B4X Booklets

B4X CustomViews

 Edition 2.2

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To search for a given word or sentence use the Search function in the Edit menu.

All the source code and files needed (layouts, images etc.) of the example projects in this guide are included in the SourceCode folder.

Updated for:
B4A version 11.0
B4i version 7.50
B4J version 9.10

B4X Booklets:
B4X Getting Started
B4X Basic Language
B4X IDE Integrated Development Environment
B4X Visual Designer
B4X Help tools

B4X CustomViews
B4X Graphics
B4X XUI B4**X** **U**ser **I**nterface
B4X SQLite Database
B4X JavaObject NativeObject
B4XPages Cross-platform projects

B4R Example Projects

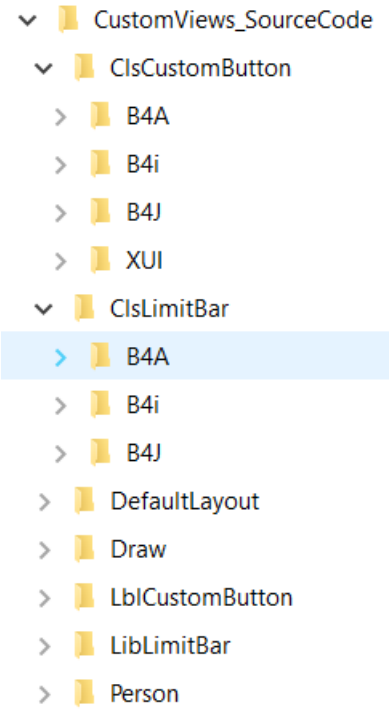
You can consult these booklets online in this link [B4X] Documentation Booklets.
Be aware that external links don't work in the online display.

1 General information

This guide is dedicated for more advanced users and treats the CustomView topic.

It covers B4A, B4i, B4J and XUI.

All the source code and files needed (layouts, images etc) for the example projects in this guide are included in the SourceCode folder.
For each project, there are three subfolders, one for each operating system.



2 Class modules

In B4X, you can use two types of Class Modules:

- Standard Class modules standard classes.
- CustomView Class Modules specialized for custom views.

2.1 Getting started

Classes definition from Wikipedia:

In object-oriented programming, a class is a construct that is used to create instances of itself – referred to as class instances, class objects, instance objects or simply objects. A class defines constituent members which enable its instances to have state and behaviour. Data field members (member variables or instance variables) enable a class instance to maintain state. Other kinds of members, especially methods, enable the behaviour of a class instances. Classes define the type of their instances.

A class usually represents a noun, such as a person, place or thing, or something nominalized. For example, a "Banana" class would represent the properties and functionality of bananas in general. A single, particular banana would be an instance of the "Banana" class, an object of the type "Banana".

Let us start with an example, the source code: *Person* in the / Person folder.

In the Person module

```
'Class Person module
Sub Class_Globals
   Private FirstName, LastName As String
   Private BirthDate As Long
End Sub

Sub Initialize (aFirstName As String, aLastName As String, aBirthDate As Long)
   FirstName = aFirstName
   LastName = aLastName
   BirthDate = aBirthDate
End Sub

Public Sub GetName As String
   Return FirstName & " " & LastName
End Sub

Public Sub GetCurrentAge As Int
   Return GetAgeAt(DateTime.Now)
End Sub

Public Sub GetAgeAt(Date As Long) As Int
   Private diff As Long
   diff = Date - BirthDate
   Return Floor(diff / DateTime.TicksPerDay / 365)
End Sub
```

Main module.

```
Sub Activity_Create(FirstTime As Boolean)
   Private p As Person
   p.Initialize("John", "Doe", DateTime.DateParse("05/12/1970"))
   Log(p.GetCurrentAge)
End Sub
```

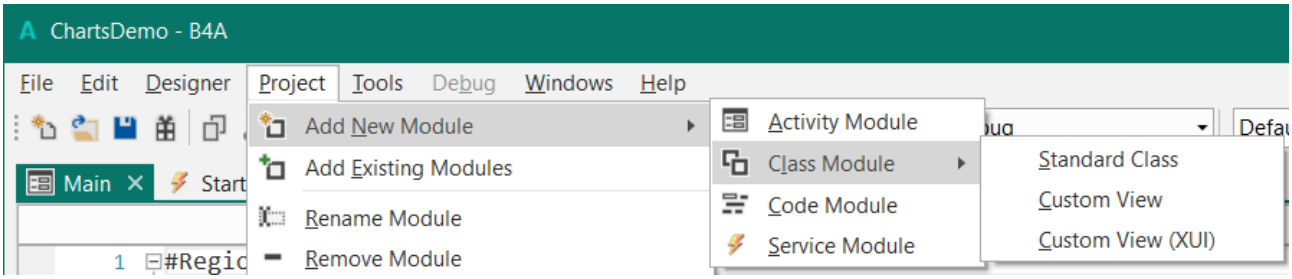
I will start by explaining the differences between classes, code modules and types.

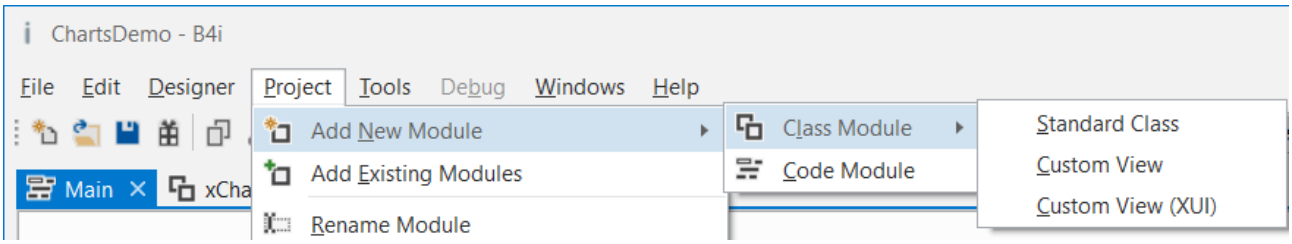
Similar to types, classes are templates. From this template, you can instantiate any number of objects.
The type fields are similar to the classes' global variables. However, unlike types which only define the data structure, classes also define the behaviour. The behaviour is defined in the classes' subs.

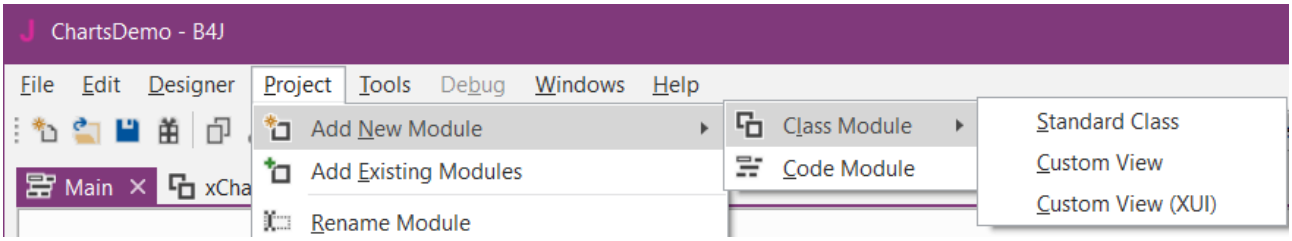
Unlike classes which are a template for objects, code modules are collections of subs. Another important difference between code modules and classes is that code modules always run in the context of the calling sub. The code module does not hold a reference to any context. For that reason, it is impossible to handle events or use CallSub with code modules.
Classes store a reference to the context of the module that called the Initialize sub. This means that classes objects share the same life cycle as the module that initialized them.

2.1.1 Adding a class module

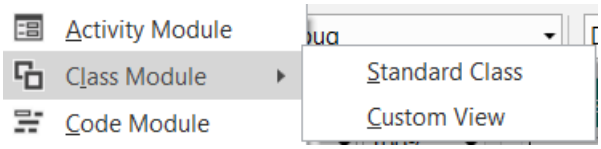
Adding a new or existing class module is done by choosing Project > Add New Module > Class module or Add Existing module.
Like other modules, classes are saved as files with *bas* extension.



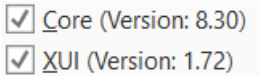




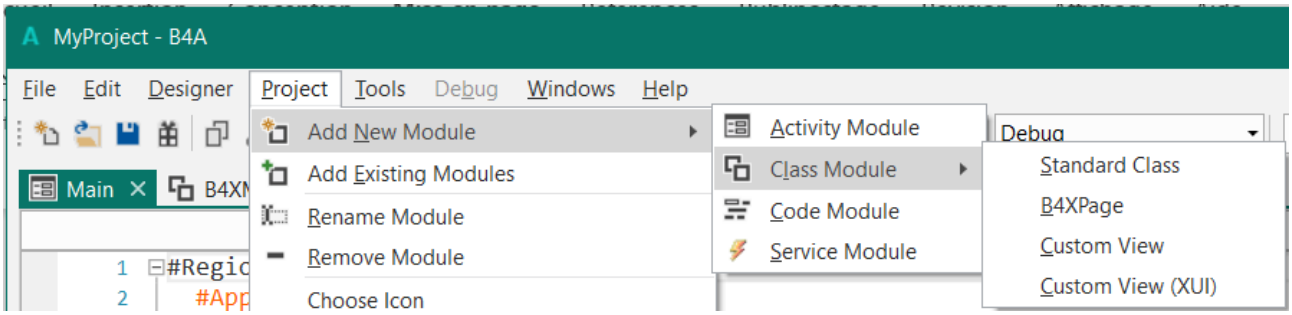
There are two class module types:
Standard Class
CustomView
CustomView (XUI)



The CustomView (XUI) is shown only when the XUI library is selected!



If you use the B4XPages template, you can select B4XPage to create a B4XPage class.



2.1.2 Polymorphism

Polymorphism allows you to treat different types of objects that adhere to the same interface in the same way.
B4X polymorphism is similar to the Duck typing concept.

As an example we will create two classes named: Square and Circle.
Each class has a sub named Draw that draws the object to a canvas:
Source code *Draw* in the Draw folder.

The code below is the B4A code.

```
'Class Square module
Sub Class_Globals
   Private mx, my, mWidth As Int
End Sub

'Initializes the object. You can add parameters to this method if needed.
Sub Initialize (Shapes As List, x As Int, y As Int, length As Int)
   mx = x
   my = y
   mLength = length
   Shapes.Add(Me)
End Sub

Sub Draw(c As Canvas)
   Private r As Rect
   r.Initialize(mx, my, mx + mLength, my + mLength)
   c.DrawRect(r, Colors.Red, False, 1dip)
End Sub


'Class Circle module
Sub Class_Globals
   Private mx, my, mRadius As Int
End Sub

'Initializes the object. You can add parameters to this method if needed.
Sub Initialize (Shapes As List, x As Int, y As Int, radius As Int)
   mx = x
   my = y
   mRadius = radius
   Shapes.Add(Me)
End Sub

Sub Draw(cvs As Canvas)
   cvs.DrawCircle(mx, my, mRadius, Colors.Blue, False, 1dip)
End Sub
```

In the main module, we create a list `Shapes` with Squares and Circles. We then go over the list and draw all the objects:

```
Sub Process_Globals
   Public Shapes As List
End Sub

Sub Globals
   Private cvs As Canvas
End Sub

Sub Activity_Create(FirstTime As Boolean)
   cvs.Initialize(Activity)
   Private Square1, Square 2 As Square
   Private Circle1 As Circle
   Shapes.Initialize
   Square1.Initialize(Shapes, 110dip, 110dip, 50dip)
   Square2.Initialize(Shapes, 10dip, 10dip, 100dip)
   Circle1.Initialize(Shapes, 50%x, 50%y, 100dip)

   DrawAllShapes
End Sub

Sub DrawAllShapes
   For i = 0 To Shapes.Size - 1
      CallSub2(Shapes.Get(i), "Draw", cvs)
   Next
   Activity.Invalidate
End Sub
```

As you can see, we do not know the specific type of each object in the list. We just assume that it has a Draw method that expects a single Canvas argument. Later we can easily add more types of shapes.
You can use the `SubExists` keyword to check whether an object includes a specific sub.

You can also use the `Is` keyword to check if an object is of a specific type.

2.1.3 Self-reference

The `Me` keyword returns a reference to the current object. `Me` keyword can only be used inside a class module.
Consider the above example. We have passed the Shapes list to the Initialize sub and then add each object to the list from the Initialize sub:

```
Sub Initialize (Shapes As List, x As Int, y As Int, radius As Int)
   mx = x
   my = y
   mRadius = radius
   Shapes.Add(Me)
End Sub
```

2.1.4 Activity object B4A only

This point is related to the Android Activities special life cycle.
Make sure to first read the activities and processes life-cycle tutorial.

Android UI elements hold a reference to the parent activity. As the OS is allowed to kill background activities in order to free memory, UI elements cannot be declared as process global variables (these variables live as long as the process lives). Such elements are named Activity objects. The same is true for custom classes. If one or more of the class global variables is of a UI type (or any activity object type) then the class will be treated as an "activity object". The meaning is that instances of this class cannot be declared as process global variables.

3 Standard class

3.1 Standard class structure

Default template of a standard class:

B4A and B4i

```
Sub Class_Globals

End Sub

'Initializes the object. You can add parameters to this method if needed.
Public Sub Initialize

End Sub
```

B4J

```
Sub Class_Globals
   Private fx As JFX
End Sub

'Initializes the object. You can add parameters to this method if needed.
Public Sub Initialize

End Sub
```

Only two routines are predefined:

`Sub Class_Globals` - This sub is similar to the Main Globals sub. These variables will be the class global variables (sometimes referred to instance variables or instance members).
In B4J, the fx library library is declared by default. You can remove it if not needed.

`Sub Initialize` - A class object must be initialized before you can call any other sub. Initializing an object is done by calling the Initialize sub. When you call Initialize you set the object's context (the parent object or service).
Note that you can modify this sub signature and add arguments as needed.

Example: Person class module
The source codes are in the Person folder.

The code is the same for all three B4X platforms (B4A. B4i, B4J).

```
'Class Person module
Sub Class_Globals
   Private mFirstName, mLastName As String
   Private mBirthDate As Long
End Sub

Sub Initialize (FirstName As String, LastName As String, BirthDate As Long)
   mFirstName = FirstName
   mLastName = LastName
   mBirthDate = BirthDate
End Sub

Public Sub GetName As String
    Return mFirstName & " " & mLastName
End Sub

Public Sub GetCurrentAge As Int
    Return GetAgeAt(DateTime.Now)
End Sub

Public Sub GetAgeAt(Date As Long) As Int
   Dim diff As Long
   diff = Date - mBirthDate
   Return Floor(diff / DateTime.TicksPerDay / 365)
End Sub
```

In the above code, we created a class named Person and later instantiate an object of this type in the main module:

```
   Private p As Person
   p.Initialize("John", "Doe", DateTime.DateParse("05/12/1970"))
   Log(p.GetCurrentAge)
```

Calling initialize is not required if the object itself was already initialized:

```
   Private p2 As Person
   p2 = p 'both variables now point to the same Person object.
   Log(p2.GetCurrentAge)
```

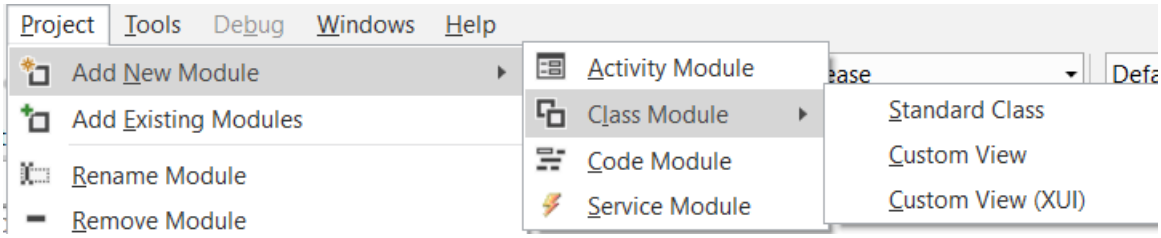
4 CustomViews

With custom view classes, you can create your own custom views which can be based on other standard or custom views, with more functions.

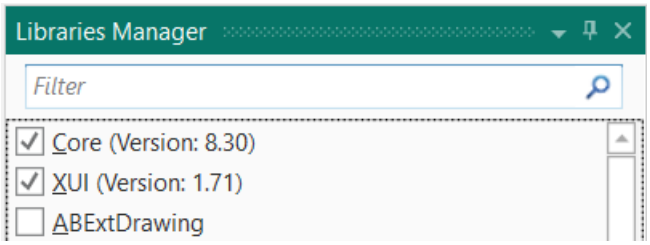
4.1 CustomView types

There are two CustomView types:

- CustomView
- CustomView (XUI)



To show the CustomView (XUI) option you must first add the XUI library.



The only differences between CustomView and CustomView (XUI) templates are the declarations.

- Standard

```
Private mBase As Panel 'ignore

Public Sub DesignerCreateView (Base As Panel, Lbl As Label, Props As Map)
```

- XUI

```
Private mBase As B4XView 'ignore

Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
```

Advice: Use directly XUI and B4XViews even for a mono platform project.

4.2 CustomView class structure

Several declarations and routines are predefined:

Default template of a CustomView class:

```
'Custom View class
#Event: ExampleEvent (Value As Int)
#DesignerProperty: Key: BooleanExample, DisplayName: Boolean Example, FieldType:
Boolean, DefaultValue: True, Description: Example of a boolean property.
#DesignerProperty: Key: IntExample, DisplayName: Int Example, FieldType: Int,
DefaultValue: 10, MinRange: 0, MaxRange: 100, Description: Note that MinRange and
MaxRange are optional.
#DesignerProperty: Key: StringWithListExample, DisplayName: String With List,
FieldType: String, DefaultValue: Sunday, List:
Sunday|Monday|Tuesday|Wednesday|Thursday|Friday|Saturday
#DesignerProperty: Key: StringExample, DisplayName: String Example, FieldType: String,
DefaultValue: Text
#DesignerProperty: Key: ColorExample, DisplayName: Color Example, FieldType: Color,
DefaultValue: 0xFFCFDCDC, Description: You can use the built-in color picker to find
the color values.
#DesignerProperty: Key: DefaultColorExample, DisplayName: Default Color Example,
FieldType: Color, DefaultValue: Null, Description: Setting the default value to Null
means that a nullable field will be displayed.

Sub Class_Globals
   Private mEventName As String 'ignore
   Private mCallBack As Object 'ignore
   Public mBase As Panel
   Public Tag As Object
   Private Const DefaultColorConstant As Int = -984833 'ignore
End Sub

Public Sub Initialize (Callback As Object, EventName As String)
   mEventName = EventName
   mCallBack = Callback
End Sub

Public Sub DesignerCreateView (Base As Panel, Lbl As Label, Props As Map)
   mBase = Base

End Sub

Public Sub GetBase As Panel
   Return mBase
End Sub
```

Additional routine in B4i and B4J:

```
Private Sub Base_Resize (Width As Double, Height As Double)

End Sub
```

This event routine is raised every time a resize occurs, device rotation in B4i or Form resize in B4J.

4.2.1 Event declarations

You should add Event declarations. If the event routine has parameters, these must also be declared.

```
#Event: ExampleEvent (Value As Int)
#RaisesSynchronousEvents: ExampleEvent
```

important for intellisense.
important for libraries.

4.2.2 Designer properties declarations

```
#DesignerProperty: Key: BooleanExample, DisplayName: Boolean Example, FieldType:
Boolean, DefaultValue: True, Description: Example of a boolean property.
```

You can add custom properties for the Designer.

More details in the chapter Custom view in the Designer.

4.2.3 Global variable declarations

In this routine, you should declare all global variables used in the class.

The variables below are mandatory.

```
Sub Class_Globals
   Private EventName As String 'ignore
   Private CallBack As Object  'ignore
   Private mBase As B4XView
End Sub
```

`EventName`	Event name used for the events in the code, same as for standard views.
`CallBack`	Module where the class is declared, used for event calls.
`mBase`	Main panel of the custom view.

You can, if you want, change the name of the base panel.

What is this for `'ignore` ?
It avoids a warning of the compiler that these variables are unused.

Variables only used in the class should be declared as `Private`.
If you want to have access to variables from other modules you must declare them as `Public`.

4.2.4 Initialization routine

The initialize routine initiates a new instance of the custom view.

You should not modify its signature.

```
Public Sub Initialize (Callback As Object, EventName As String)
   mCallBack = Callback
   mEventName = EventName
End Sub
```

The two variables will be used to call event routines in the module where the custom view is initialized.

Example:

```
' if a callback routine exists in the calling module we call it
If SubExists(mCallback, mEventName & "_ValuesChanged") Then
   CallSub3(mCallback, mEventName & "_ValuesChanged", mLimit(0), mLimit(1))
End If
```

4.2.5 Designer support routine DesignerCreateView

This routine assures the support for the Designer, it is called directly after the Initialize routine of the custom view class.

You should not modify its signature.

- Standard

  B4A and B4i
  ```
  Public Sub DesignerCreateView (Base As Panel, Lbl As Label, Props As Map)
    mBase = Base
  End Sub
  ```

  B4J
  ```
  Public Sub DesignerCreateView (Base As Pane, Lbl As Label, Props As Map)
    mBase = Base
  End Sub
  ```

- **XUI**
  ```
  Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
    mBase = Base
  End Sub
  ```

`Base` Is the base Panel / Pane / Object defined in the Designer, it holds the Left, Top, Width, Height and Parent properties of the custom view. The Base object can be used or not.

`Lbl` Is a Label which holds all the text properties defined in the Designer.
This Label can be used or not.

`Props` Is a Map holding additional properties.
The ones you defined yourself in the designer properties definition.

Default properties:
'activity' gets the parent view/node
```
mParent = Props.Get("activity")
```

Advice: Use directly XUI and B4XViews even for a mono platform project.

4.2.6 Routine to get the base Panel

You can use this routine if you want to access the base panel / pane from other modules.

B4A / B4i

```
Public Sub GetBase As Panel
   Return mBase
End Sub
```

B4J

```
Public Sub GetBase As Pane
   Return mBase
End Sub
```

XUI

```
Public Sub GetBase As Object
  Return mBase
End Sub
```

In the calling module:

```
Private pnlClass As Panel
pnlClass = clsTest.GetBase
```

```
Private pnlClass As Pane
pnlClass = clsTest.GetBase
```

```
Private pnlClass As B4XView
pnlClass = clsTest.GetBase
```

Advice: Use directly XUI and B4XViews even for a mono platform project.

4.3 Adding a custom view by code

To offer the possibility to add the custom view by code you must add a routine in the class which adds the custom view onto a parent view which can be either for:

B4A	an Activity or a Panel.	`Public Sub AddToParent(Parent As Activity,`
B4i	a Panel.	`Public Sub AddToParent(Parent As Panel,`
B4J	a Pane.	`Public Sub AddToParent(Parent As Pane,`
XUI	a B4XView	`Public Sub AddToParent(Parent As Object,`

Example:

```
Public Sub AddToParent(Parent As B4XView, Left As Int, Top As Int, Width As Int, Height
As Int)
   mBase.Initialize("mBase")
   Parent.AddView(mBase, Left, Top, Width, Height)
End Sub
```

`Parent`	is the parent view which can be an Activity, Panel or a Pane.
`Left`	is the `Left` property.
`Top`	is the `Top` property.
`Width`	is the `Width` property.
`Height`	is the `Height` property.

You can add other parameters or properties to the routine if necessary.

And in the calling module:

B4A / B4i

```
Private clsTest2 As ClsCustomView

clsTest2.Initialize(Me, "clsTest2")
clsTest2.AddToParent(MyPanel, 10dip, 10dip, 200dip, 50dip)
```

B4J Pane instead of Panel and no dip values.

```
Private clsTest2 As ClsCustomView

clsTest2.Initialize(Me, "clsTest2")
clsTest2.AddToParent(MyPane, 10, 10, 200, 50)
```

XUI Panel, with dip values (the dip values have no effect in B4J).

```
Private clsTest2 As ClsCustomView

clsTest2.Initialize(Me, "clsTest2")
clsTest2.AddToParent(MyPanel, 10dip, 10dip, 200dip, 50dip)
```

4.4 Add properties

Property routines can be added, which work like any property of the standard views.

These properties can be read and or set.

To read a property you must add a routine beginning with `get`, **lower case** and the property name.
Examples:
Get the *Left* Property.

```
'gets the Left property
Public Sub getLeft As Int
   Return ltbPanelBack.Left
End Sub
```

Get the custom *Max* property.

```
'gets the Max value
Public Sub getMax As Int
   Return MaxValue
End Sub
```

To set a property you must add a routine beginning with `set`, **lower case** and the property name.
Examples:
Set the *Left* Property.

```
'sets the Left property
Public Sub setLeft(Left As Int)
   ltbPanelBack.Left = Left
End Sub
```

Set the custom *Max* property.

```
'sets the Max value
Public Sub setMax(MaxValue As Int)
   mMaxValue = MaxValue
   Scale = (x1 - x0) / mMaxValue
End Sub
```

If you define only a `get` routine the property is read only.
If you define only a `set` routine the property is write only.
If you define both a `set` and a `get` routine, the property is write and read.

Note:
`Public Sub setMax` and `Public Sub SetMax` are not the same!

`Public Sub setMax` is considered as a Property.
Usage: xxx.Max = 100

`Public Sub SetMax` is considered as a Public Subroutine.
Usage: xxx.SetMax(100)

4.5 Add Events

You can add events seen from outsides the class.

In the class you can add event routines like in any other interface module.
From the internal event routines, you can call external routines generating external events.

Example: TheTouch event of the xClsLimitBar project.

4.5.1 Code in the Class

Code in the class, Touch event of the front panel, which is a B4XView (Panel / Pane), Unrelevant code has been removed, for simplification:

```
Private Sub ltbPanelFront_Touch (Action As Int, X As Double, Y As Double)
   ' check if the cursor is outsides the limits
   Private xx As Double
   xx = X
   xx = Max(x0, xx)
   xx = Min(x1, xx)

   ' select the Action type
   Select Action
      Case ltbPanelFront.TOUCH_ACTION_DOWN
         If xx < Abs(PositionPixels(0) + PositionPixels(1)) / 2 Then
            ' if X is closer to the left cursor we choose it
            PosIndex = 0
         Else
            ' otherwise we choose the right cursor
            PosIndex = 1
         End If
      Case ltbPanelFront.TOUCH_ACTION_MOVE
         If xui.SubExists(mCallback, mEventName & "_ValuesChanged", 2) Then
            CallSub3(mCallback, mEventName & "_ValuesChanged", mLimit(0), mLimit(1))
         End If

      Case ltbPanelFront.TOUCH_ACTION_UP
         'call the ValuesChanged routine if it exists
         If xui.SubExists(mCallback, mEventName & "_ValuesChanged", 2) Then
            CallSub3(mCallback, mEventName & "_ValuesChanged", mLimit(0), mLimit(1))
         End If
   End Select
End Sub
```

We use the CallSub keyword to generate the ‘external’ event.
There are different routines depending on the number of parameters to transmit.

- **CallSub**(Component As Object, Sub As String)
- **CallSub2**(Component As Object, Sub As String , Argument As Object)
- **CallSub3**(Component As Object, Sub As String , Argument1 As Object, Argument2 As Object)

Component = the calling object.
In the example : mCallBack which is initialized in the Initialize routine.
Sub = sub name. Composed of EventName and event type.
In the example : `mEventName & "_ValuesChanged"`
`mEventName` Event name, initialized in the Initialize routine.
`"_ValuesChanged"` Event type.
Argument = prarameter(s) to transmit.

`mCallback` and `mEventName` initialization:

```
Public Sub Initialize(Callback As Object, EventName As String)
   mCallback = Callback
   mEventName = EventName
```

You can use Objects like List, Map, Type variable or Array to transmit more arguments.

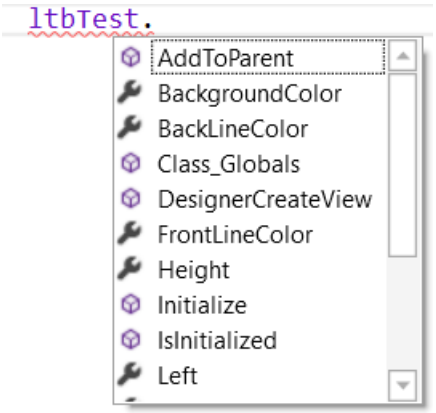
4.5.2 Event declaration in the class

These declarations are added at the top of the class.

```
'Events declaration
```

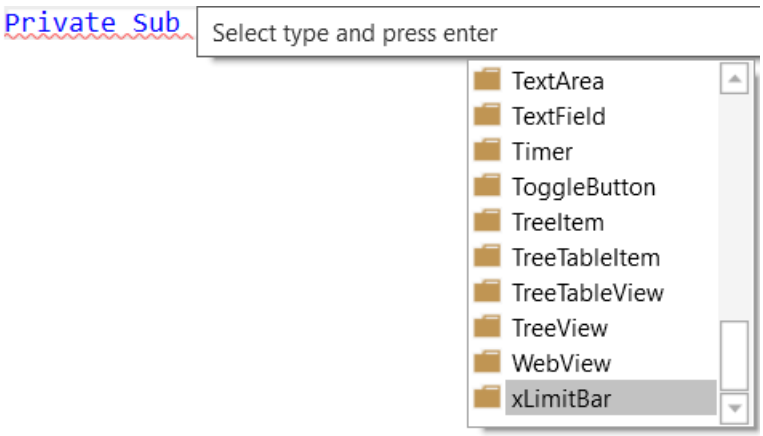
- `#Event: ValuesChanged(LimitLeft As Int, LimitRight As Int)`

  Important for intellisense to show properties and methods.



- `#RaisesSynchronousEvents: ValuesChanged`

  Important to show the intellisence for event routines.



4.5.3 Code in the calling module

Event routine in the calling module.
In the example: **`ltbTest_ValuesChanged`** with two parameters.

```
Private ltbTest As xLimitBar

Private Sub ltbTest_ValuesChanged(LimitLeft As Int, LimitRight As Int)
   lblLimitLeft.Text = LimitLeft
   lblLimitRight.Text = LimitRight
End Sub
```

4.6 Custom view and custom properties in the Designer

You can add code to make custom properties visible in the Designer.
The images below are from the DefaultLayout project in the *CustomViews\CustomViewsSourceCode\DefaultLayout* folder.
Only the B4A version.

On the top of the code you must include declaration lines. The default layout of a custom view class includes these example declarations:

```
#DesignerProperty: Key: BooleanExample, DisplayName: Boolean Example, FieldType:
Boolean, DefaultValue: True, Description: Example of a boolean property.
#DesignerProperty: Key: IntExample, DisplayName: Int Example, FieldType: Int,
DefaultValue: 10, MinRange: 0, MaxRange: 100, Description: Note that MinRange and
MaxRange are optional.
#DesignerProperty: Key: StringWithListExample, DisplayName: String With List,
FieldType: String, DefaultValue: Sunday, List:
Sunday|Monday|Tuesday|Wednesday|Thursday|Friday|Saturday
#DesignerProperty: Key: StringExample, DisplayName: String Example, FieldType: String,
DefaultValue: Text
#DesignerProperty: Key: ColorExample, DisplayName: Color Example, FieldType: Color,
DefaultValue: 0xFFCFDCDC, Description: You can use the built-in color picker to find
the color values.
#DesignerProperty: Key: DefaultColorExample, DisplayName: Default Color Example,
FieldType: Color, DefaultValue: Null, Description: Setting the default value to Null
means that a nullable field will be displayed.
```

Each property declaration is made of several fields, the following fields are required:

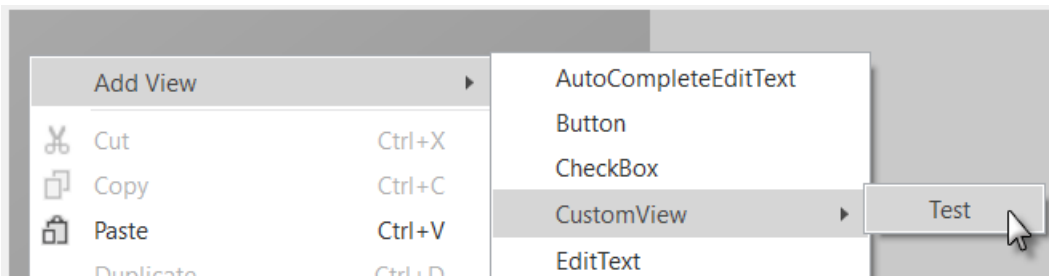
`Key`	Is the key value for the Map. This will be used to get the value from the Props map.
`DisplayName`	Is the name displayed in the Designer property grid.
`FieldType`	Is the type of the field. Possible values: String, Int, Double, Boolean or Color.
`DefaultValue`	Is the default value which is set in the Designer.

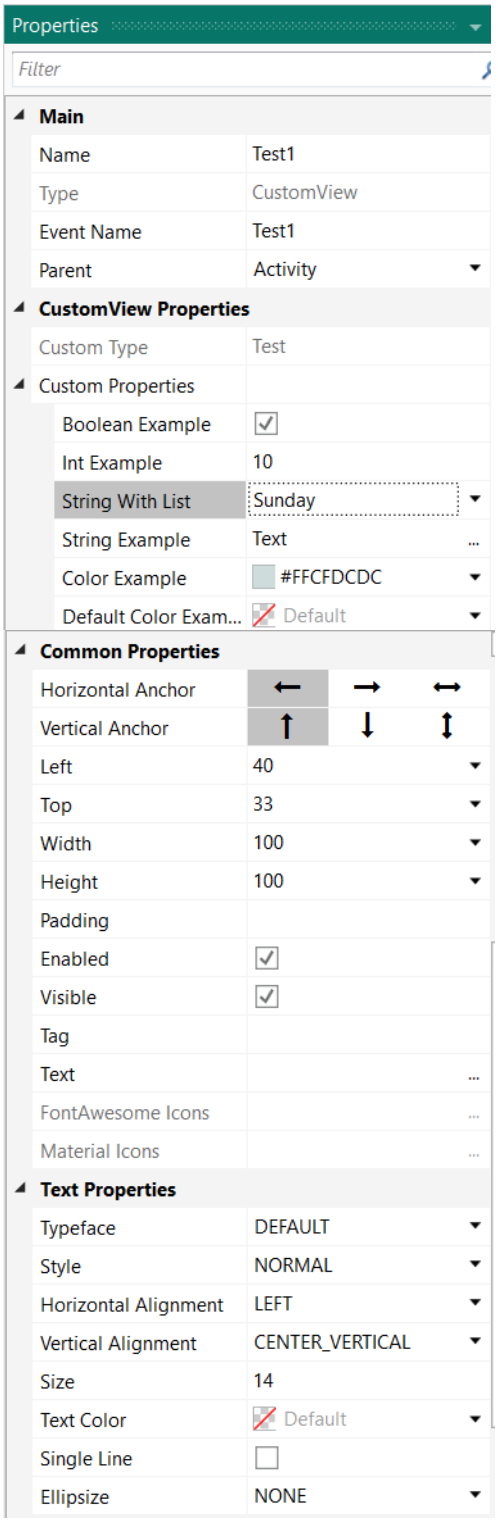
Optional fields:

`Description`	Is the explanation text displayed in the Designer.
`MinRange` / `MaxRange`	Minimum and maximum numeric values allowed.
`List`	A pipe (|) separated list of items from which the developer can choose (should be used with string fields).

In the Designer, you can add a CustomView like this:

Right click in the screen area, select Add View and select CustomView.
Select the custom from the list of available custom views *Test* in the example.



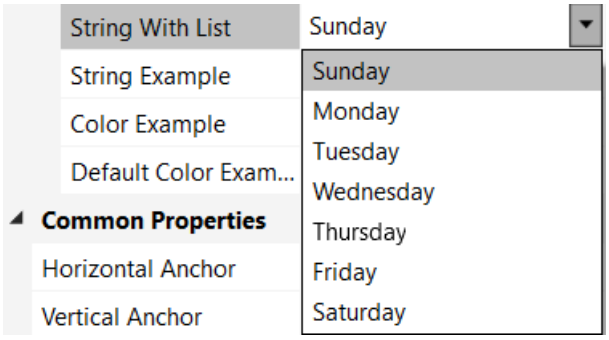


In the Properties window, you find all the properties for the selected custom view.
Images B4A.

Custom properties:

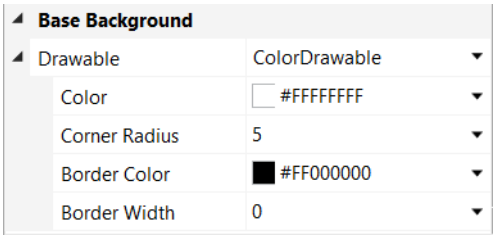
Here we see the six custom properties declared on top of the Class code.

Example with the String With List property.



Common Properties:
The common properties like any view.

Text Style:
The properties are set to the `Lbl` Label of the class.



v
Base Background:
Background of the base panel `Base`.

To access the custom properties you must use the Props Map in the **DesignerCreateView** routine.

Variable declaration:

```
Private BooleanTest As Boolean
Private IntTest As Int
Private Day As String
Private StringTest As String
Private ColorTest As Int
Private DefaultColorTest As Int
```

And the DesignerCreateView routine:

```
Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
   mBase = Base

   BooleanTest = Props.Get("BooleanExample")
   IntTest = Props.Get("IntExample")
   Day = Props.Get("StringWithListExample")
   StringTest = Props.Get("StringExample")
   ColorTest = xui.PaintOrColorToColor(Props.Get("ColorExample"))
   DefaultColorTest = Props.Get("DefaultColorExample")
End Sub
```

You can also get properties with default values with `Props.GetDefault`, like this:

```
BooleanTest = Props.GetDefault("BooleanExample", True)
```

This is useful especially when you add new Designer properties later on.
Then, if you do not open and close the Designer with an ‘old’ layout you will get an error because the new property is unknown in the old layout.

The declarations of the **DesignerCreateView** routine are different depending on the product.

B4A / B4i
```
Public Sub DesignerCreateView (Base As Panel, Lbl As Label, Props As Map)
```

B4J the Base declaration is different, Pane instead of Panel.
```
Public Sub DesignerCreateView (Base As Pane, Lbl As Label, Props As Map)
```

XUI the Base declaration is different, Object instead of Panel or Pane.
```
Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
```

You can get properties of the Base Panel / Pane like:

B4A / B4i / B4J
```
Private mWidth As Int
mWidth = Base.Width

Private mHeight As Int
mHeight = Base.Height
```

You can get text properties from the Lbl Label like:

B4A
```
Private mText As String
mText = Lbl.Text

Private mTextColor As Int
mTextColor = Lbl.TextColor

Private mTextSize As Float
mTextSize = Lbl.TextSize
```

B4i
```
Private mText As String
mText = Lbl.Text

Private mTextColor As Int
mTextColor = Lbl.TextColor

Private fnt As Font
Private mTextSize As Float
fnt = Lbl.Font
mTextSize = fnt.Size
```

B4J
```
Private mText As String
mText = Lbl.Text

Private mTextColor As Paint
mTextColor = Lbl.TextColor

Private mTextSize As Double
mTextSize = Lbl.TextSize
```

XUI
```
Private mText As String
mText = Lbl.Text

Private mTextColor As Int
mTextColor = xui.PaintOrColorToColor(Lbl.TextColor)
```
we must convert the color.

```
Private mTextSize As Double
mTextSize = Lbl.TextSize
```

4.7 Add layouts to a CusomView

You can add specific layouts to a CustomView.

Code to load a layout.

```
Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
   mBase = Base

   Sleep(0)
   mBase.LoadLayout("CustomViewLayout")
End Sub
```

This code loads the *CustomViewLayout* onto mBase.
Note: `Sleep(0)` before loading the layout.
This is necessary to make sure that the dimensions of mBase are OK.

You need one layout file for each product!

If you create a B4X Libary you must add the layout files in the Files folder of the library.
See more details in chapter Generate a B4X Library *.b4xlib.

4.8 Libraries

Why should we create a library?

- Break large projects into several smaller (more maintainable) projects.
- Build reusable components and use them from any number of projects.
- Share components with other developers without sharing the source code.
- Create different versions of your application (free, pro...) by referencing the same "core" library.
- Share cross platform libraries (B4X Libraries).

4.8.1 Generate a B4X Library *.b4xlib

You can also create XUI cross platform libraries: **xxx.b4xlib**.
B4X libraries were introduced in B4A 8.80, B4i 5.50 and B4J 7.00

These libraries contain cross platform classes which don't need to be compiled as libraries.

A B4X library is a simple zip file with the following structure:

- Code modules. All types are supported including Activities and Services.
- Files, including layout files.
- Optional manifest file with the following fields:
  - Version
  - Author
  - DependsOn (list of required libraries), Supported Platforms. Fields can be shared between the platforms or be platform specific.
  - Comment: adds a comment to the library.
    This comment will be shown in the Libaries Manager Tab.

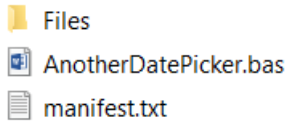
Files and code modules can also be platform specific.

Creating a b4x library is simple. You just need to create a zip file with these resources. The zip file extension should be b4xlib. That is all.

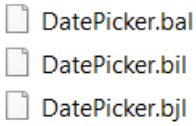
Note that the source code can be extracted from a b4x library.

B4X libraries appear like all other libraries in the Libraries Manager tab.

Example: AnotherDatePicker.b4xlib
The zip file structure:



- *Files* contains all the needed files, the three layout files in the example.

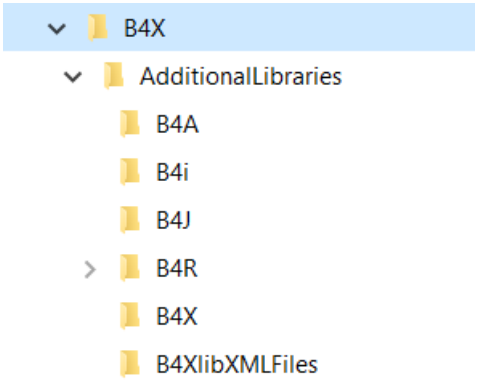
- *AnotherDatePicker.bas* is the Custom View file.
- *manifest.txt* contains:

```
Version=2.00                        version number.
Author=Erel                         version number.
B4J.DependsOn=jXUI, jDateUtils      libraries used for B4J.
B4A.DependsOn=XUI, DateUtils        libraries used for B4A.
B4i.DependsOn=iXUI, iDateUtils      libraries used for B4i.
IDE Comment= Test version 12        IDE comment, optional
```

  Be careful, no empty character between Comment and =.
  IDE Comment = will not be displayed.

Copy the xxx.b4xlib file to the AdditionalLibaries\B4X folder.

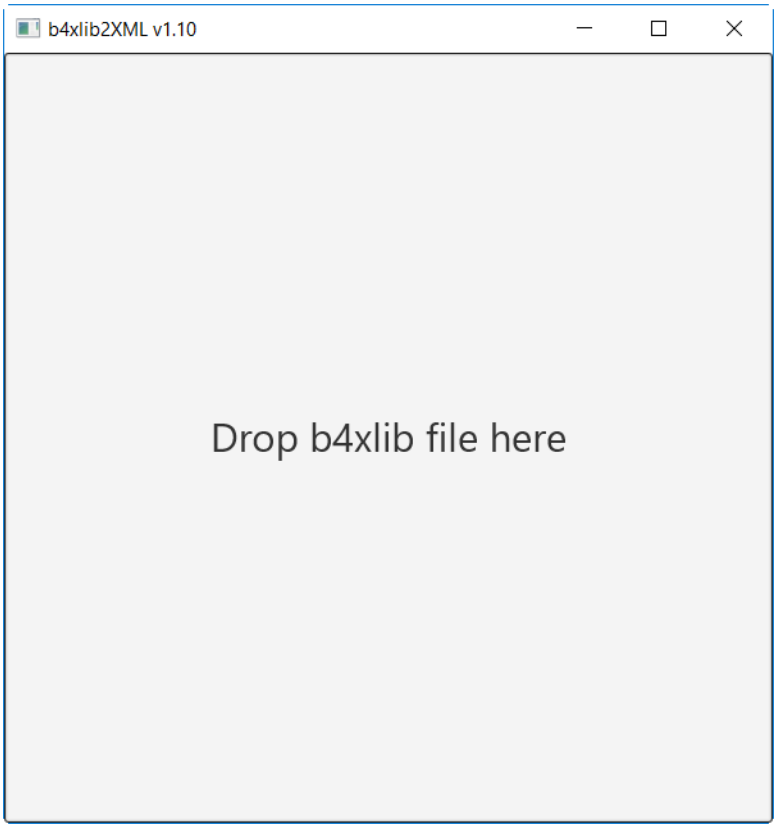
4.8.1.1 AdditionalLibraries folder



Structure of the AdditionalLibraries folder:

4.8.1.2 Xml help files for B4X Libraries

Erel has written an application to create xml help files for B4X Libraries.



You can download it from the forum HERE.

It looks like this:

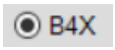
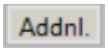
Simply, drag and drop a xxx.b4xlib file into the from.
The xml file will be created, and you will be asked where you want to save it.

Tip:
Save all the b4xlib xml files into a specific folder.
Example: \AdditionalLibraries\B4XlibXMLFiles.

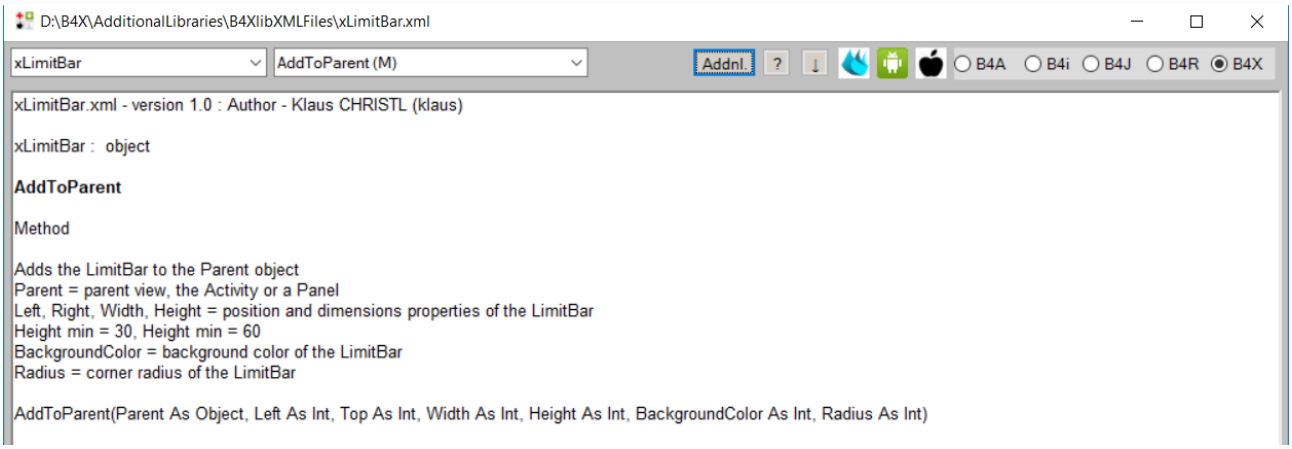
The xml files are useful for the HelpViewer applications like:
B4X Help Viewer
B4X Object Browser

If you have the [B4X Help Viewer] you can look at the help for the library.

Example with the B4A LimitBar library.

Select  and click on  and load xLimitBar.xml.

And the result.



4.8.2 Complie to a product specific library

In B4A, B4i and B4J you can compile your project, or part of it to a regular library.

For cross platform libtaries you should use B4XLibraies!
You can use B4XLibs even for mono platform projects.

The output of library compilation is:

- Two files for B4A and B4J:
  A jar file with the compiled code and a xml file that includes the metadata that is required by the IDE.
  These two files are automatically saved in the additional libraries folders.
- Three files for B4i:
  The xml file like above which is copied to the additional libraries folders.
  And, an xxx.a and a xxx.h file are created in the Mac Libs folder.

You can exclude other modules as well with the ExcludeFromLibrary attribute.

```
#ExcludeFromLibrary: True
```

The Main module ia always excluded from the library!

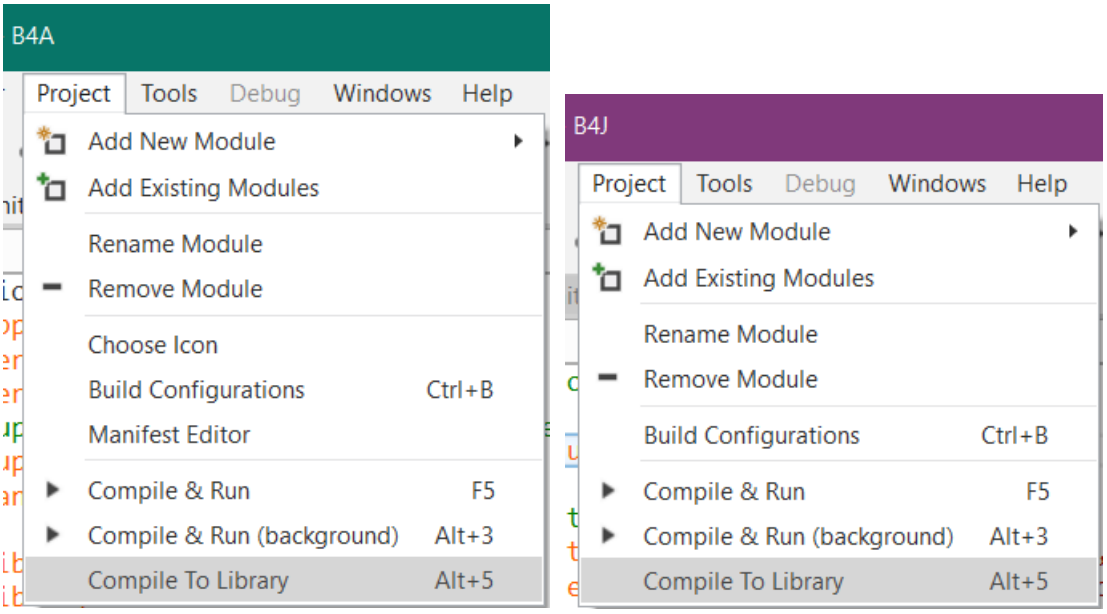
The Main module and the other excluded modules can be used to test the library.

You can reference the library from other projects and access the same functionality as in the original project.

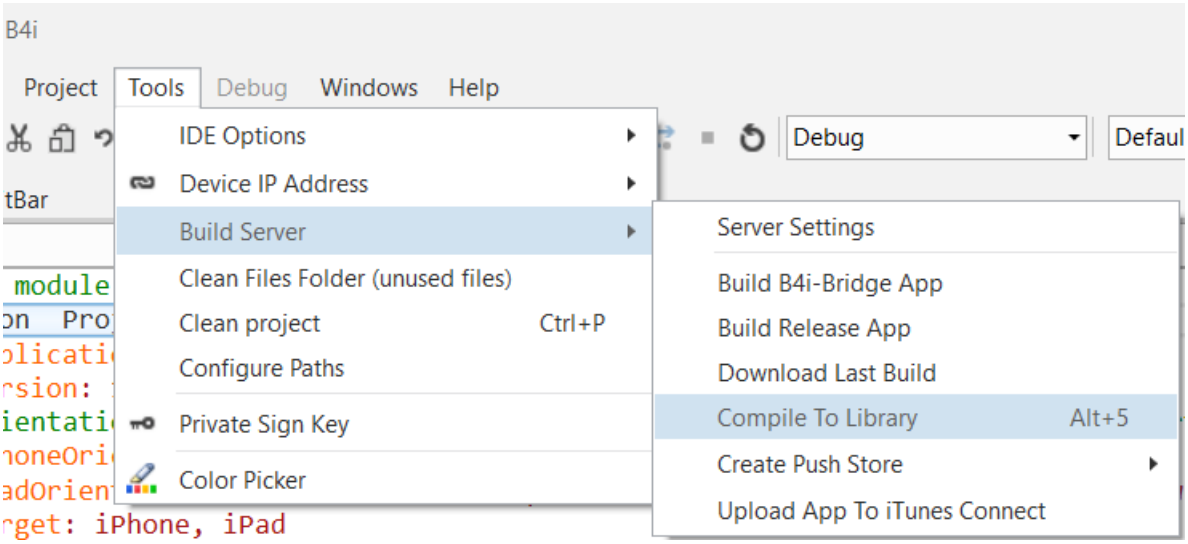
XUI:
With XUI, a cross platform CustomView class code module can be a unique module shared between the projects for the three products. You can make a B4XLibrary with it.
But, if you want to compile the CustomView to a library, you must compile three libraries, one for each product, because the library code is product specific.

Compiling to a platform specific library is quite simple.
Under Project menu there is the compile option - "Compile To Library (Alt + 5)".
When you choose this option all the modules **except** of the main activity are compiled into a library.

B4A **B4J**

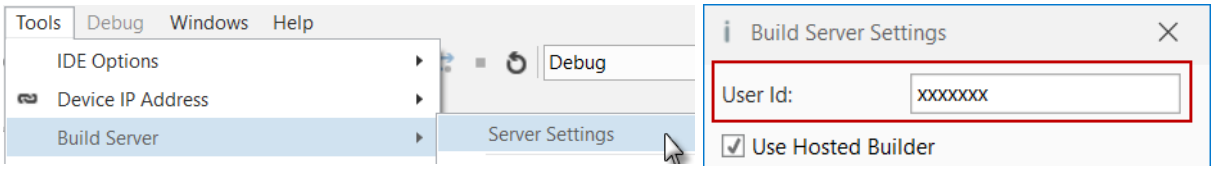


B4i



Note: If you are using the hosted builder then you need to first receive a permission to compile a specific library. Please contact support@basic4ppc.com and send your hosted builder id and the library name.

You find the hosted builder id in Tools / Build Server / Server Settings.



4.8.2.1 Library specific attributes

The following attributes are specific for library compilation:

Main module:

Project attributes (placed on top of the code in the Main module):
`#LibraryName`
- The compiled library name. Sets the library name.
`#LibraryAuthor`
- The library author. This value is added to the library xml file.
`#LibraryVersion`
- A number that represents the library version. This number will appear next to the library name in the libraries list.

Example, LimitBar projects.

B4A
```
#LibraryName: xLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

B4i
```
#LibraryName: ixLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

B4J
```
#LibraryName: jxLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

All modules:
`#ExcludeFromLibrary` - Whether to exclude this module during library compilation. Values: True or False. Note that the Main activity is always excluded.

CustomView classes:
`#Event` - Adds an event to the list of events. This attribute can be used multiple times.
The parameters must be included.
Note that the events list only affects the IDE events autocompletion feature.
`#RaisesSynchronousEvents` - Needed if you compile the CustomView into a library.
It is used for the Rapid Debugger. You need one for each event.
Details in the LimitBar project here.

Example, xLimitBar projects.
```
#Event: ValuesChanged(LimitLeft As Int, LimitRight As Int)
#RaisesSynchronousEvents: ValuesChanged
```
`ValuesChanged` is the name of the event for its call.

If you have other modules in the same project which should not be in the library, you must add
```
#ExcludeFromLibrary: True
```

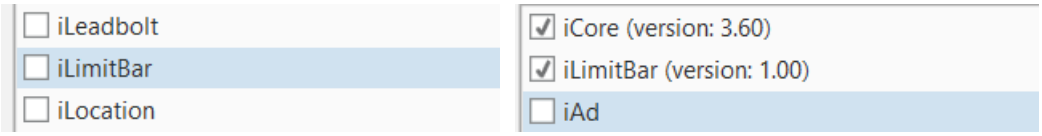
Notes

- You should right click on the libraries list and choose Refresh after a library update.
- CallSub / CallSubDelayed - The first parameter for these keywords is a reference to the target module. When working with modules that reside in a library you should pass the module reference and not the module name as string (this is the better way to reference all modules in all cases).
- Code obfuscation - Libraries can be obfuscated during library compilation. Strings will not be obfuscated in this mode.
- Services that host home screen widgets cannot be compiled into a library.

The library files are automatically saved in the Additional Libraries folder.

You can see it in the Libraries Manager Tab.

Right click somewhere in the Libraries Manager Tab and click on Refresh.



Example with the B4i LimitBar project.

The library name is the name you entered in `#LibraryName: jxLimitBar`.

When you select the library, it moves on top of the list and shows the version number.
You should not have the modules and the library in the same project!

When you declare a custom view, you must use the Module/Object name:
Library: jxLimitBar Object: xLimitBar

```
Private ltbTest, ltbTest1 As xLimitBar
```

4.8.2.2 Tip for MaterialIcons and Fontawesome fonts

If you use FontAwesome or MaterialIcons fonts in a class which is compiled into a library, you may get an error like this one:

```
Error occurred on line: 25 (Main)
java.lang.RuntimeException: Font asset not found b4x_fontawesome.otf
      at android.graphics.Typeface.createFromAsset(Typeface.java:879)
```

To avoid this, add the line below in the Main module where you use the library, not in the code where you compile the library.

B4A:

```
If False Then Log(Typeface.MATERIALICONS)
```

and/or

```
If False Then Log(Typeface.FONTAWESOME)
```

B4i:

```
If False Then Log(Typeface.MATERIALICONS)
```

and/or

```
If False Then Log(Typeface.FONTAWESOME)
```

B4J:

```
If False Then Log(Typeface.MATERIALICONS)
```

and/or

```
If False Then Log(Typeface.FONTAWESOME)
```

4.9 Program flow

Below, a comparison of the program flow with two custom views, one added in the Designer and the other in the code.

B4A	B4i	B4J
0 Process_Globals	0 Process_Globals	0 Process_Globals
0 Globals	0 Application_Start	0 AppStart
0 Activity_Create	1 Class_Globals	1 Class_Globals
1 Class_Globals	1 Class Initialize	1 Class Initialize
1 Class Initialize	1 DesignerCreateView	1 DesignerCreateView
1 DesignerCreateView	1 Base_Resize	1 Base_Resize
2 Class_Globals	2 Class_Globals	2 Class_Globals
2 Class Initialize	2 Class Initialize	2 Class Initialize
2 AddToParent	2 AddToParent	2 AddToParent
0 Activity_Resume	0 Page1_Resize	0 MainForm_Resize
Turn device	**Turn device**	**Resize Main Form**
0 Activity_Pause	0 Page1_Resize	0 MainForm_Resize
1 Class_Globals	1 Base_Resize	1 Base_Resize
1 Class Initialize		
1 DesignerCreateView		
2 Class_Globals		
2 Class Initialize		
2 AddToParent		
0 Activity_Resume		

0 = Main
1 = CustomView Designer
2 = CustomView code

Note: The B4A example project above has no Starter service module.

We notice that when we start the program the flow is the same in B4i and B4J but in B4A it is a bit different.

When we turn the B4i device or resize the B4J form the program flow is the same.
In B4A it is quite different.

In B4A, the Activity is destroyed and recreated.
In B4i and B4J, the layout remains and a Resize event is raised.

The advantage of adding custom views in the Designer, in B4i and B4J, is that it handles the resize event and reapplies the anchors and designer script (and variant changes).
In B4A this is also executed because the Activity is recreated at every change.
This is shown in the LimitBar projects.

4.10 Intellisense help

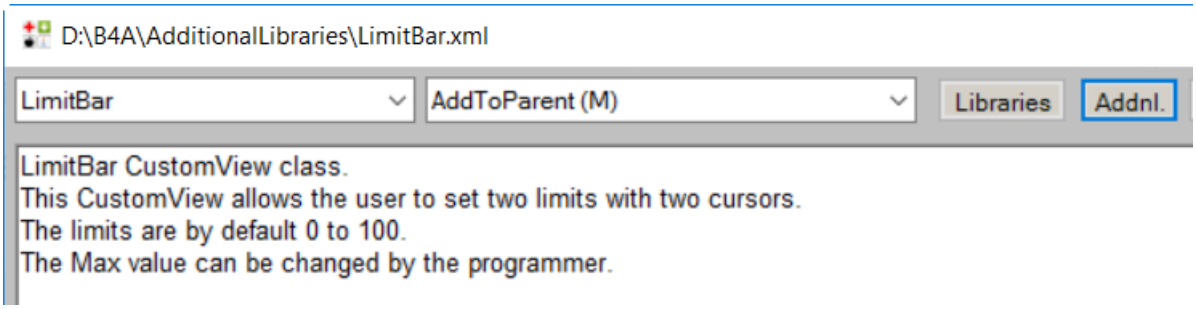
It is adviced to add help comments in the code for the users of your library.

4.10.1 Comments before Sub Class_Globals

Comments before `Sub Class_Globals` are considered as the help header when the class is compiled to a Library.

```
'LimitBar CustomView class.
'This CustomView allows the user to set two limits with two cursors.
'The Min value is 0 and the Max value is 100.
'The Max value can be changed by the programmer.
Sub Class_Globals
```

Example with the B4X Help Viewer and the LimitBar library.

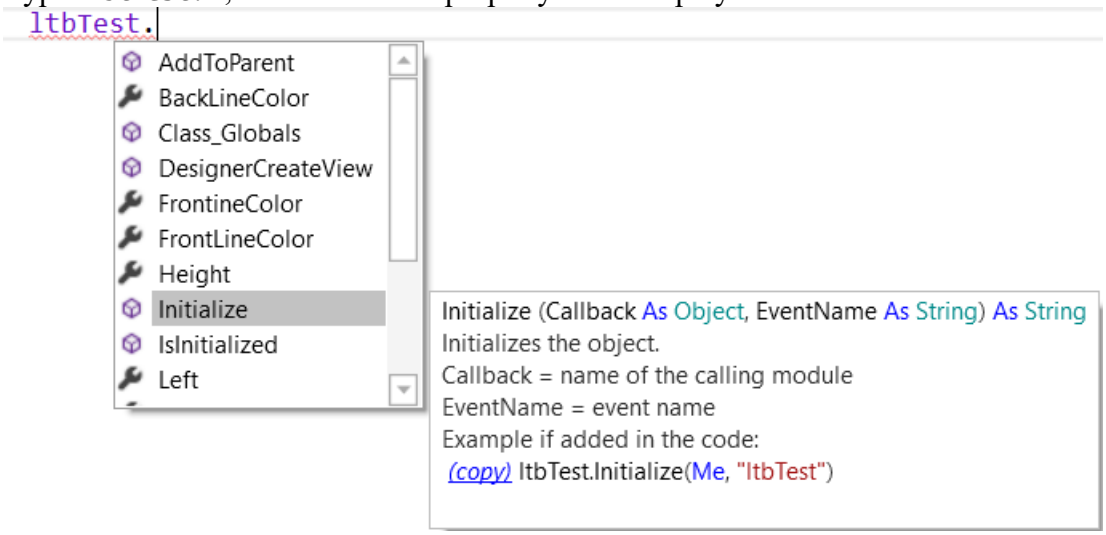


4.10.2 Comments before a routine

Comments before a routine are considered as intellisense help.

```
'Initializes the object.
'Callback = name of the calling module
'EventName = event name
'Example if added in the code:
'<code>ltbTest.Initialize(Me, "ltbTest")'</code>
Public Sub Initialize(Callback As Object, EventName As String)
```

Type ‘`lbtTest.`’ , the method and property list is displayed.

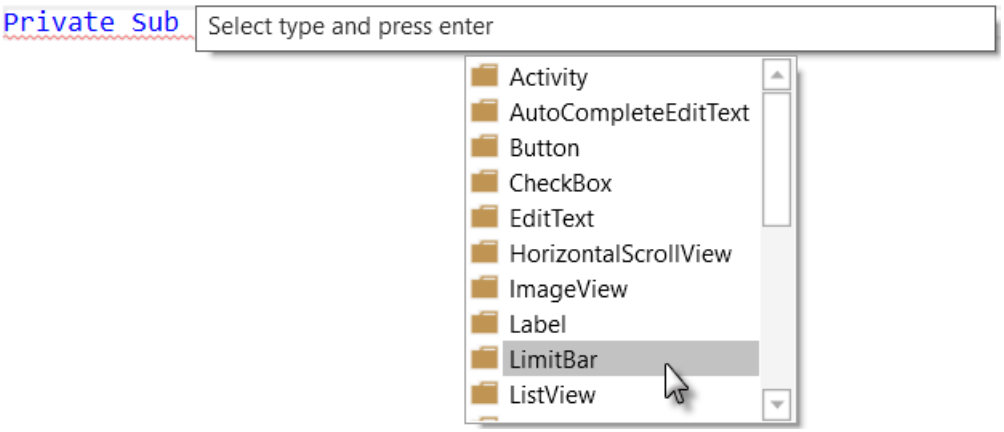


4.10.3 Comments before an event routine

Events declared on top of the code in the class module with `#Event:` are displayed as intellisense when the class is compiled to a Library.

```
'Custom View class LimitBar
'Events declaration
#Event: ValuesChanged(LimitLeft As Int, LimitRight As Int)
```

When you use the library in another project, type '`Public Sub '` (with a space at the end) and press on Tab to show the objects list.



Select LimitBar.

Select ValuesChanged(LimitLeft As Int, LimitRight As Int).

```
Private Sub EventName_ValuesChanged(LimitLeft As Int, LimitRight As Int)

End Sub
```

The sub frame is added.

```
Private Sub ltbTest1_ValuesChanged(LimitLeft As Int, LimitRight As Int)

End Sub
```

Enter the LimitBar name and press Return, and the sub frame is finished.

```
Private Sub ltbTest1_ValuesChanged(LimitLeft As Int, LimitRight As Int)

End Sub
```

4.11 CustomViews (XUI)

XUI CustomViews are like ‘standard’ CustomViews but cross platform.

4.11.1 CustomViews (XUI) class structue

Several declarations and routines are predefined:

Default template of a CustomView (XUI) class:

```
#DesignerProperty: Key: BooleanExample, DisplayName: Show Seconds, FieldType: Boolean,
DefaultValue: True
#DesignerProperty: Key: TextColor, DisplayName: Text Color, FieldType: Color,
DefaultValue: 0xFFFFFFFF, Description: Text color

Sub Class_Globals
   Private mEventName As String 'ignore
   Private mCallBack As Object 'ignore
   Public mBase As B4XView 'ignore
   Private xui As XUI 'ignore
End Sub

Public Sub Initialize (Callback As Object, EventName As String)
   mEventName = EventName
   mCallBack = Callback
End Sub

'Base type must be Object
Public Sub DesignerCreateView (Base As Object, Lbl As Label, Props As Map)
   mBase = Base
   Tag = mBase.Tag
   mBase.Tag = Me
   Dim clr As Int = xui.PaintOrColorToColor(Props.Get("TextColor")) 'Example of getting
a color value from Props
End Sub

Public Sub Base_Resize (Width As Double, Height As Double)

End Sub
```

It is similar to the ‘standard’ CustomView class.
The main differences are:

- Declaration of the XUI library.
- In the DesignerCreateView routine, the type of Base is Object and not a Panel or Pane.
- Example on how to get a color property.

All the other principles are the same, exept that you might use B4X objects instead of ‘standard’ objects.

4.12 GetView

To be able to get CustumView from a parent view, you can use the code below.

In the CustomView class add the code below in the DesignerCreateView routine, mBase is the base view of the CustomView:

```
mBase.Tag = Me
```

And in the main code, MyCustomView is the CustomView name:

```
Private MyView As MyCustoView = Parent.GetView(0).Tag
```

4.13 Add many CustomViews in the code

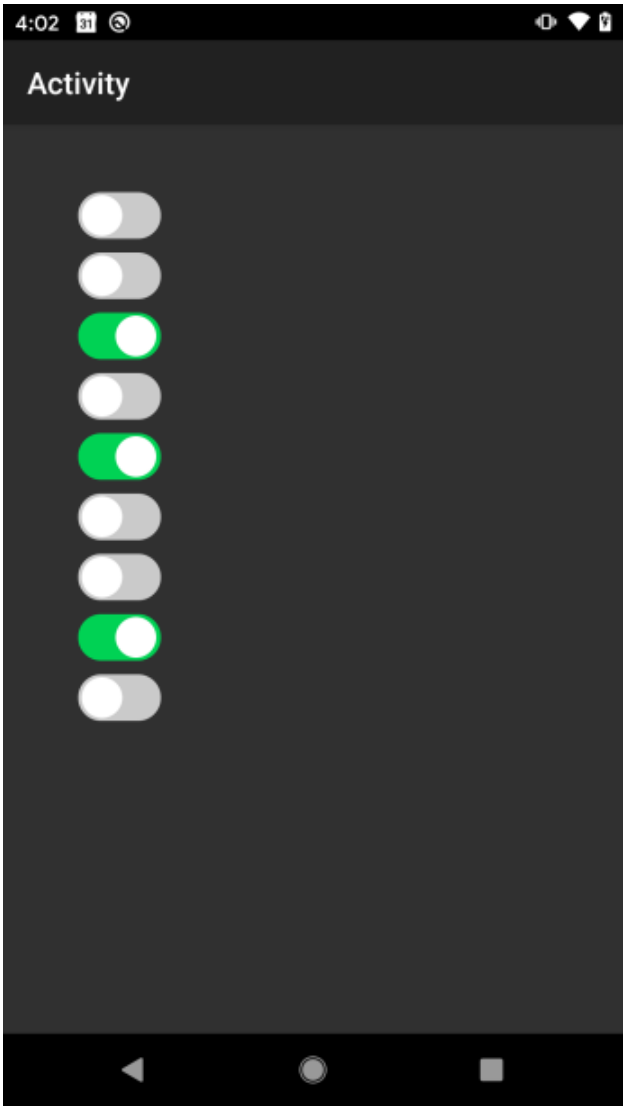
Custom views are designed to be added with the designer.

It is however very simple to create a layout file with the custom view and load it multiple times.

Tip: remove the call to AutoScaleAll from the designer script.

Complete example:

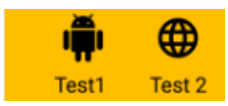
```
Sub Globals
   Private B4XSwitch1 As B4XSwitch
End Sub

Sub Activity_Create(FirstTime As Boolean)
   For i = 1 To 20
      AddSwitch(50dip, 40dip * i, i)
   Next
End Sub

Sub AddSwitch (Left As Int, Top As Int, Tag As Object) As B4XSwitch
   Activity.LoadLayout("B4XSwitch")
   B4XSwitch1.mBase.Left = Left 'B4XSwitch1 global variable will point to the last one
added
   B4XSwitch1.mBase.Top = Top
   B4XSwitch1.Tag = Tag
   Return B4XSwitch1
End Sub

Sub B4XSwitch1_ValueChanged (Value As Boolean)
   Dim switch As B4XSwitch = Sender
   Log(switch.Tag)
End Sub
```

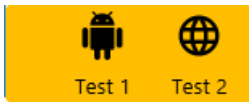


5 First example CustomButton

We will make a simple CustumButton.

B4A B4i B4J





The button has a transparent base Panel (B4A, B4i) / Pane (B4J) plus one Label with a Material Icon and a second Label with text.

The CustumButton can be added in the Designer or in the code.
For B4A, in the Designer, you must set the Alpha property to 0 to make sure that the base Panel is transparent.

The CustumButton has two events Click and LongClick.
B4J has no Click nor LongClick event, Click is called Action or MouseClicked.
I kept the Click name and added the LongClick event.

The code is kept simple and minimalistic, the main goal here is to show the principle.
Feel free to add more properties and functionalities.

There are three different projects, one for each product.
In chapter 6 you find the same project but XUI cross platform.
You can look at the differences in the different projects to see the power of XUI.

5.1 Event declarations

First, we declare the events on top of the code.
Needed when the class is compiled to a library.

```
'CustomButton Class
#Event: Click
#Event: LongClick
#RaisesSynchronousEvents: Click
#RaisesSynchronousEvents: LongClick
```

5.2 Custom properties for the Designer

We have only one custom property: Text.
This is the text below the icon.

The other properties, like icon character and text color, are defined in the Designer or in the AddToParent routine.
The icon and text sizes are calculated in the class code acording to the button height.

```
#DesignerProperty: Key: Text, DisplayName: Text, FieldType: String, DefaultValue: Text,
Description: Text at the bottom of the button.
```

5.3 Class help header

We add a header text, just before `Sub Class_Globals`, explaining the purpose of the button as a help for the user.

```
'CustomButton is a button based on a Panel with two Labels
'one with a Material Icon and the other with text.
'It has two events: Click and LongClick.
Sub Class_Globals
```

5.4 Global variables

We define the global variables below. There are some differences between the three operating systems.

B4A

```
Sub Class_Globals
   Private mEventName As String
   Private mCallBack As Object
   Private mBase As Panel

   Private mLeft, mTop, mWidth, mHeight As Int
   Private mText, mIcon As String
   Private mIconTypeface As Typeface
   Private mTextColor As Int
   Private mIconTextSize, mTextSize As Float
   Private mTag As Object

   Private mLabel, mIconLabel As Label
   Private mParent As Panel
End Sub
```

B4i `Typeface` is replaced by `Font`.

```
Private mIconTypeface As Font
```

B4J `Typeface` is replaced by `Font`. For the color `Int` is replaced by `Paint`.
We add another variable for the LongClick event timing

```
Private mIconTypeface As Font
Private mTextColor As Paint
Private mClickTime As Long      'used to distinguish Click and LongClick
Private mParent As Pane
```

XUI

```
Sub Class_Globals
#If B4J
   Private fx As JFX
   Private mClickTime As Long    'used to distinguish Click and LongClick
#End If
   Private mEventName As String
   Private mCallBack As Object
   Private xBase As B4XView                  ‘B4XView instead of Panel or Pane

   Private mLeft, mTop, mWidth, mHeight As Int
   Private mText, mIcon As String

   Private xLabelFont, xIconFont As B4XFont   ‘B4XFont instead of Typeface or Font

   Private mTextColor As Object                     ‘Object instead of Int
   Private mIconTextSize, mLabelTextSize As Double  ‘Double instead of Float
   Private mTag As Object

   Private mLabel, mIconLabel As Label
   Private xLabel, xIconLabel As B4XView      ‘Added
   Private mParent As B4XView                 ‘B4XView instead of Panel or Pane

   Private xui As XUI
End Sub
```

5.5 Initialize routine

We get the CallBack module and EventName and initialize three default values.

B4A / B4i

```
Public Sub Initialize (Callback As Object, EventName As String)
   mEventName = EventName
   mCallBack = Callback

   mIcon = Chr(0xE859)
   mText = "Test"
   mTextColor = Colors.Black
End Sub
```

B4J the color is `fx.Colors.Black` instead of `Colors.Black`.

```
mTextColor = fx.Colors.Black
```

XUI

```
mTextColor = xui.Color_Black
```

5.6 DesignerCreateView routine

Here we get the properties from the Designer.
We initialize mBase and add it to the parent view.
We need this because we use event routines of the base panel / pane.
Just setting `mBase = Base` does not enable to use events.

B4A

```
Public Sub DesignerCreateView (Base As Panel, Lbl As Label, Props As Map)
   mLeft = Base.Left
   mTop = Base.Top
   mWidth = Base.Width
   mHeight = Base.Height
   mIcon = Lbl.Text
   mText = Props.Get("Text")
   mBase.Initialize("mBase")
   mParent = Base.Parent
   Base.AddView(mBase, 0, 0, mWidth, mHeight)

   mTextColor = Lbl.TextColor
   mIconTypeface = Lbl.Typeface
   mTag = Base.Tag

   InitClass
End Sub
```

B4i `Typeface` is replaced by `Font`.

```
mIconTypeface = Lbl.Font
```

Plus, the Base_Resize routine.

B4J `Typeface` is replaced by `Font`. `Base.AddView` is replaced by `Base.AddNode`

```
mIconTypeface = Lbl.Font
Base.AddNode(mBase, 0, 0, mWidth, mHeight)
```

```
mHeight = Base.Height
```

Plus, the Base_Resize routine.
The `InitClass` routine, `mWidth = Base.Width` and `mHeight = Base.Height` are moved to the **`Base_Resize`** routine.

XUI `Typeface` is replaced by `Font`.

5.7 Base_Resize routine B4i / B4J only

The Base_Resize routine is called every time a resize is done.
Device orientation change in B4i or a Form resize in B4J.

B4i

```
Private Sub Base_Resize (Width As Double, Height As Double)
   mHeight = Height
   mWidth = Width
End Sub
```

B4J

```
Private Sub Base_Resize (Width As Double, Height As Double)
   mWidth = Width
   mHeight = Height
   mBase.PrefWidth = mWidth
   mBase.PrefHeight = mHeight

   InitClass
End Sub
```

5.8 AddToParent routine

This routine is needed when we add the CustomButton in the code.
We memorize the position, dimensions and properties.
And call InitClass

B4A / B4i

```
Public Sub AddToParent(Parent As Panel, Left As Int, Top As Int, Width As Int, Height
As Int, TextColor As Int, Icon As String, Text As String)
   mLeft = Left
   mTop = Top
   mWidth = Width
   mHeight = Height
   mParent = Parent

   mBase.Initialize("mBase")
   Parent.AddView(mBase, mLeft, mTop, mWidth, mHeight)

   mIcon = Icon
   mText = Text
   mTextColor = TextColor

   InitClass
End Sub
```

B4J `Parent.AddView` is relaced by `Parent.AddNode`.

```
Parent.AddNode(mBase, mLeft, mTop, mWidth, mHeight)
```

5.9 InitClass routine

Here we initialize the common part independent if the CustomButton is added in the Designer or in the code.

B4A

```
Private Sub InitClass
   'calculate the dimensions of the internal Labels
   Private lblLeft, lblWidth  As Int
   lblWidth = 2 * mHeight / 3    'icon Label width and height = 2/3 of button height
   lblLeft = (mWidth - lblWidth) / 2

   'initialize and add the icon Label
   mIconLabel.Initialize("")
   mIconTextSize = mHeight / 2 / GetDeviceLayoutValues.Scale            'B4A, B4i
   mIconLabel.Typeface = mIconTypeface                                  'B4A
   mIconLabel.TextSize = mIconTextSize                                  'B4A, B4J
   mIconLabel.Gravity = Gravity.CENTER                                  'B4A
   mIconLabel.TextColor = mTextColor
   mBase.AddView(mIconLabel, lblLeft, 0, lblWidth, lblWidth)            'B4A, B4i
   mIconLabel.Text = mIcon

   'initialize and add the text Label
   mLabel.Initialize("")
   mTextSize = lblWidth / 3 / GetDeviceLayoutValues.Scale               'B4A, B4i
   mLabel.TextSize = mTextSize                                          'B4A, B4J
   mLabel.TextColor = mTextColor
   mLabel.Gravity = Bit.Or(Gravity.CENTER_HORIZONTAL, Gravity.TOP)      'B4A
   mBase.AddView(mLabel, 0, 2 * mHeight / 3, mWidth, mHeight / 3)       'B4A, B4i
   mLabel.Text = mText
End Sub
```

`'B4A` means that this line is only for B4A and different from B4i and B4J.
`'B4A, B4i` means that this line is the same for B4A and B4i, but is different in B4J.

B4i

```
Private Sub InitClass
   'calculate the dimensions of the internal Labels
   Private lblLeft, lblWidth  As Int
   lblWidth = 2 * mHeight / 3    'icon Label width and height = 2/3 of button height
   lblLeft = (mWidth - lblWidth) / 2

   'initialize and add the icon Label
   mIconLabel.Initialize("")
   mIconTextSize = mHeight / 2 / GetDeviceLayoutValues.Scale            'B4i, B4A
   mIconFont = Font.CreateNew2(mIconFont.Name, mIconTextSize)           'B4i
   mIconLabel.Font = mIconFont                                          'B4i, B4J
   mIconLabel.TextAlignment = mIconLabel.ALIGNMENT_CENTER               'B4i
   mIconLabel.TextColor = mTextColor
   mBase.AddView(mIconLabel, lblLeft, 0, lblWidth, lblWidth)            'B4i, B4A
   mIconLabel.Text = mIcon

   'initialize and add the text Label
   mLabel.Initialize("")
   mTextSize = lblWidth / 3 / GetDeviceLayoutValues.Scale               'B4i, B4A
   mLabel.Font = Font.CreateNew(mTextSize)                              'B4i
   mLabel.TextColor = mTextColor
   mLabel.TextAlignment = mIconLabel.ALIGNMENT_CENTER                   'B4i
   mBase.AddView(mLabel, 0, 2 * mHeight / 3, mWidth, mHeight / 3)       'B4i, B4A
   mLabel.Text = mText
End Sub
```

B4J

```
Private Sub InitClass
   'calculate the dimensions of the internal Labels
   Private lblLeft, lblWidth  As Int
   lblWidth = 2 * mHeight / 3    'icon Label width and height = 2/3 of button height
   lblLeft = (mWidth - lblWidth) / 2

   'initialize and add the icon Label
   mIconLabel.Initialize("")
   mIconTextSize = mHeight / 2                                          'B4J
   mIconLabel.Font = mIconFont                                          'B4J, B4i
   mIconLabel.TextSize = mIconTextSize                                  'B4J, B4A
   mIconLabel.Alignment = "CENTER"                                      'B4J
   mIconLabel.TextColor = mTextColor
   mBase.AddNode(mIconLabel, lblLeft, 0, lblWidth, lblWidth)            'B4J
   mIconLabel.Text = mIcon

   'initialize and add the text Label
   mLabel.Initialize("")
   mTextSize = lblWidth / 3                                             'B4J
   mLabel.TextSize = mTextSize                                          'B4J, B4A
   mLabel.TextColor = mTextColor
   mLabel.Alignment = "TOP_CENTER"                                      'B4J
   mBase.AddNode(mLabel, 0, 2 * mHeight / 3, mWidth, mHeight / 3)       'B4J
   mLabel.Text = mText
End Sub
```

5.10 Click / LongClick event routines

The two event routines.

B4A / B4i

```
Private Sub mBase_Click
   If SubExists(mCallBack, mEventName & "_Click") = True Then
      CallSub(mCallBack,  mEventName & "_Click")
   End If
End Sub

Private Sub mBase_LongClick
   If SubExists(mCallBack, mEventName & "_LongClick") = True Then
      CallSub(mCallBack,  mEventName & "_LongClick")
   End If
End Sub
```

B4J
Very different, because the LongClick event doesn't exist in B4J.

```
Private Sub mBase_MousePressed (EventData As MouseEvent)
   mClickTime = DateTime.Now
End Sub

Private Sub mBase_MouseReleased (EventData As MouseEvent)
   If DateTime.Now - mClickTime < 500 Then
      If SubExists(mCallBack, mEventName & "_Click") = True Then
         CallSub(mCallBack,  mEventName & "_Click")
      End If
   Else
      If SubExists(mCallBack, mEventName & "_LongClick") = True Then
         CallSub(mCallBack,  mEventName & "_LongClick")
      End If
   End If
End Sub
```

In **mBase_MousePressed**, we memorize the time when the mouse is pressed.

In **mBase_MousePressed**, we check the time elapsed between press and release.
If the time is less than 500 milli-seconds, then we admid a Click and if time is longer we admit a LongClick event.

5.11 Property routines

Below the routine to set the IconTypeFace / IconFont property.

B4A

```
'set the icon typeface
'must be FontAwsome or Material Icons
Public Sub setIconTypeface(IconTypeface As Typeface)
   mIconTypeface = IconTypeface
End Sub
```

B4i / B4J

```
'set the icon typeface
'must be FontAwsome or Material Icons
Public Sub setIconFont(IconFont As Font)
   mIconFont = IconFont
End Sub
```

And the Tag property.

B4A / B4i / B4J

```
'get or set the Tag property
Public Sub setTag(Tag As Object)
   mTag = Tag
   mBase.Tag = Tag
End Sub

Public Sub getTag As Object
   Return mTag
End Sub
```

I haven’t added other properties to not overload the code.

5.12 Main code

5.12.1 Globals

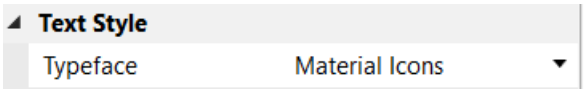
Only two variables, in addition to the default declarations in B4i and B4J.

B4A / B4i B4J

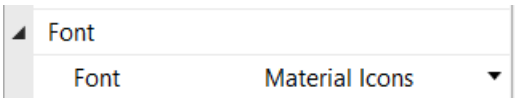
```
Sub Globals
   Private cbtTest10 As CustomButton
   Private lblDummy As Label
End Sub
```

We need a dummy invisible Label to get the Material Icons TypeFace / Font for the icon Label when the CustomButton is added in the code.

B4A



B4i / B4J



5.12.2 Program start

B4A

```
Sub Activity_Create(FirstTime As Boolean)
   Activity.LoadLayout("Main")

   cbtTest10.Initialize(Me, "cbtTest")
   cbtTest10.IconTypeface = lblDummy.Typeface
   cbtTest10.AddToParent(Activity, 20dip, 200dip, 60dip, 60dip, Colors.RGB(0, 0, 139),
Chr(0xE149), "Test 10")
   cbtTest10.Tag = 10
End Sub
```

B4i

```
Private Sub Application_Start (Nav As NavigationController)
   NavControl = Nav
   Page1.Initialize("Page1")
   Page1.Title = "Page 1"
   Page1.RootPanel.Color = Colors.White
   Page1.RootPanel.LoadLayout("Main")
   NavControl.ShowPage(Page1)

   cbtTest10.Initialize(Me, "cbtTest")
   cbtTest10.IconFont = lblDummy.Font
   cbtTest10.AddToParent(Page1.RootPanel, 30, 100, 60, 60, Colors.RGB(0, 0, 139),
Chr(0xE05C), "Test 10")
   cbtTest10.Tag = 10
End Sub
```

B4J

```
Sub AppStart (Form1 As Form, Args() As String)
   MainForm = Form1
   MainForm.RootPane.LoadLayout("Main") 'Load the layout file.
   MainForm.Show

   MainForm.Title = "jClsCustomButton"

   cbtTest10.Initialize(Me, "cbtTest")
   cbtTest10.IconFont = lblDummy.Font
   cbtTest10.AddToParent(MainForm.RootPane, 100, 100, 60, 60, fx.Colors.RGB(0, 0, 139),
Chr(0xE05C), "Test 10")
   cbtTest10.Tag = 10
End Sub
```

Besides the default operating system methods, the CustomButton declaration is also a bit different.

- Parent object: **B4A** Activity (Panel), **B4i** Page1.RootPanel, **B4J** MainForm.RootPane.
- Font type:
  B4A TypeFace
  `cbtTest10.IconTypeface = lblDummy.Typeface`
  B4i / B4J Font
  `cbtTest10.IconFont = lblDummy.Font`

5.13 Click event routine

The Click event routine is the same for all three operating systems:

```
Private Sub cbtTest_Click
   Private cbt As CustomButton
   Private Index As Int

   cbt = Sender
   Index = cbt.Tag

   Select Index
   Case 1
       Log("cbtTest1_Click")
   Case 2
       Log("cbtTest2_Click")
   Case 10
       Log("cbtTest10_Click")
   Case Else
       Log("cbtTest" & Index & "_Click")
   End Select
End Sub
```

I set the same event name for all CustomButtons and use the Tag property of the Sender object to know which button raised the event.

The LongClick event routine is almost the same, `LongClick` replaces `Click`.

5.14 Compile to Library

We add the library declarations on top of the code in the Main module.

B4A

```
#LibraryName: CustomButton
#LibraryAuthor: Klaus CHRISTL
#LibraryVersion: 1.0
```

B4i

```
#LibraryName: iCustomButton
#LibraryAuthor: Klaus CHRISTL
#LibraryVersion: 1.0
```

B4J

```
#LibraryName: jCustomButton
#LibraryAuthor: Klaus CHRISTL
#LibraryVersion: 1.0
```

And we compile the CustomButton module to a Library.

The Library files are automatically copied to the AdditionalLibraries folder.

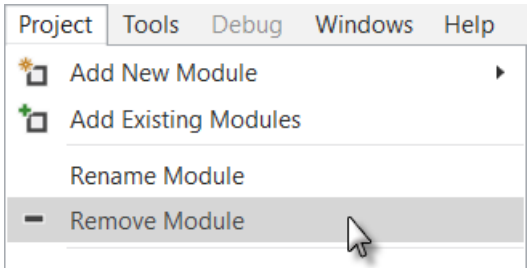
If you use the hosted compiler for B4i, you must ask Erel for permission to be able to compile a library.

5.15 Use the library in a program

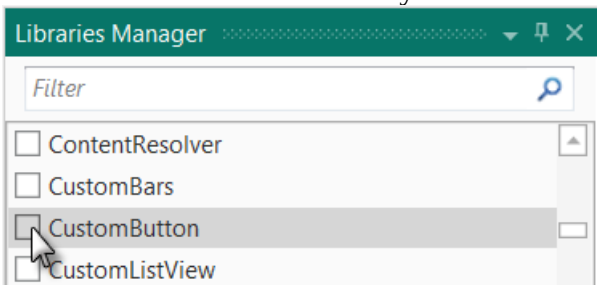
Copy the projects to new folders where you replace *Cls* by *Lib*.
The source codes are in the *LibCustomButton* folders

Then:

- Load the projects in the IDE.
- Rename the package name.
- Rename the `#ApplicationLabel: LblCustomButton` (B4A and B4i only)
- Remove the three lines:
```
#LibraryName: CustomButton
#LibraryAuthor: Klaus CHRISTL
#LibraryVersion: 1.0
```
- Remove the CustomButton class module.
Select the CustomButton module and remove it.



- Select the CustomButton library in the Labaraies Manager Tab.



- Run the program.

The rest of the code in the Main module remains the same.
The layout file remains the same.

6 XUI xCustomButton

This project is the same as the previous one, but a cross platform XUI project.

Again, one project for each product, but only one common CustomView module file saved in the B4J project and a relative link to it in B4A and B4i.

The projects source codes are in the xCustomButton folder.

7 XUI xLimitBar

Another concrete example, a LimitBar, which is a XUI CustomView.

The LimitBar looks like this, images from the B4J project:

Two cursors allow to define two limits between 0 and a max value.

In the demo program, we add two labels, one on each side, to display the two limit values these are not part of the custom view.

There are two projects for each operating system:

- ClsLimitBarDemo, project with the custom view class module.
- LibLimitBarDemo, project with the custom view as a library (class module compiled to a library), only for B4J, the principle is the same for the two other products .

It supports adding a xLimiBar in the Designer or in the code.
In the demo projects two xLimitBars are added, one in the Designer and one in the code.

The source codes are in the \ClsLimitBar folder, one folder for each operating system.
There is only one xLimitBar.bas file in the B4J project. The same file is used in B4A and B4i with a relative link to it.

We use two B4XView panels:

- `ltbPanelBack` the background with the background color and the red 'background' line.

- `ltbPanelFront` the foreground, transparent with the 'foreground' line and the two cursors.

and two B4XCanavas objects:

- `cvsPanelBack` to draw the background and background line onto `ltbPanelBack`.
- `cvsPanelFront` to draw the foreground line and the cursors onto `ltbPanelFront`.

7.1 Event declaration

On top of the code we declare the event:

```
'Events declaration
#Event: ValuesChanged(LimitLeft As Int, LimitRight As Int)
#RaisesSynchronousEvents: ValuesChanged
```

We need this for the intellisense system when the class module is compiled to a library.

7.2 Custom properties for the Designer

The xLimitBar has following custom properties:

- Max
  Sets or gets the max limit value when the curser is at the most right position.
  The default value is 100.
- LimitLeft
  Sets or gets the left limit value. The default value is 0.
- LimitRight
  Sets or gets the right limit value. The default value is 100.
- BackgroundColor
  Sets or gets the background. The default value is blue (0xFF0000FF).
- BackLineColor
  Sets or gets the back-line color. The default value is red (0xFFFF0000).
- FrontLineColor
  Sets or gets the front-line color. The default value is light blue (0x FF33B5E5).

To support setting these properties in the Designer we must declare them:

```
'Designer property declarations
#DesignerProperty: Key: Max, DisplayName: Max, FieldType: Int, DefaultValue: 100,
Description: Sets the max value.
#DesignerProperty: Key: LimitLeft, DisplayName: Left limit, FieldType: Int,
DefaultValue: 10, Description: Sets the left limit value.
#DesignerProperty: Key: LimitRight, DisplayName: Right limit, FieldType: Int,
DefaultValue: 100, Description: Sets the right limit value.
#DesignerProperty: Key: Radius, DisplayName: Radius, FieldType: Int, DefaultValue: 5,
Description: Sets the corner radius.
#DesignerProperty: Key: BackgroundColor, DisplayName: BackgroundColor, FieldType:
Color, DefaultValue: 0xFF0000FF, Description: Sets the background color.
#DesignerProperty: Key: BackLineColor, DisplayName: BackLineColor, FieldType: Color,
DefaultValue: 0xFFFF0000, Description: Sets the back line color.
#DesignerProperty: Key: FrontLineColor, DisplayName: FrontLineColor, FieldType: Color,
DefaultValue: 0xFF33B5E5, Description: Sets the front line color.
```

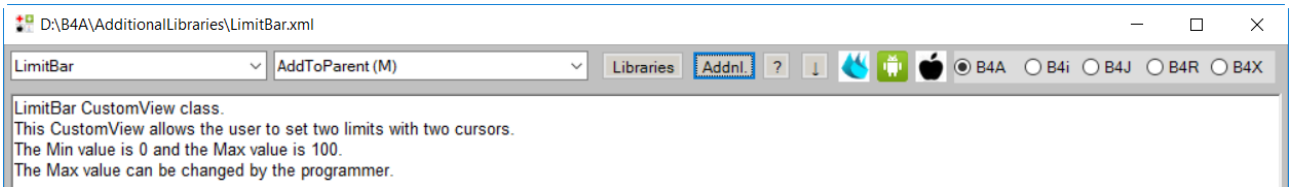
We will add also code to set or get these properties in the code.

7.3 Class help header

Class header help text, just before `Sub Class_Globals`.

```
'xLimitBar CustomView class cross platform.
'This CustomView allows the user to set two limits with two cursors.
'The Min value is 0 and the Max value is 100.
'The Max value can be changed by the programmer.
Sub Class_Globals
```

If you use the B4X Help Viewer you'll see this text when you load the library.



7.4 Global variables

In `Sub Class_Globals` we declare the objects and variables.

```
Sub Class_Globals
   Private xui As XUI
   Private mCallback As Object          ' calling module
   Private mEventName As String         ' event name
   Private xBase As B4XView
   Private xParent As B4XView

   Private mLeft, mTop, mWidth, mHeight, mRadius As Double

   Private ltbPanelBack As B4XView      ' the background panel
   Private ltbPanelFront As B4XView     ' the background panel
   Private cvsPanelBack As B4XCanvas    ' the background canvas
   Private cvsPanelFront As B4XCanvas   ' the foreground canvas
   Private rectPanelFront As B4XRect    ' a rectangle for the foreground canvas

   Private mBackgroundColor As Int      ' color for the background
   Private mBackLineColor As Int        ' color for the background line
   Private mFrontLineColor As Int       ' color for the foreground line
   Private mMargin As Double            ' left and right margins for the line
   Private x0, y0, x1, y1, y2 As Double' backline and cursor coordinates
   Private mMaxValue As Int             ' value of the Max property
   Private mScale As Double             ' scale between position value and pixels
   Private mLimit(2) As Int             ' value of the limits
   Private PositionPixels(2) As Double ' left and right positions in pixels
   Private PosIndex As Int
   ‘ two paths for the cursor shape and the background
   Private CursorPaths(2), BackgroundPath As B4XPath
End Sub
```

7.5 Initialize routine

Then we need the routine to initialize the xLimitBar, the code is self explanatory.
This routine is automatically called if you add the LimitBar in the Designer.
If you add the LimitBar in the code, you must call this routine first.
You should not modify the signature of this routine

```
'Initializes the object.
'Callback = name of the calling module
'EventName = event name
'Example if added in the code:
'<Code>ltbTest.Initialize(Me, "ltbTest")'</Code>
Public Sub Initialize(Callback As Object, EventName As String)
   mCallback = Callback
   mEventName = EventName

   ' initialize default values
   mBackgroundColor = xui.Color_Blue
   mBackLineColor = xui.Color_Black
   mFrontLineColor = xui.Color_RGB(51, 181, 229)
   mRadius = 10dip
   mMargin = 15dip
   mMaxValue = 100
   mLimit(0) = 0
   mLimit(1) = mMaxValue
End Sub
```

7.6 DesignerCreateView routine

Then we have the DesignerCreateView routine.
This routine is called automatically after Initialize when the xLimitBar is added in the Designer.
It is NOT used when you add the LimitBar in the code.

```
Public Sub DesignerCreateView(Base As Object, Lbl As Label, Props As Map)
   ' we use the Base panel as the background panel
   xBase = Base

   ' we memorize the Base Width and Height properties
   mLeft = xBase.Left
   mTop = xBase.Top
   mWidth = xBase.Width
   mHeight = xBase.Height

   ' we memorize the custom properties
   mMaxValue = Props.Get("Max")
   mLimit(0) = Props.Get("LimitLeft")
   mLimit(0) = Max(0, mLimit(0))       ' we check the min value, not less than 0

   'we set the two limit values
   mLimit(1) = Props.Get("LimitRight")
   mLimit(1) = Min(mMaxValue, mLimit(1)) ' we check the max value, not higher than Max

   'we get the Radius and color properties
   mRadius = DipToCurrent(Props.Get("Radius"))
   mBackgroundColor = xui.PaintOrColorToColor(Props.Get("BackgroundColor"))
   mBackLineColor = xui.PaintOrColorToColor(Props.Get("BackLineColor"))
   mFrontLineColor = xui.PaintOrColorToColor(Props.Get("FrontLineColor"))

   #If B4A
      InitClass     ' initializes the common parts for Designer and code
   #End If
End Sub
```

We use the Base Panel with the name `ltbPanelBack`, and get the custom properties from the Props Map object.

As the xLimitBar custom view can also be added in the code we initialize the rest in the `InitClass` routine.
In B4A, the InitClass routine is called from the **`DesignerCreateView`** routine.
In B4i and B4J it is called from the **`Base_Resize`** routine to make sure that the width and height are known!

```
#If B4A
   InitClass        ' initializes the common parts for Designer and code
#End If
```

7.7 Base_Resize routine B4i / B4J only

In B4i and B4J there is a specific routine `Private Sub Base_Resize`.
This routine is executed every time a resize is operated.

```
Private Sub Base_Resize (Width As Double, Height As Double)
   mWidth = Width
   mHeight = Height

   If ltbPanelBack.IsInitialized = False Then
      InitClass            ' initializes the common parts for Designer and code
   Else
      rectPanelFront.Width = mWidth
      rectPanelFront.Height = mHeight

      ltbPanelBack.Width = mWidth
      ltbPanelBack.Height = mHeight

      ltbPanelFront.Width = mWidth
      ltbPanelFront.Height = mHeight

      cvsPanelBack.Resize(mWidth, mHeight)
      cvsPanelFront.Resize(mWidth, mHeight)

      InitCursors
      DrawBackGround
      DrawCursors
   End If
End Sub
```

In B4J the width and height of the Base pane is known only in the **`Base_Resize`** routine.
This routine is called directly after **`DesignerCreateView`** when the xLimitBar is added in the Designer.
It is not called when the xLimitBar is added in the code.

7.8 AddToParent routine

The AddToParent routine.
This routine must be called when you add the LimitBar in the code.
It is not used when the LimitBar is added in the Designer.

```
'Adds the LimitBar to the Parent object
'Parent = parent view, the Activity or a Panel
'Left, Right, Width, Height = position and dimensions properties of the LimitBar
'Height min = 30, Height min = 60
'BackgroundColor = background color of the LimitBar
'Radius = corner radius of the LimitBar
Public Sub AddToParent(Parent As Object, Left As Int, Top As Int, Width As Int, Height
As Int, BackgroundColor As Int, Radius As Int)
   mLeft = Left
   mTop = Top
   mWidth = Width
   mHeight = Max(Height, 30dip)        ' limits the height to min 30 pixels
   mHeight = Min(Height, 60dip)        ' limits the height to max 60 pixels
   mRadius = Min(Radius, Height / 2)   ' limits the max radius to half the height
   mBackgroundColor = BackgroundColor
   xParent = Parent

   ' initialize the background panel ltbPanelBack and add it onto the parent view
   xBase = xui.CreatePanel("")
   xParent.AddView(xBase, Left, Top, Width, Height)

   InitClass        ' initializes the common parts for Designer and code
End Sub
```

We memorize several properties, initialize `ltbPanelBack` and add it onto the parent view and set its background and call `InitClass`.

Example:

```
   'adds a second xLimitBar in the code
   ltbTest1.Initialize(Me, "ltbTest1")
   ltbTest1.FrontLineColor = Colors.Blue
   ltbTest1.AddToParent(Activity, 30dip, 100dip, 200dip, 30dip, Colors.Red, 10dip)
```

7.9 InitClass routine

In this routine, we initialize the common code parts independent if the LimitBar is added in the Designer or in the code.
This routine is called either from the **DesignerCreateView** when the LimitBar is added in the Designer or from the **AddToParent** routine when the custom view is added in the code.

```
Private Sub InitClass
   ltbPanelBack = xui.CreatePanel("ltbPanelBack")
   xBase.AddView(ltbPanelBack, 0, 0, mWidth, mHeight)

   ' set the background color and the radius for the background panel
   ltbPanelBack.SetColorAndBorder(mBackgroundColor, 0, mBackgroundColor, mRadius)

   ' initialize the background canvas and draw the background line
   cvsPanelBack.Initialize(ltbPanelBack)

   ' initialize the foreground panel and canvas
   ltbPanelFront = xui.CreatePanel("ltbPanelFront")
   xBase.AddView(ltbPanelFront, 0, 0, mWidth, mHeight)
   cvsPanelFront.Initialize(ltbPanelFront)

   ' initialize the foreground panel rectangle used to erase ltbPanelFront
   rectPanelFront.Initialize(0, 0, ltbPanelFront.Width, ltbPanelFront.Height)

   ' set the limit max value, which calculates also the scale limit values <> pixels
   setMax(mMaxValue)

   DrawBackGround
End Sub
```

The code is self explanatory.

7.10 InitCursors routine

In this routine, we initialize the variables used for the background line and the cursors drawing.

```
Private Sub InitCursors
   x0 = mMargin
   x1 = mWidth - mMargin
   mScale = (x1 - x0) / mMaxValue
   PositionPixels(0) = mLimit(0) * mScale + x0
   PositionPixels(1) = mLimit(1) * mScale + x0

   y0 = 0.2 * mHeight
   y1 = y0 + 8dip + 0.05 * mHeight
   y2 = 0.9 * mHeight

   'initialize a path for the background with rounded corners
   BackgroundPath.InitializeRoundedRect(rectPanelFront, mRadius)
End Sub
```

7.11 Draw the background and background line

We need to draw the background color and background line from several places in the code so we use a routine.

```
Private Sub DrawBackGround
   ' set the background color and the radius for the background panel
   cvsPanelBack.ClipPath(BackgroundPath)
   cvsPanelBack.DrawRect(rectPanelFront, mBackgroundColor, True, 1dip)
   cvsPanelBack.RemoveClip
   'draw the background line
   cvsPanelBack.DrawLine(x0, y0, x1, y0, mBackLineColor, 2dip)
   cvsPanelBack.Invalidate
End Sub
```

We draw the background with: `cvsPanelBack.DrawRect`.
And the background line, with: `cvsPanelBack.DrawLine`

7.12 DrawCursors routine

The drawing routine for the cursors and the foreground line:
We use two Path objects to draw the cursor shapes.

```
Private Sub DrawCursors
   ' draw a transparent rectangle to erase the foreground panel
   cvsPanelFront.ClearRect(rectPanelFront)

   ' define the left cursor path according to its current position
   Paths(0).Initialize(PositionPixels(0), y0)
   Paths(0).LineTo(PositionPixels(0), y2)
   Paths(0).LineTo(PositionPixels(0) - 12dip, y2)
   Paths(0).LineTo(PositionPixels(0) - 12dip, y1)
   Paths(0).LineTo(PositionPixels(0), y0)

   ' define the right cursor path according to its current position
   Paths(1).Initialize(PositionPixels(1), y0)
   Paths(1).LineTo(PositionPixels(1), y2)
   Paths(1).LineTo(PositionPixels(1) + 12dip, y2)
   Paths(1).LineTo(PositionPixels(1) + 12dip, y1)
   Paths(1).LineTo(PositionPixels(1), y0)

   ' draw the two cursors and the front line
   cvsPanelFront.DrawPath(Paths(0), mFrontLineColor, True, 1)
   cvsPanelFront.DrawPath(Paths(1), mFrontLineColor, True, 1)
   cvsPanelFront.DrawLine(PositionPixels(0), y0, PositionPixels(1), y0, mFrontLineColor,
3dip)
   cvsPanelFront.Invalidate
End Sub
```

We:

- Erase the whole foreground panel with `ClearRect`.
- Define both cursors according to the current position.
  The cursor shapes are defined with two Paths.
- Draw the cursors.
- Draw the foreground line.

7.13 Cursor moving

To detect cursor moves we use the touch event of the foreground panel:

```
Private Sub ltbPanelFront_Touch (Action As Int, X As Double, Y As Double)
   ' check if the cursor is outsides the limits
   Private xx As Double
   xx = X
   xx = Max(x0, xx)
   xx = Min(x1, xx)

   ' select the Action type
   Select Action
      Case ltbPanelFront.TOUCH_ACTION_DOWN
         If xx < Abs(PositionPixels(0) + PositionPixels(1)) / 2 Then
            ' if X is closer to the left cursor we choose it
            PosIndex = 0
         Else
            ' otherwise we choose the right cursor
            PosIndex = 1
         End If
         mLimit(PosIndex) = Floor((xx - x0) / mScale + .5)
         PositionPixels(PosIndex) = xx
         DrawCursors
      Case ltbPanelFront.TOUCH_ACTION_MOVE
         If SubExists(mCallback, mEventName & "_ValuesChanged") Then
            CallSub3(mCallback, mEventName & "_ValuesChanged", mLimit(0), mLimit(1))
         End If

         mLimit(PosIndex) = Floor((xx - x0) / mScale + .5)
         PositionPixels(PosIndex) = xx
         DrawCursors
      Case ltbPanelFront.TOUCH_ACTION_UP
         'call the ValuesChanged routine if it exists
         If SubExists(mCallback, mEventName & "_ValuesChanged") Then
            CallSub3(mCallback, mEventName & "_ValuesChanged", mLimit(0), mLimit(1))
         End If

         ' when Action is UP (mouse released) check if mLimit(0) > mLimit(1)
         ' if yes we invert the limit values and redraw the cursors
         ' if a callback routine exists in the calling module we call it
         If mLimit(0) > mLimit(1) Then
            Private val As Int
            val = mLimit(0)
            mLimit(0) = mLimit(1)
            mLimit(1) = val
            PositionPixels(0) = mLimit(0) * mScale + x0
            PositionPixels(1) = mLimit(1) * mScale + x0
            DrawCursors
         End If
   End Select
End Sub
```

7.14 Properties

Finally, we add a few properties:
To add properties, see more details in Add properties.

The Max property:

```
'gets or sets the max value
Public Sub setMax(MaxValue As Int)
   mMaxValue = MaxValue
   InitCursors
   DrawCursors
End Sub

Public Sub getMax As Int
   Return mMaxValue
End Sub
```

The LimitLeft property:

```
'gets or sets the left limit
Public Sub setLimitLeft(Pos As Int)
   ' if Pos is lower than 0 set cLimitLeft to 0
   mLimit(0) = Max(0, Pos)
   InitCursors
   DrawCursors
End Sub

Public Sub getLimitLeft As Int
   Return mLimit(0)
End Sub
```

The LimitRight property:

```
'gets or sets the right limit
Public Sub setLimitRight(Pos As Int)
   ' if Pos is higher than mMaxValue set mLimitRight to mMaxValue
   mLimit(1) = Min(mMaxValue, Pos)
   InitCursors
   DrawCursors
End Sub

Public Sub getLimitRight As Int
   Return mLimit(1)
End Sub
```

The Visible property:

```
'gets or sets the Visible property
Sub setVisible(IsVisible As Boolean)
   ltbPanelBack.Visible = IsVisible
End Sub

Sub getVisible As Boolean
   Return ltbPanelBack.Visible
End Sub
```

The Width property:

```
'gets or sets the Width property
Public Sub setWidth(Width As Int)
   mWidth = Width

   ' set the new widths
   xBase.Width = mWidth
   ltbPanelBack.Width = mWidth
   ltbPanelFront.Width = mWidth

   ' resize the two Canvases
   cvsPanelBack.Resize(mWidth, mHeight)
   cvsPanelFront.Resize(mWidth, mHeight)

   ' adjust the width of rectPanelFront
   rectPanelFront.Width = mWidth

   InitCursors
   DrawBackGround
   DrawCursors
End Sub

Public Sub getWidth As Int
   Return mWidth
End Sub
```

In this routine, as the width of the CustomView has changed, we need to:

- set the Width of all three B4XPanels `xBase, ltbPanelBack` and `ltbPanelFront.`
- resize the two B4XCanvases `cvsPanelBack` and `cvsPanelFront.`
- set the Width of the B4XRect `rectPanelFront.`
- and `InitCursors`, initialize the cursors.
- `DrawBackGround` draw the background
- `DrawCursors` draw the cursors.

The Height property routine is similar to the Width property routine.

There are other properties not explained here.

7.15 Make a B4X Library

We make a B4X Library for the xLimitBar CustomView.

We generate the manifest file, it's a text file with the content below,

```
Version=1.0
Author=Klaus CHRISTL (klaus)
B4J.DependsOn=jXUI
B4A.DependsOn=XUI
B4i.DependsOn=iXUI
```

`Version`:	the version number
`Author`:	the author name
`B4J.DependsOn`:	the list of all B4J libraries the custom view depends on.
`B4A.DependsOn`:	the list of all B4A libraries the custom view depends on.
`B4i.DependsOn`:	the list of all B4iJ libraries the custom view depends on.

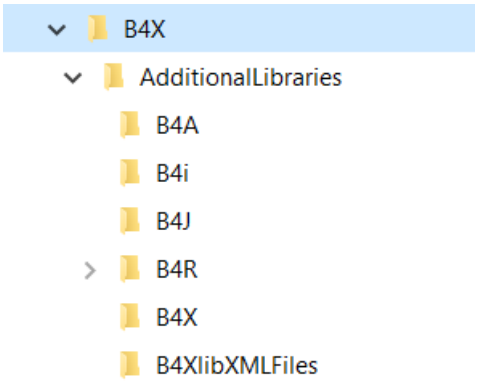
And save it with the name: *manifest.txt*.

In our case xLimitBar depends only on the xui libraries.

Then we zip the manifest.txt file and the xLimitBar.bas file to generate the xLimitBar.b4xlib file. The extension must be *b4xlib*.

Copy this file into the \AdditionalLibraries\B4X folder.

Remember the subfolder structure of the AdditionalLibraries folder.



More information in chapter Generate a B4XLibrary.

7.16 Compile to a platform specific Library

In the Project Attributes Region in the Main module we add following new attributes:

Example, LimitBar projects.

B4A
```
#LibraryName: xLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

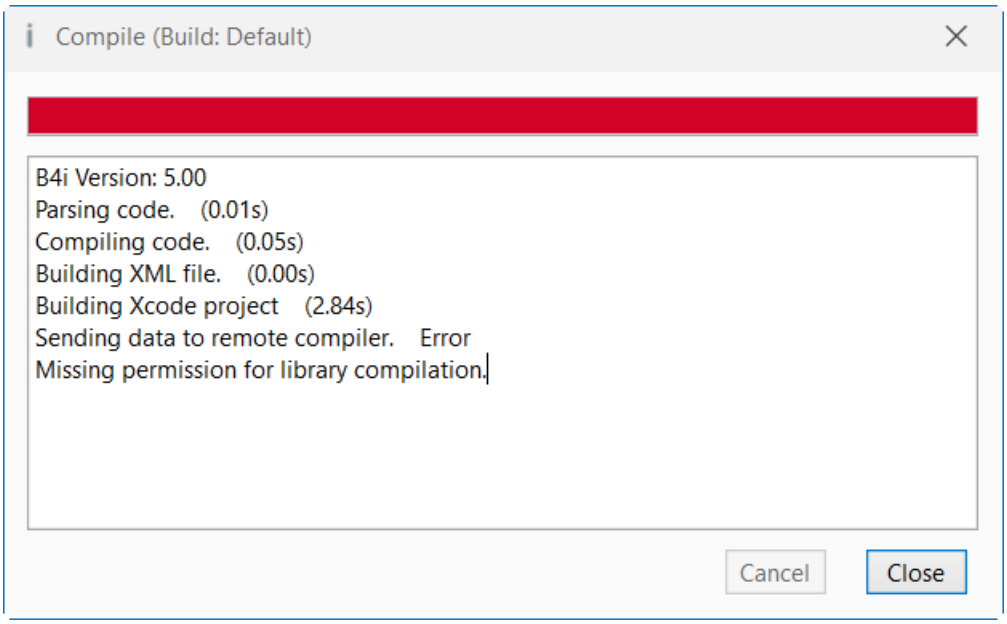
B4i
```
#LibraryName: ixLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

B4J
```
#LibraryName: jxLimitBar
#LibraryAuthor: Klaus Christl
#LibraryVersion: 1.0
```

And we compile the Limitbar module to a Library.

The Library files are automatically copied to the AdditionalLibraries folder.

If you use the hosted compiler for B4i, you must ask Erel for permission to be able to compile a library. You will get this message.

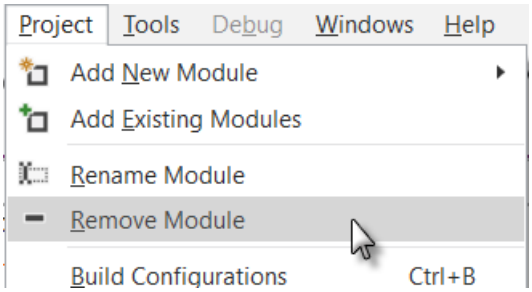


7.16.1 Using the library in a program

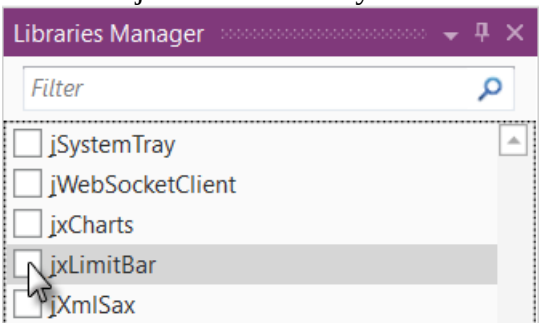
Copy the projects to new folders where you replace *Cls* by *Lib*.
The source codes are in the *xLibLimitBar* folders.
The example below is based on the B4J project.

Then:

- Load the projects in the IDE.
- Rename the package name.
- Rename the `#ApplicationLabel: LblLimitBar` (B4A and B4i only)
- Remove the three lines:
```
#LibraryName: xLimitBar
#LibraryAuthor: Klaus CHRISTL
#LibraryVersion: 1.0
```
- Remove the xLimitBar class module.
  Select the xLimitBar module and remove it.



- Select the jxLimitBar library in the Labaraies Manager Tab.



- Run the program.

The rest of the code in the Main module remains the same.
The layout file remains the same.