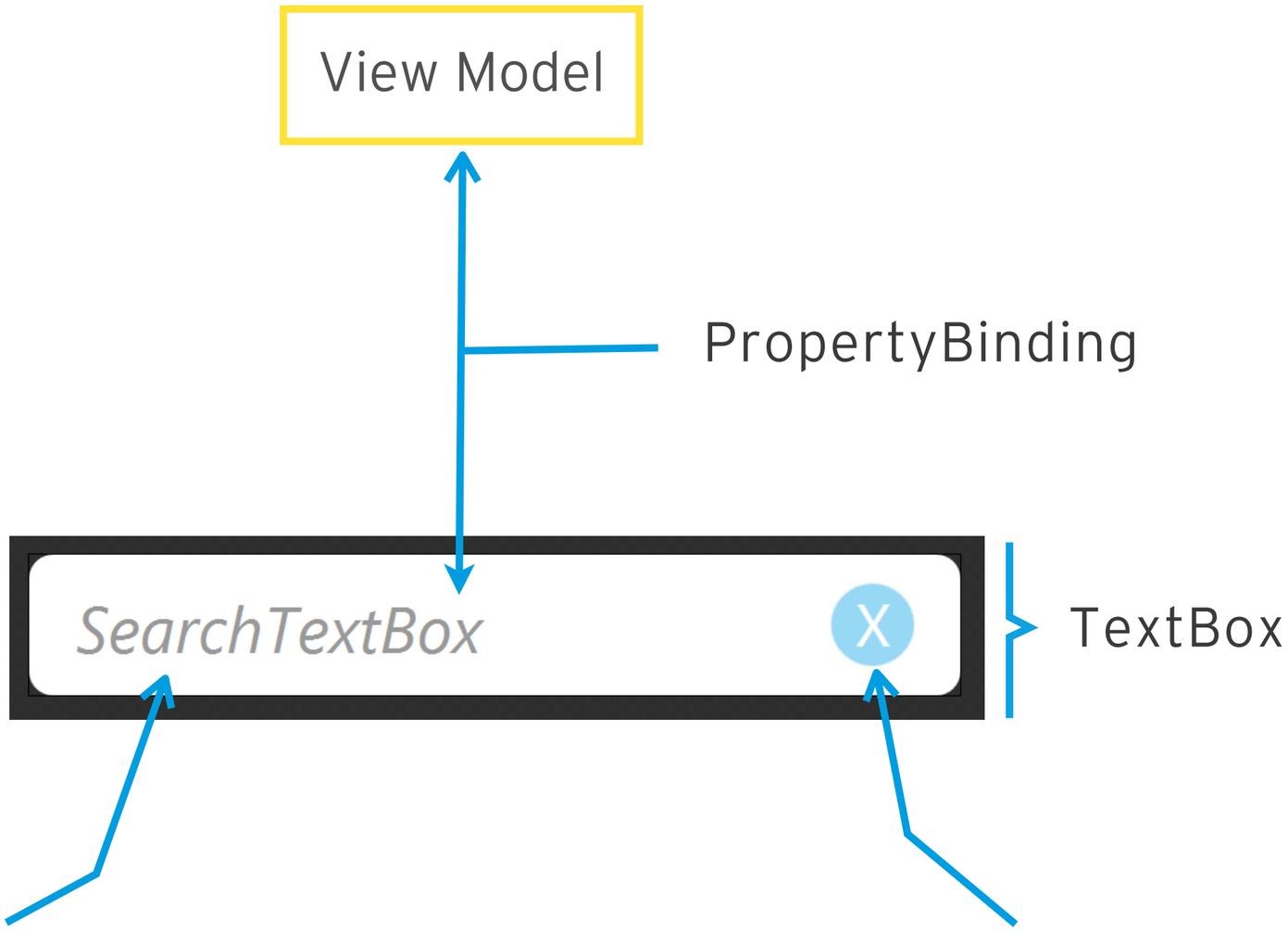

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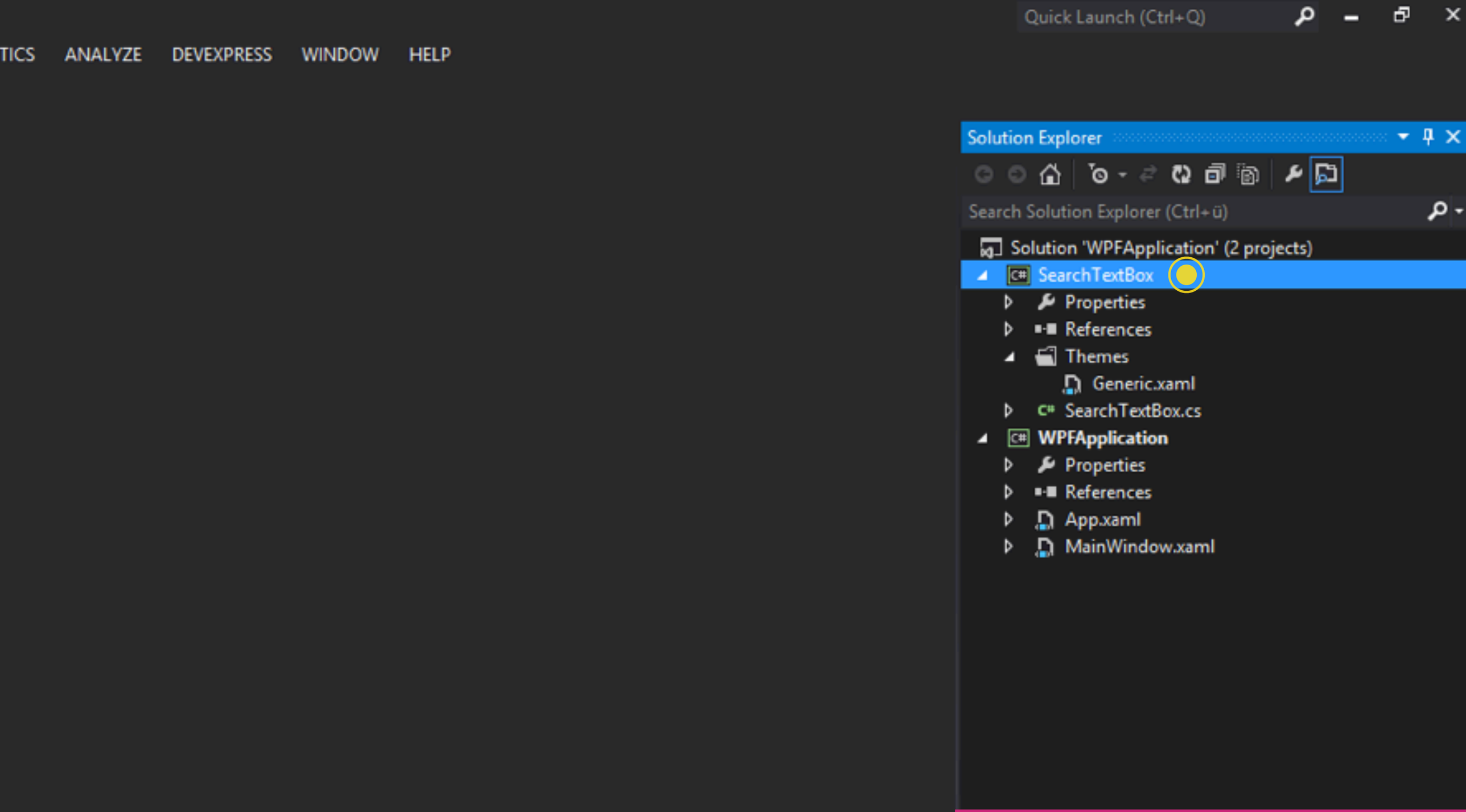
ClearCommand

(Rucksetzen des Texts)

CUSTOM CONTROL LIBRARY



Es kann losgehen!

```
/// <summary> ...
[ContentPropertyAttribute("MyDefaultContentProperty")]
[Description("The class SearchTextBox represents a textbox with watermark and clear t
public class SearchTextBox : TextBox
{
    Members

    DependencyProperties

    PropertyChangedCallbacks

    Events

    Commands

    Handlers

    Ctor

    Init/Cleanup

    OverrideMethods

    Methods

    Properties
}
```

Basisklasse bestimmen

(SearchTextBox.cs)

STYLE & TEMPLATE

SEARCHTEXTBOX STYLE & TEMPLATE

http://msdn.microsoft.com/en-us/library/aa970773(v=vs.110).aspx

TextBox Styles and Templates

.NET Framework 4.5 | Other Versions | 1 out of 2 rated this helpful

This topic describes the styles and templates for the TextBox control. You can modify the default ControlTemplate to give the control a unique appearance. For more information, see Customizing the Appearance of an Existing Control by Creating a ControlTemplate.

TextBox Parts

The following table lists the named parts for the TextBox control.

Part	Type	Description
PART_ContentHost	FrameworkElement	A visual element that can contain a FrameworkElement. The text of the TextBox is displayed in this element.

```
<Style TargetType="{x:Type TextBox}">
  <Setter Property="SnapsToDevicePixels"
          Value="True" />
  <Setter Property="OverridesDefaultStyle"
          Value="True" />
  <Setter Property="KeyboardNavigation.TabNavigation"
          Value="None" />
  <Setter Property="FocusVisualStyle"
          Value="{x:Null}" />
  <Setter Property="MinWidth"
          Value="120" />
  <Setter Property="MinHeight"
          Value="20" />
  <Setter Property="AllowDrop"
          Value="true" />
  <Setter Property="Template">
    <Setter.Value>
      <ControlTemplate TargetType="{x:Type TextBoxBase}">
        <Border Name="Border"
                CornerRadius="2"
                Padding="2"
                BorderThickness="1">
          <ScrollViewer Margin="0"
                        x:Name="PART_ContentHost" />
        </Border>
      </ControlTemplate>
    </Setter.Value>
  </Setter>
</Style>
```

ERGOSIGN

```
<Style TargetType="{x:Type local:SearchTextBox}">
    <Setter Property="Foreground" Value="Black" />
    <Setter Property="Background" Value="White" />
    <Setter Property="BorderBrush" Value="Black" />
    <Setter Property="BorderThickness" Value="1" />
    <Setter Property="Padding" Value="1" />
    <Setter Property="AllowDrop" Value="true" />
    <Setter Property="ScrollViewer.PanningMode" Value="VerticalFirst" />
    <Setter Property="Stylus.IsFlicksEnabled" Value="False" />
    <Setter Property="WatermarkFontStyle" Value="Italic" />
    <Setter Property="Template">
        <Setter.Value>
            <ControlTemplate TargetType="{x:Type local:SearchTextBox}">
                <Border x:Name="Bd"
                        Background="{TemplateBinding Background}"
                        BorderBrush="{TemplateBinding BorderBrush}"
                        BorderThickness="{TemplateBinding BorderThickness}"
                        SnapsToDevicePixels="true">
                    <Grid>
                        <Grid.ColumnDefinitions>
                            <ColumnDefinition />
                            <ColumnDefinition Width="auto" />
                        </Grid.ColumnDefinitions>
                        <Grid x:Name="TextContainer">
                            <TextBlock x:Name="Watermark"
                                       Margin="{TemplateBinding Padding}"
                                       FontStyle="{TemplateBinding WatermarkFontStyle}"
                                       Opacity=".5"
                                       Text="{TemplateBinding Watermark}"
                                       Visibility="Hidden" />
                            <ScrollViewer x:Name="PART_ContentHost" SnapsToDevicePixels="{TemplateBinding SnapsToDevicePixels}" />
                        </Grid>
                        <Button Grid.Column="1"
                                Width="15"
                                Height="15"
                                Margin="0 0 5 0"
                                Padding="0 -2 0 0"
                                Command="{x:Static local:SearchTextBox.ClearTextCommand}"
                                Content="X"
                                Focusable="False"
                                Style="{DynamicResource {ComponentResourceKey TypeInTargetAssembly={x:Type local:SearchTextBox},
                                                                              ResourceId=SearchTextBoxButtonStyle}}" />
                    </Grid>
                </Border>
                <ControlTemplate.Triggers>
                    <MultiTrigger>
                        <MultiTrigger.Conditions>
                            <Condition Property="IsKeyboardFocused" Value="false" />
                            <Condition Property="Text" Value="" />
```

Style & Template

(Generic.xaml)

DEPENDENCY PROPERTIES BASICS

Dependency Properties - Basics

Dependency Properties - Basics

- Oberflächlich wie .NET Properties (Get, Set). Unterschied liegt in der Implementierung. Ausschließliche Verwendung bei Controls

Dependency Properties - Basics

- Oberflächlich wie .NET Properties (Get, Set). Unterschied liegt in der Implementierung. Ausschließliche Verwendung bei Controls
- Metadaten und Speicherperformance, Änderungsbenachrichtigungen Grundlage für Trigger, Data Binding, Animationen etc.

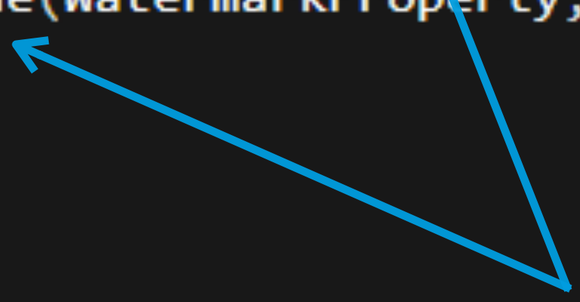
```
/// <summary>
/// WatermarkProperty - Gets or sets the watermark.
/// </summary>
public static readonly DependencyProperty WatermarkProperty = DependencyProperty.Register(
    "Watermark",
    typeof(string),
    typeof(SearchTextBox),
    new FrameworkPropertyMetadata(string.Empty));
```

- Registrieren über Statische Funktion
  - Name
  - Typ
  - Control Typ bzw. Klasse
  - Metadaten

Properties anlegen 1/2

(SearchTextBox.cs)

```
/// <summary>
/// Gets or sets the watermark.
/// </summary>
[Description("Gets or sets the watermark."), Category(PROPERTY_CATEGORY)]
public string Watermark
{
    get { return (string)GetValue(WatermarkProperty); }
    set { SetValue(WatermarkProperty, value); }
}
```



› Verwendung der Methoden GetValue(), SetValue()

Properties anlegen 2/2

(SearchTextBox.cs)

ROUTED COMMANDS

RoutedCommands

RoutedCommands

- RoutedCommand Klasse implementiert ICommand

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- Löst eine Aktion innerhalb eines Controls aus und muss abonniert werden

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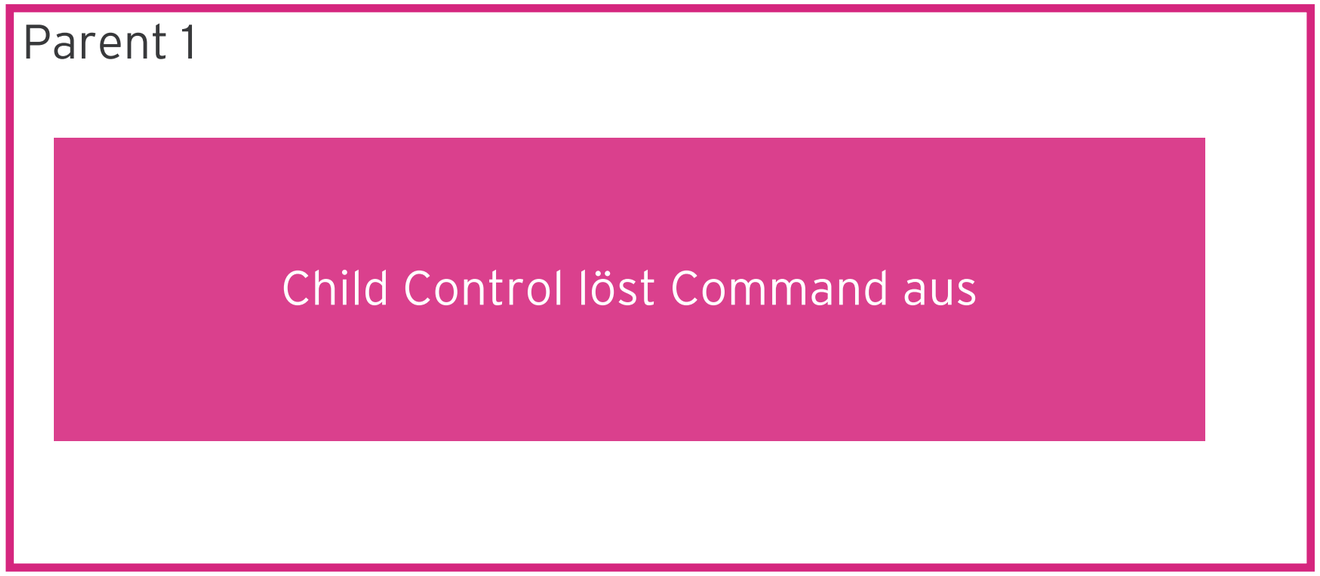
- Löst eine Aktion innerhalb eines Controls aus und muss abonniert werden
- Verknüpfung mit Methode oder Funktion der Control Klasse per CommandBinding
- Kann über Command Property ausgelöst werden

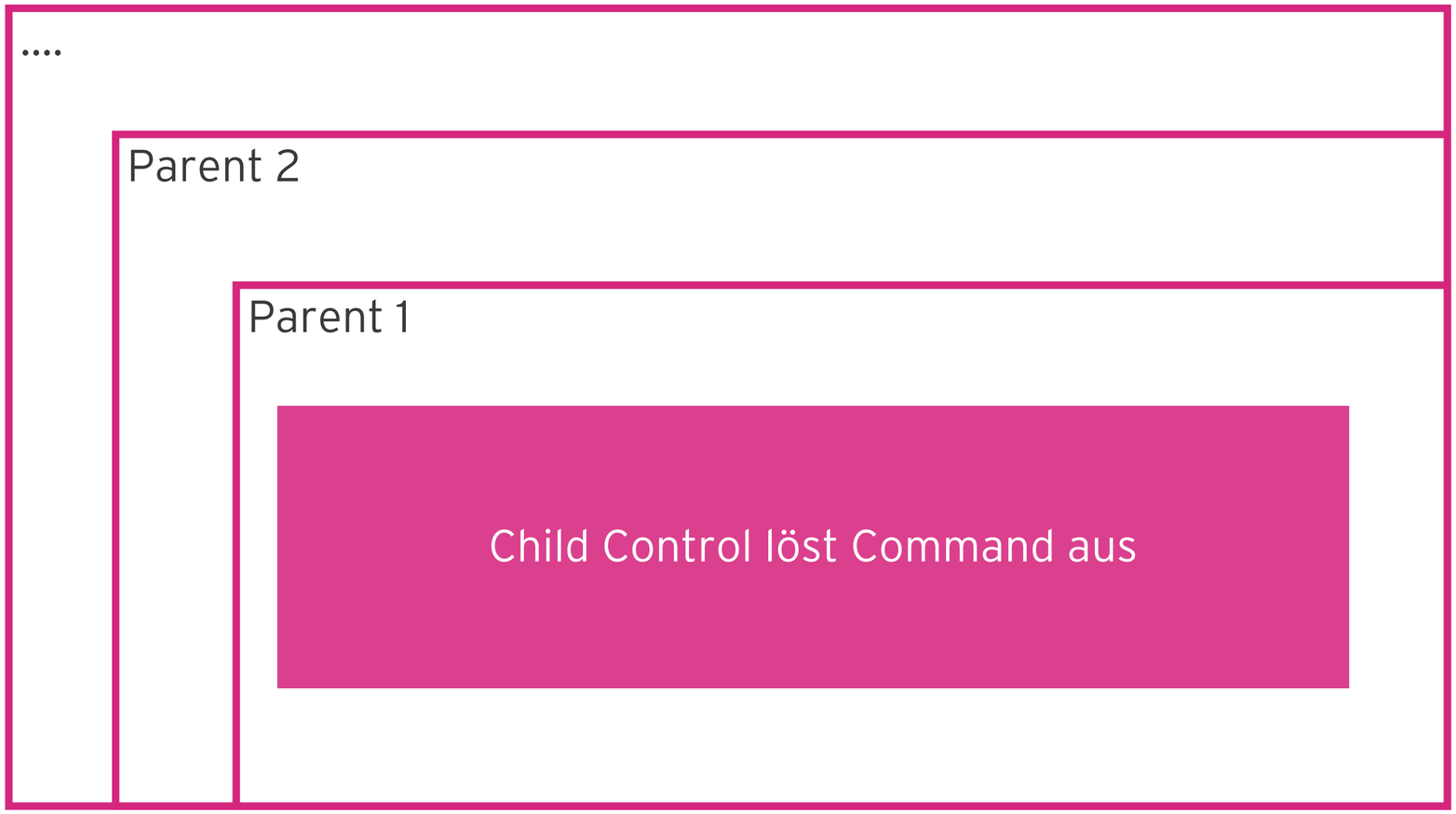
SEARCHTEXTBOX ROUTEDCOMMANDS

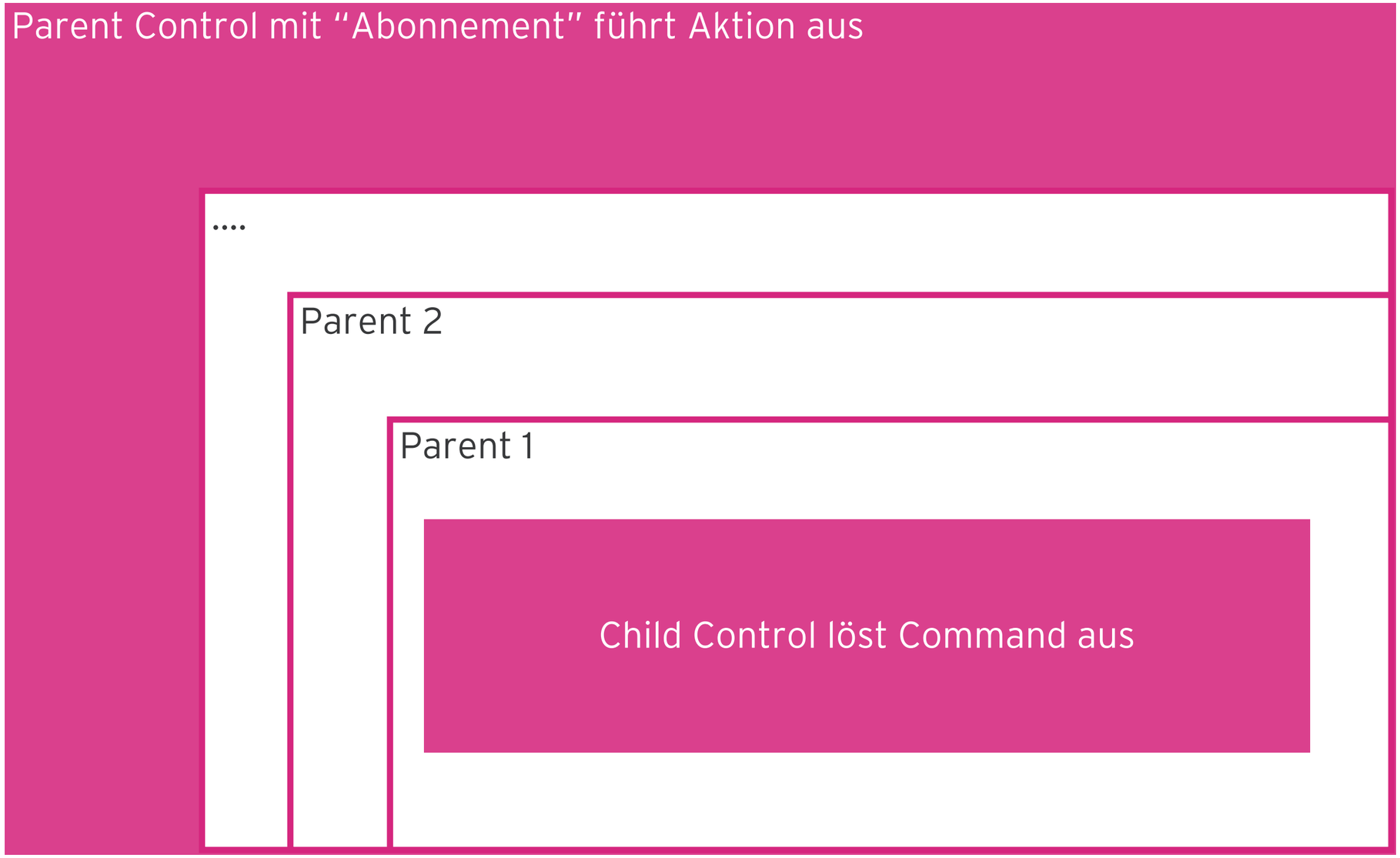
Child Control löst Command aus

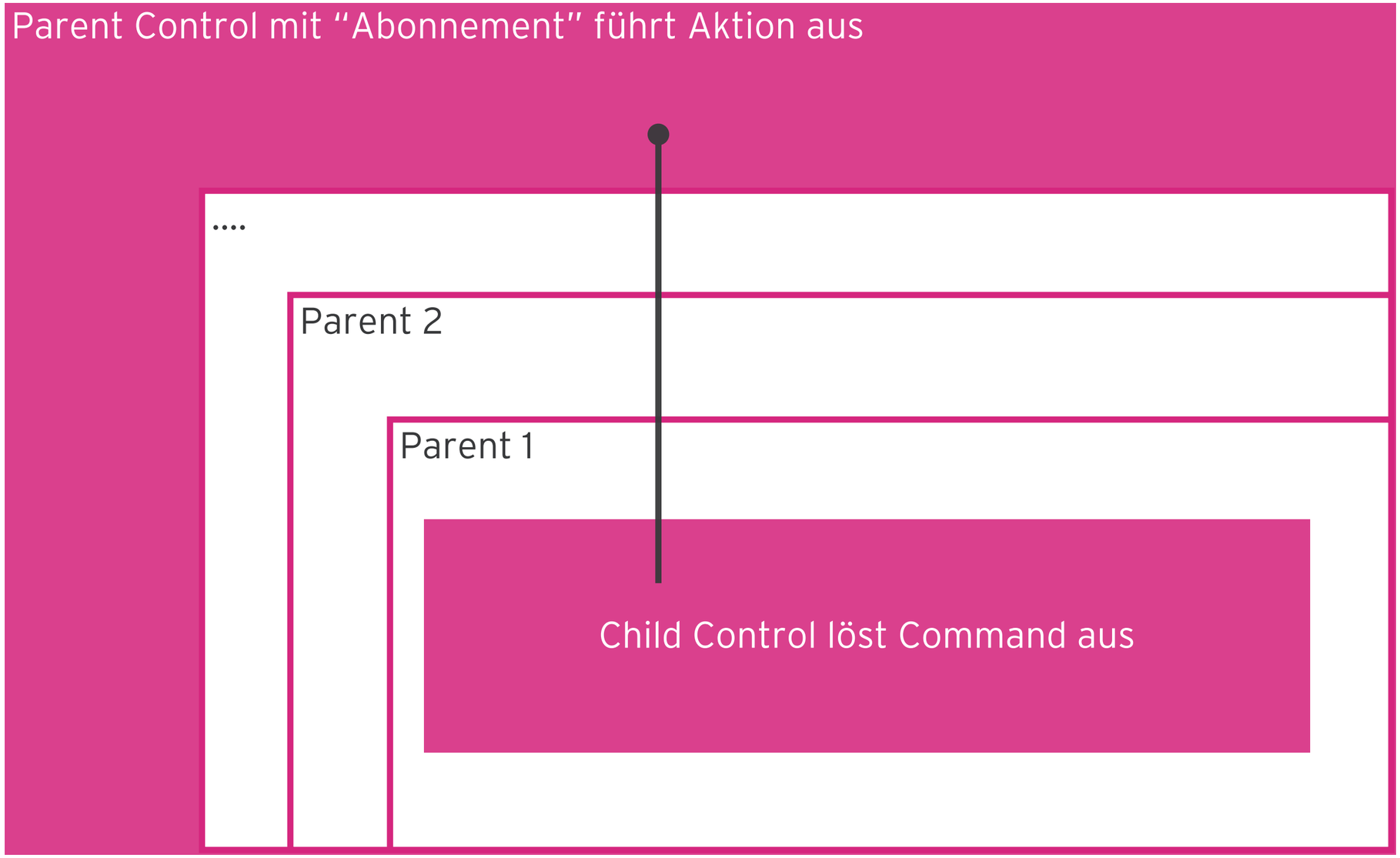
SEARCHTEXTBOX ROUTEDCOMMANDS




Parent 2
Parent 1
Child Control löst Command aus


....
Parent 2
Parent 1
Child Control löst Command aus

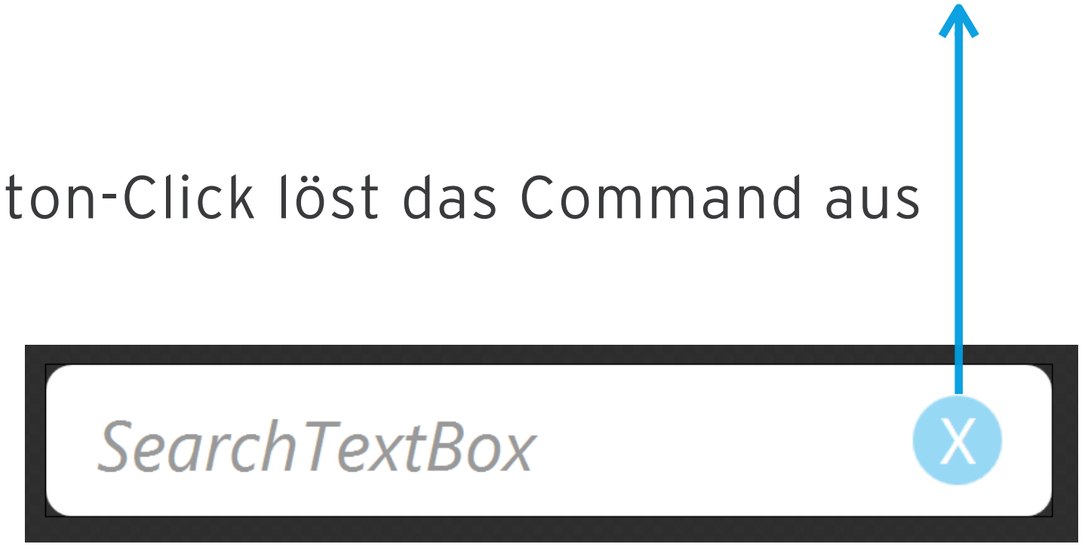

Parent Control mit “Abonnement” führt Aktion aus
....
Parent 2
Parent 1
Child Control löst Command aus


Parent Control mit “Abonnement” führt Aktion aus
....
Parent 2
Parent 1
Child Control löst Command aus

SEARCHTEXTBOX ROUTEDCOMMANDS

SEARCHTEXTBOX ROUTEDCOMMANDS

1.Button-Click löst das Command aus



2. SearchTextBox mit

“Abonnement” führt Aktion aus

1.Button-Click löst das Command aus

3. Command stoppt

2. SearchTextBox mit

“Abonnement” führt Aktion aus

1.Button-Click löst das Command aus

- Routed Command anlegen
  - Name
  - Control Typ bzw. Klasse

```
/// <summary>
/// ClearTextCommand - This command clears the text property.
/// </summary>
public static readonly RoutedCommand ClearTextCommand = new RoutedCommand("ClearTextCommand", typeof(SearchTextBox));

/// <summary> ...
private static void ExecuteClearTextCommand(object sender, ExecutedRoutedEventArgs e)
{
    SearchTextBox self = sender as SearchTextBox;
    self.Clear();
}

/// <summary> ...
private static void CanExecuteClearCommand(object sender, CanExecuteRoutedEventArgs e)
{
    SearchTextBox self = sender as SearchTextBox;
    e.CanExecute = self.CanClearText();
}
```

- Execute Aktion
- CanExecute Abfrage

Routed Command 1/3

(SearchTextBox.cs)

```
/// <summary>
/// static ctor
/// </summary>
static SearchTextBox()
{
    DefaultStyleKeyProperty.OverrideMetadata(
        typeof(SearchTextBox),
        new FrameworkPropertyMetadata(typeof(SearchTextBox)));

    CommandManager.RegisterClassCommandBinding(
        typeof(SearchTextBox),
        new CommandBinding(ClearTextCommand, ExecuteClearTextCommand, CanExecuteClearCommand));
}
```

- Command Binding erzeugen
  - Command
  - Execute
  - CanExecute

Routed Command 2/3

(SearchTextBox.cs)

```
<Button Grid.Column="1"
        Command="{x:Static local:SearchTextBox.ClearTextCommand}"/>
```

- Auslösen über Command Property / x:Static Verweis

Routed Command 3/3

(Generic.xaml)

VIEWMODEL KOMMUNIKATION

ViewModel Kommunikation - Basics

ViewModel Kommunikation - Basics

- Binding (Implementierung *INotifyPropertyChanged*)

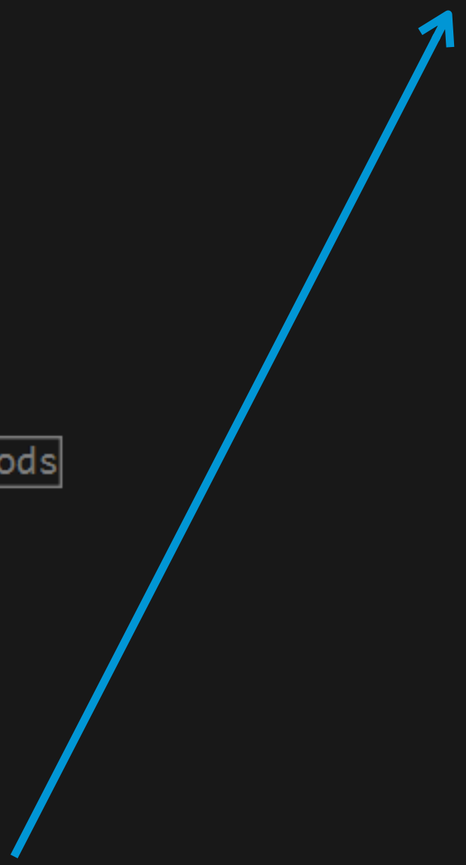
```
<SearchTextBox x:Name="SearchTextBox"
               Margin="0 0 0 10"
               Text="{Binding SearchString,
                      UpdateSourceTrigger=PropertyChanged}"
Watermark="Search Points" />
```

- Binding an ViewModel Property

ViewModel Kommunikation 1/3

(MainView.xaml)

```
public class SampleViewModel : INotifyPropertyChanged
{
    Members

    Commands

    Ctor

    Init/Cleanup

    OverrideMethods

    Methods

    Properties
}
```



- Implementieren von *INotifyPropertyChanged*

ViewModel Kommunikation 2/3

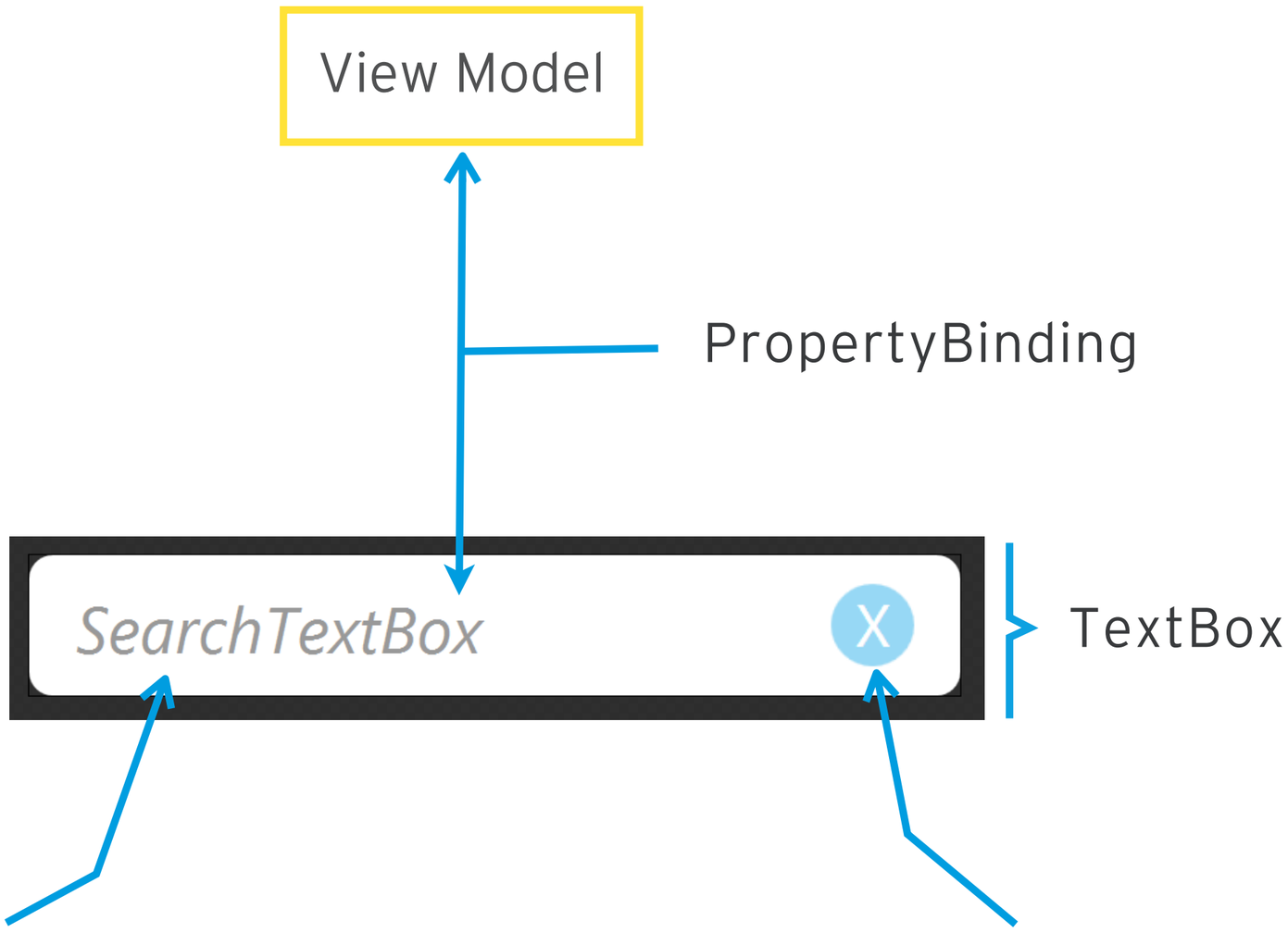
(SampleViewModel.cs)

```
/// <summary> ...
private string searchString;

/// <summary> ...
public string SearchString
{
    get
    {
        return searchString;
    }

    set
    {
        if (value != this.searchString)
        {
            this.searchString = value;
            UpdateHighlighting();
            OnPropertyChanged("SearchString");
        }
    }
}
```

- Aufruf der Update Logik
- Aufrufen von OnPropertyChanged (Update des Bindings)

ViewModel Kommunikation 3/3

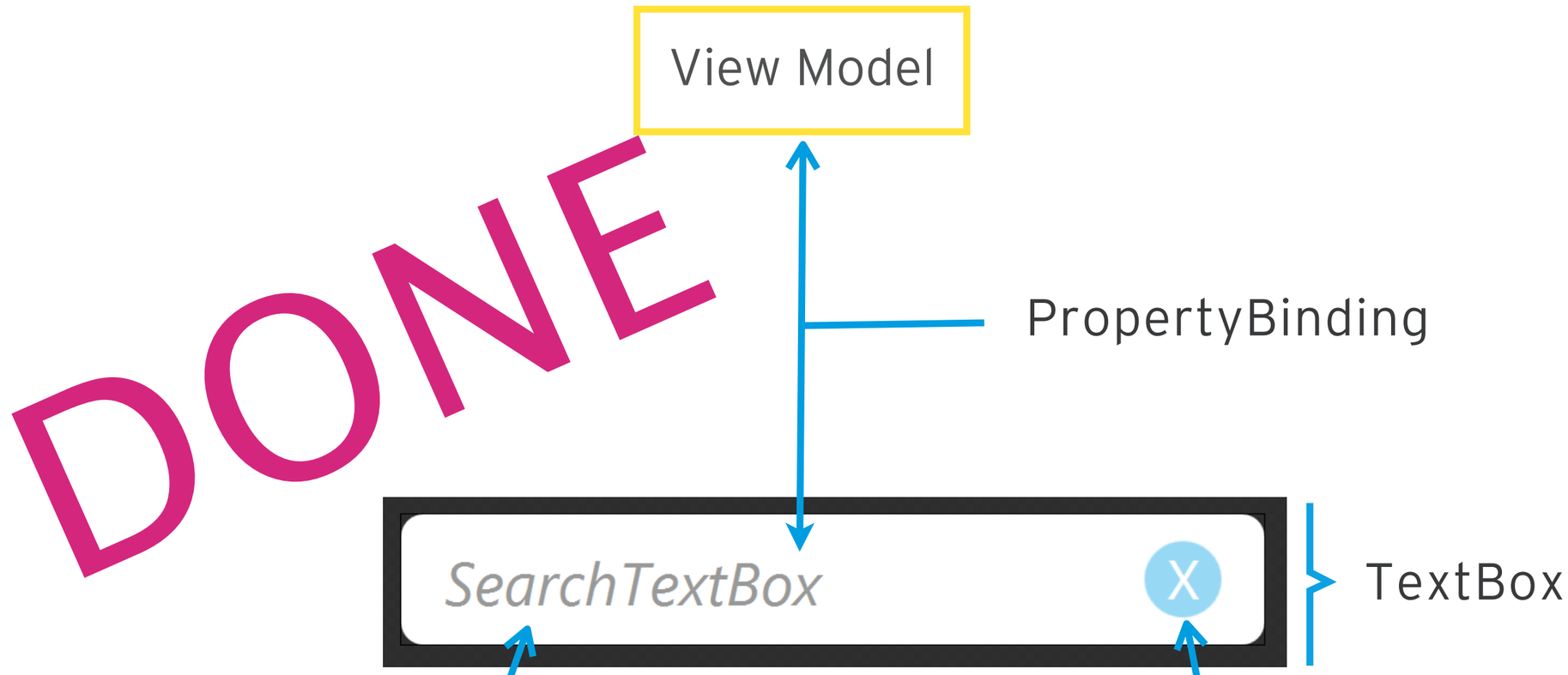
(SampleViewModel.cs)



- Watermark
- WatermarkFontStyle
- WatermarkFontWeight
- WatermarkForeground

ClearCommand

(Rucksetzen des Texts)



- Watermark
- WatermarkFontStyle
- WatermarkFontWeight
- WatermarkForeground

ClearCommand

(Rucksetzen des Texts)

POINTCHART

André Lanninger
UIDeveloper

Datagraph 11

ChangeStyle

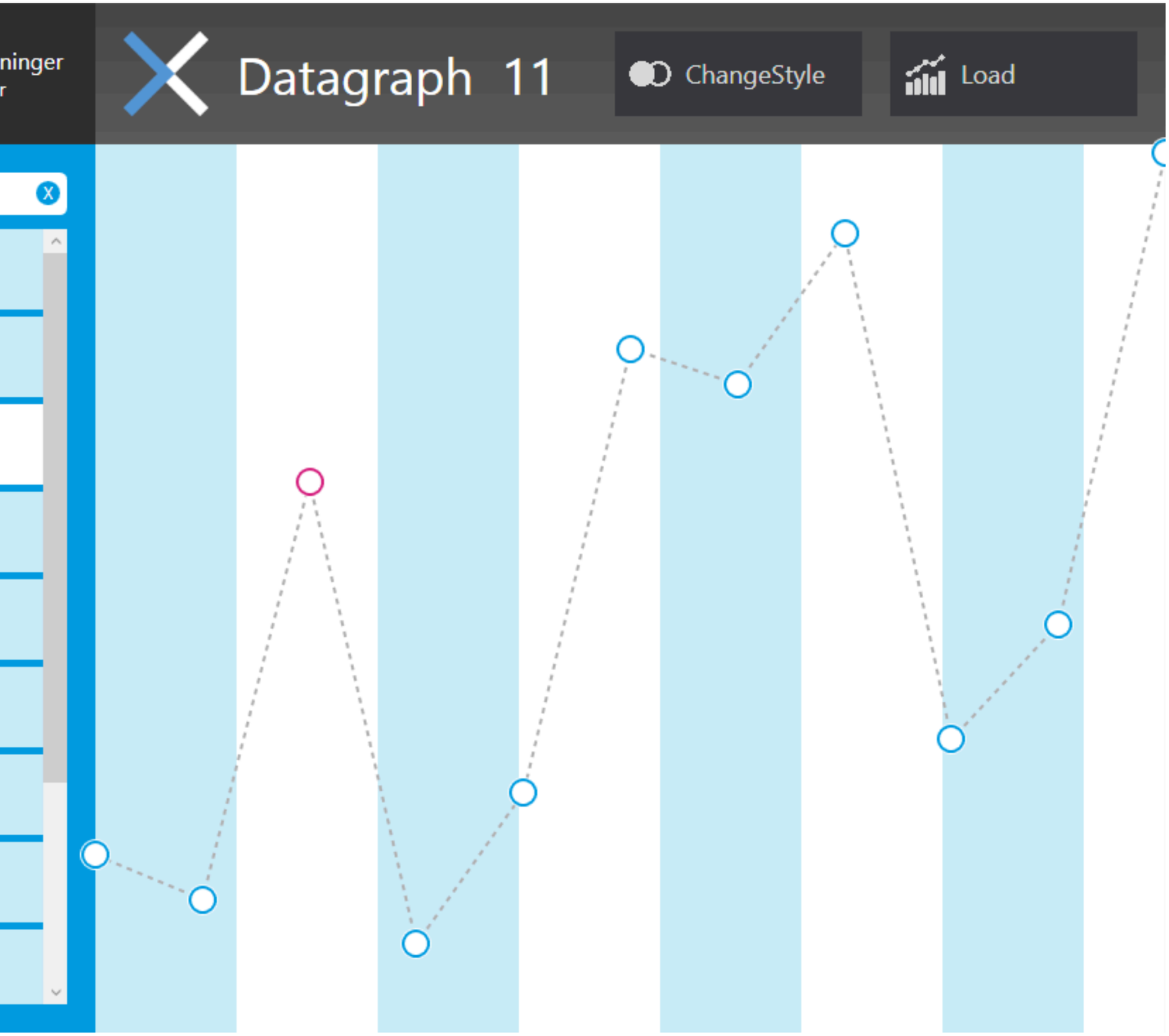
Load

62

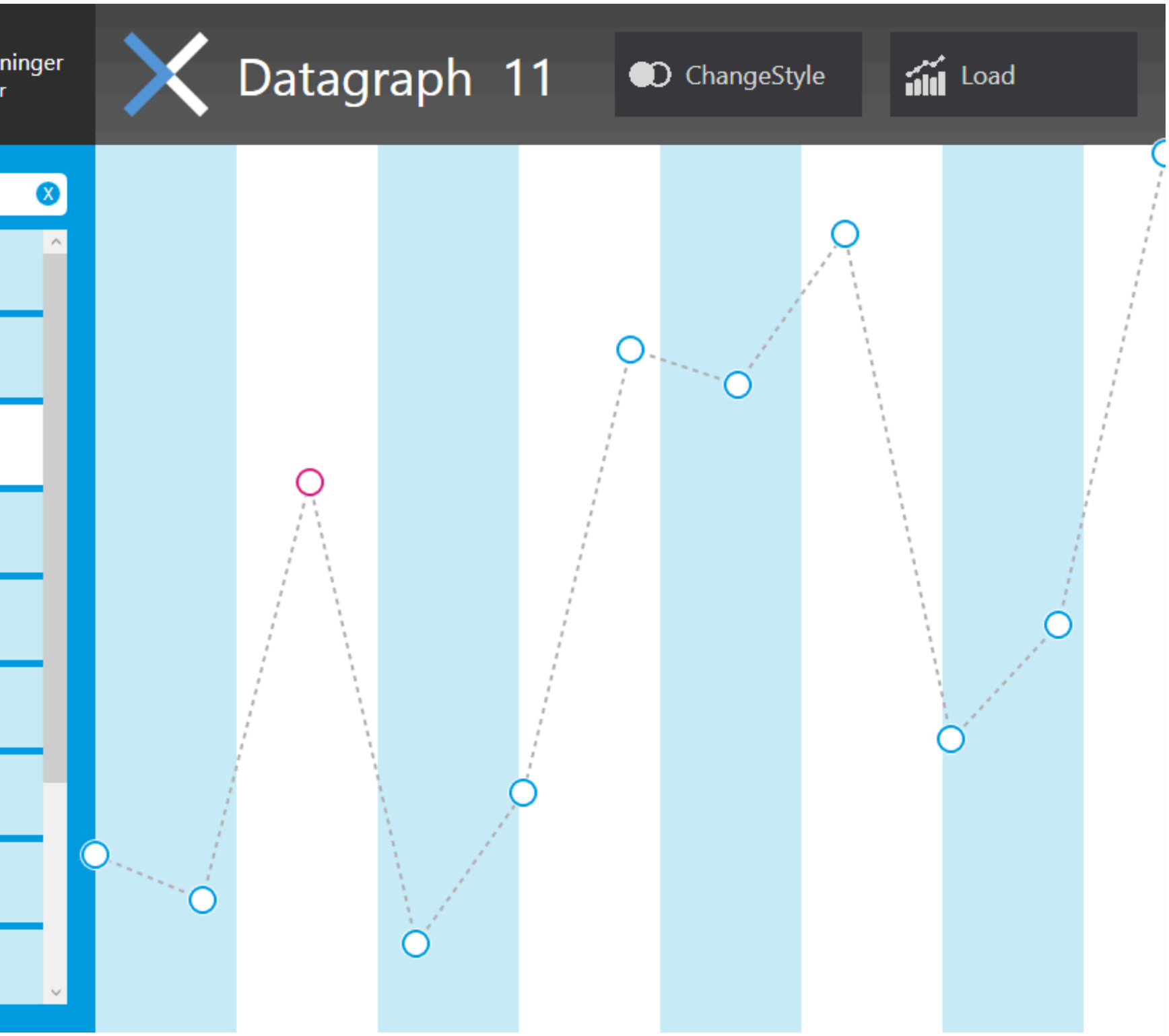
- Bubble 18
  0, 20
- Bubble 19
  10, 15
- Bubble 20
  20, **62**
- Bubble 21
  30, 10
- Bubble 22
  40, 27
- Bubble 23
  50, 77
- Bubble 24
  60, 73
- Bubble 25
  70, 90
- Bubble 26
  80, 33

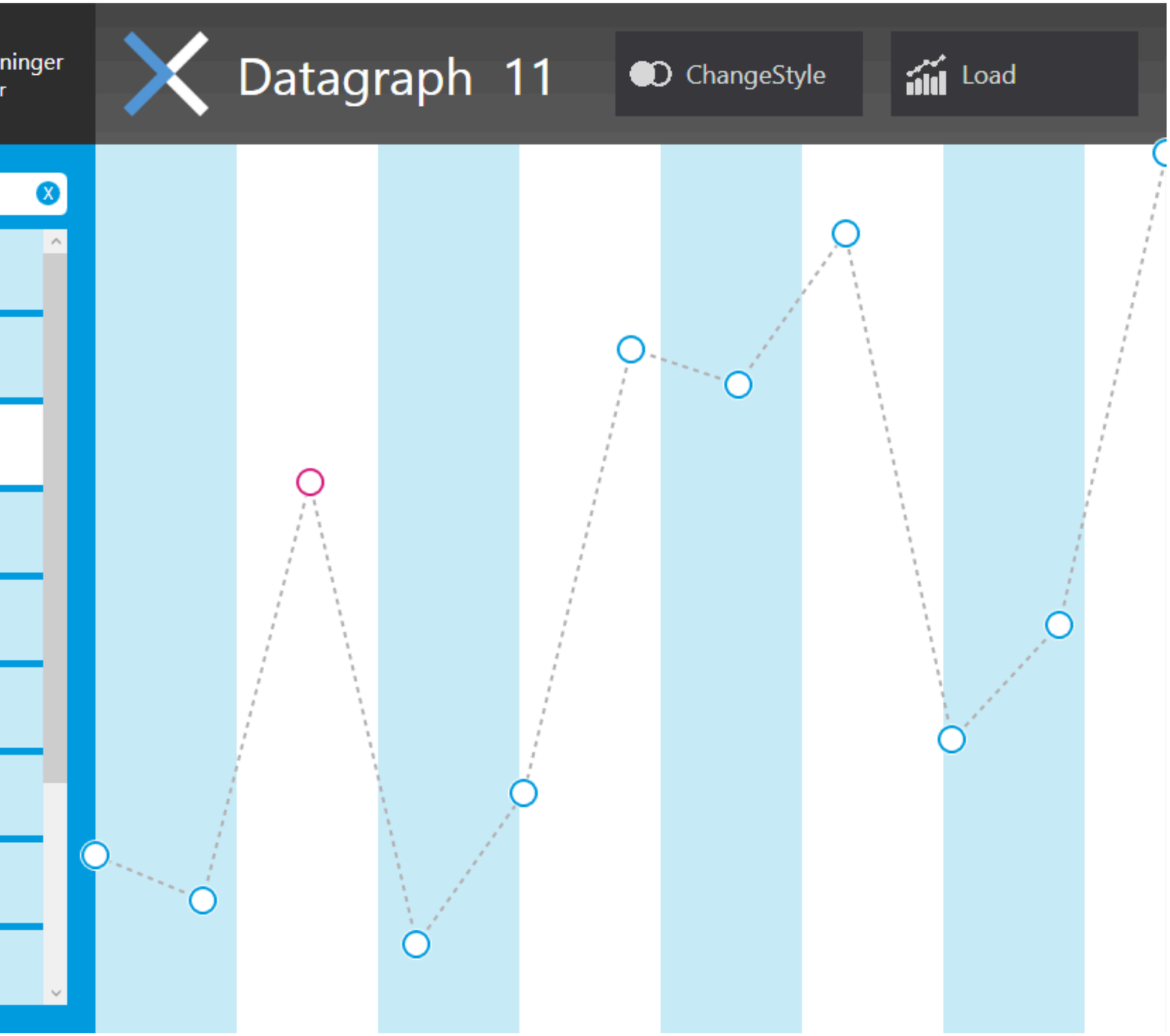
PointChart

ANALYSE


Datagraph 11
ChangeStyle
Load

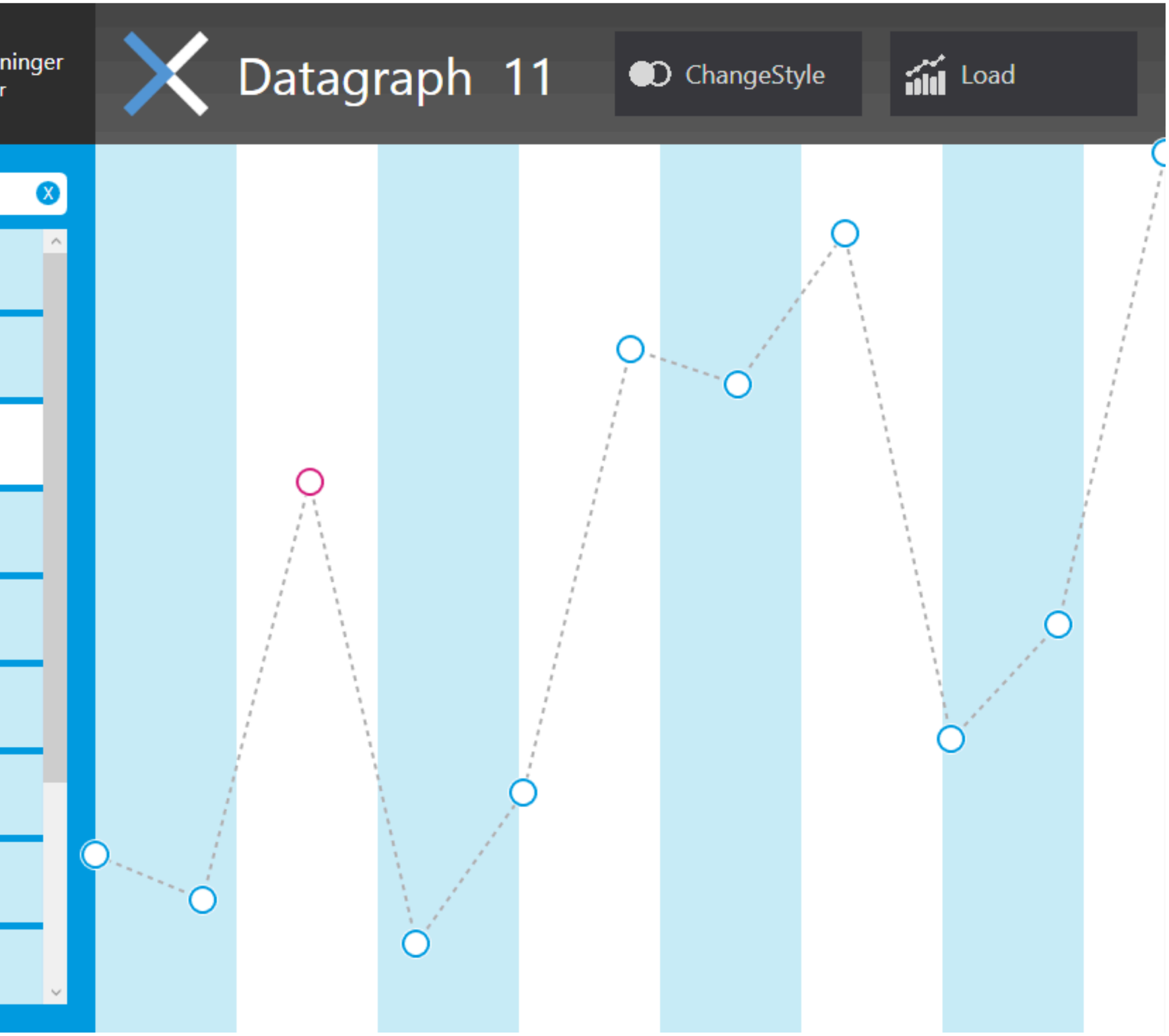
PointChartViewModel





PointChartViewModel

Points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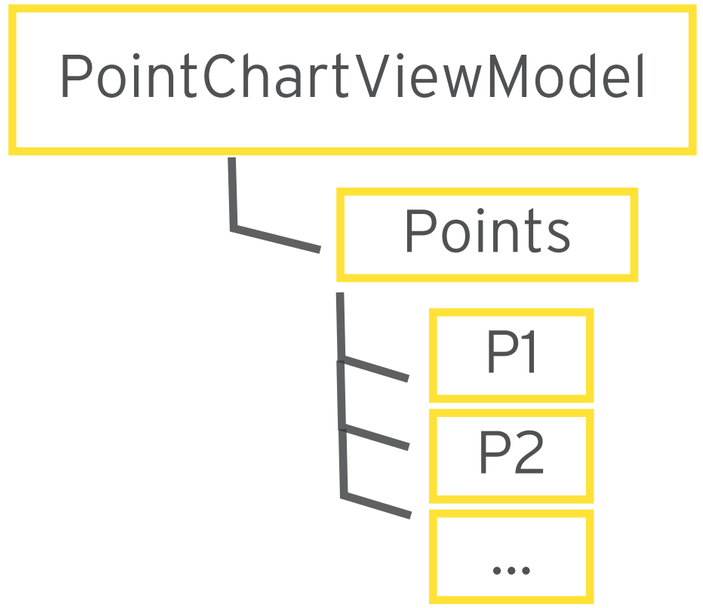
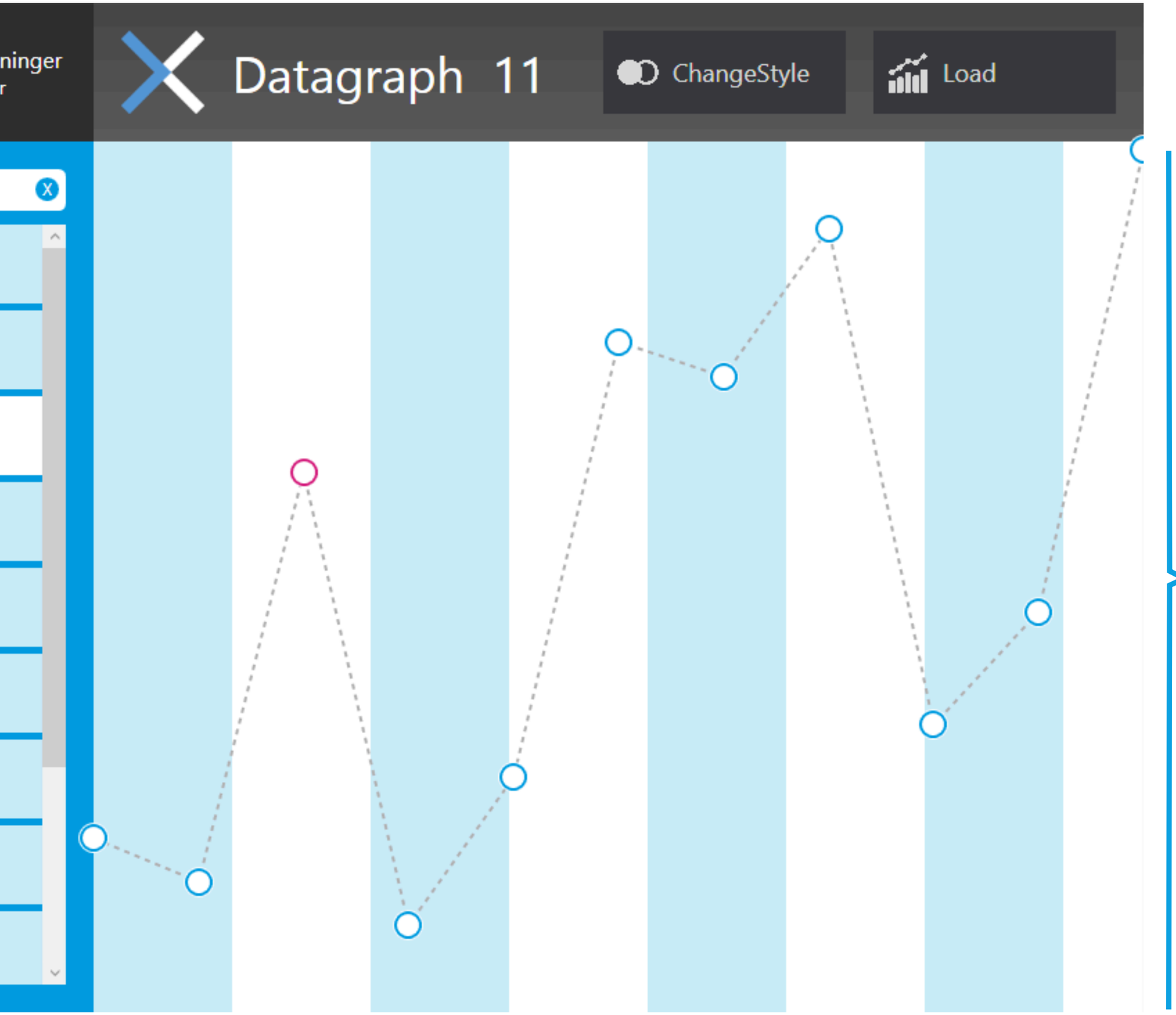
Datagraph 11
ChangeStyle
Load


PointChartViewModel
Points
P1
P2
...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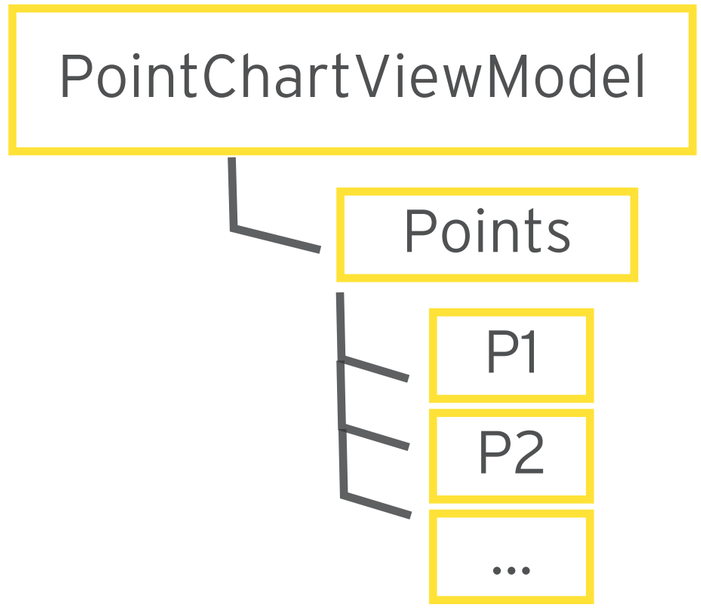
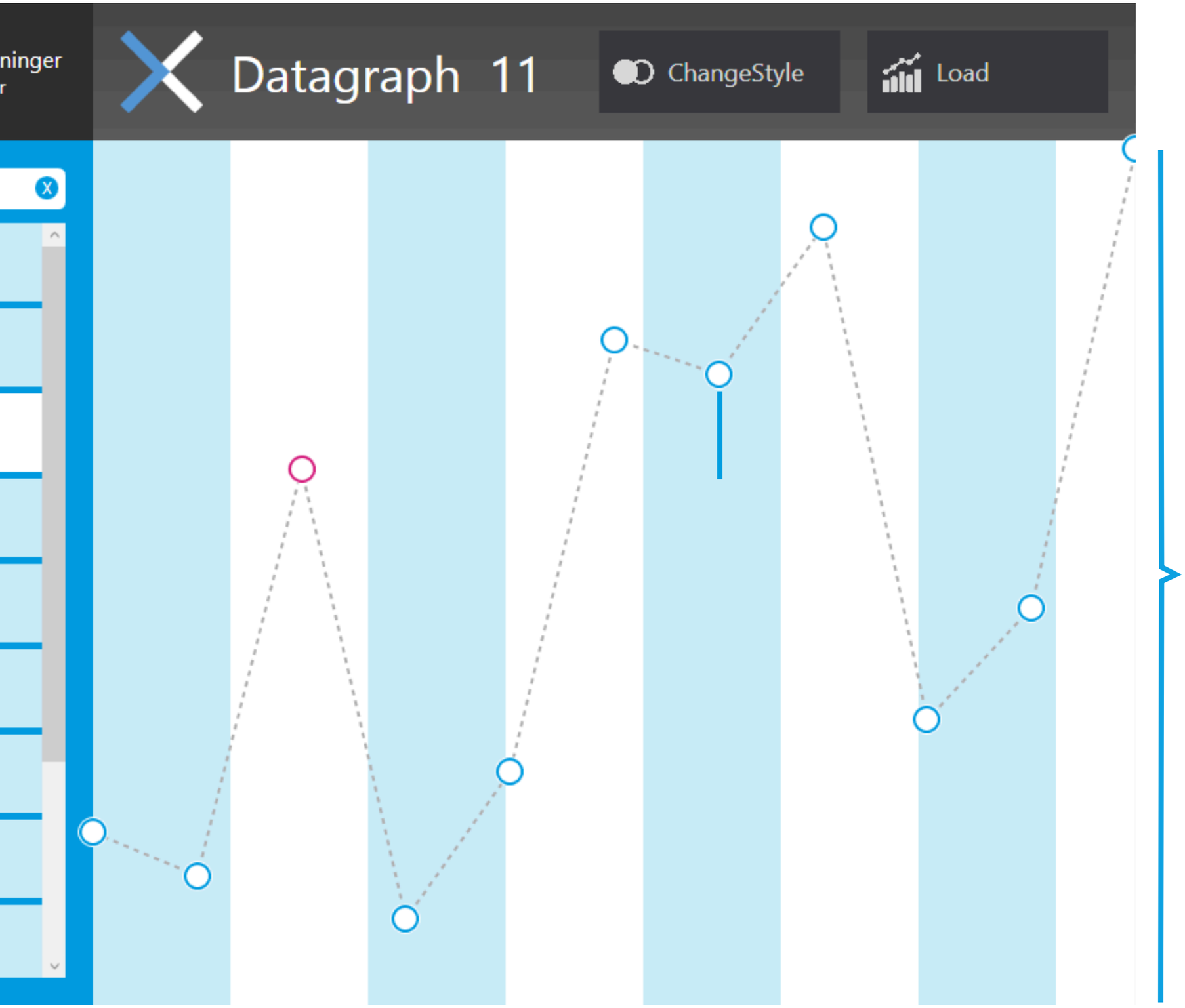
Datagraph 11
ChangeStyle
Load


PointChartViewModel
Points
P1
P2
...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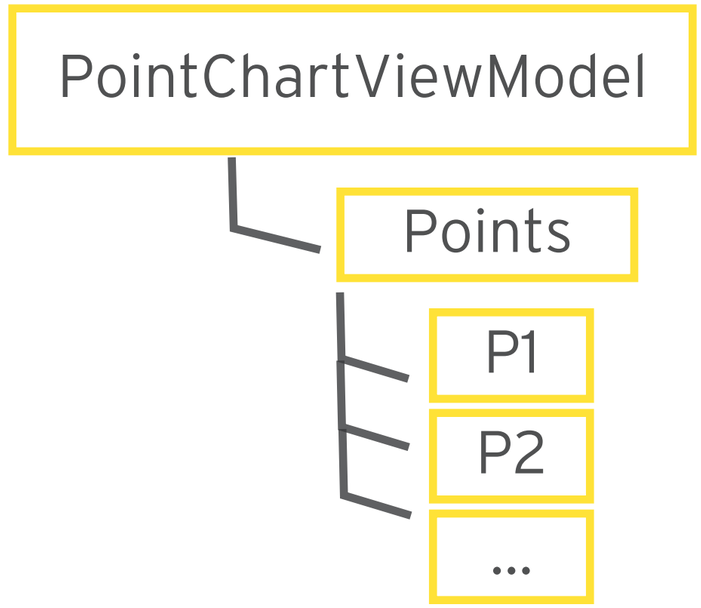
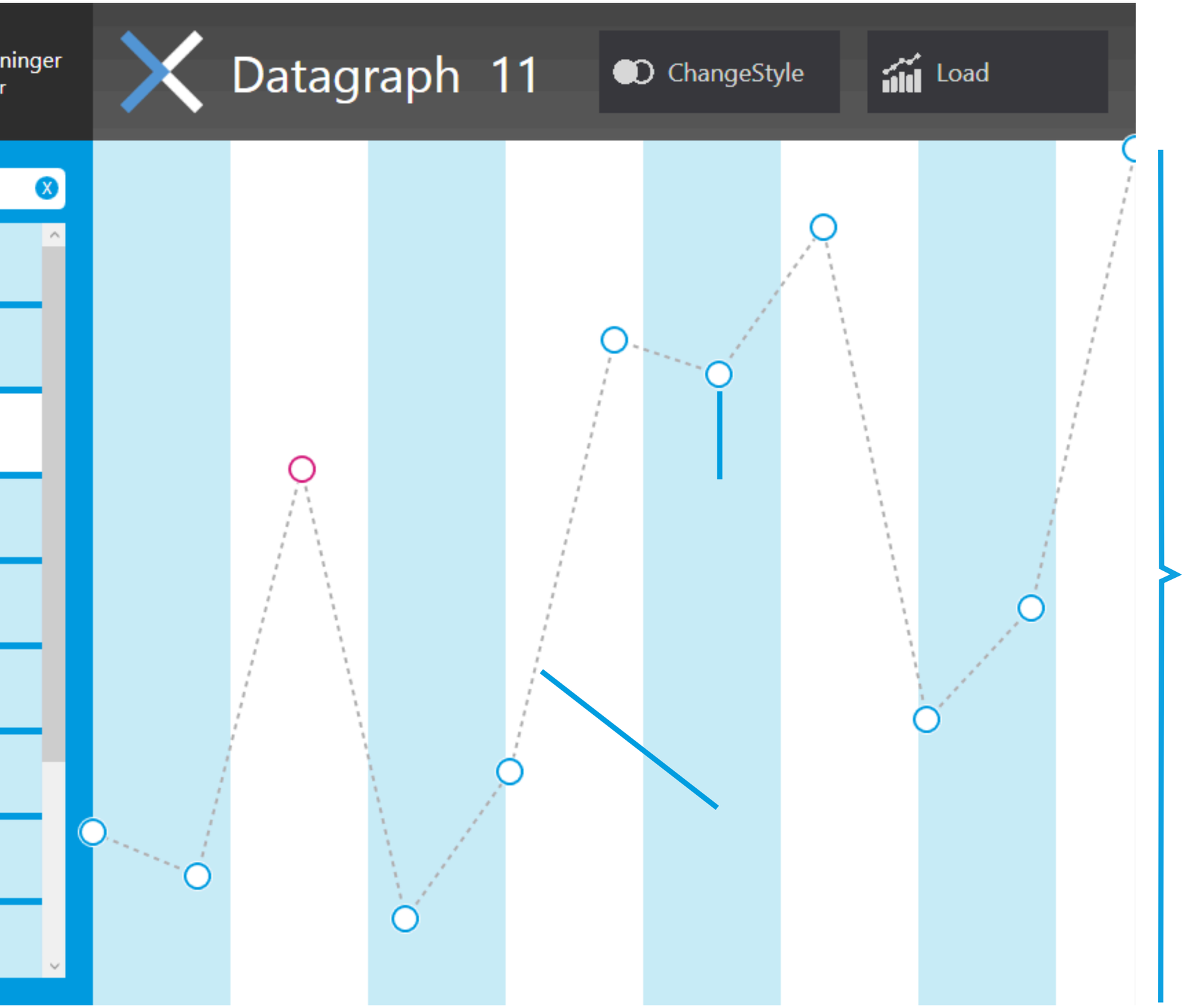
Datagraph 11
ChangeStyle
Load


PointChartViewModel
Points
P1
P2
...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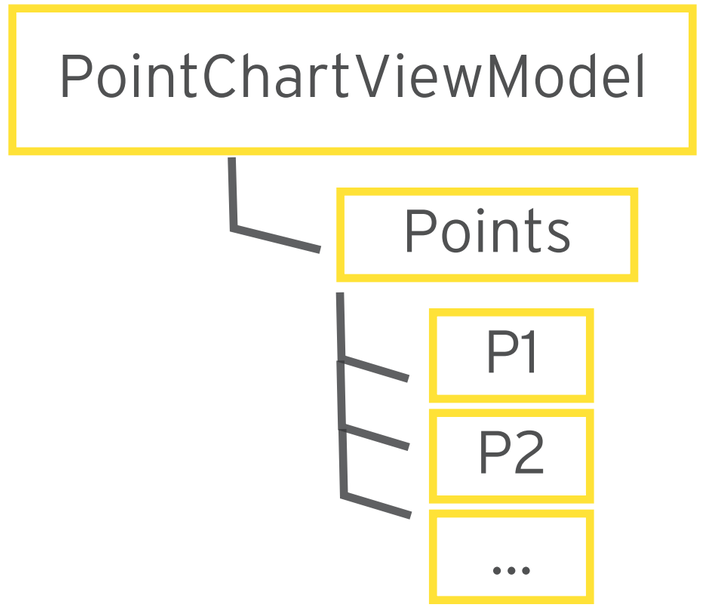
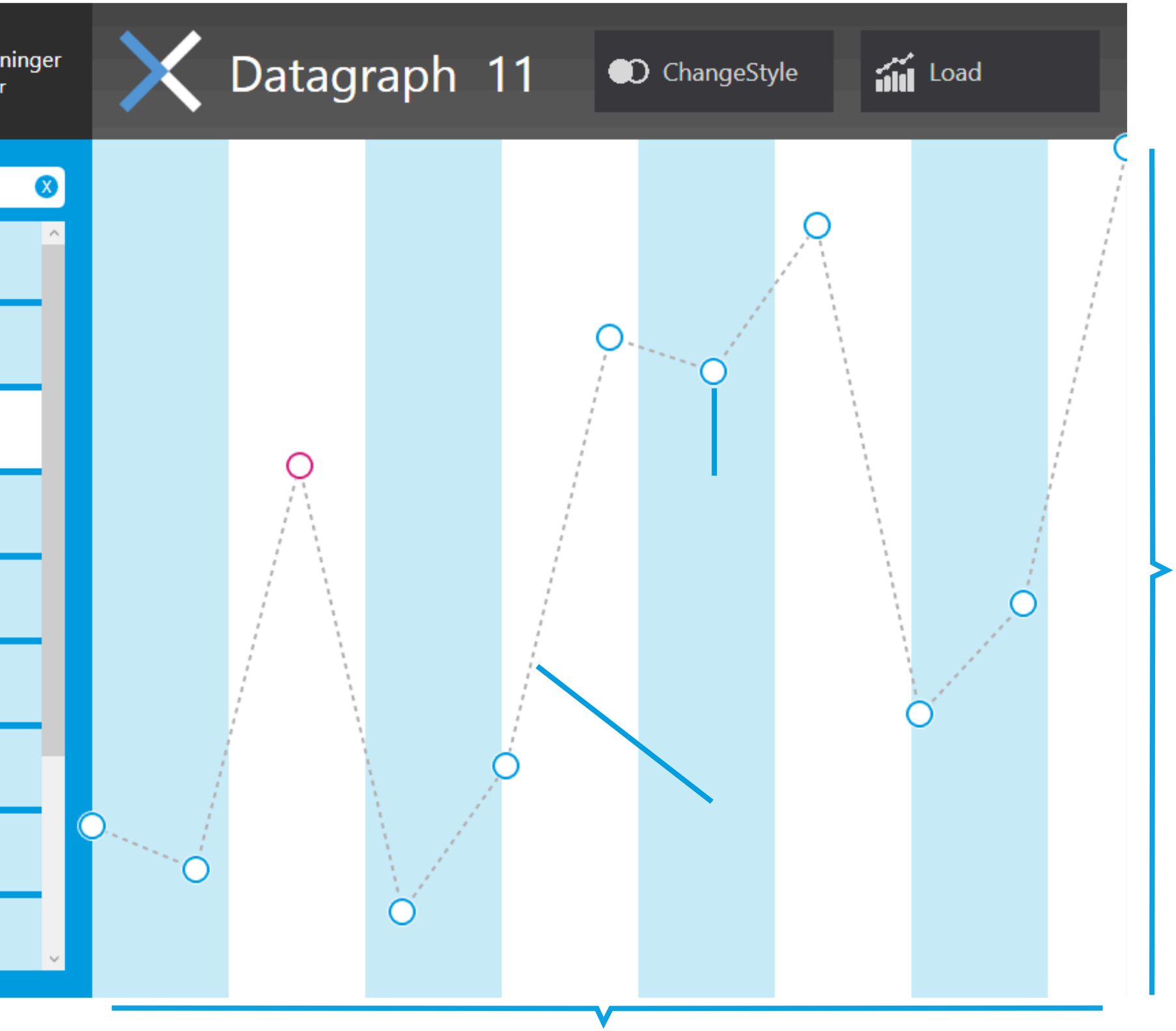
r
Datagraph 11
ChangeStyle
Load


PointChartViewModel
Points
P1
P2
...


ninger
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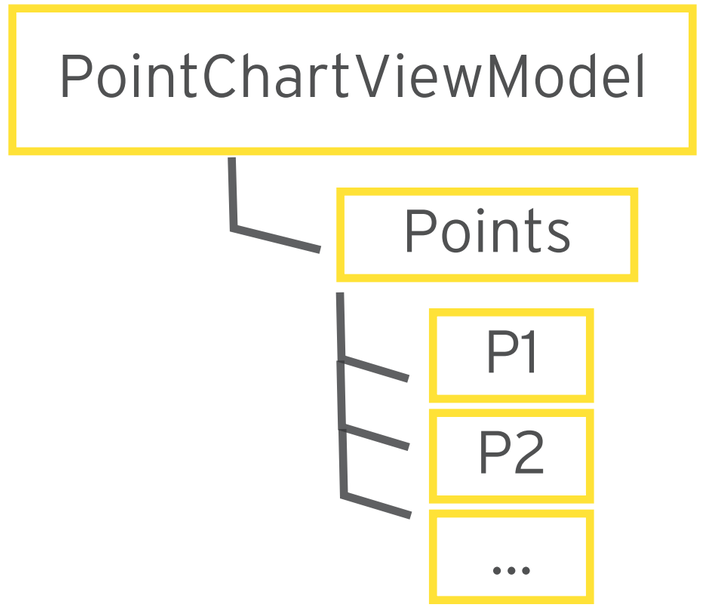
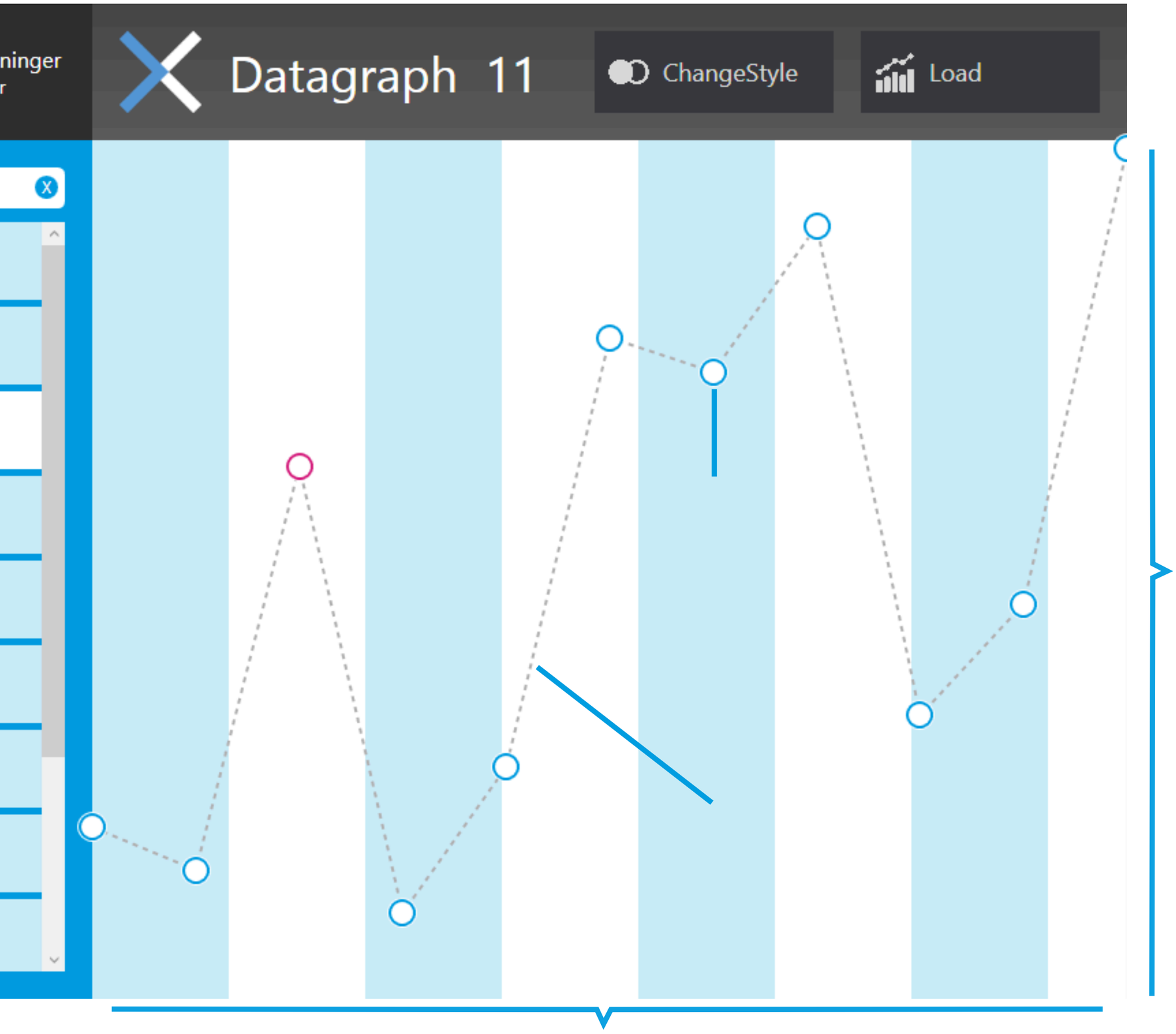
Datagraph 11
ChangeStyle
Load


PointChartViewModel
Points
P1
P2
...



PointChartViewModel

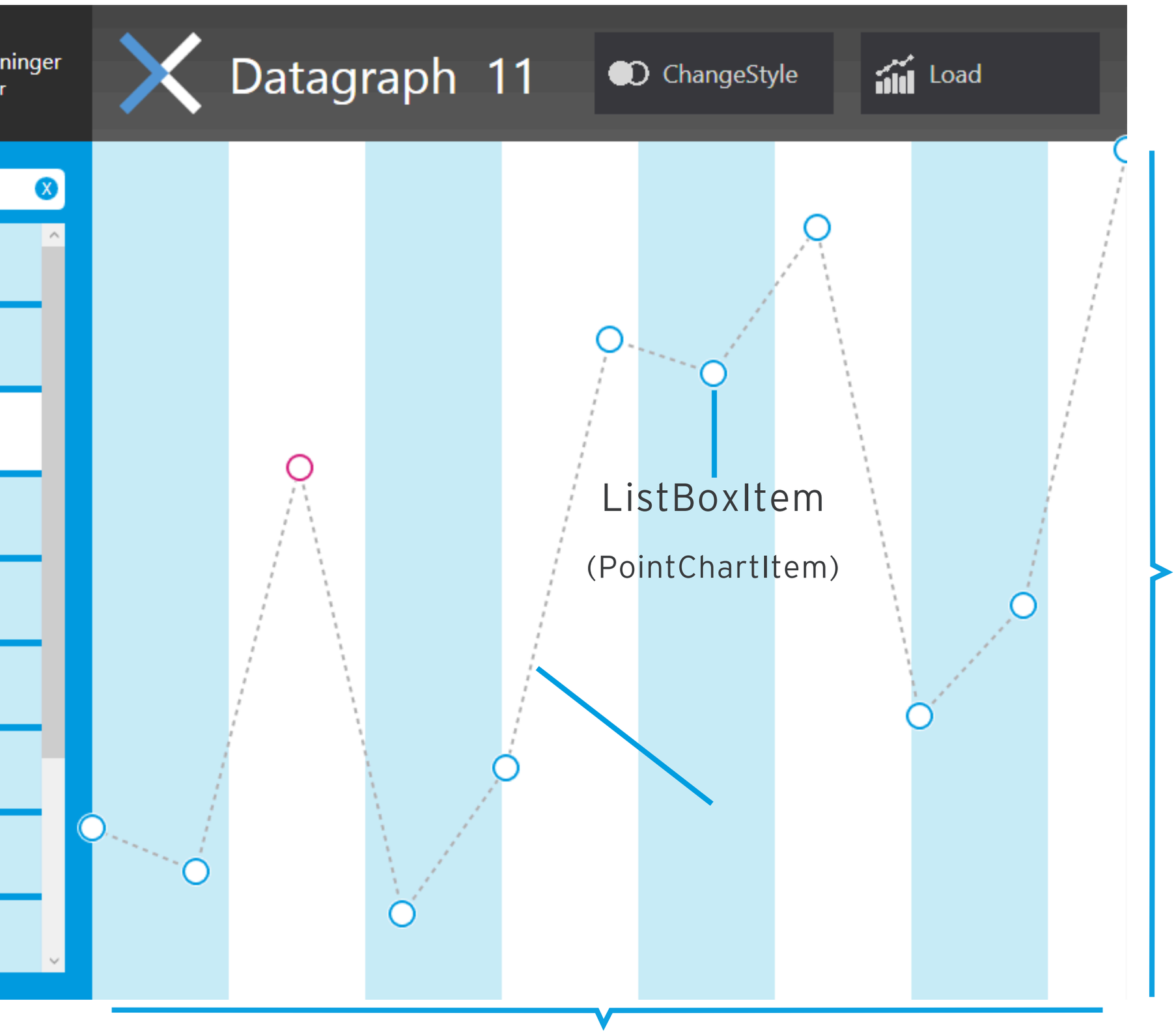
Points

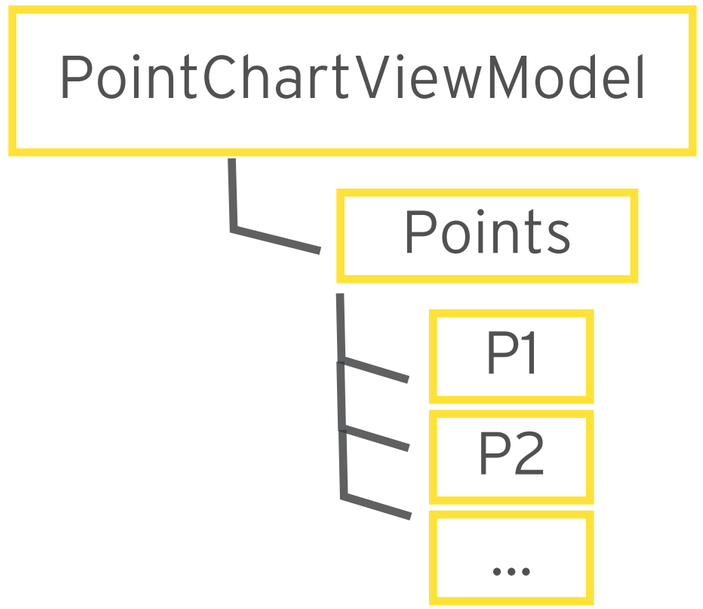
P1

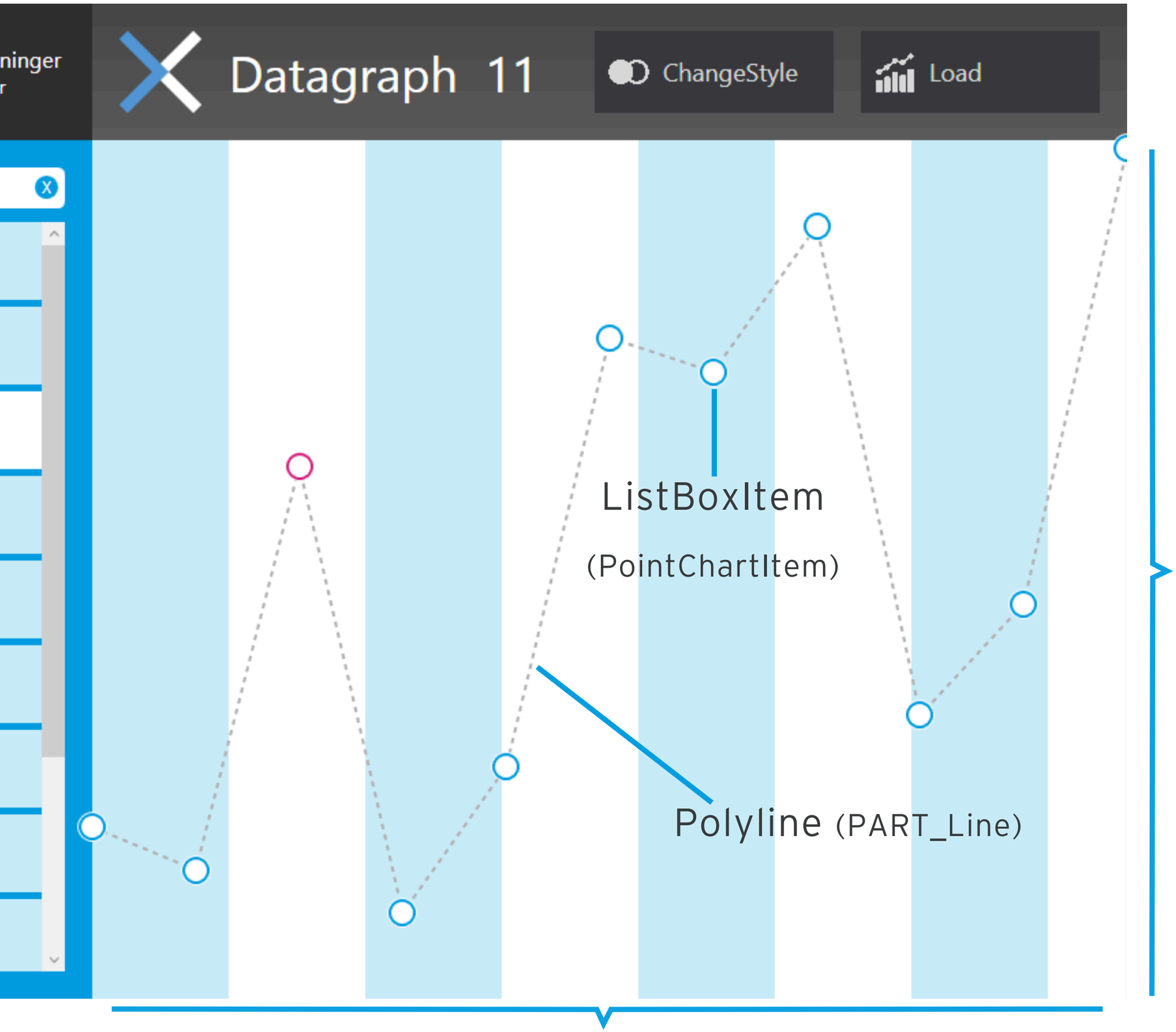
P2

...

ListBox (PointChart)


ninger
r
Datagraph 11
ChangeStyle
Load
ListBoxItem
(PointChartItem)
ListBox (PointChart)


PointChartViewModel
Points
P1
P2
...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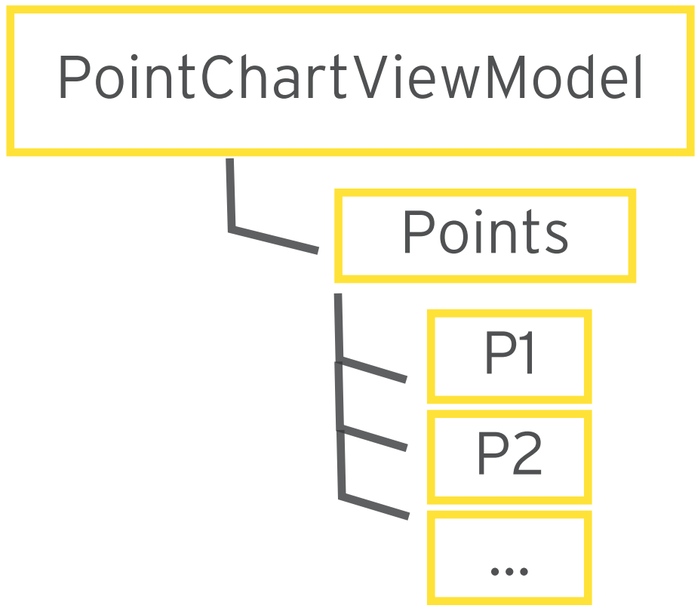
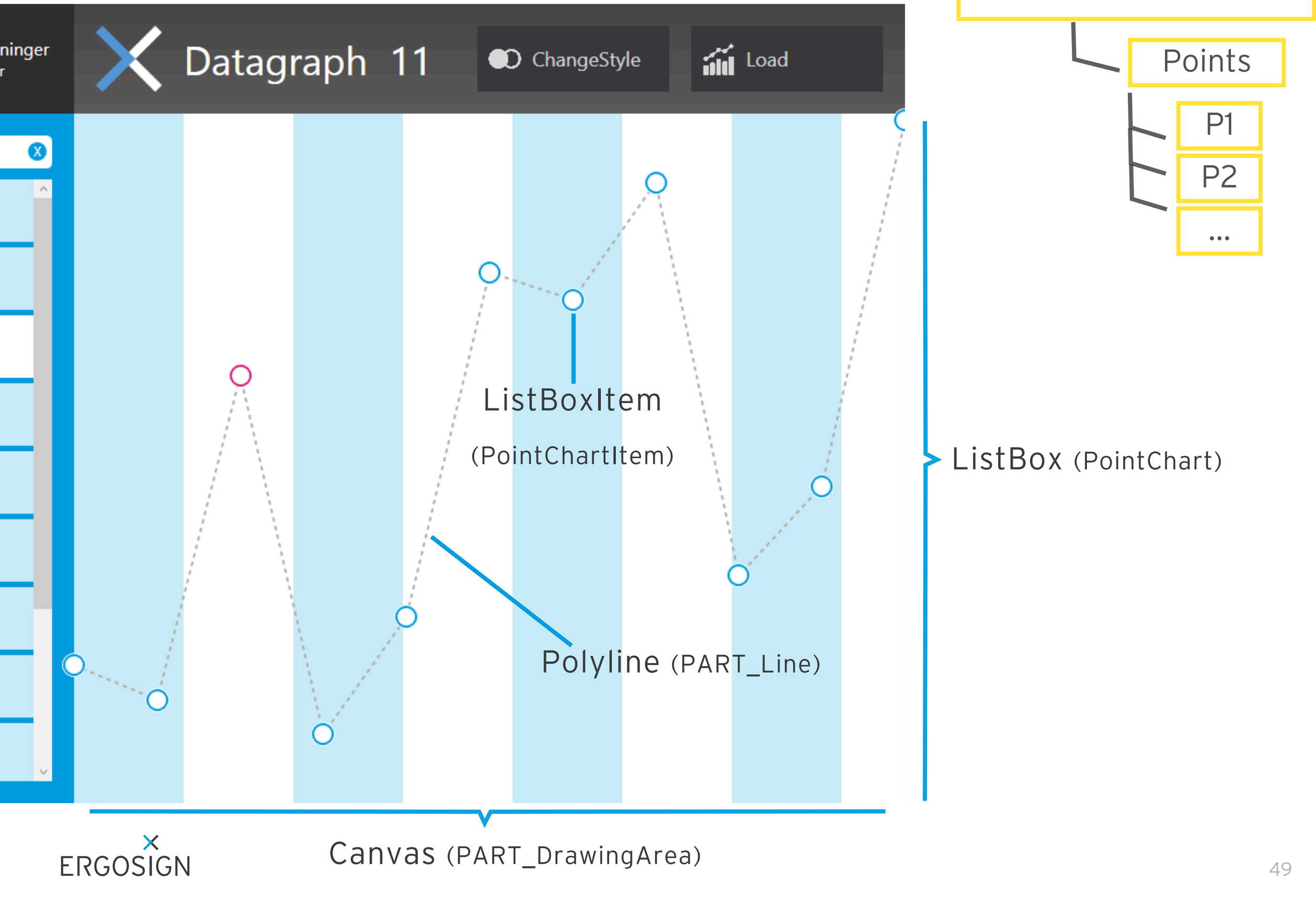
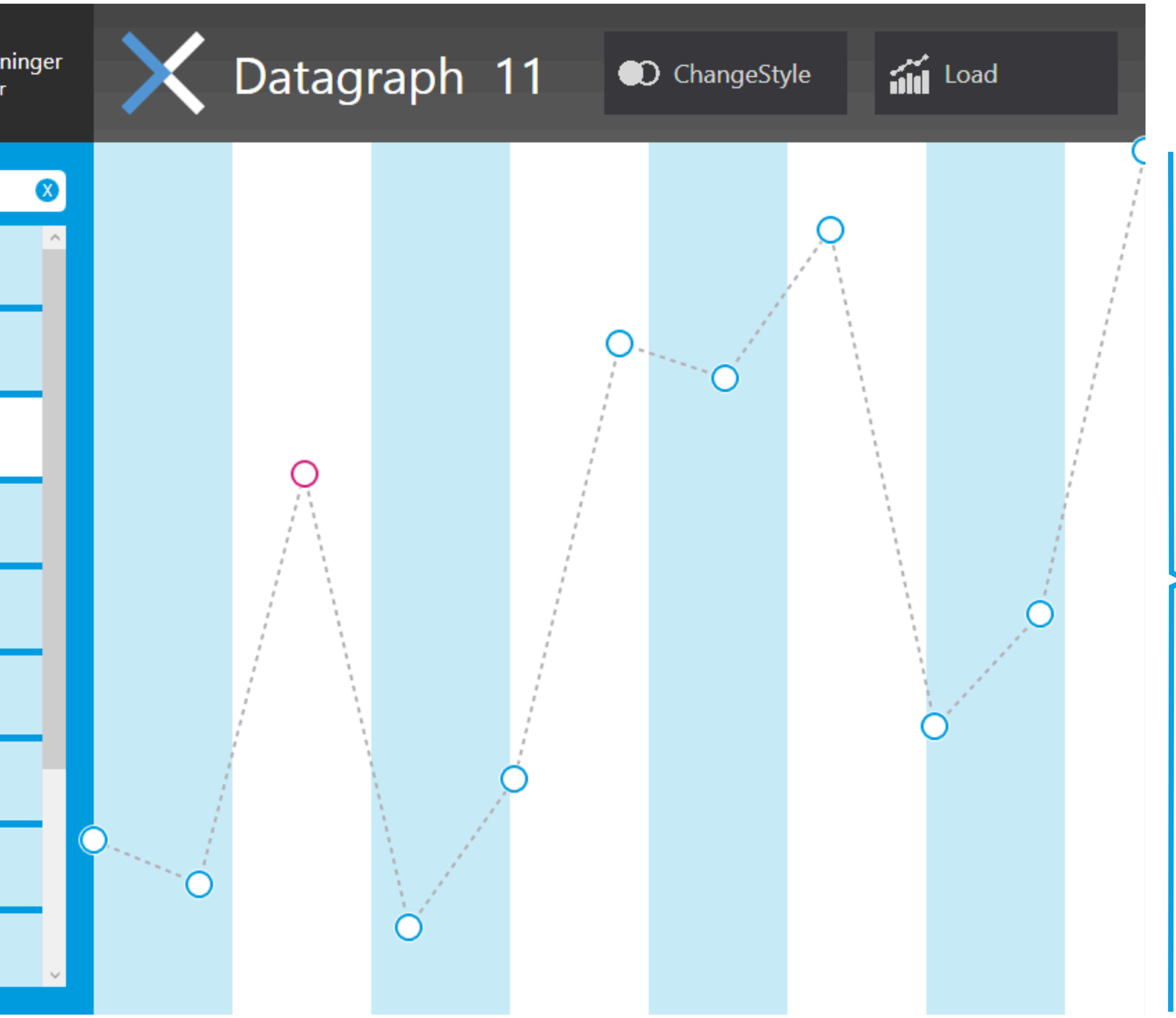
Datagraph 11
ChangeStyle
Load
ListBoxItem
(PointChartItem)
Polyline (PART_Line)
ListBox (PointChart)


PointChartViewModel
Points
P1
P2
...


Datagraph 11
ChangeStyle
Load
ListBoxItem
(PointChartItem)
Polyline (PART_Line)
ListBox (PointChart)
Canvas (PART_DrawingArea)

PointChartViewModel
Points
P1
P2
...



PointChartViewModel

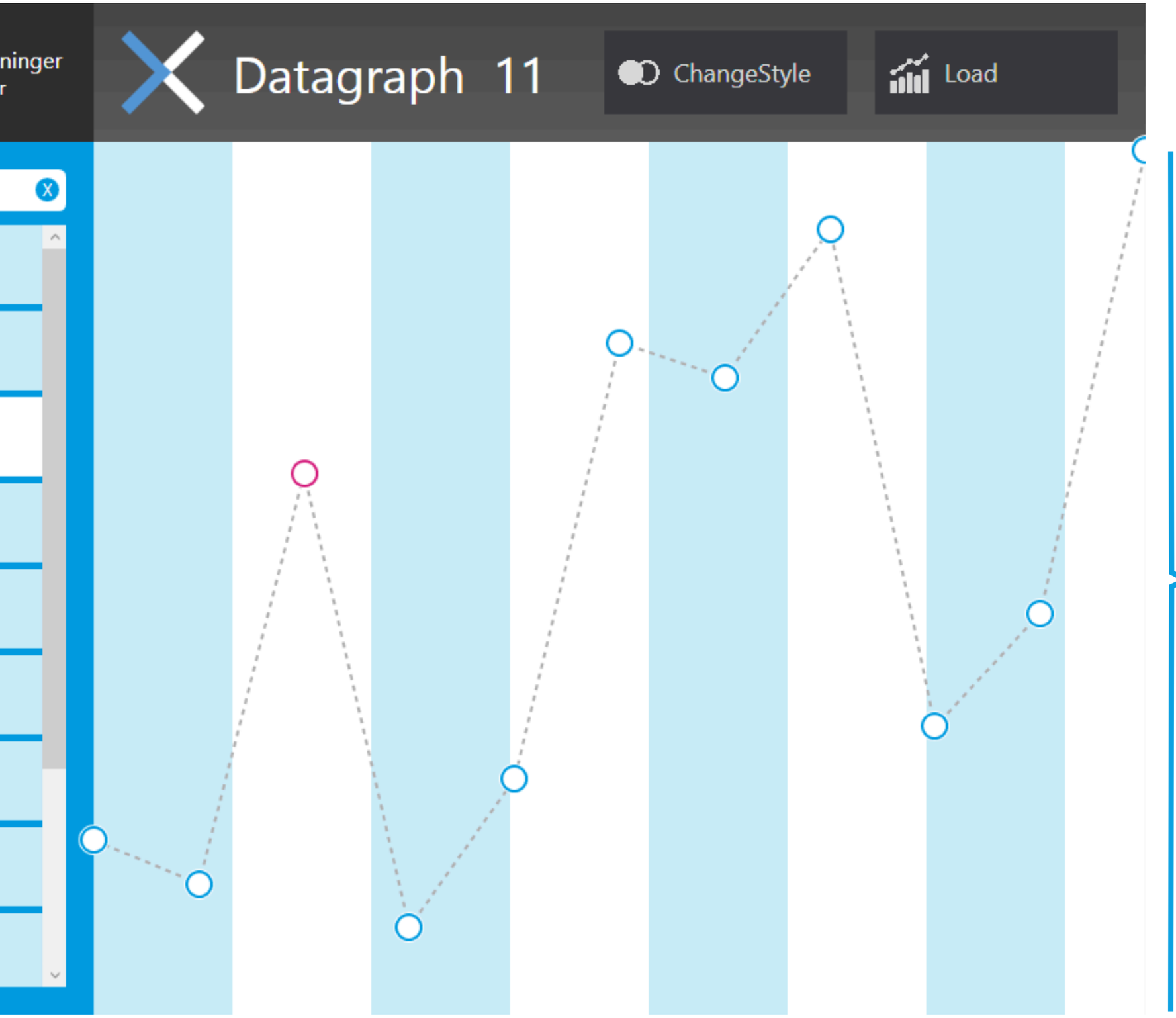
Points

P1

P2

...

ListBox (PointChart)

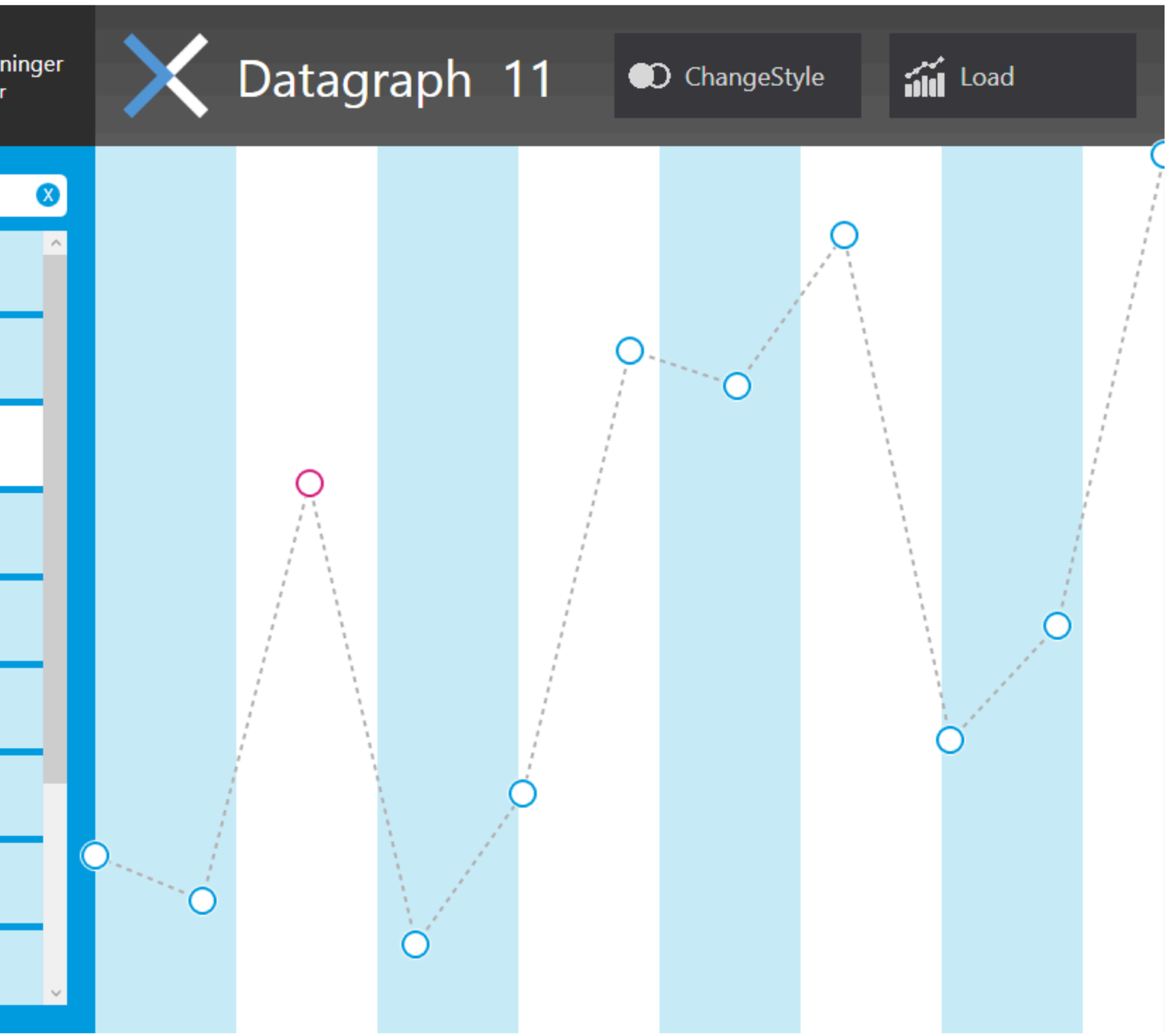


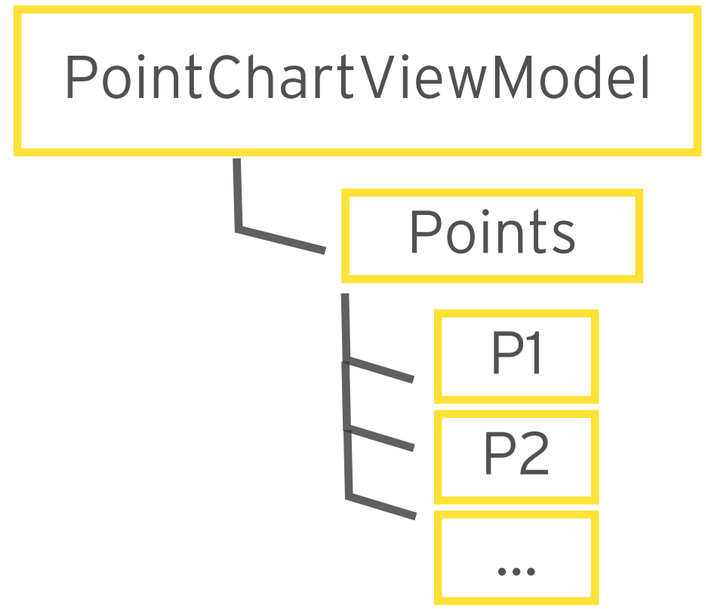
PointChartViewModel

- Points
  - P1
  - P2
  - ...

ListBox (PointChart)

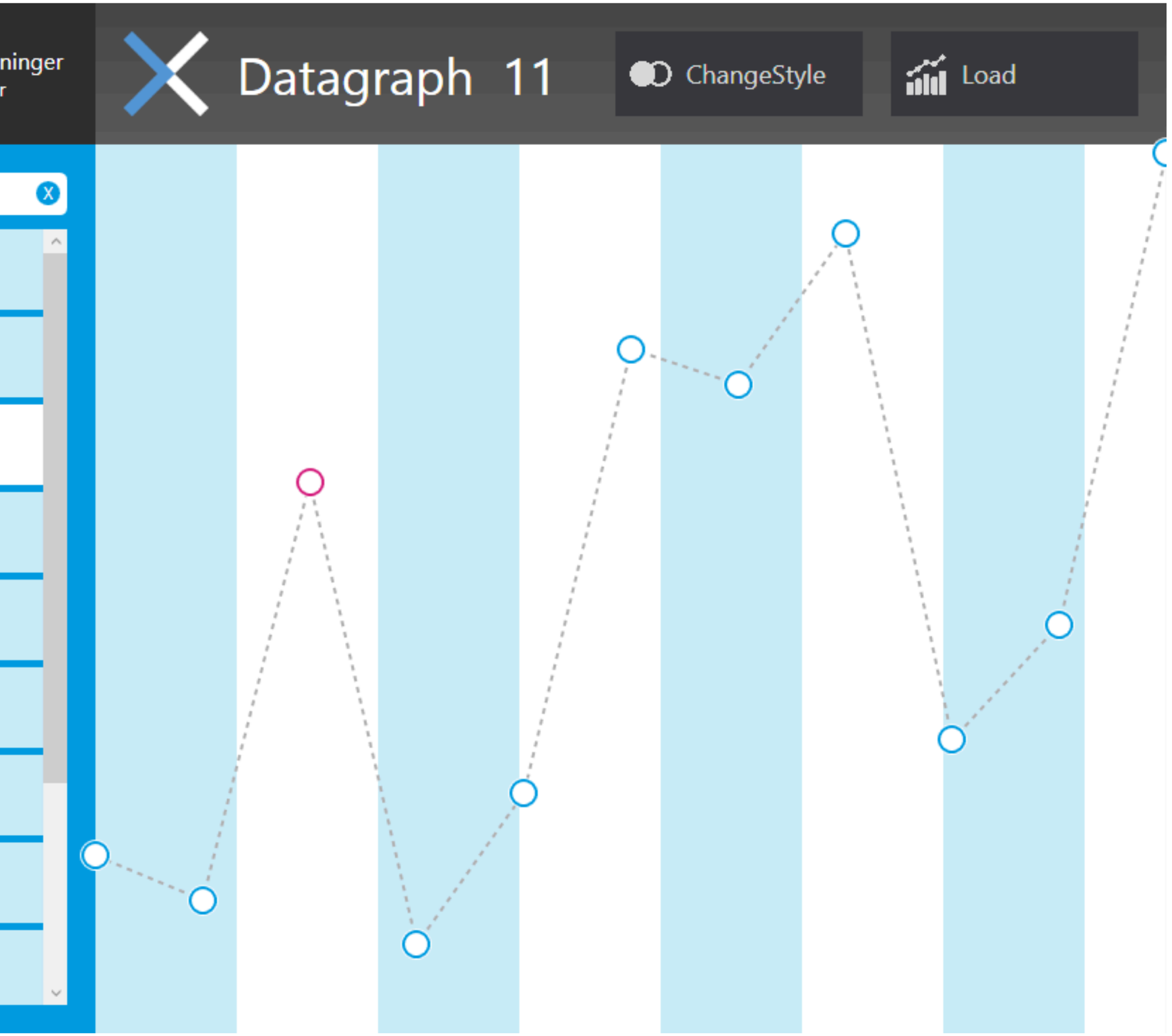
› X/YMinimum





ListBox (PointChart)

- X/YMinimum
- X/YMaximum

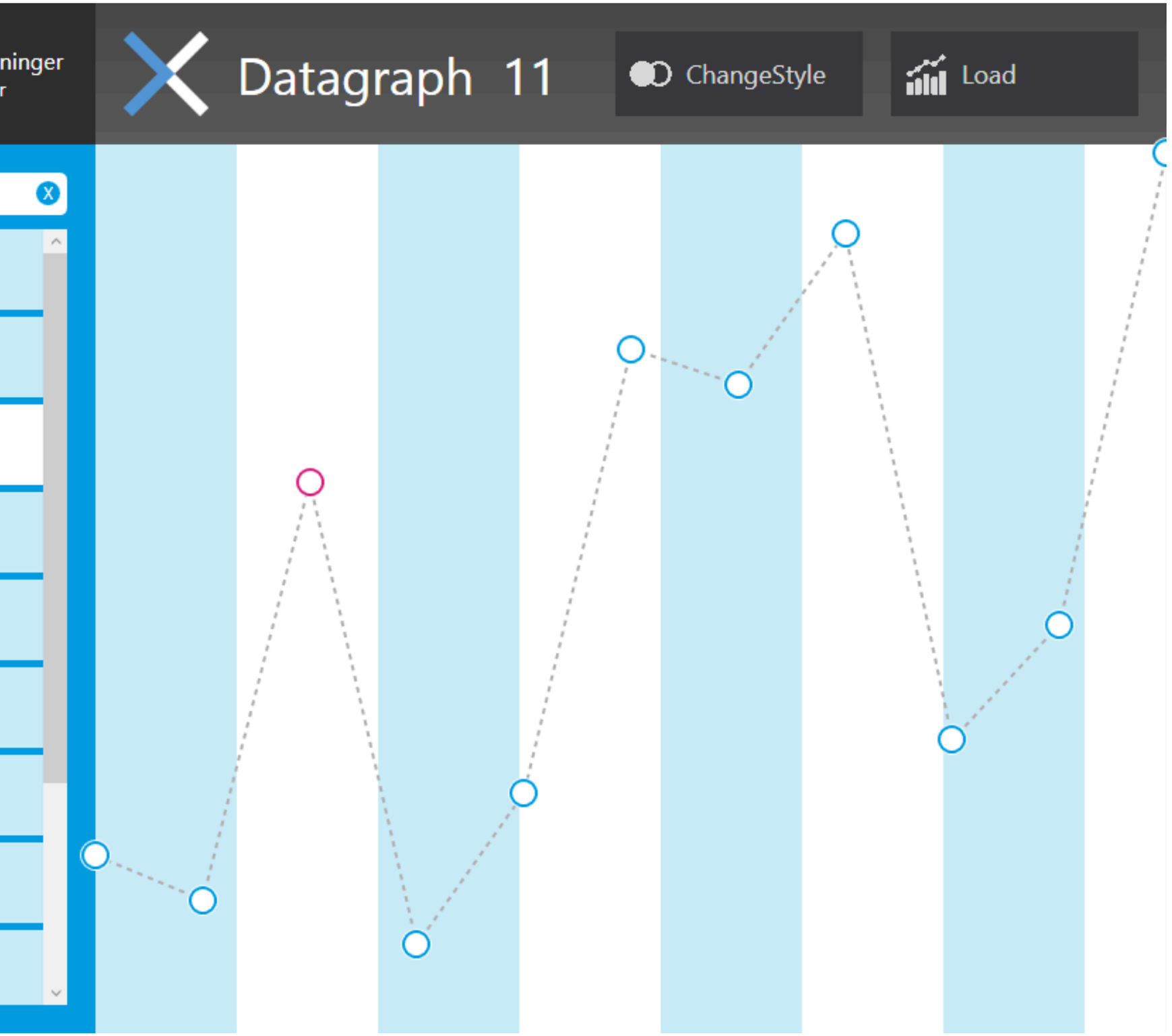


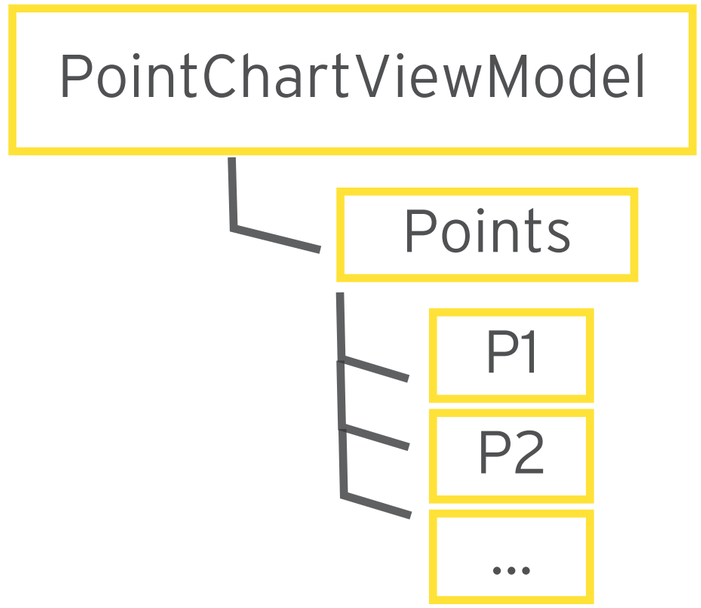
PointChartViewModel

- Points
  - P1
  - P2
  - ...

ListBox (PointChart)

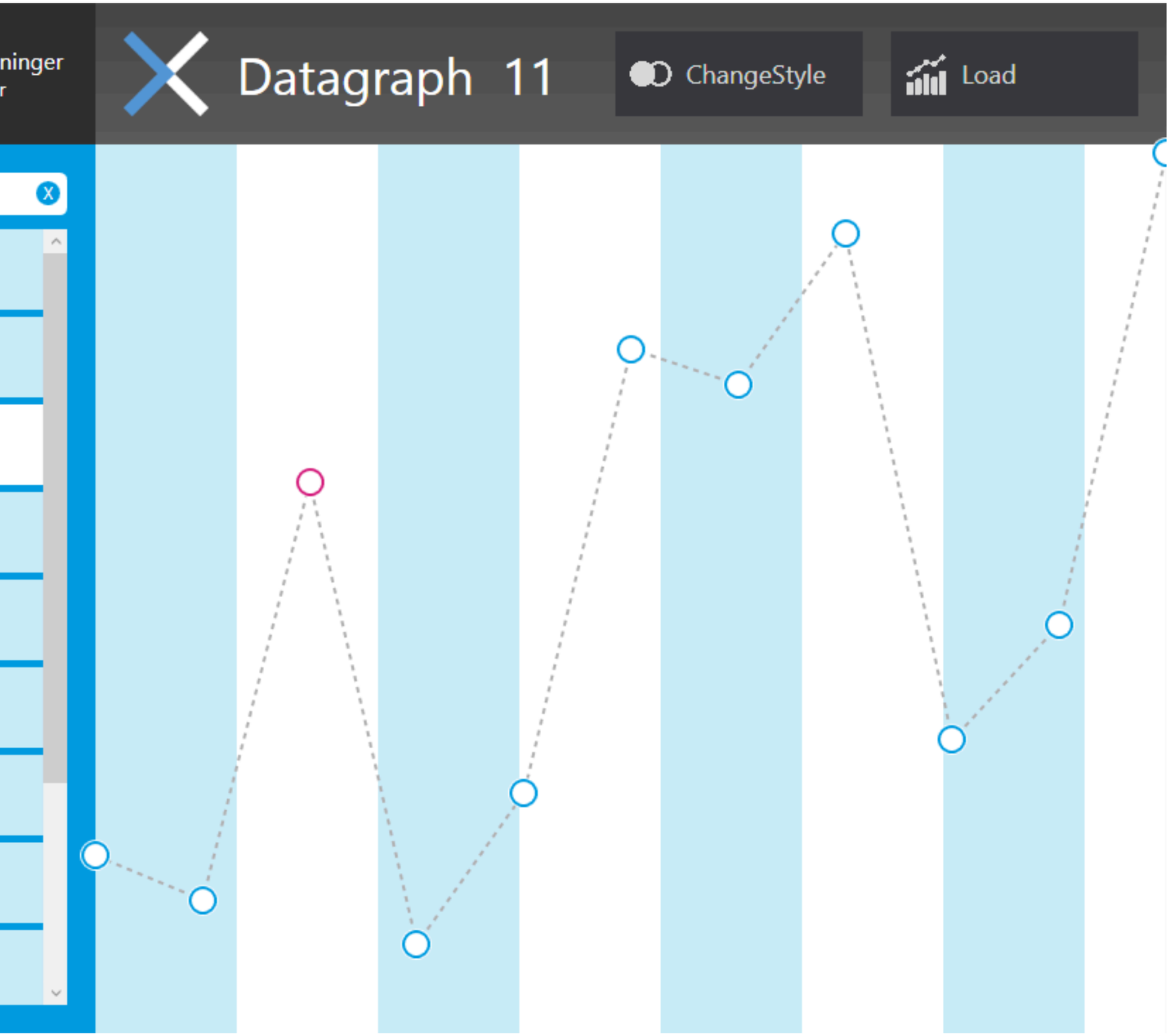
- X/YMinimum
- X/YMaximum
- LineThickness





ListBox (PointChart)

- X/YMinimum
- X/YMaximum
- LineThickness
- LineBrush



PointChartViewModel

Points

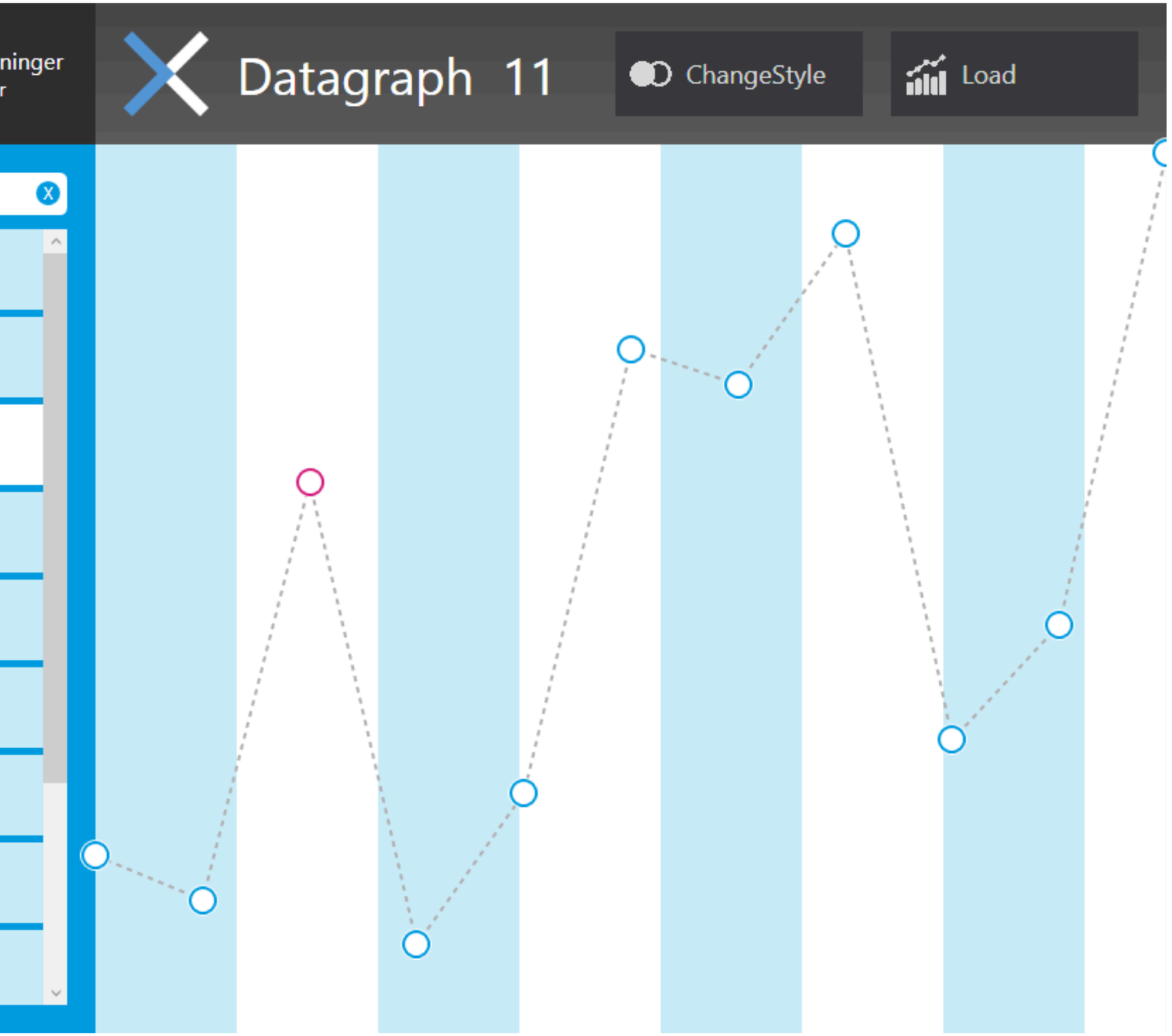
P1

P2

...

ListBox (PointChart)

- X/YMinimum
- X/YMaximum
- LineThickness
- LineBrush
- ...



PointChartViewModel

Points

P1

P2

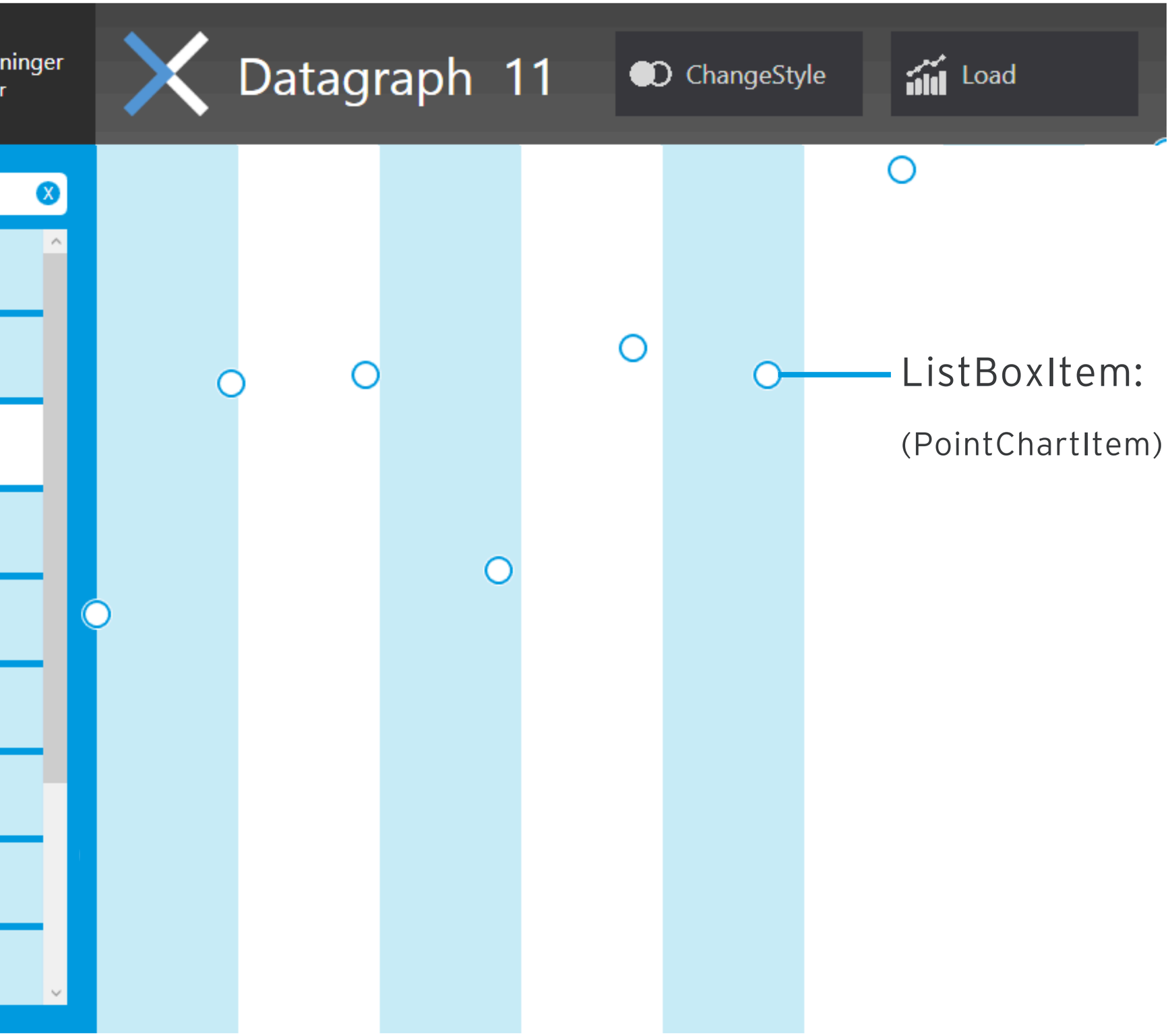
...

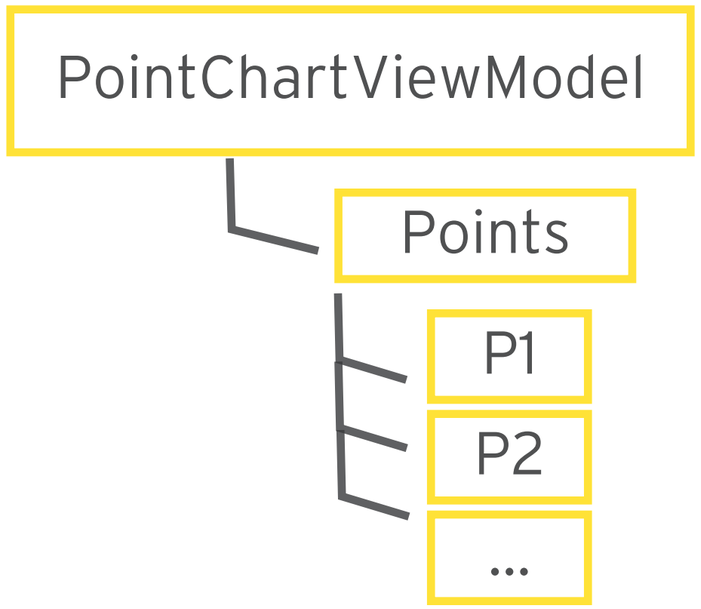
Property-Binding

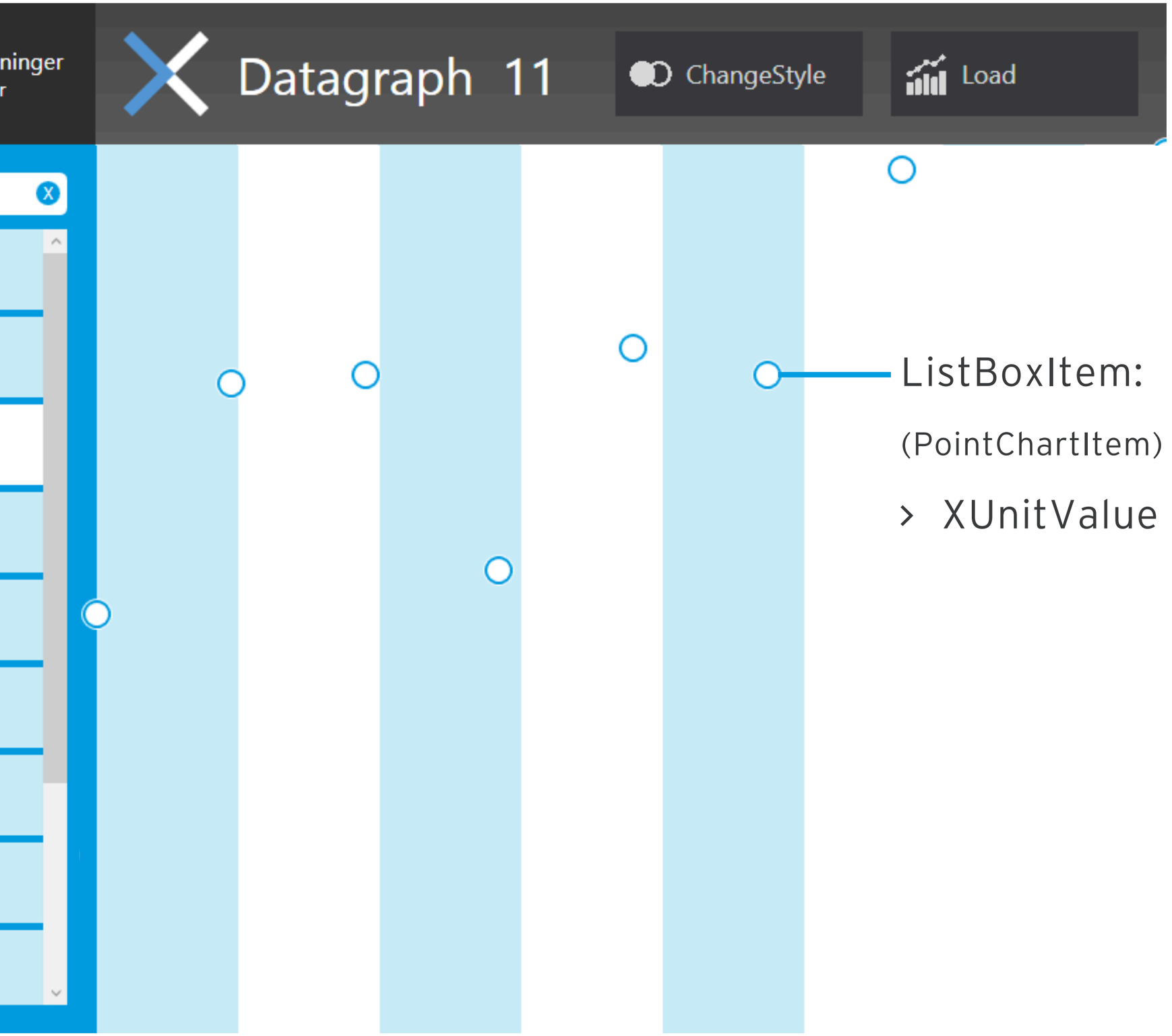
(ItemsSource)

ListBox (PointChart)

- X/YMinimum
- X/YMaximum
- LineThickness
- LineBrush
- ...


ninger
r
Datagraph 11
ChangeStyle
Load
ListBoxItem:
(PointChartItem)

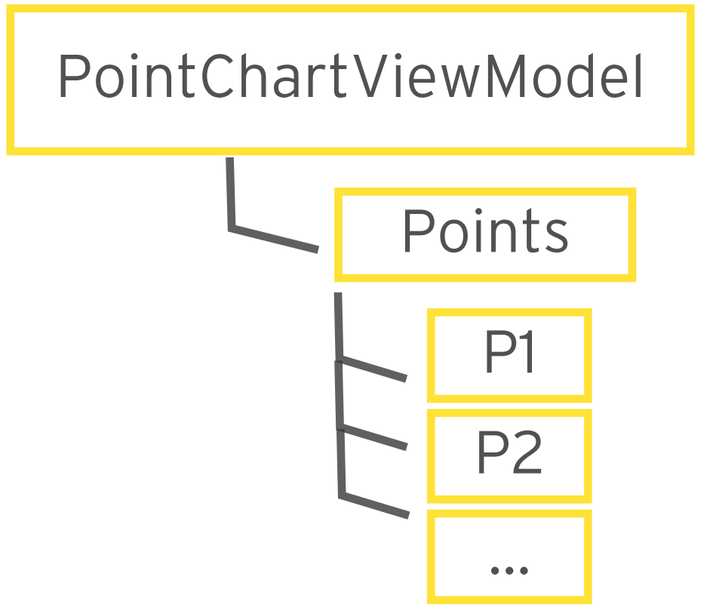

PointChartViewModel
Points
P1
P2
...

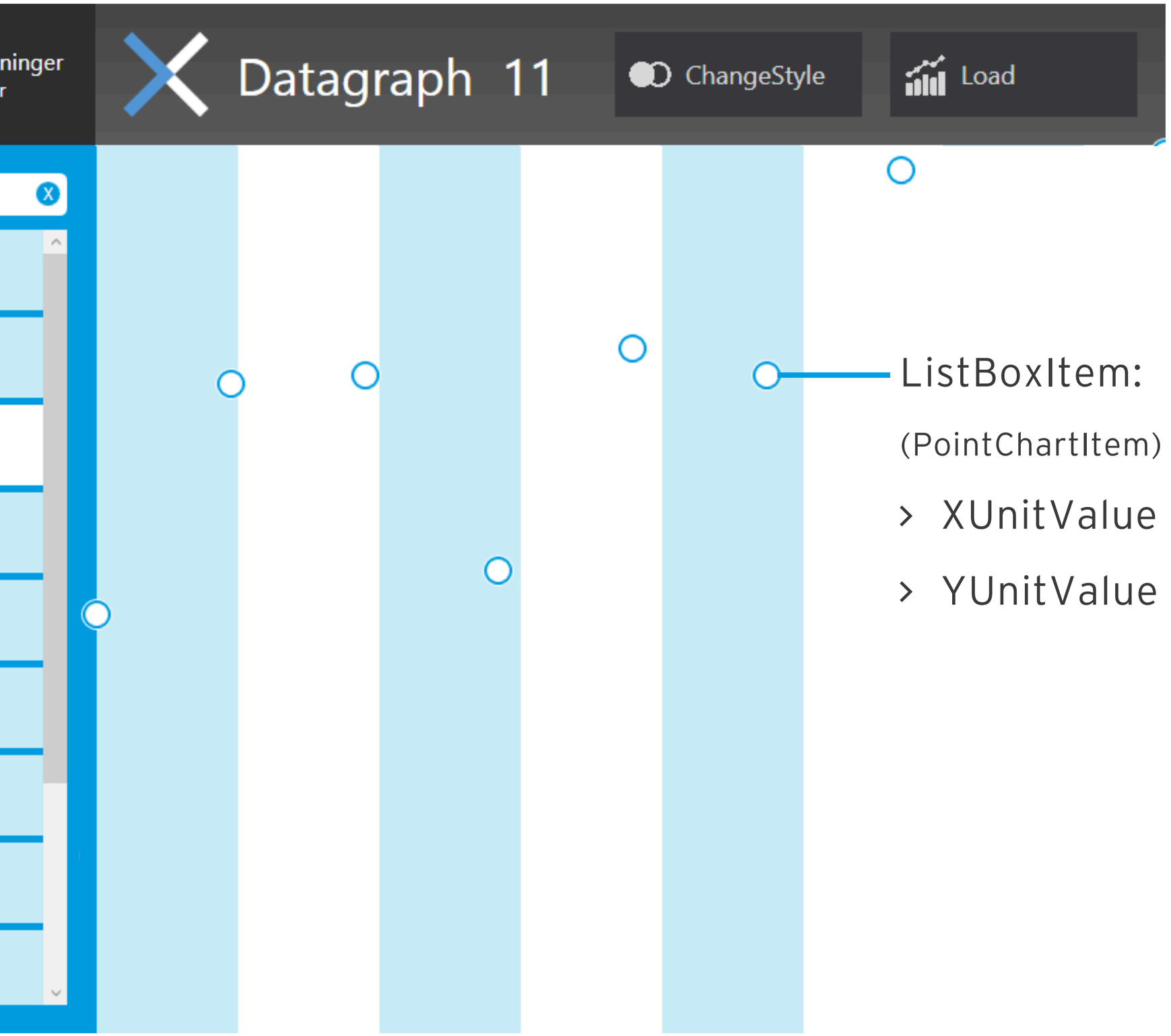


ListBoxItem:

(PointChartItem)

› XUnitValue



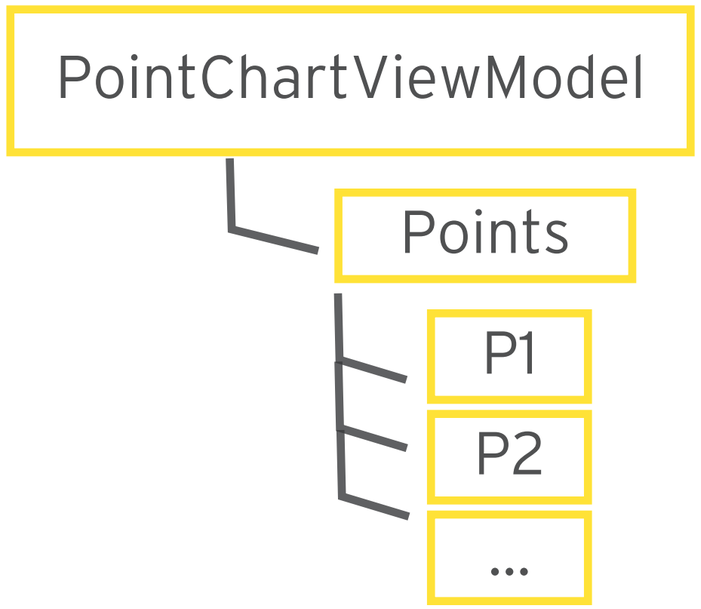


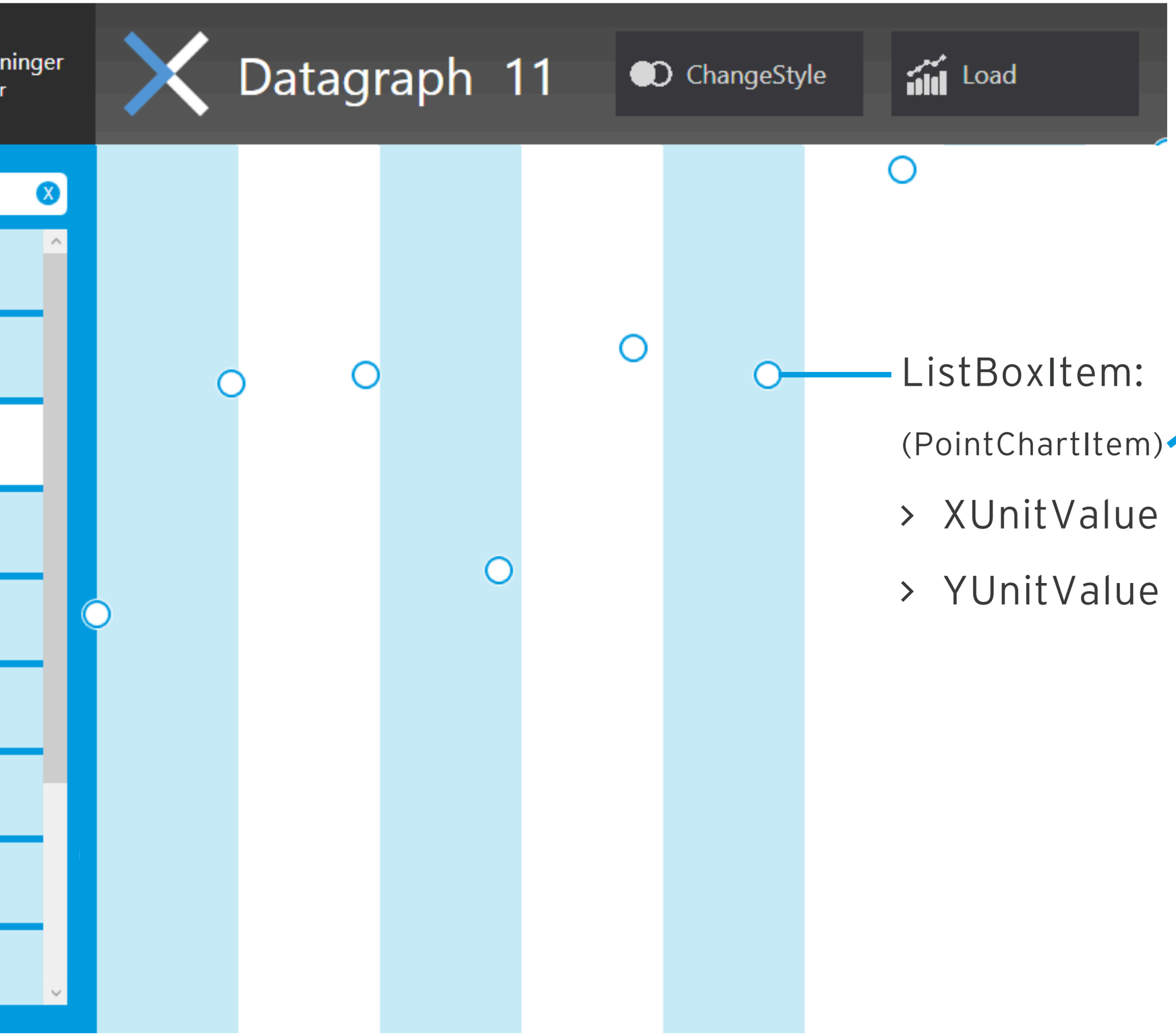
ListBoxItem:

(PointChartItem)

› XUnitValue

› YUnitValue





ListBoxItem:

(PointChartItem)

› XUnitValue

› YUnitValue

PointChartViewModel

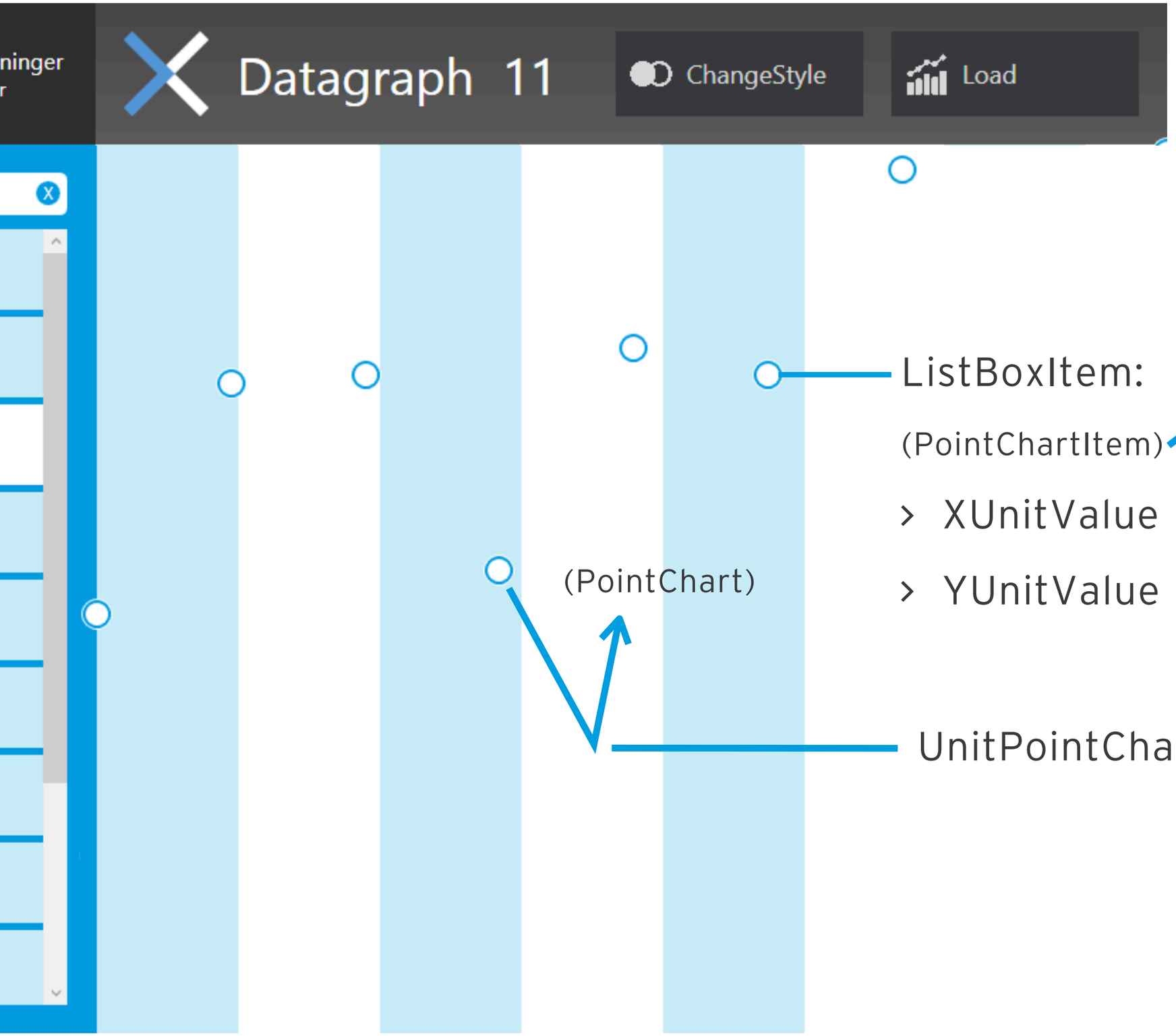
Points

P1

P2

...

Property Binding



PointChartViewModel

Points

P1

P2

...

ListBoxItem:

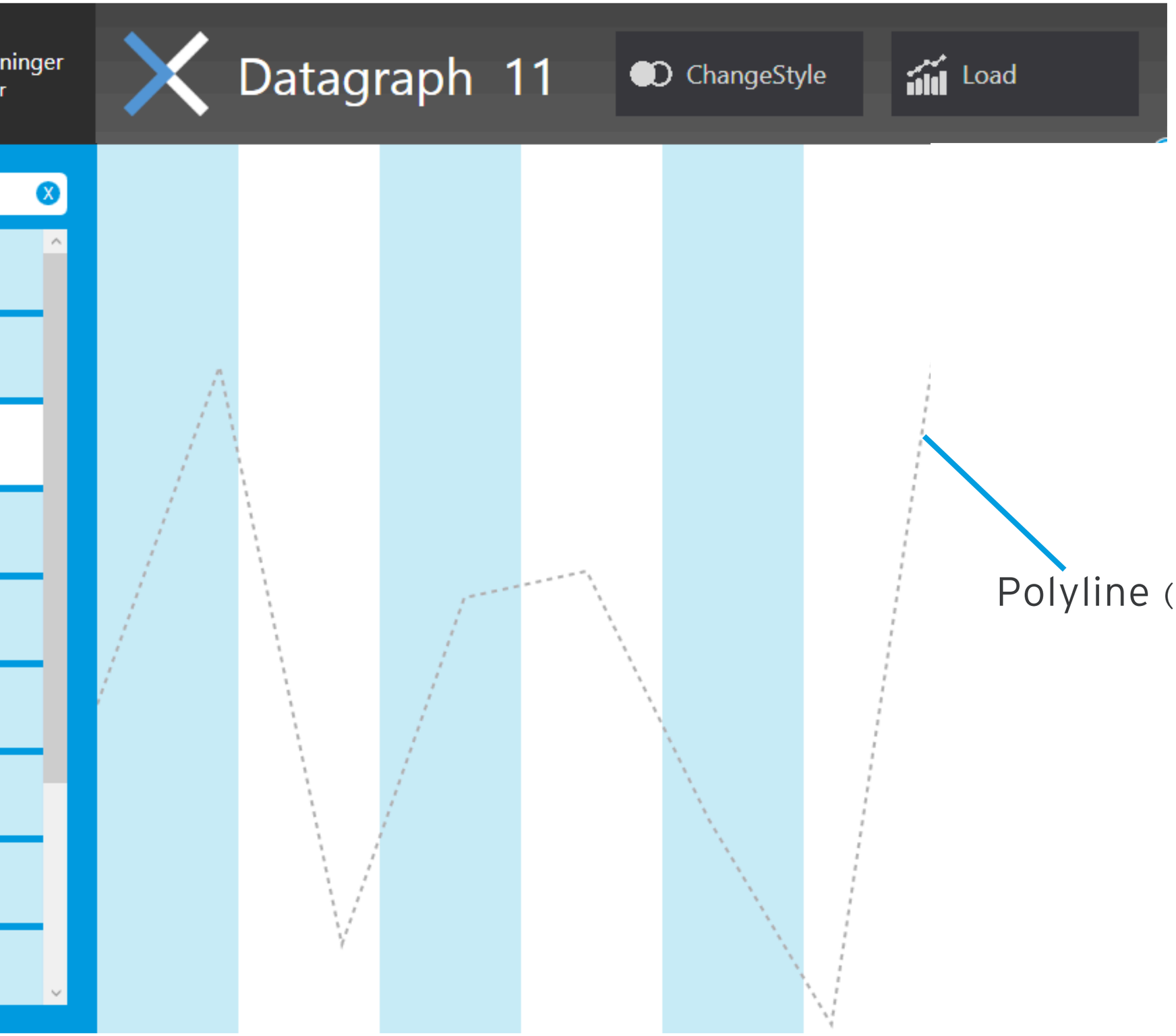
(PointChartItem)

› XUnitValue

› YUnitValue

Property Binding

UnitPointChanged-RoutedEvent



PointChartViewModel

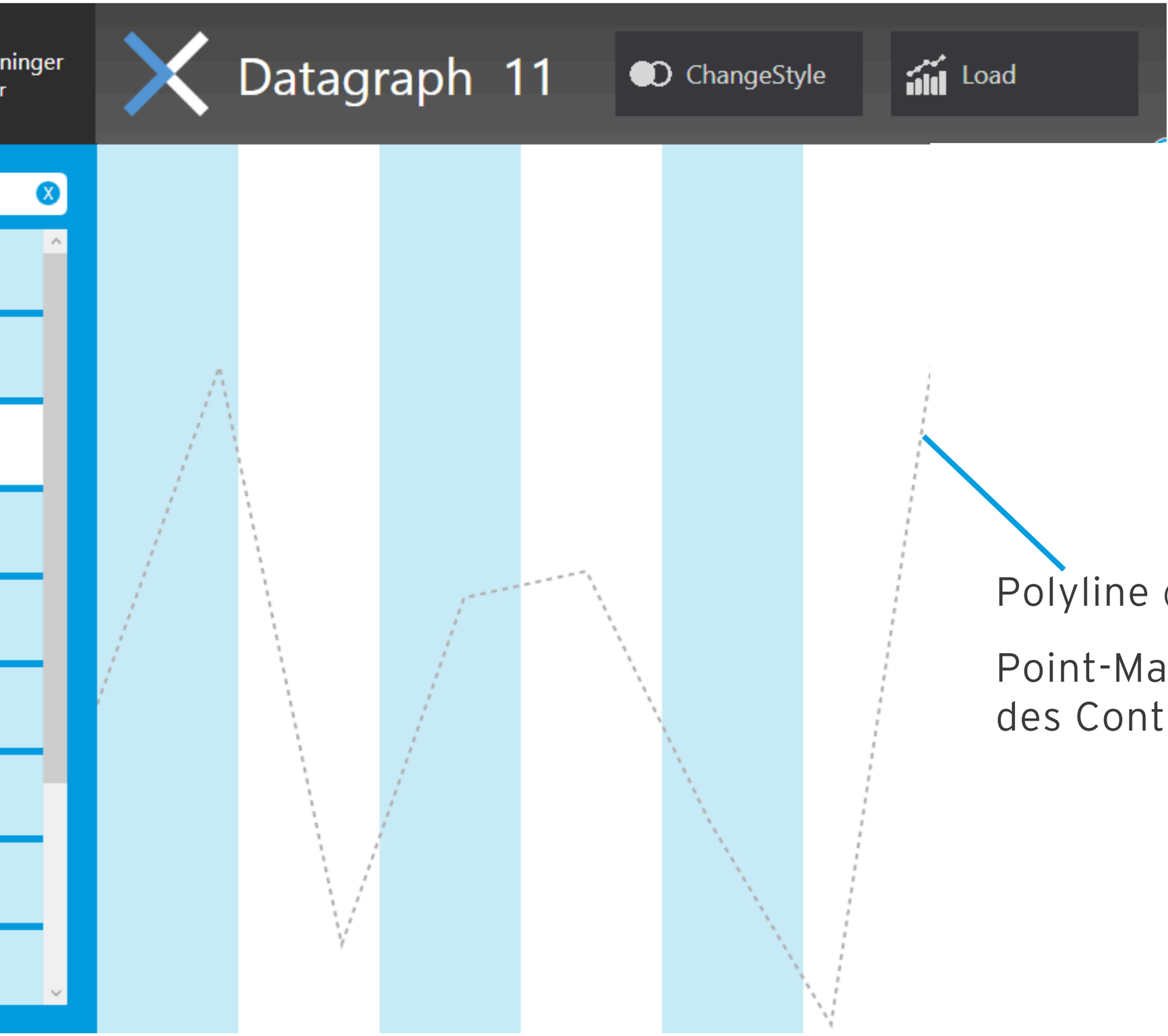
Points

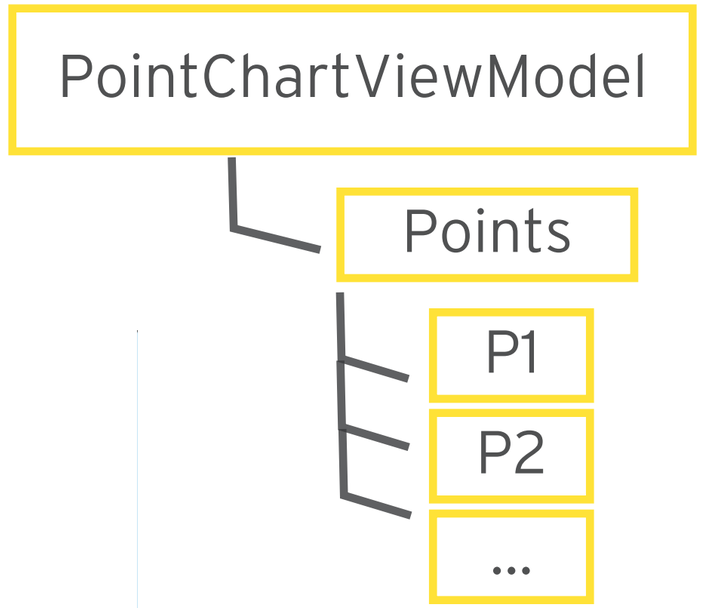
P1

P2

...

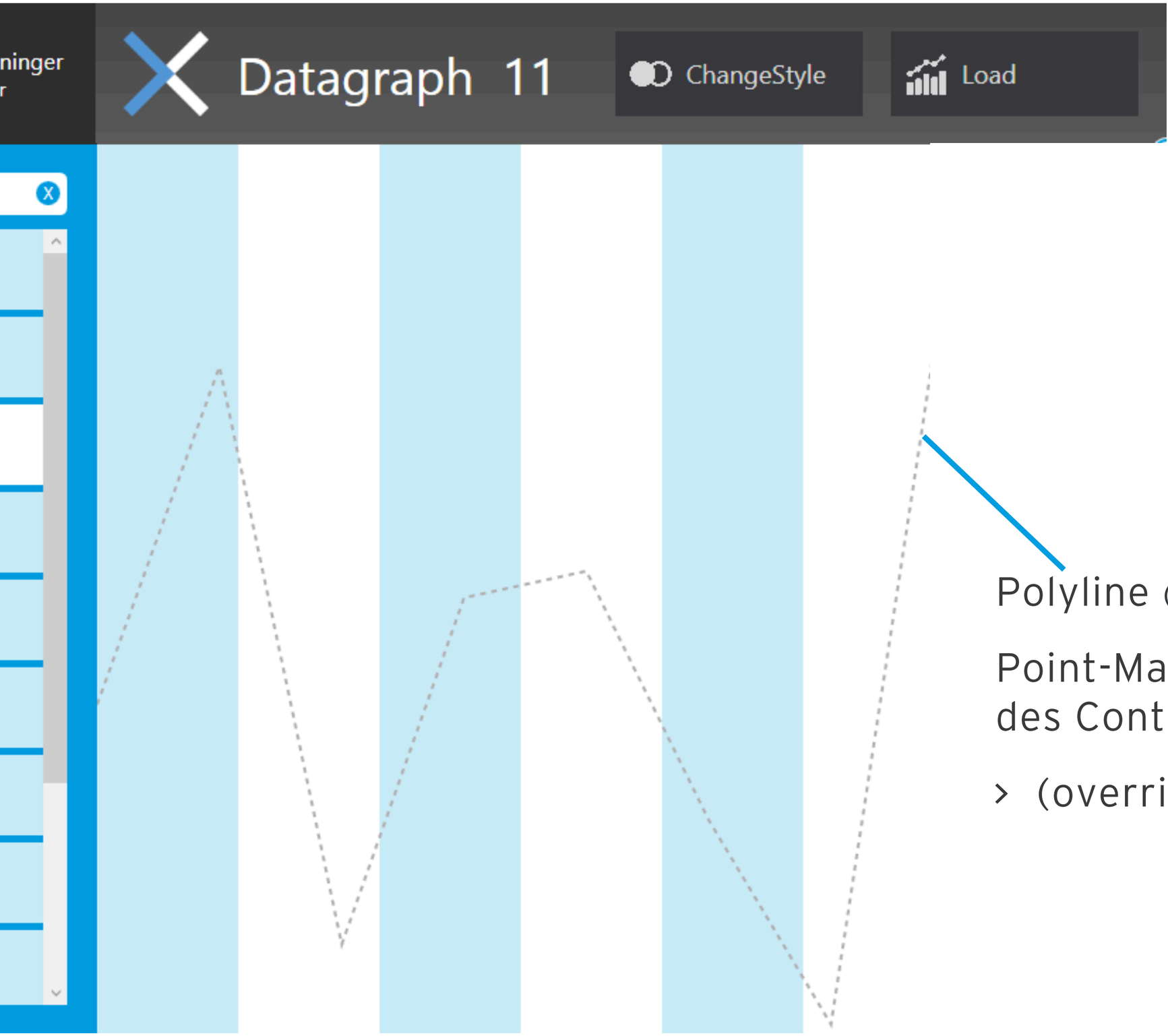
Polyline (PART_Line)

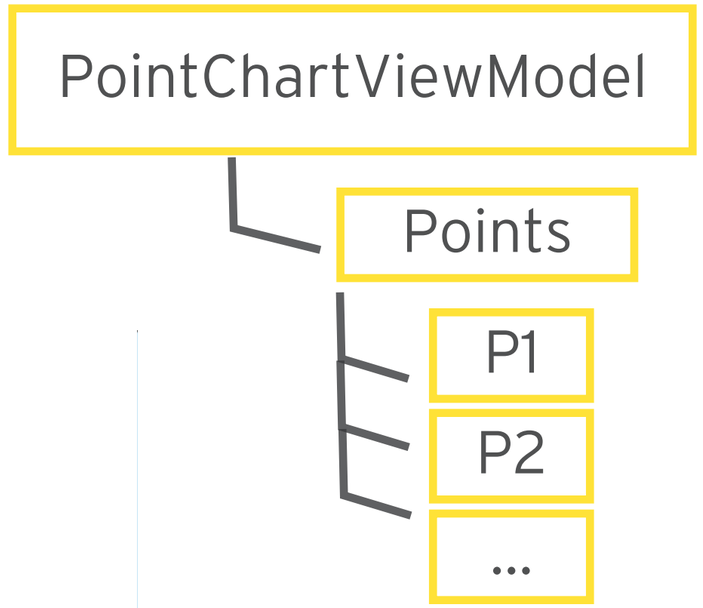




Polyline (PART_Line)

Point-Management innerhalb des Controls

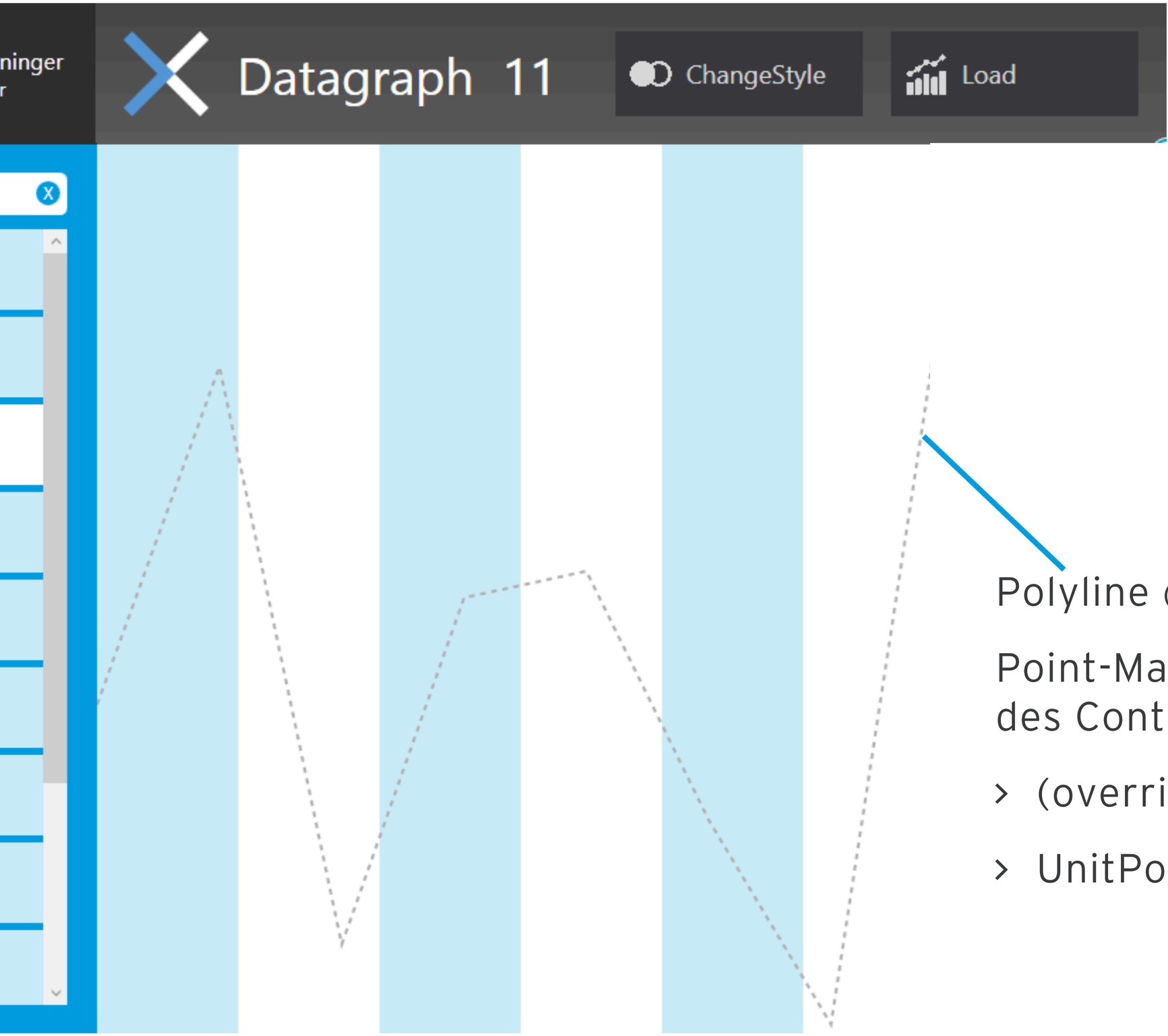


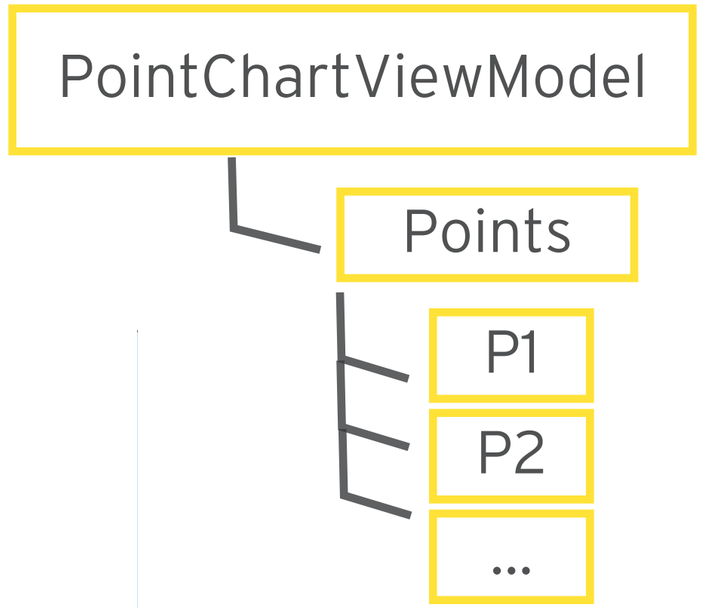


Polyline (PART_Line)

Point-Management innerhalb des Controls

› (override) ItemsChanged



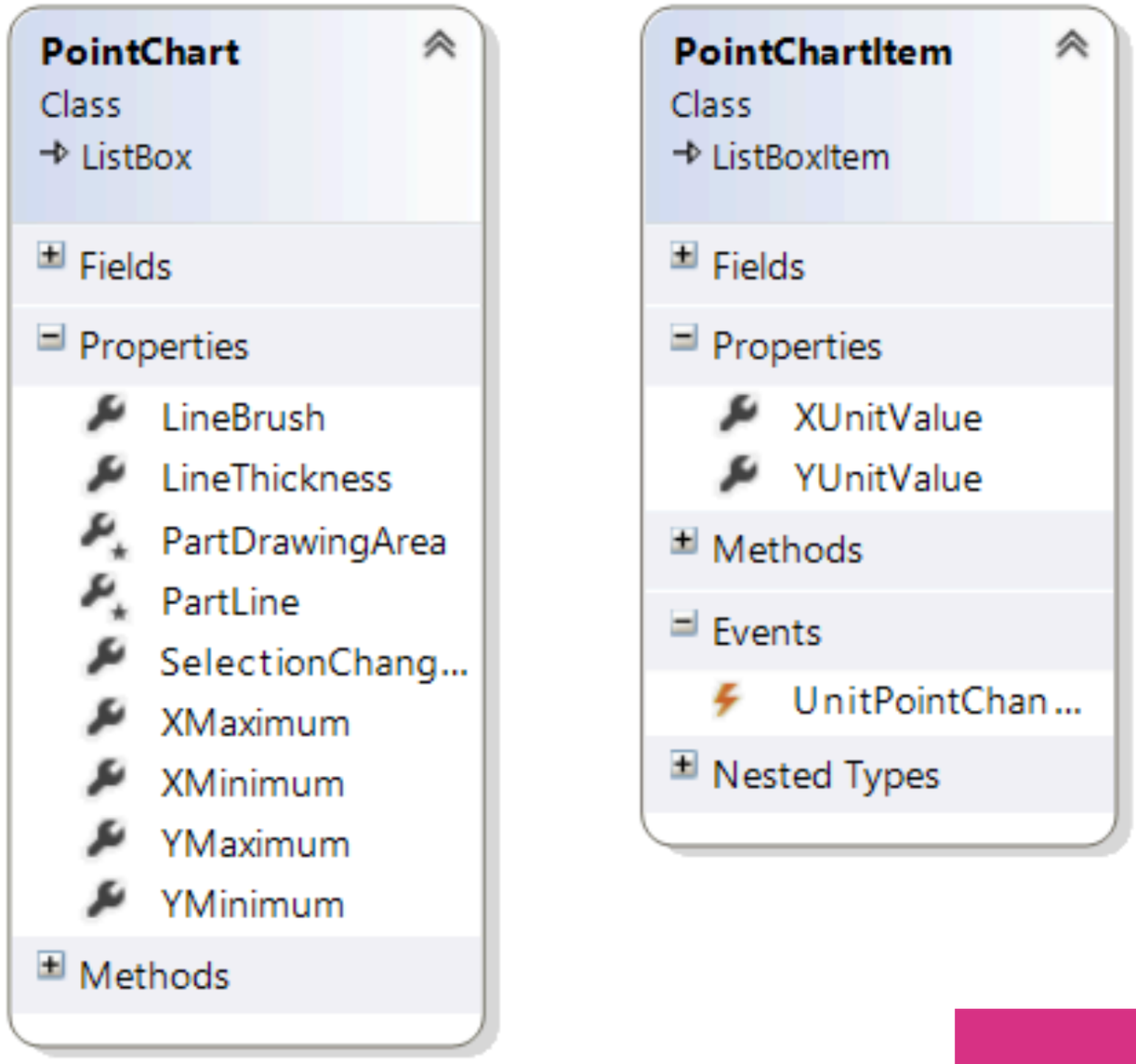


Polyline (PART_Line)

Point-Management innerhalb des Controls

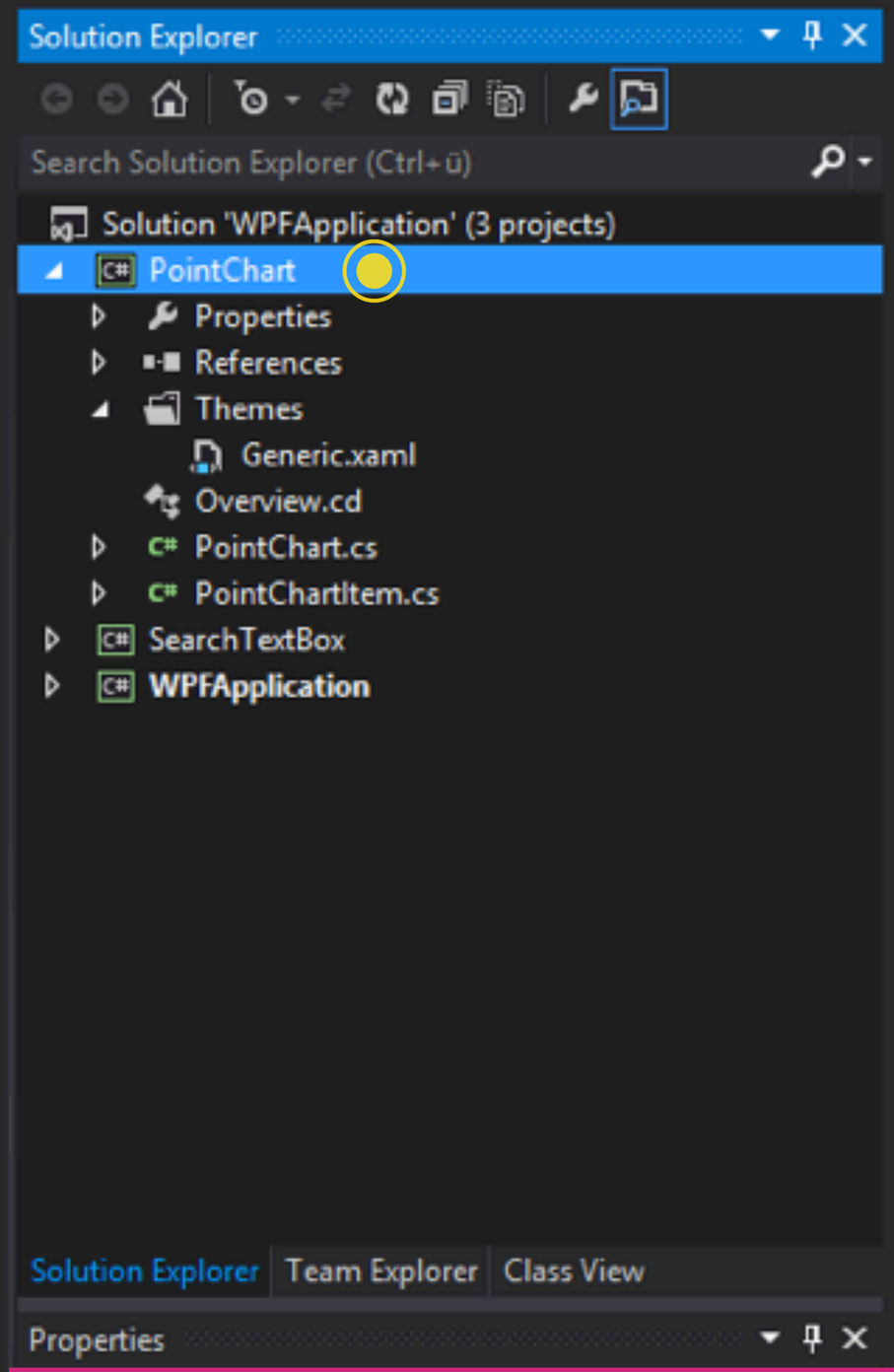
› (override) ItemsChanged

› UnitPointChanged


PointChart
Class
ListBox
Fields
Properties
LineBrush
LineThickness
PartDrawingArea
PartLine
SelectionChang...
XMaximum
XMinimum
YMaximum
YMinimum
Methods
PointChartItem
Class
ListBoxItem
Fields
Properties
XUnitValue
YUnitValue
Methods
Events
UnitPointChan...
Nested Types

That's it ;)

CUSTOM CONTROL LIBRARY



Custom Control Library erstellen

```
public class PointChart : ListBox
{
    Members

    DependencyProperties

    PropertyChangedCallbacks

    Events

    Handlers

    ClassHandlers

    Ctor

    Init/Cleanup

    OverrideMethods

    Methods

    Properties
}
```

Basisklasse bestimmen

(PointChart.cs)

```
public class PointChartItem : ListBoxItem
{
    Members

    DependencyProperties

    PropertyChangedCallbacks

    Events

    Handlers

    Ctor

    Init/Cleanup

    OverrideMethods

    Methods

    Properties
}
```

Basisklasse bestimmen

(PointChartItem.cs)

```
public class PointChartItem : ListBoxItem...
```

```
public class PointChart : ListBox...
```

Basisklasse bestimmen

(PointChart.cs)
(PointChartItem.cs)

Besonderheit ItemsControl

Besonderheit ItemsControl

- (Override) IsItemItsOwnContainerOverride

Besonderheit ItemsControl

- (Override) IsItemItsOwnContainerOverride
  - Ist das Item sein eigener Container?

Besonderheit ItemsControl

- (Override) IsItemItsOwnContainerOverride
  - Ist das Item sein eigener Container?
- (Override) GetContainerForItemOverride

Besonderheit ItemsControl

- (Override) IsItemItsOwnContainerOverride
  - Ist das Item sein eigener Container?
- (Override) GetContainerForItemOverride
  - Liefert das Element zum Anzeigen des Items

```
/// <summary> ...
protected override bool IsItemItsOwnContainerOverride(object item)
{
    return item is PointChartItem;
}

/// <summary> ...
protected override DependencyObject GetContainerForItemOverride()
{
    return new PointChartItem();
}
```

Besonderheit ItemsControl

(PointChart.cs)

STYLE & TEMPLATE

```
<Style TargetType="local:PointChart">
    <Setter Property="BorderThickness" Value="1 0 0 1" />
    <Setter Property="BorderBrush" Value="Gray" />
    <Setter Property="LineBrush" Value="Black" />
    <Setter Property="LineThickness" Value="1" />
    <Setter Property="Margin" Value="-10" />
    <Setter Property="Padding" Value="10" />
    <Setter Property="Focusable" Value="False" />
    <Setter Property="LineBrush" Value="Black" />
    <Setter Property="LineThickness" Value="1" />
    <Setter Property="Template">
        <Setter.Value>
            <ControlTemplate TargetType="local:PointChart">
                <Grid ClipToBounds="True">
                    <Border Margin="{TemplateBinding Padding}"
                            Background="{TemplateBinding Background}"
                            BorderBrush="{TemplateBinding BorderBrush}"
                            BorderThickness="{TemplateBinding BorderThickness}">
                        <Grid>
                            <Grid.LayoutTransform>
                                <ScaleTransform ScaleY="-1" />
                            </Grid.LayoutTransform>
                            <Polyline x:Name="PART_Line"
                                      Stroke="{TemplateBinding LineBrush}"
                                      StrokeThickness="{TemplateBinding LineThickness}" />
                            <Canvas x:Name="PART_DrawingArea"
                                    IsItemsHost="True" />
                        </Grid>
                    </Border>
                </Grid>
            </ControlTemplate>
        </Setter.Value>
    </Setter>
</Style>
```

Style & Template: PointChart

(Generic.xaml)

Style & Template: PointChartItem

(Generic.xaml)

```xaml
<Style TargetType="local:PointChartItem">
    <Setter Property="Width" Value="20" />
    <Setter Property="Height" Value="20" />
    <Setter Property="Background" Value="Transparent" />
    <Setter Property="BorderBrush" Value="Red" />
    <Setter Property="FocusVisualStyle" Value="{x:Null}" />
    <Setter Property="Template">
        <Setter.Value>
            <ControlTemplate TargetType="local:PointChartItem">
                <Ellipse Fill="{TemplateBinding Background}" Stroke="{TemplateBinding BorderBrush}" />
            </ControlTemplate>
        </Setter.Value>
    </Setter>
    <Style.Triggers>
        <Trigger Property="IsMouseOver" Value="True">
            <Setter Property="Background" Value="Black" />
        </Trigger>
        <Trigger Property="IsSelected" Value="True">
            <Setter Property="Background" Value="Blue" />
        </Trigger>
    </Style.Triggers>
</Style>
```

ONAPPLYTEMPLATE()

OnApplyTemplate()

OnApplyTemplate()

- Logic (C#, Klasse) und Visualisierung (Xaml, Template) getrennt

OnApplyTemplate()

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- Elemente innerhalb Control Template werden nach Konvention mit *PART_...* benannt

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- Element-Referenzierung über *OnApplyTemplate()* Methode *GetTemplateChild()* Methode mit *PART_...* aufrufen

OnApplyTemplate()

- Logic (C#, Klasse) und Visualisierung (Xaml, Template) getrennt
- Elemente innerhalb Control Template werden nach Konvention mit *PART_…* benannt
- Element-Referenzierung über *OnApplyTemplate()* Methode *GetTemplateChild()* Methode mit *PART_…* aufrufen
- **Achtung:** Element müssen nicht in der Template vorhanden sein

Element-Referenzierung 1/2

(Generic.xaml)

```
<Style TargetType="local:PointChart">
    <Setter Property="BorderThickness" Value="1 0 0 1" />
    <Setter Property="BorderBrush" Value="Gray" />
    <Setter Property="LineBrush" Value="Black" />
    <Setter Property="LineThickness" Value="1" />
    <Setter Property="Margin" Value="-10" />
    <Setter Property="Padding" Value="10" />
    <Setter Property="Focusable" Value="False" />
    <Setter Property="LineBrush" Value="Black" />
    <Setter Property="LineThickness" Value="1" />
    <Setter Property="Template">
        <Setter.Value>
            <ControlTemplate TargetType="local:PointChart">
                <Grid ClipToBounds="True">
                    <Border Margin="{TemplateBinding Padding}"
                            Background="{TemplateBinding Background}"
                            BorderBrush="{TemplateBinding BorderBrush}"
                            BorderThickness="{TemplateBinding BorderThickness}">
                        <Grid>
                            <Grid.LayoutTransform>
                                <ScaleTransform ScaleY="-1" />
                            </Grid.LayoutTransform>
                            <Polyline x:Name="PART_Line"
                                      Stroke="{TemplateBinding LineBrush}"
                                      StrokeThickness="{TemplateBinding LineThickness}" />
                            <Canvas x:Name="PART_DrawingArea"
                                    Width="{Binding ActualWidth,
                                                    ElementName=PART_DrawingArea}"
                                    Height="{Binding ActualHeight,
                                                     ElementName=PART_DrawingArea}"
                                    IsItemsHost="True" />
                        </Grid>
                    </Border>
                </Grid>
            </ControlTemplate>
        </Setter.Value>
    </Setter>
</Style>
```

- Diese beiden Elemente sollen referenziert werden

Element-Referenzierung 2/2

(PointChart.cs)

```
/// <summary>
/// Get Template PART_-Elements
/// </summary>
public override void OnApplyTemplate()
{
    base.OnApplyTemplate();

    PartDrawingArea = GetTemplateChild("PART_DrawingArea") as FrameworkElement;
    PartLine = GetTemplateChild("PART_Line") as Polyline;

    Init();
}
```

> Referenz kann null sein!

OnApplyTemplate() - Tipps 1/2

OnApplyTemplate() - Tipps 1/2

- Nur verwenden wenn Template Binding, RoutedCommands oder RoutedEvents nicht zu dem gewünschten Ergebnis führen

OnApplyTemplate() - Tipps 1/2

- Nur verwenden wenn Template Binding, RoutedCommands oder RoutedEvents nicht zu dem gewünschten Ergebnis führen
- NullReferenceException vermeiden und defensiv programmieren

OnApplyTemplate() - Tipps 1/2

- Nur verwenden wenn Template Binding, RoutedCommands oder RoutedEvents nicht zu dem gewünschten Ergebnis führen
- NullReferenceException vermeiden und defensiv programmieren
- *OnApplyTemplate*() Methode kann mehrfach aufgerufen werden, mit internen Properties arbeiten (Mehr Kontrolle)

OnApplyTemplate() - Tipps 1/2

- Nur verwenden wenn Template Binding, RoutedCommands oder RoutedEvents nicht zu dem gewünschten Ergebnis führen
- NullReferenceException vermeiden und defensiv programmieren
- *OnApplyTemplate*() Methode kann mehrfach aufgerufen werden, mit internen Properties arbeiten (Mehr Kontrolle)
- *OnApplyTemplate()* Methode kann manuell aufgerufen werden. Dadurch wird Control Template geladen

Element-Referenzierung Tips

(PointChart.cs)

```
/// <summary> ...
protected FrameworkElement PartDrawingArea
{
    get
    {
        return partDrawingArea;
    }

    private set
    {
        if (value == partDrawingArea)
            return;

        if(partDrawingArea != null)
            partDrawingArea.SizeChanged -= partDrawingArea_SizeChanged;

        partDrawingArea = value;

        if (partDrawingArea != null)
            partDrawingArea.SizeChanged += partDrawingArea_SizeChanged;
    }
}
```

OnApplyTemplate() - Tipps 2/2

OnApplyTemplate() - Tipps 2/2

- PropertyChangedCallbacks werden noch vor OnApplyTemplate aufgerufen

OnApplyTemplate() - Tipps 2/2

- PropertyChangedCallbacks werden noch vor OnApplyTemplate aufgerufen
- Interne Variable *internalIsLoaded* um Update-Logik erst durchzuführen wenn Template angewandt wurde (siehe Dependency Properties - Extended)

Element-Referenzierung Tips

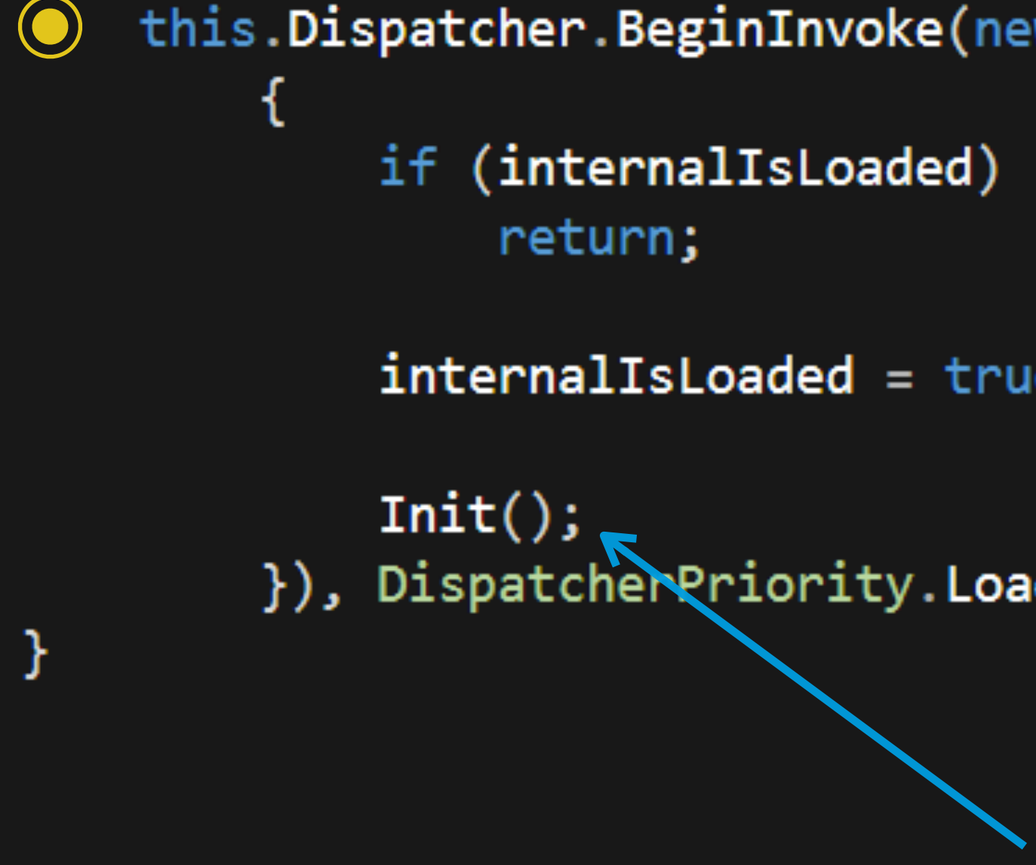
(PointChart.cs)

```
/// <summary> ...
public PointChart()
{
    //this.Loaded += PointChartLoaded;

    this.Dispatcher.BeginInvoke(new Action(() =>
        {
            if (internalIsLoaded)
                return;

            internalIsLoaded = true;

            Init();
        }), DispatcherPriority.Loaded);
}
```



› Initialisierung ;)

DEPENDENCY PROPERTIES EXTENDED

```
/// <summary> ...
public static readonly DependencyProperty LineBrushProperty = DependencyProperty.Register(
    "LineBrush",
    typeof(Brush),
    typeof(PointChart),
    new FrameworkPropertyMetadata(Brushes.Black));

/// <summary> ...
public static readonly DependencyProperty LineThicknessProperty = DependencyProperty.Register(
    "LineThickness",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(1.0));

/// <summary> ...
public static readonly DependencyProperty XMinimumProperty = DependencyProperty.Register(
    "XMinimum",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(0.0, RangeChanged));

/// <summary> ...
public static readonly DependencyProperty XMaximumProperty = DependencyProperty.Register(
    "XMaximum",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(100.0, RangeChanged));

/// <summary> ...
public static readonly DependencyProperty YMinimumProperty = DependencyProperty.Register(
    "YMinimum",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(0.0, RangeChanged));

/// <summary> ...
public static readonly DependencyProperty YMaximumProperty = DependencyProperty.Register(
    "YMaximum",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(100.0, RangeChanged));

/// <summary> ...
public static readonly DependencyProperty SelectionChangedCommandProperty = DependencyProperty.Register(
    "SelectionChangedCommand",
    typeof(ICommand),
    typeof(PointChart),
    new FrameworkPropertyMetadata(null));
```

› Was ist das?

Properties anlegen 1/2

(PointChart.cs)

```
/// <summary> ...
public static readonly DependencyProperty XUnitValueProperty = DependencyProperty.Register(
    "XUnitValue",
    typeof(double),
    typeof(PointChartItem),
    new FrameworkPropertyMetadata(double.NaN, PointPropertyChanged));

/// <summary> ...
public static readonly DependencyProperty YUnitValueProperty = DependencyProperty.Register(
    "YUnitValue",
    typeof(double),
    typeof(PointChartItem),
    new FrameworkPropertyMetadata(double.NaN, PointPropertyChanged));
```

› Schon wieder?

Properties anlegen 2/2

(PointChartItem.cs)

Dependency Properties - Extended 1/2

Dependency Properties - Extended 1/2

› Reagieren auf Änderungen über Changed Callback möglich

Dependency Properties - Extended 1/2

- Reagieren auf Änderungen über Changed Callback möglich
- Angabe einer statischen Funktion. Über das Metadatenobjekt innerhalb der Funktion erhält man Zugriff auf die Instanz des Controls sowie Informationen über Änderungen (*ChangedEventArgs*)

Dependency Properties - Extended 1/2

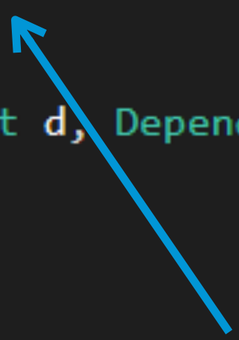
- Reagieren auf Änderungen über Changed Callback möglich
- Angabe einer statischen Funktion. Über das Metadatenobjekt innerhalb der Funktion erhält man Zugriff auf die Instanz des Controls sowie Informationen über Änderungen (*ChangedEventArgs*)
- Statische Methoden möglichst kurz halten und auf der Instanz eine Methode aufrufen

```
/// <summary> ...
public static readonly DependencyProperty XMinimumProperty = DependencyProperty.Register(
    "XMinimum",
    typeof(double),
    typeof(PointChart),
    new FrameworkPropertyMetadata(0.0, RangeChanged));

/// <summary> ...
private static void RangeChanged(DependencyObject d, DependencyPropertyChangedEventArgs e)
{
    PointChart self = d as PointChart;

    if (!self.internalIsLoaded)
        return;

    self.UpdateAllPoints();
}
```



- Angabe Callback

- Callback mit ChangedEventArgs

Properties Changed Callback

(PointChart.cs)

Dependency Properties - Extended 2/2

Dependency Properties - Extended 2/2

- Doch was wenn bereits existierende Properties Elemente beeinflussen?

Dependency Properties - Extended 2/2

› Doch was wenn bereits existierende Properties Elemente beeinflussen?

› Hier:

Dependency Properties - Extended 2/2

- Doch was wenn bereits existierende Properties Elemente beeinflussen?

- Hier:
  - Width, Height

Dependency Properties - Extended 2/2

- Doch was wenn bereits existierende Properties Elemente beeinflussen?

- Hier:
  - Width, Height
  - Items

Dependency Properties - Extended 2/2

- Doch was wenn bereits existierende Properties Elemente beeinflussen?

- Hier:
  - Width, Height
  - Items

- **Lösung:** Überschreiben bereits vorhandener Methoden oder Properties

```
/// <summary> ...
protected override void OnItemsChanged(System.Collections.Specialized.NotifyCollectionChangedEventArgs e)
{
    base.OnItemsChanged(e);

    if(PartLine == null)
        return;

    switch (e.Action)
    {
        case NotifyCollectionChangedAction.Remove:
            PartLine.Points.RemoveAt(e.OldStartingIndex);
            break;
        case NotifyCollectionChangedAction.Add:
            PartLine.Points.Insert(e.NewStartingIndex, new Point());
            break;
        case NotifyCollectionChangedAction.Reset:
            PartLine.Points.Clear();
            for (int i = 0; i < Items.Count; i++)
                PartLine.Points.Add(new Point());
            break;
    }
}

/// <summary> ...
protected override void OnRenderSizeChanged(SizeChangedInfo sizeInfo)
{
    base.OnRenderSizeChanged(sizeInfo);

    if (!internalIsLoaded)
        return;

    UpdateAllPoints();
}
```

Override Methods

(PointChart.cs)

```
/// <summary> ...
static PointChart()
{
    DefaultStyleKeyProperty.OverrideMetadata(
        typeof(PointChart),
        new FrameworkPropertyMetadata(typeof(PointChart)));

    EventManager.RegisterClassHandler(
        typeof(PointChart),
        PointChartItem.UnitPointChangedEvent,
        new RoutedEventHandler(OnItemUnitPointChangedEvent));

    WidthProperty.OverrideMetadata(
        typeof(PointChart),
        new FrameworkPropertyMetadata(double.NaN, RangeChanged));
}

/// <summary> ...
private static void RangeChanged(DependencyObject d, DependencyPropertyChangedEventArgs e)
{
    PointChart self = d as PointChart;

    if (!self.internalIsLoaded)
        return;

    self.UpdateAllPoints();
}
```

Override Properties

(PointChart.cs)

ROUTED EVENTS

RoutedEvents

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- RoutedEvents können je nach Strategy im visuellen Baum hoch oder hinunter navigieren.

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  - Bubbling = Up

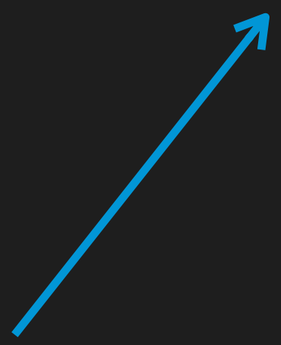
RoutedEvents

- RoutedEvents können je nach Strategy im visuellen Baum hoch oder hinunter navigieren.
- Somit können Sie mehrere Handler auf verschiedenen Elementen auslösen
- Strategien:
  - Tunneling = Down
  - Bubbling = Up
  - Direct = Direct (Vergleiche standard .NET Events)

```
/// <summary> ...
public static readonly RoutedEvent UnitPointChangedEvent = EventManager.RegisterRoutedEvent(
    "UnitPointChanged",
    RoutingStrategy.Bubble,
    typeof(UnitPointChangedEventHandler),
    typeof(PointChartItem));

/// <summary> ...
public delegate void UnitPointChangedEventHandler(object sender, RoutedEventArgs args);

/// <summary> ...
[Description("This event occurs when the x or y unit value has changed.")]
public event UnitPointChangedEventHandler UnitPointChanged...
```



- Anlegen des Events in der auslösenden Klasse

Routed Events 1/3

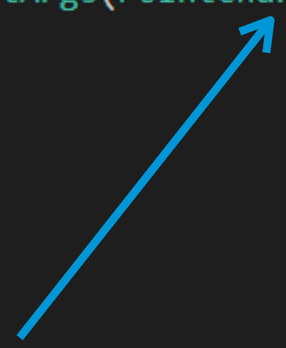
(PointChartItem.cs)

```
/// <summary> ...
public static readonly DependencyProperty YUnitValueProperty = DependencyProperty.Register(
    "YUnitValue",
    typeof(double),
    typeof(PointChartItem),
    new FrameworkPropertyMetadata(double.NaN, PointPropertyChanged));

/// <summary> ...
private static void PointPropertyChanged(DependencyObject d, DependencyPropertyChangedEventArgs e)
{
    PointChartItem self = d as PointChartItem;

    if (!self.internalIsLoaded)
        return;

    self.RaiseEvent(new RoutedEventArgs(PointChartItem.UnitPointChangedEvent, self));
}
```



- Aufrufen des angelegten Events

Routed Events 2/3

(PointChartItem.cs)

```
/// <summary> ...
static PointChart()
{
    DefaultStyleKeyProperty.OverrideMetadata(
        typeof(PointChart),
        new FrameworkPropertyMetadata(typeof(PointChart)));

    EventManager.RegisterClassHandler(
        typeof(PointChart),
        PointChartItem.UnitPointChangedEvent,
        new RoutedEventHandler(OnItemUnitPointChangedEvent));
}

/// <summary> ...
private static void OnItemUnitPointChangedEvent(object sender, RoutedEventArgs e)
{
    PointChart pointChart = sender as PointChart;
    PointChartItem pointChartItem = e.OriginalSource as PointChartItem;

    pointChart.UpdatePosition(pointChartItem, pointChart.ItemContainerGenerator.IndexFromContainer(pointChartItem));
}
```

- Event abonnieren und Aktion definieren

Routed Events 3/3

(PointChart.cs)

VIEWMODEL KOMMUNIKATION

ViewModel Kommunikation - Extended

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- Siehe SearchTextBox :)

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- SampleViewModel.cs, PointViewModel.cs implementieren INotifyPropertyChanged

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- SampleViewModel.cs, PointViewModel.cs implementieren INotifyPropertyChanged

- Binding der Items an XUnitValue, YUnitValue

ViewModel Kommunikation - Extended

- Siehe SearchTextBox :)

- SampleViewModel.cs, PointViewModel.cs implementieren INotifyPropertyChanged
- Binding der Items an XUnitValue, YUnitValue
- Binding der ItemsSource an ObservableCollection Points

- Binding PointChart
  - Points
  - SelectedItem

```
<PointChart x:Name="MyPointChart"
            Panel.ZIndex="100"
            ItemsSource="{Binding Points}"
            SelectedItem="{Binding SelectedItem}"
            SelectionMode="Extended">
    <PointChart.ItemContainerStyle>
        <Style TargetType="PointChartItem" BasedOn="{StaticResource PointChartItemStyle}">
            <Setter Property="XUnitValue" Value="{Binding X}" />
            <Setter Property="YUnitValue" Value="{Binding Y}" />
            <Setter Property="IsSelected" Value="{Binding IsSelected}" />
            <Setter Property="attachedProperties:AttachedProperties.IsSearchResult" Value="{Binding IsSearchResult}" />
        </Style>
    </PointChart.ItemContainerStyle>
</PointChart>
```

- Binding PointChartItem
  - XUnitValue
  - YUnitValue
  - IsSelected
  - ...

ViewModel Kommunikation 1/3

(MainView.xaml)

```
/// <summary>
/// PointsProperty gets or sets the Points.
/// </summary>
public ObservableCollection<PointViewModel> Points
{
    get
    {
        return pointsSource;
    }

    set
    {
        if (value != this.pointsSource)
        {
            this.pointsSource = value;
            OnPropertyChanged("Points");
        }
    }
}
```

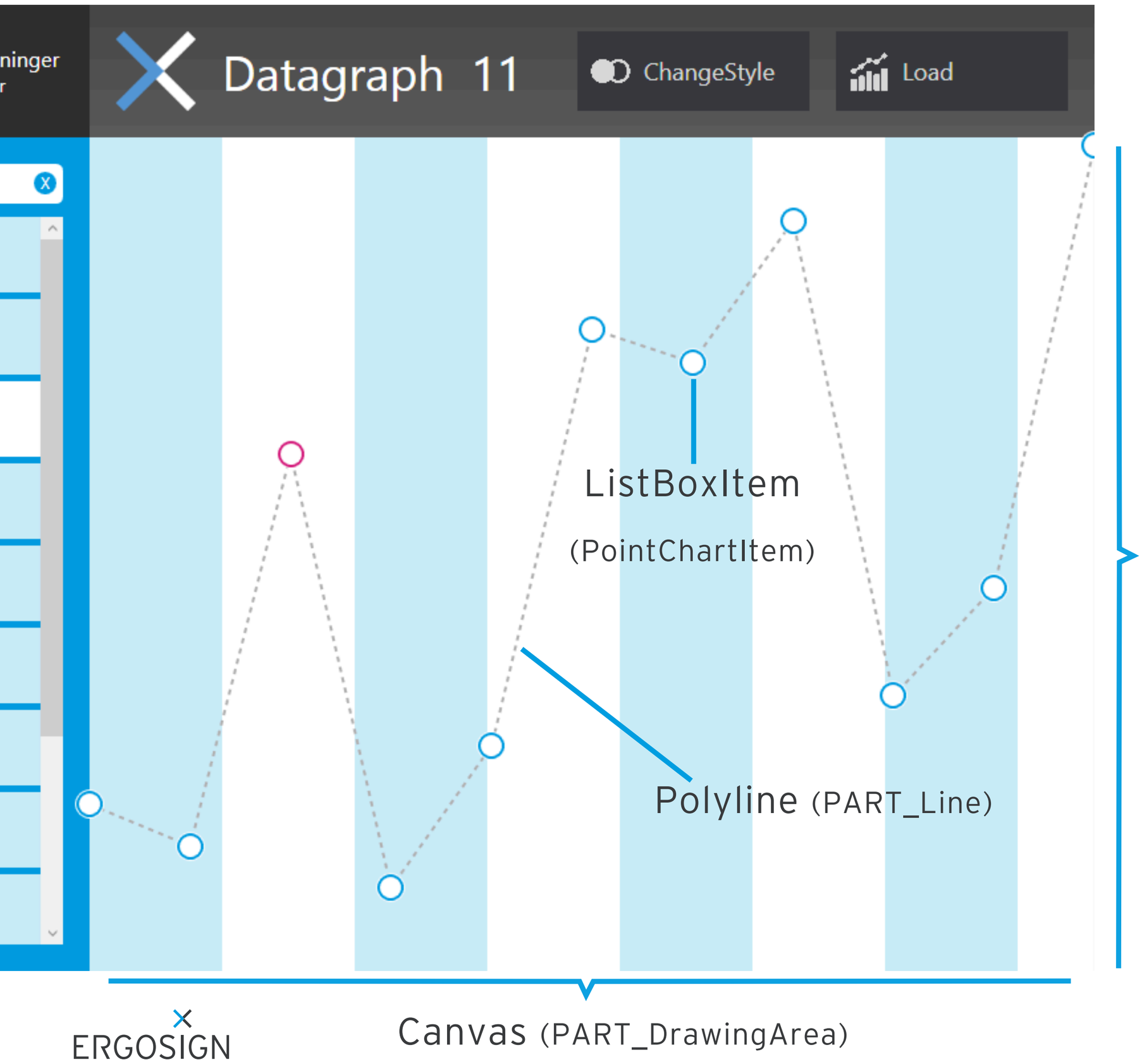
- Aufrufen von OnPropertyChanged (Update des Bindings)

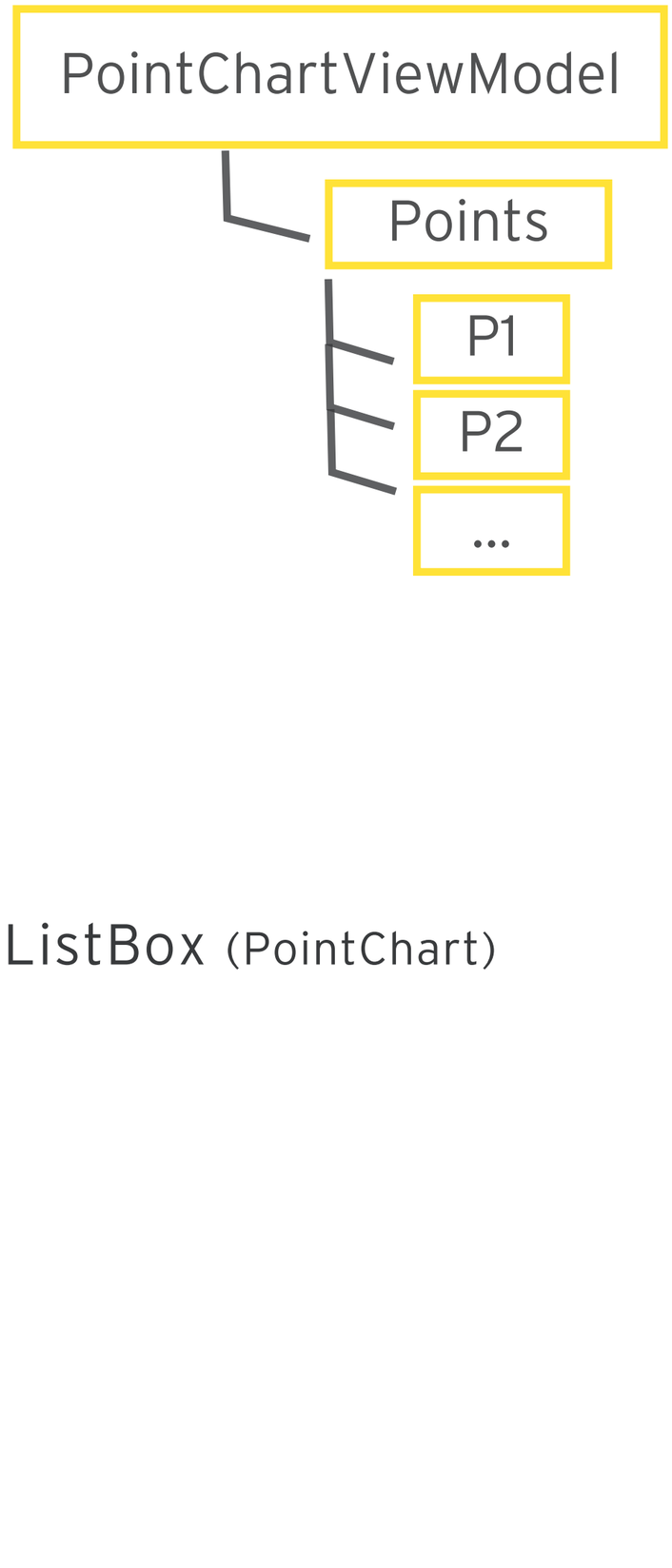
```
/// <summary>
/// SelectedItemProperty gets or sets the SelectedItem.
/// </summary>
public object SelectedItem
{
    get
    {
        return selectedItem;
    }

    set
    {
        if (value != this.selectedItem)
        {
            this.selectedItem = value;
            Debug.WriteLine("SelectedItem " + SelectedItem);
            OnPropertyChanged("SelectedItem");
        }
    }
}
```

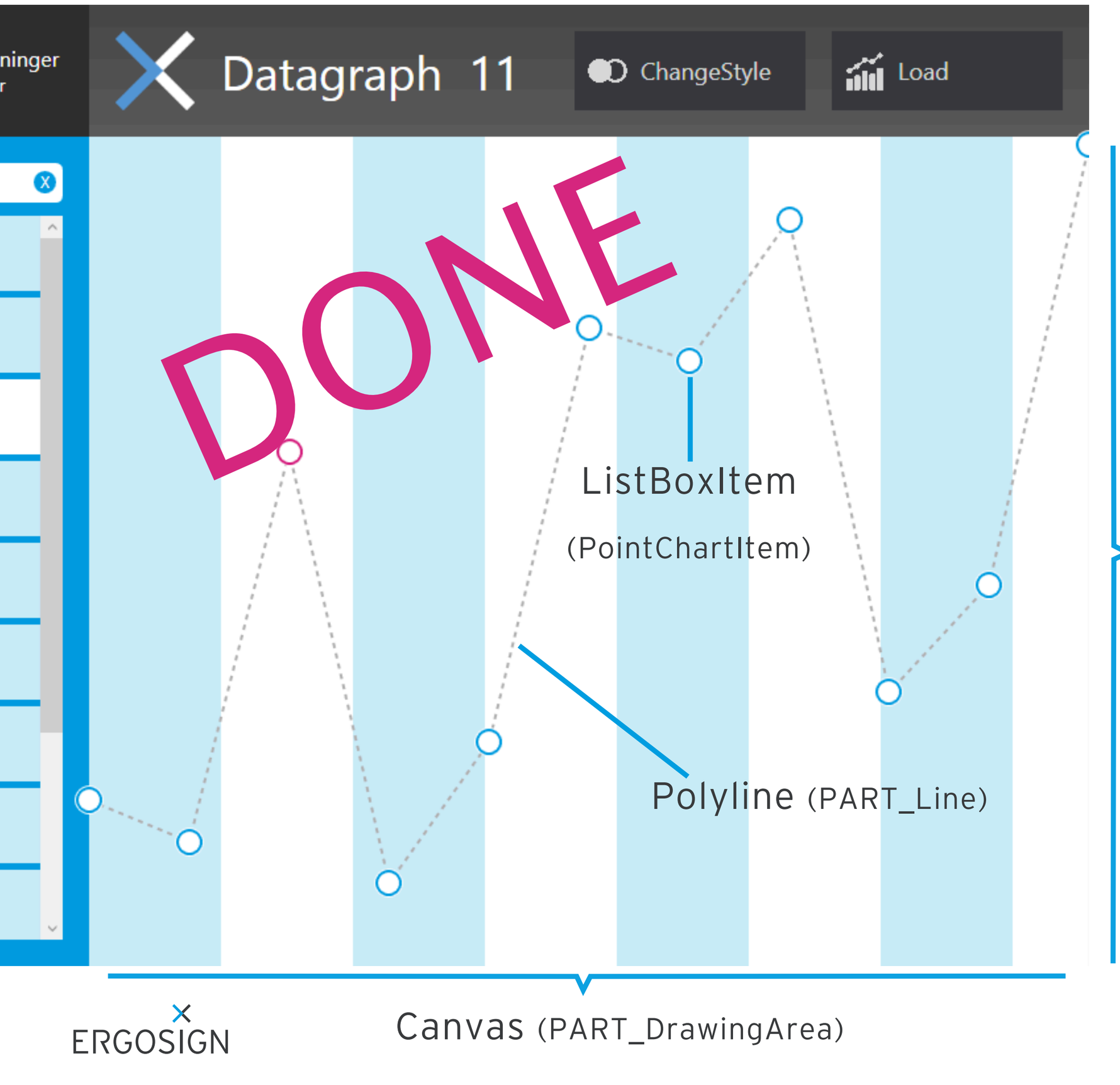
- Aufruf der Update Logik

ViewModel Kommunikation 2/3

(SampleViewModel.cs)


ninger
r
Datagraph 11
ChangeStyle
Load
ListBoxItem
(PointChartItem)
Polyline (PART_Line)
Canvas (PART_DrawingArea)


PointChartViewModel
Points
P1
P2
...
ListBox (PointChart)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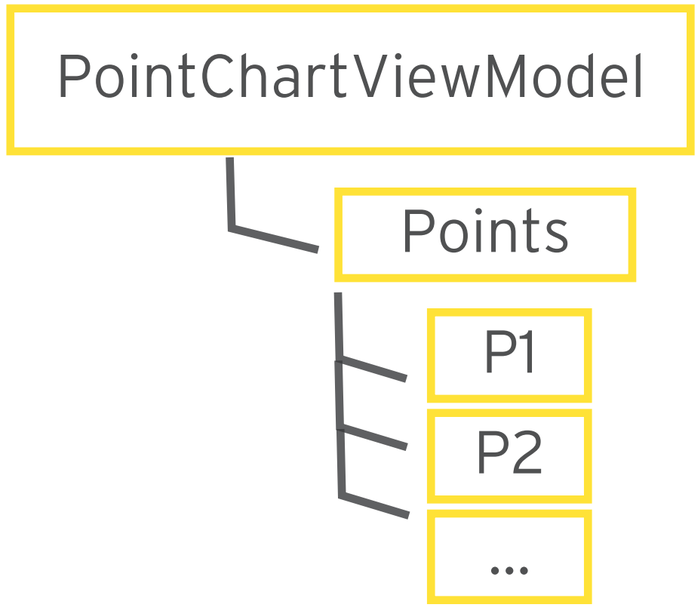
DONE
ListBoxItem
(PointChartItem)
Polyline (PART_Line)
ListBox (PointChart)
Canvas (PART_DrawingArea)


PointChartViewModel
Points
P1
P2
...

BLENDABILITY

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- Xaml friendly und Blend kompatibel

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- Default Property Values, Styles und Templates

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- Mode Properties für Trigger
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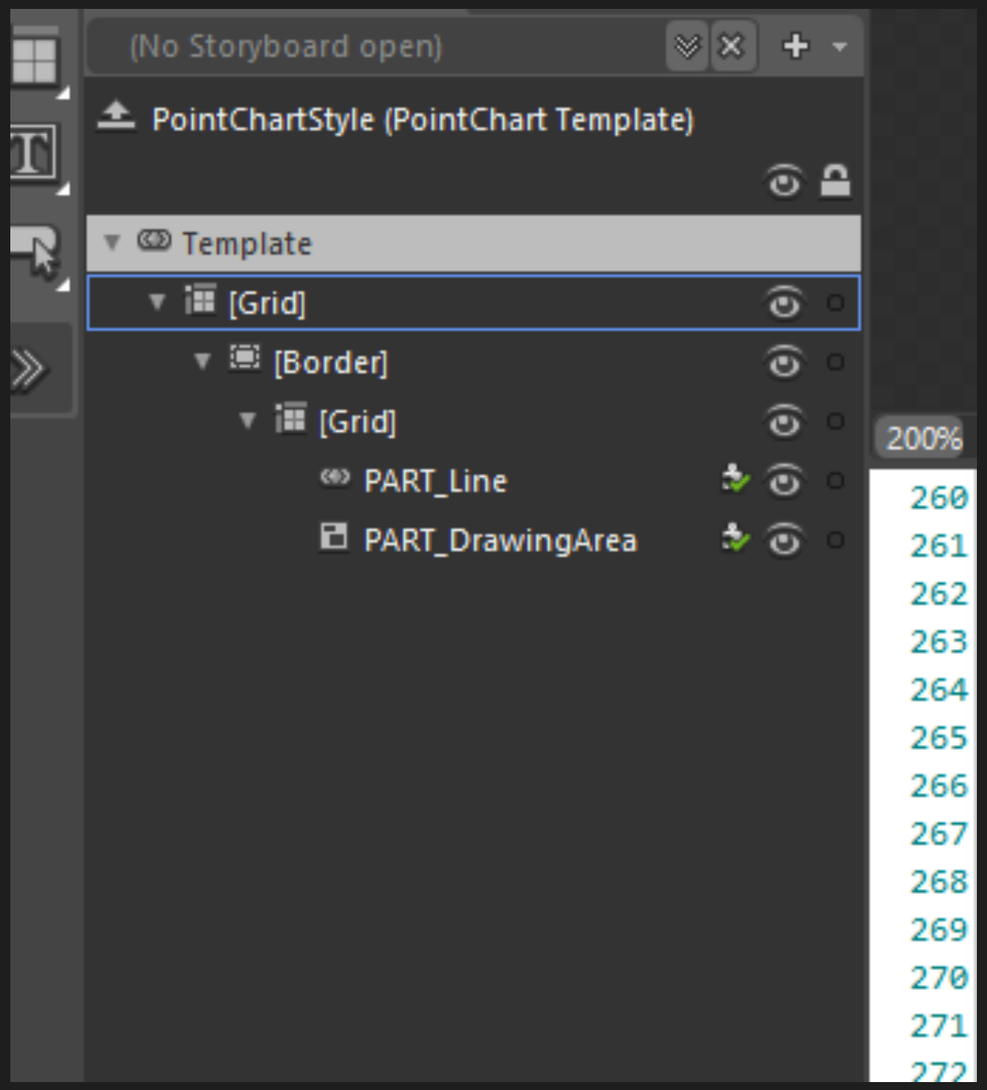
- …

```
/// <summary> ...
[TemplatePart(Name = "PART_DrawingArea", Type = typeof(FrameworkElement))]
[TemplatePart(Name = "PART_Line", Type = typeof(Polyline))]
public class PointChart : ListBox...
```



TemplatePart Attribute

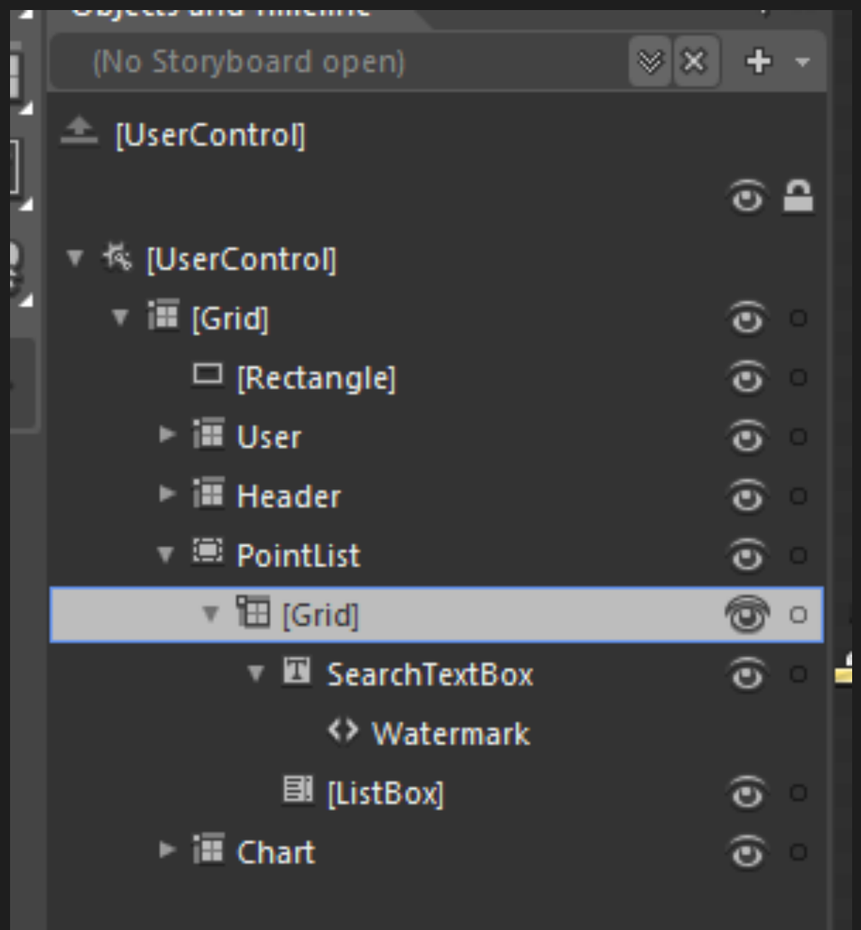
(PointChart.cs)

```
/// <summary> ...
[ContentPropertyAttribute("MyDefaultContentProperty")]
[Description("The class SearchTextBox represents a textbox with watermark and clear text command")]
public class SearchTextBox : TextBox
{
    Members

    DependencyProperties

    PropertyChangedCallbacks

    Events

    Commands

    Handlers

    Ctor

    Init/Cleanup

    OverrideMethods

    Methods

    Properties
```

ContentProperty Attribute

(SearchTextBox.cs)

```
/// <summary> ...
[Description("Gets or sets the watermark."), Category(PROPERTY_CATEGORY)]
[AlternateContentProperty]
public string Watermark
{
    get { return (string)GetValue(WatermarkProperty); }
    set { SetValue(WatermarkProperty, value); }
}
```



AlternateContent-Property Attribute

(SearchTextBox.cs)

Description Attribute 1/2

(SearchTextBox.cs)

```
/// <summary> ...
[ContentPropertyAttribute("MyDefaultContentProperty")]
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public class SearchTextBox : TextBox
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```

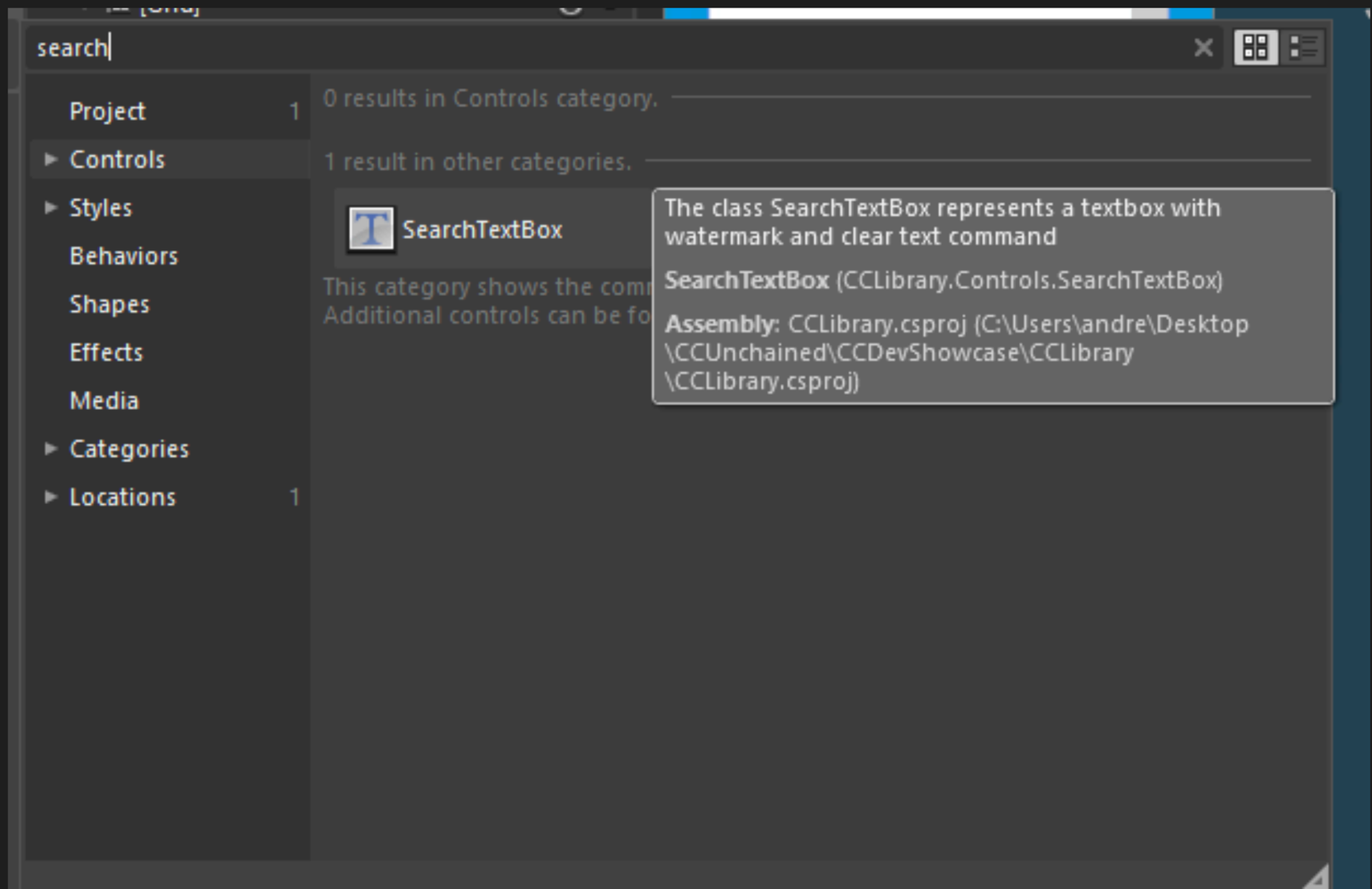

```
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}
```
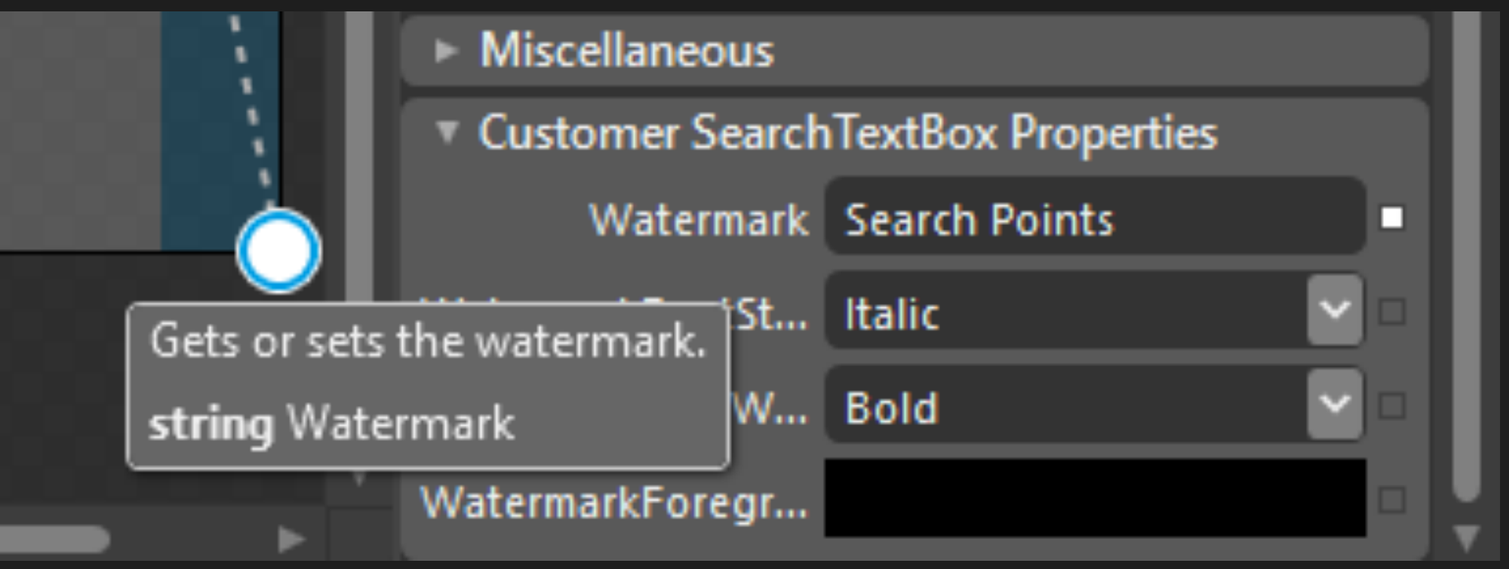
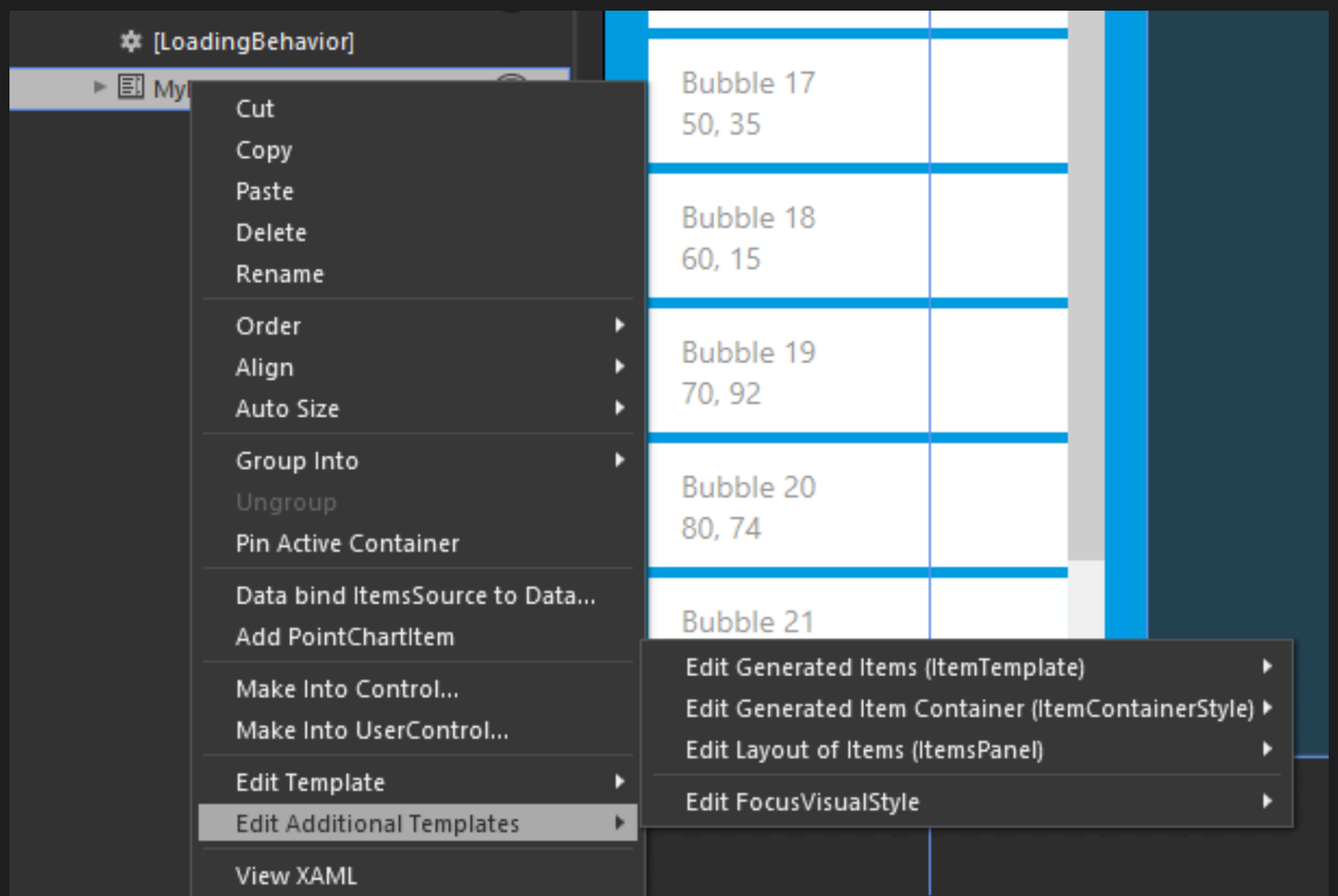



Description Attribute 2/2

(SearchTextBox.cs)

```
[TemplatePart(Name = "PART_DrawingArea", Type = typeof(FrameworkElement))]
[TemplatePart(Name = "PART_Line", Type = typeof(Polyline))]
[StyleTypedProperty(Property = "ItemContainerStyle", StyleTargetType = typeof(PointChartItem))]
[Description("The class PointChart represents a selectable point chart")]
public class PointChart : ListBox
{
    Members

    DependencyProperties

    PropertyChangedCallbacks
```



StyledTypedProperty Attribute

(PointChart.cs)

```
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Controls.PointChart")]
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Controls.HighlightableTextBlock")]
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Controls.SearchTextBox")]
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Controls.CircularProgressBar")]
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Controls.NumericUpDown")]
[assembly: XmlnsDefinition("http://schemas.microsoft.com/winfx/2006/xaml/presentation", "CCLibrary.Behaviors")]
```

```
<serachTextBox:SearchTextBox x:Name="SearchTextBox"
                             Margin="0 0 0 10"
                             Text="{Binding SearchString,
                                            UpdateSourceTrigger=PropertyChanged}"
                             Watermark="Search Points" />

<SearchTextBox x:Name="SearchTextBoxWithDefaultMerge"
               Margin="0 0 0 10"
               Text="{Binding SearchString,
                              UpdateSourceTrigger=PropertyChanged}"
               Watermark="Search Points" />
```

Namespace Merge

(AssemblyInfo.cs)

```
if (!DesignerProperties.GetIsInDesignMode(this))
    return;
```

DesignTime

(AssemblyInfo.cs)

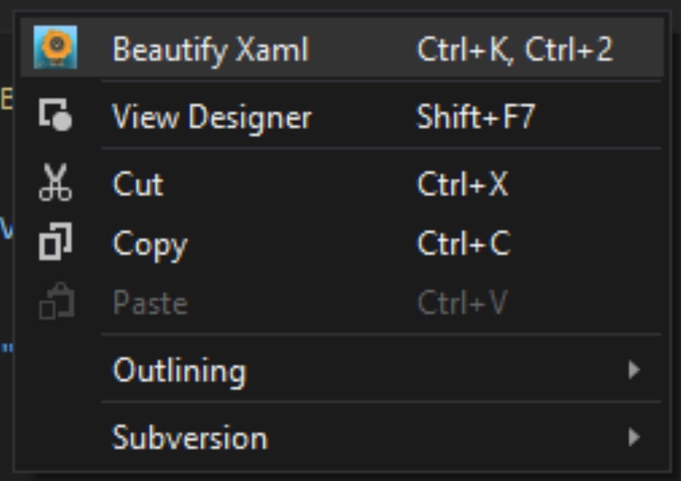
TOOLS :)

1

```
<Grid Width="{TemplateBinding MinWidth}" Height="{TemplateBinding MinHeight}">
    <Ellipse Margin="-1" Fill="{StaticResource WhiteBrush}"
                    StrokeThickness="2" />
    <Ellipse Fill="{TemplateBinding Background}"
                           Stroke="{TemplateBinding BorderBrush}"
       StrokeThickness="2" /></Grid>
<Grid x:Name="HoverBorder"
```

2

```
<Grid Width="{TemplateBinding MinWidth}" Height="{TemplateBinding MinHeight}">
    <Ellipse Margin="-1" Fill="{StaticResource WhiteBrush}"
                    StrokeThickness="2" />
    <Ellipse Fill="{TemplateBinding Background}"
                           Stroke="{TemplateBinding B
       StrokeThickness="2" /></Grid>
<Grid x:Name="HoverBorder"
      Margin="0 0 0 30" HorizontalAlignment="Center" V
      Opacity="0">
    <Grid.Effect>
        <DropShadowEffect PresentationOptions:Freeze="
    </Grid.Effect>
    <Grid.RowDefinitions>
        <RowDefinition Height="auto" />
```



3

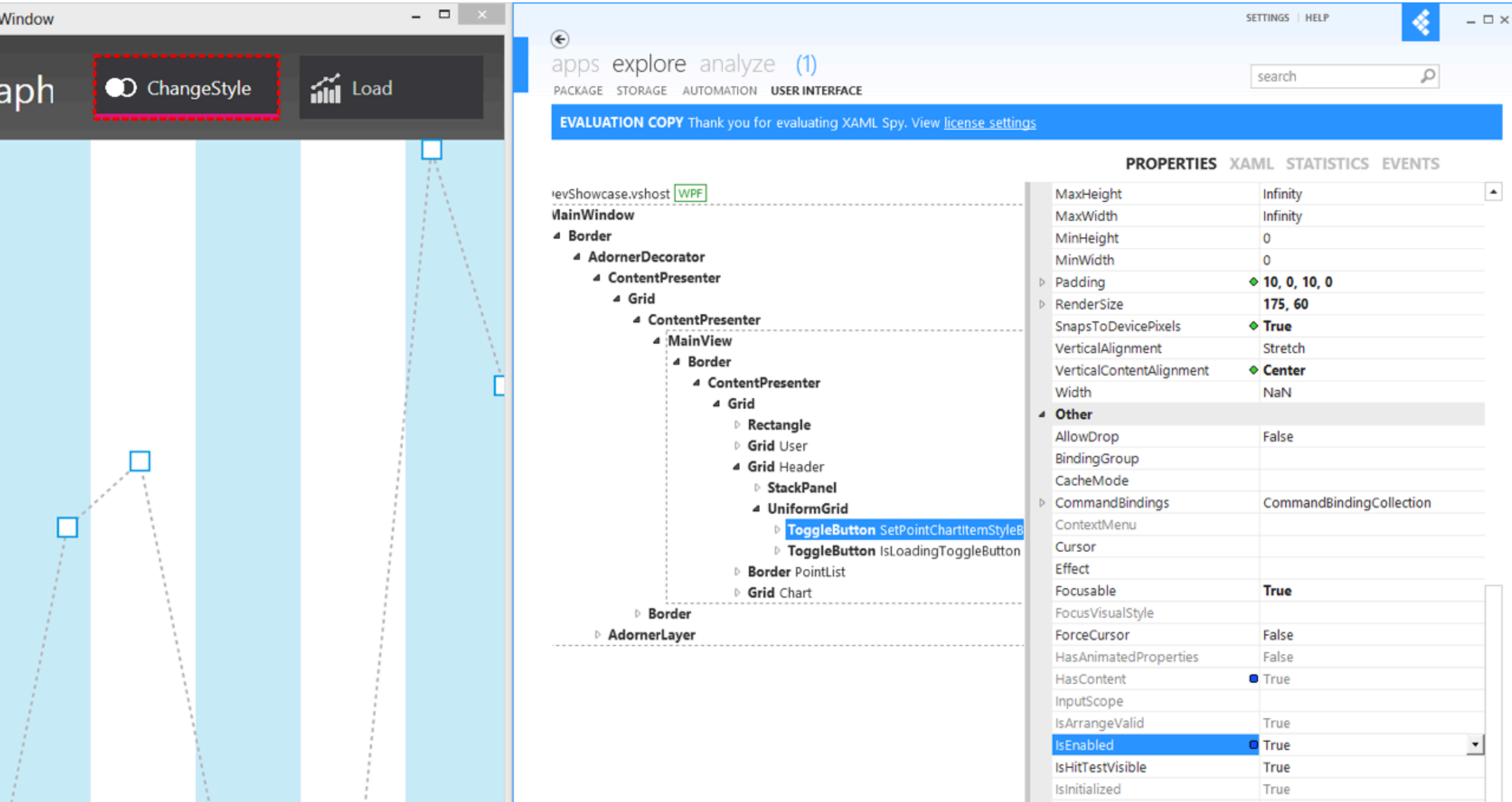
```
<Grid>
    <Grid Width="{TemplateBinding MinWidth}" Height="{TemplateBinding MinHeight}">
        <Ellipse Margin="-1"
                 Fill="{StaticResource WhiteBursh}"
                 StrokeThickness="2" />
        <Ellipse Fill="{TemplateBinding Background}"
                 Stroke="{TemplateBinding BorderBrush}"
                 StrokeThickness="2" />
    </Grid>
    <Grid x:Name="HoverBorder"
```

Xaml Styler

- Element & Speicher Analyse

Xaml Spy

(Alternative WPF Inspector)



- Element & Speicher Analyse

Xaml Spy

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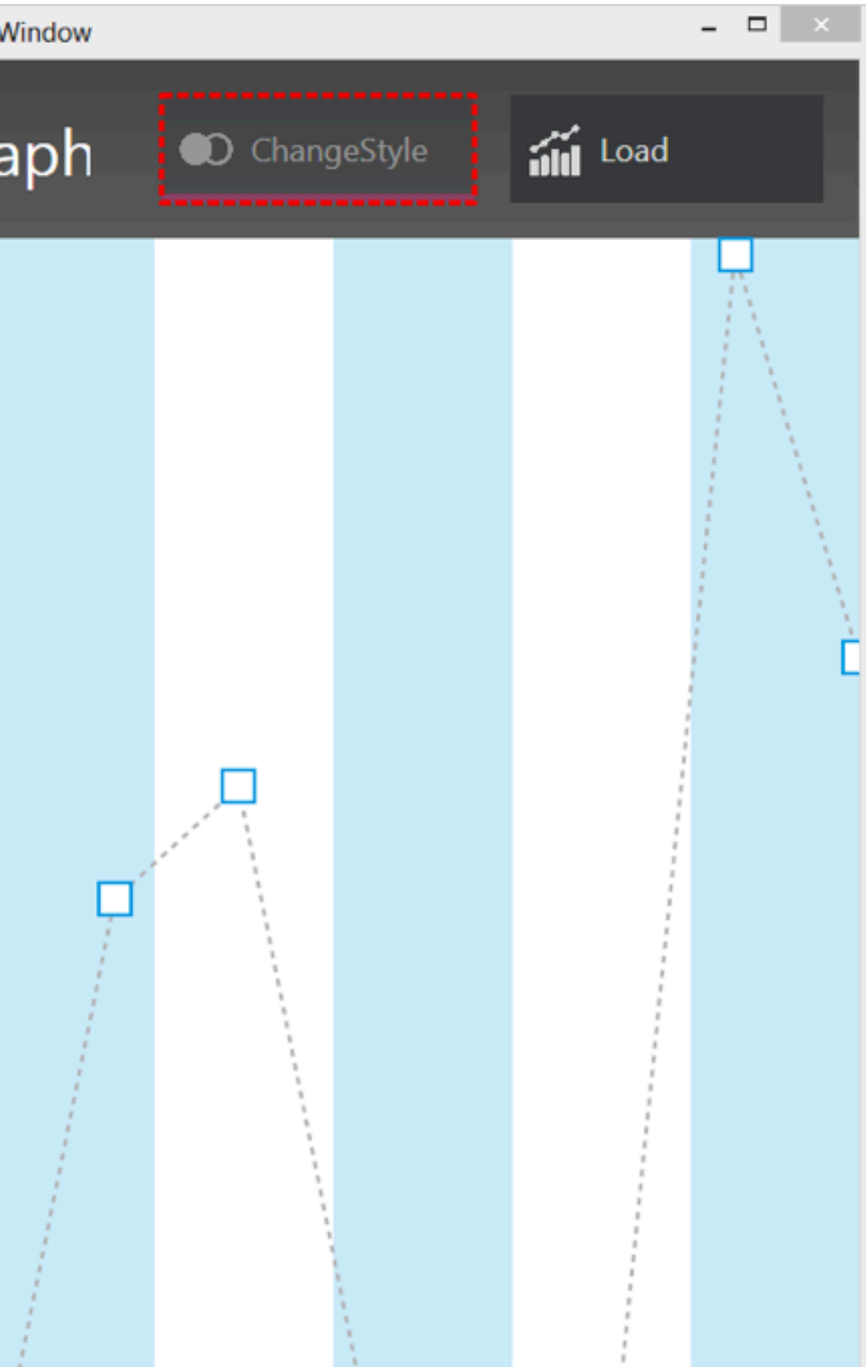
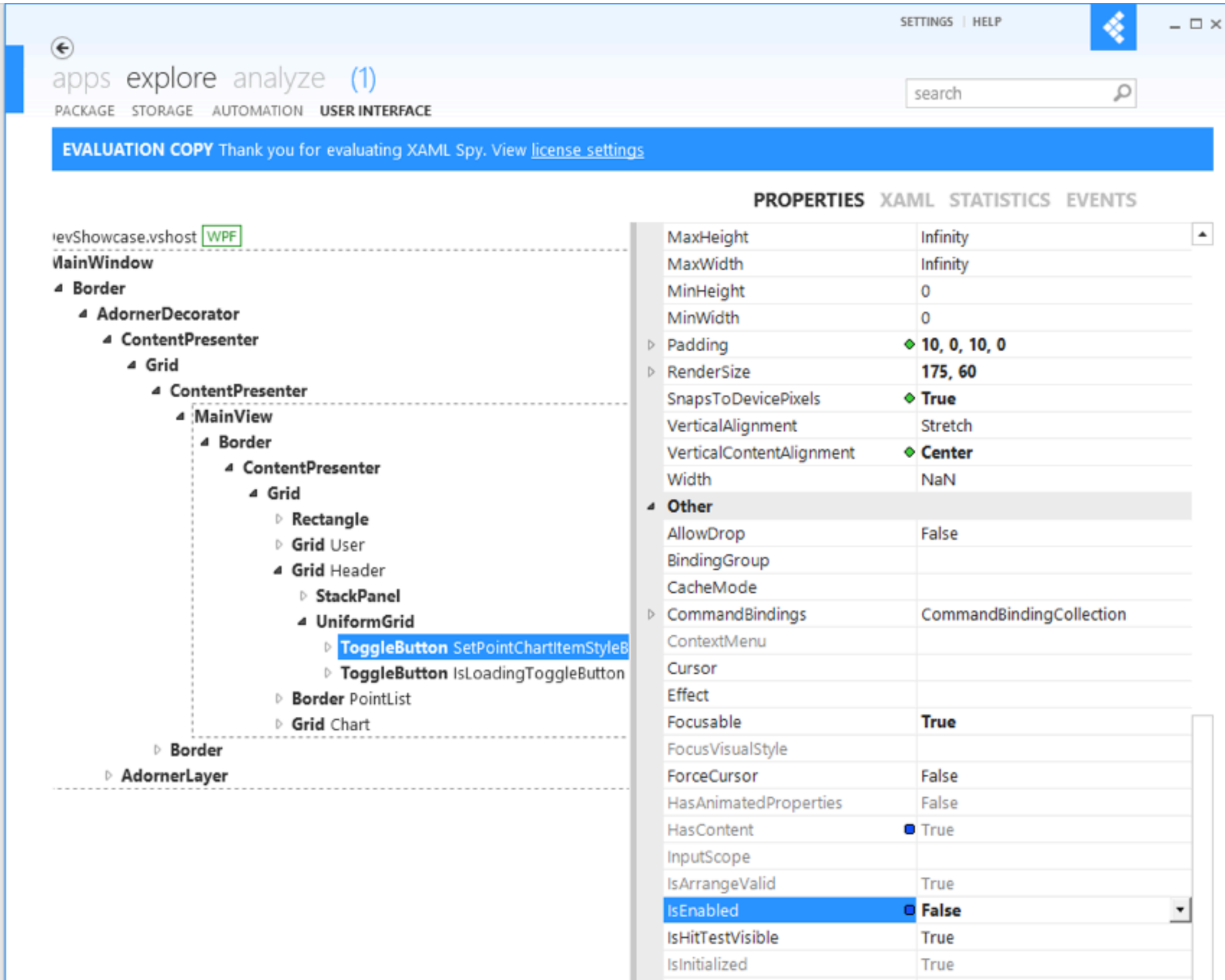
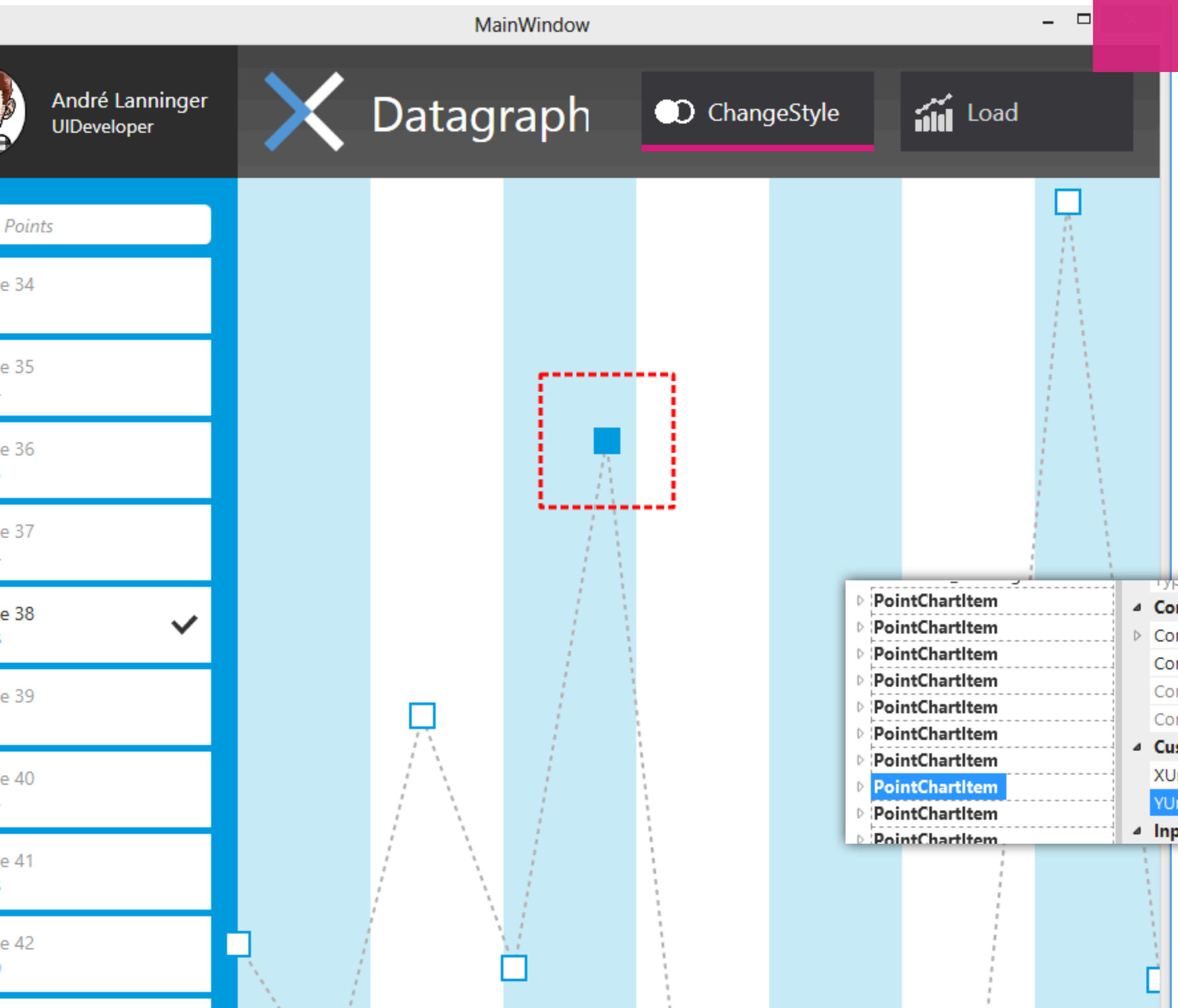




› **Live** Property Editing

Xaml Spy

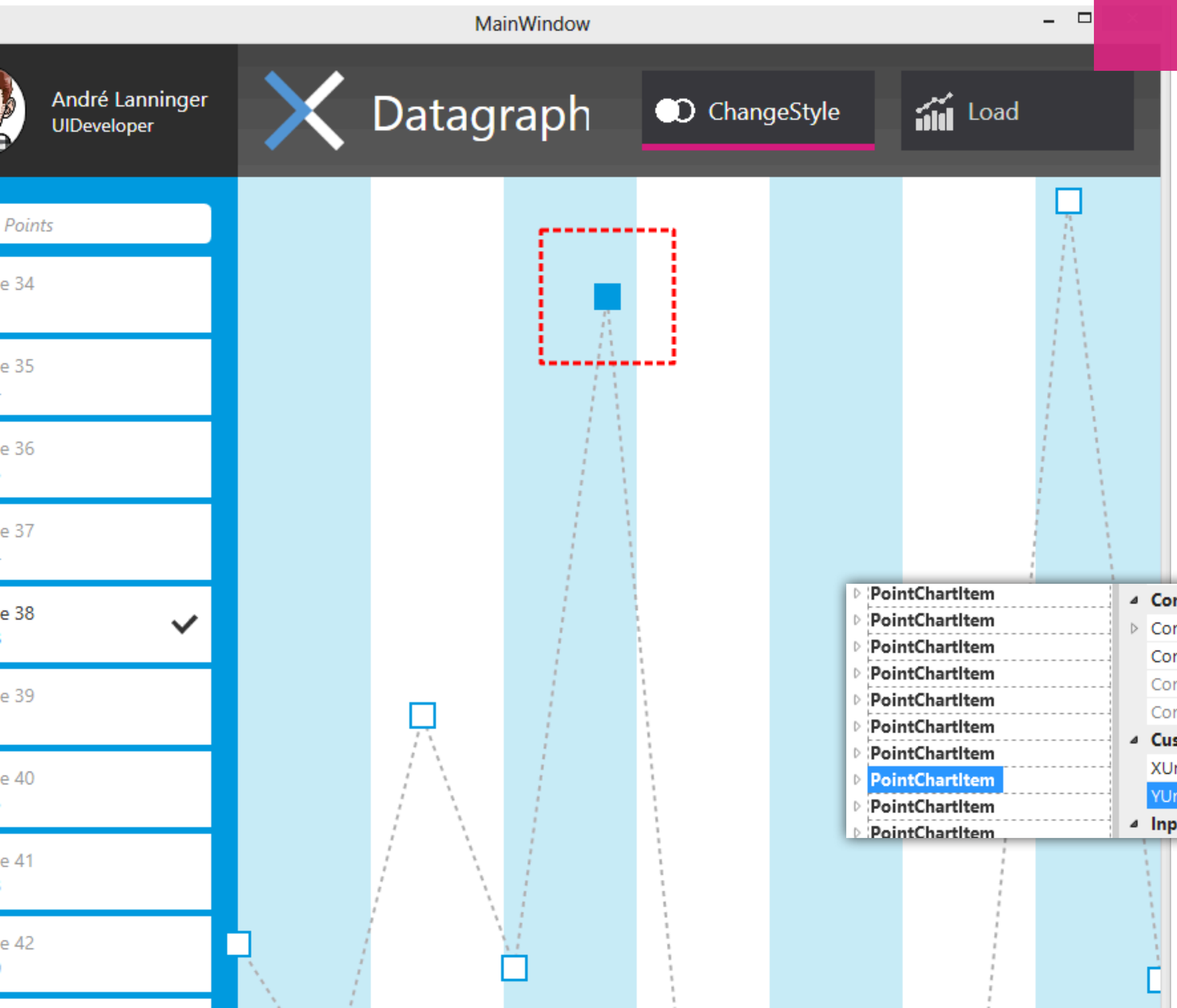
(Alternative WPF Inspector)



- **Live** Property Editing

Xaml Spy

(Alternative WPF Inspector)



FAZIT

FAZIT

- WPF bietet die optimale Basis für Custom Control Development
- Custom Controls sinnvoll einsetzen
- Sorgen für mehr Konsistenz (Bausteine)
- Erhöhen die Produktivität (Implementierung, Blendability)

VIELEN DANK.

ERGOSIGN

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