USER GUIDE

Bridgetek

BRIDGING TECHNOLOGY

EVE Screen Designer 4.19 Widget Guide

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A. Preface

Purpose

The purpose of this document is to explain the functionalities and attributes of the widgets available in the **EVE S**creen **D**esigner (**ESD**) **4.19.0**.

Intended Audience

This documentation is targeted towards **ESD** users who wish to develop embedded GUI applications for the EVE-based platform.

Document References

Document Name	Document Type	Document Format
BT81X Series Programming Guide	Application Note (Programming Guide)	PDF
BT81X Advanced Embedded Video Engine Datasheet	Datasheet	PDF
FT81x Series Programmers Guide	Application Note (Programming Guide)	PDF
FT81x Embedded Video Engine Datasheet	Datasheet	PDF
FT9xx Toolchain Installation Guide	Application Note (Installation Guide)	PDF
EVE Screen Designer User Guide	Application Note (User Guide)	PDF

Feedback

Every effort has been taken to ensure that the document is accurate and complete. However, any feedback on the document may be emailed to docufeedback@brtchip.com. For any additional technical support, refer to http://brtchip.com/contact-us/.

B. Widget Overview

A *widget* is a logic node that is visually rendered by the Embedded Video Engine (**EVE**) and can be accessed through the library browser window of ESD. There are two types of widgets: *ESD Widgets* (built-in widgets) and *User Widgets* (custom widgets defined by users).

Advanced users may create custom widgets using the C source files directly. It is important to note that the first member in a custom widget must always be a predefined structure "*ESD_Widget"* to ensure that the ESD Widget framework function properly.

Widget is serialized into xml file format or C file format, depending how it is constructed. If widget is created by connecting the nodes in logic node editor, it is in xml format.

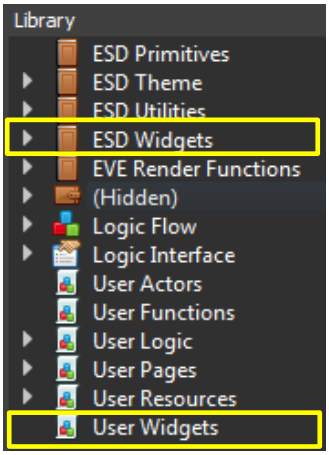


Figure 1 - Widgets

What's new in ESD 4.19 Widget

New widgets added:

- *Add Scrolling Text Widget.*
- *Add Image Slide Show Widget.*

Enhancement to existing widgets:

- Improve widget functionality by enabling the selection of the corresponding radio button and checkbox widget through text-clicking.
- Improve ESD Polygon Widget.
- Add options for the ESD Clock Widget to select between a background or no background.
- Add options for Gauge Widget: OPT_NOBACK , OPT_NOTICKS, OPT_NOPOINTER.

Basic Widgets

ESD Basic widgets are introduced in ESD 4.0. These widgets are the widget wrappers for the Elemental and Primitive Rendering functions which include drawing lines, rectangles, points (circles) and bitmaps.

ESD Line Widget

ESD Line Widget allows the user to display a line as widget instead of a render function on the screen.

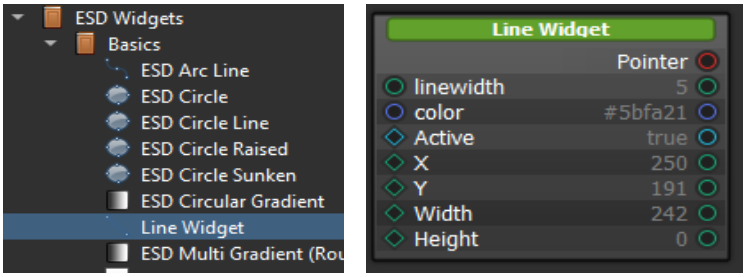


Figure 2 - ESD Line Widget

Property Name	Description
Pointer	The pointer reference of the widget object
linewidth	The thickness of a line widget
color	Select background colour
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Width of the widget
Height	Height of the widget

Table 1 - ESD Line Widget Properties

ESD Circle (Raised and Sunken) Widgets

The *ESD Circle* Widgets allow the user to display a circle as widget instead of a render function on the screen. ESD Circle will display a flat circle while ESD Circle Raised has raised border and ESD Circle Sunken has sunken border.

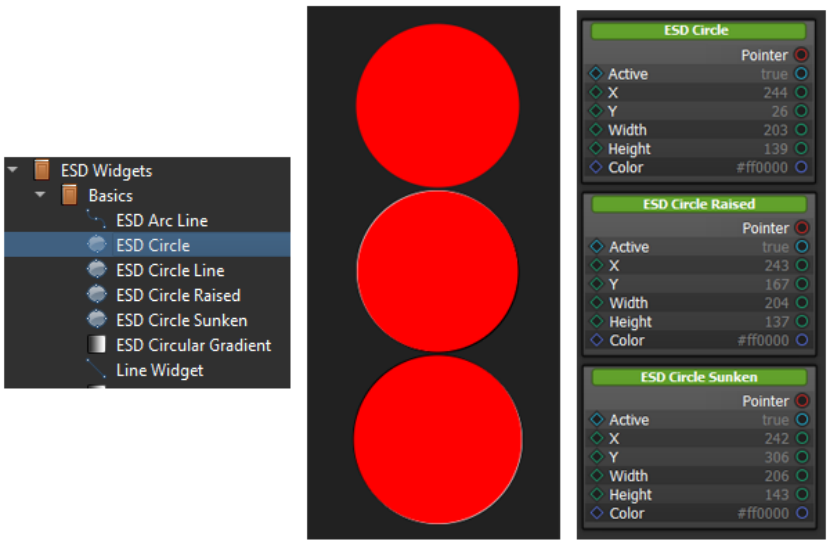


Figure 3 - ESD Circle, ESD Circle Raised & ESD Circle Sunken Widgets

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set true if this widget is active.
Color	RGB value to be rendered inside the circle
X	x coordinate of central point, in pixels
Y	y coordinate of central point, in pixels
Width	Width of the circle
Height	Height of the circle

Table 2 - ESD Circle Element Properties

ESD Circle Line Widgets

The *ESD Circle Line* Widgets allow the user to display circle line with a hollow centre. ESD Circle Line has configurable border and colour.

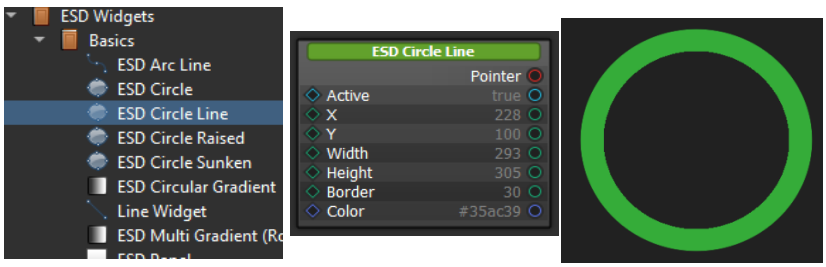


Figure 4 - ESD Circle Line Widgets

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set true if this widget is active.
X	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Border	The border of the circle line widget
Color	ARGB value to be rendered as the circle line widget

Table 3 - ESD Circle Line Element Properties

ESD Arc Line Widgets

The *ESD Arc Line* Widgets allow the user to display arc line which can cover 0 to 360 degrees of arc segment. ESD Arc Line has configurable border, colour, and origin of arc direction, value of arc segment in degree, clockwise directional flag, start point and end point settings.

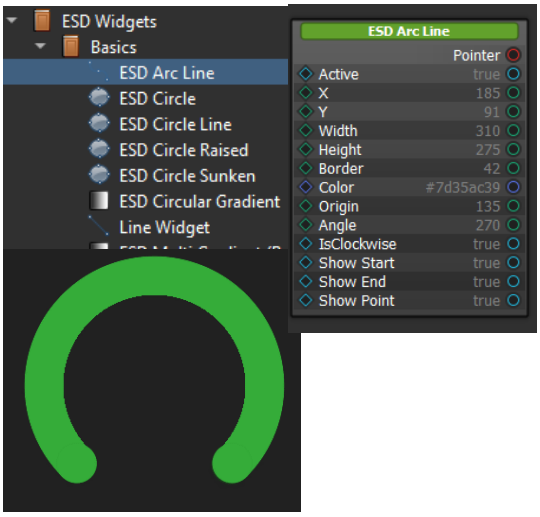


Figure 5 - ESD Arc Line Widgets

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set true if this widget is active.
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Border	The border of the arc line widget
Color	ARGB value to be rendered as the arc line widget
Origin	The origin of the arc direction, range from 0 to 360
Angle	The arc segment angle value, range from 0 to 360
IsClockwise	The Boolean to set for the arc's direction. Set true as clockwise direction.
Show Start Point	The Boolean to enable rendering start point
Show End Point	The Boolean to enable rendering end point
Show Point Shadow	The Boolean to enable rendering point shadow on start and end points

Table 4 - ESD Arc Line Element Properties

ESD Gradient Arc Line Widgets

The *ESD Gradient Arc Line* Widgets allow the user to display arc line which can cover 0 to 360 degrees of arc segment with gradient colour. ESD *Gradient Arc Line* has configurable border and origin of arc direction, value of arc segment in degree, clockwise directional flag, start point and end point settings. Additionally, the widget provides options to customize the gradient colour effect by specifying start and end colour.

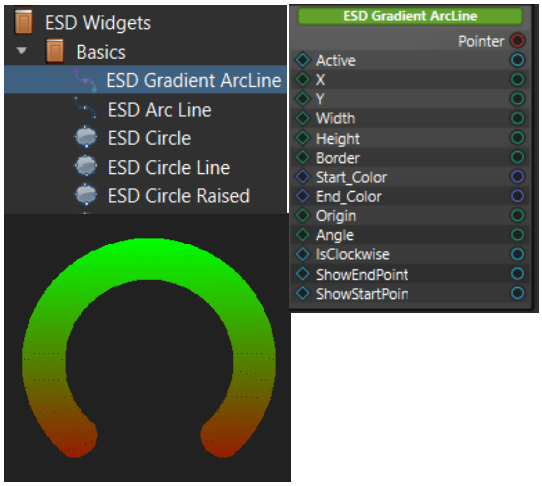


Figure 6 - ESD Gradient Arc Line Widgets

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set true if this widget is active.
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Widget width
Height	Widget height
Border	The border of the arc line widget
Start_Color	Select the starting colour of the gradient effect
End_Color	Select the ending colour of the gradient effect
Origin	The origin of the arc direction, range from 0 to 360
Angle	The arc segment angle value, range from 0 to 360
IsClockwise	The Boolean to set for the arc's direction. Set true as clockwise direction.
Show Start Point	The Boolean to enable rendering start point
Show End Point	The Boolean to enable rendering end point

Table 5 - ESD Gradient Arc Line Element Properties

ESD Panel and Panel Color Widgets

The *ESD Panel* Widgets allow the user to display panel as widget instead of a render function on the screen. *ESD Panel* background color can be configured by the theme selectable by the user. *ESD Panel Color* widget allows the user to select the background color of user choice unlike the theme selection offered by *ESD Panel* widget.

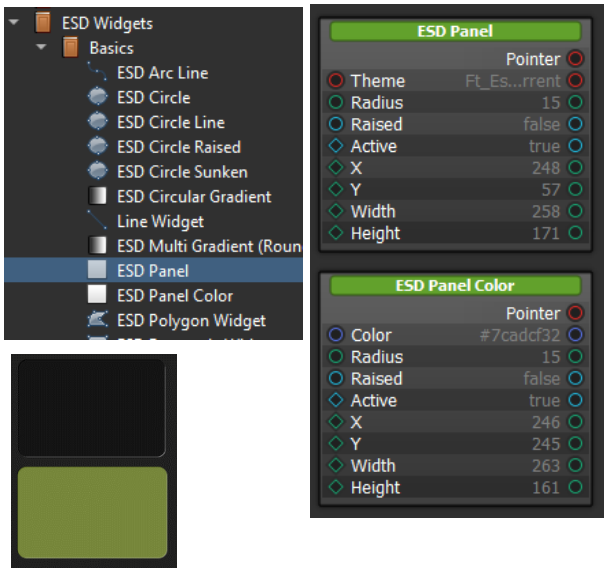


Figure 7 - ESD Panel and Panel Color Widgets

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Select the theme which affects the background colour
Raised	Set true for raised border, else it will be sunken border
X	x coordinate of central point, in pixels
Y	y coordinate of central point, in pixels
Radius	Radius of the point

Table 6 - ESD Panel Widget Properties

Property Name	Description
Pointer	The pointer reference of the widget object
Color	Select background colour
Active	Set true to activate this widget
X	x coordinate of central point, in pixels
Y	y coordinate of central point, in pixels
Radius	Radius of the point
Raised	Set true for raised border, else it will be sunken border

Table 7 - ESD Panel Color Widget Properties

ESD Touch Panel Widget

The ESD Touch Panel Widget allows the user to display panel as widget with touch event handler together. It consists of one ESD Panel, one touch tag and one touch area when it is applicable.

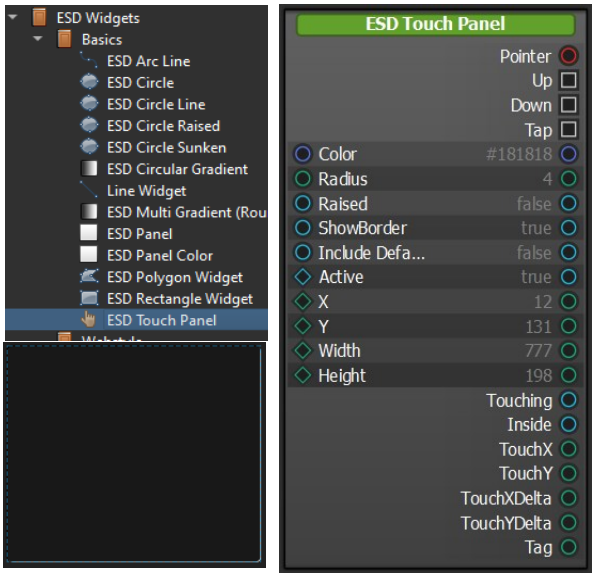


Figure 8 - ESD Touch Panel Widgets

Property Name	Description
Color	Select the background colour
Raised	Set true for raised border, else it will be sunken border
Radius	Radius of the point
ShowBorder	Show border of the touch panel
Include default tag	Set true to include default tag
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Widget Width
Height	Widget Height

Table 8 - ESD Touch Panel Widget Properties

Output / Signal	Description
Pointer	The pointer reference of the widget object
Up	Touch Up event signal
Down	Touch Down event signal
Tap	Touch Tap event signal
Touching	The output of touching status
Inside	The output of touch inside status
TouchX	The output of X coordinate of the touch point
TouchY	The output of Y coordinate of the touch point
TouchXDelta	The output of X difference between last two touch points
TouchYDelta	The output of Y difference between last two touch points
Tag	The output of touch tag ID

Table 9 - ESD Touch Panel Widget Output/Signal

ESD Circular Gradient Widget

The *ESD Circular Gradient Widget* allows the user to display a circular gradient in two different styles. User is able to select any gradient style by choosing it from the gradient type property as mentioned in the Table 10 - ESD Circular Gradient Widget Properties. In the Gaussian style, the central circle inscribed in the outer square. In Pythagorean style, the central circle is larger and is partially obscured by the four sides of the outer square.

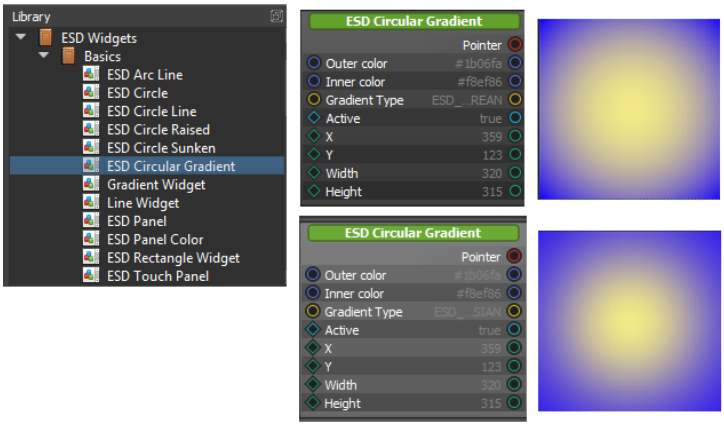


Figure 9 - ESD Circular Gradient Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Outer color	Select the outer colour of the gradient effect
Inner color	Select the inner colour of the gradient effect
Gradient Type	Set the gradient style to either ESD_PYTHAGOREAN to get Pythagorean Style, or ESD_GAUSSIAN to get Gaussian style
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Width of the widget
Height	Height of the widget

Table 10 - ESD Circular Gradient Widget Properties

ESD Rectangle Widget

The *ESD Rectangle Widget* allows the user to display a rectangle. User needs to specify the top right coordinates along with the height, width, border width and border color of the rectangle.

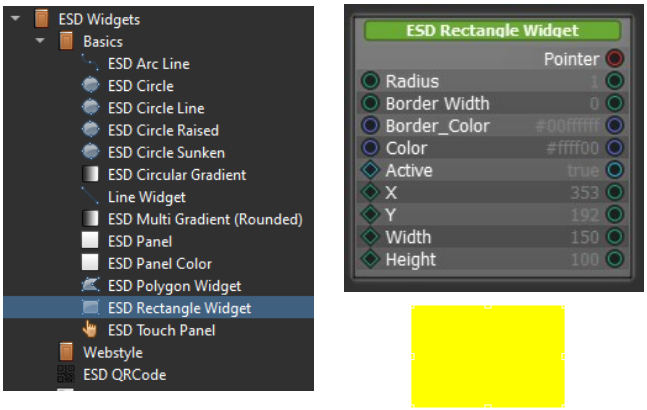


Figure 10 - ESD Rectangle Widget

Property Name	Description
Pointer	The pointer reference of the widget object

Radius	Radius of the vertex point
Color	Select the inner colour of the polygon
Active	Set true to activate this widget
X	x coordinate of the top right coordinate, in pixels
Y	y coordinate of the top right coordinate, in pixels
Width	Width of the widget
Height	Height of the widget
Border Width	Set the width of a rectangle's border
Border Color	Select the border colour of the polygon

Table 11 - ESD Rectangle Widget Properties

ESD Polygon Widget

The *ESD Polygon Widget* allows the user to display a polygon. User can draw up to 8-sided polygons. User can also select the inner color and the border color.

Properties x_i, y_i (x0, y0 ~ x2, y2) represent vertices coordinate of a polygon. These coordinates relative to the top-left pixel of the widget, rather than the screen. The values of (x_i, y_i) are not absolute. Users can modify the vertices property to add or remove a vertex. The number of vertices ranges from 1 to 20.

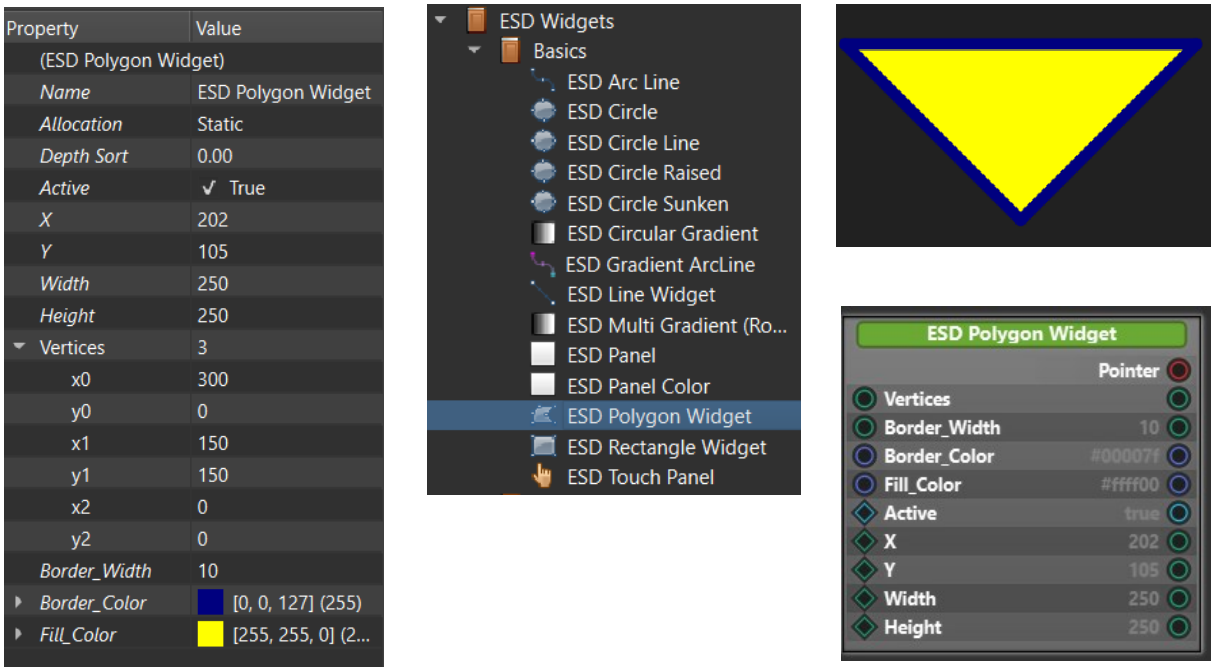


Figure 11 - ESD Polygon Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Border_Width	Select the border width of the polygon
Border_Color	Select the border colour of the polygon
Fill_Color	Select the inner colour of the polygon
Active	Set true to activate this widget
X	x coordinate of central point, in pixels

Y	y coordinate of central point, in pixels
Vertices	Specify the number of vertices in the polygon
x_i	x coordinate of the i-th vertex, in pixels
y_i	y coordinate of the i-th vertex, in pixels
Width	Width of the widget
Height	Height of the widget

Table 12 - ESD Polygon Widget Properties

ESD Multi Gradient (Rounded) Widget

The *ESD Multi Gradient (Rounded)* Widget allows gradient rectangle with a user selectable color at all the vertex of the rectangle. User can also choose to round the edges.

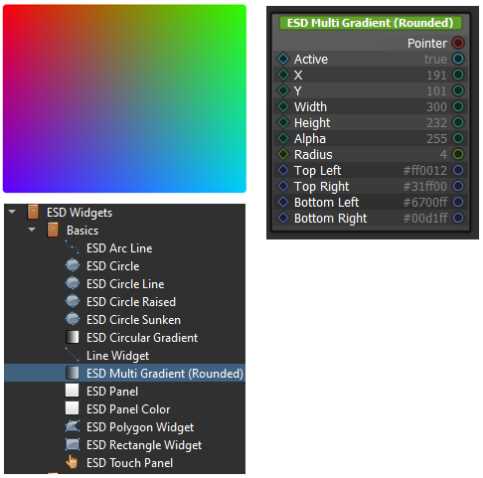


Figure 12 - ESD Multi Gradient (Rounded)

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Width of the widget
Height	Height of the widget
Alpha	Level of transparency or opacity of the widget
Radius	Radius for the rounding at the edge of the rectangle
Top left	Color at the top left of the rectangle
Top right	Color at the top right of the rectangle
Bottom left	Color at the bottom left of the rectangle
Bottom right	Color at the bottom right of the rectangle

Table 13 - ESD Multi Gradient Widget Properties

Webstyle Widgets

This section covers a new series of webstyle widgets that are introduced in ESD 4.14. The widgets are built with the combinations of the different widgets and utilities to provide user with webstyle effect type of widgets. These widgets also serve as a demonstration to show how the existing widgets can be used as the fundamentals to create more customized widgets.

Webstyle widgets are not included by default as part of project. To include webstyle widgets into the project, users need to choose the "Esd_WebStyle_Widgets (Optional)" option in the "New Project" dialog as Figure 13_ – Include webstyle widget into project.

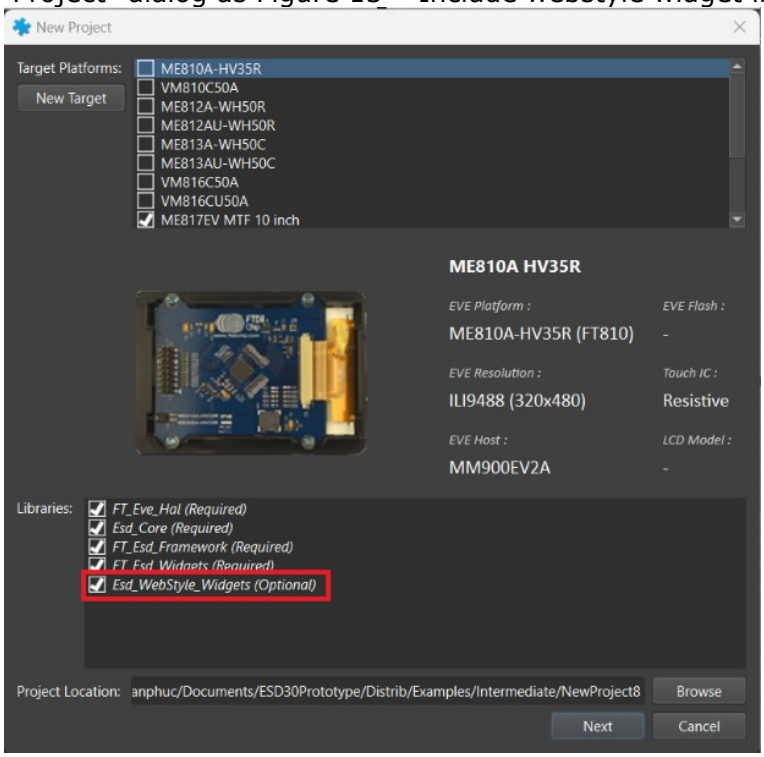


Figure 13 – Include webstyle widget into project

ESD Web Outline Button Widget

The *ESD Web Outline Button* allows the user to add an outline of the specified width to the button. At the time of activation, the background and text color will toggle.

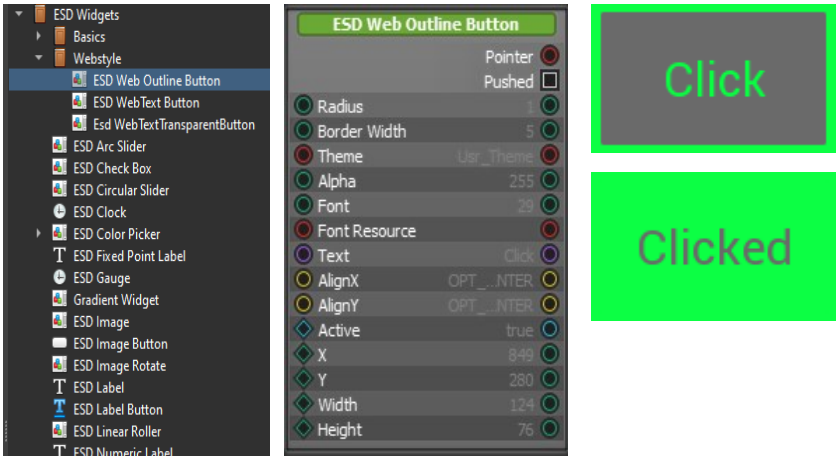


Figure 14 - ESD Web Outline Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Radius	Radius for the rounding at the edge of the rectangle
Border width	The width of the outline
Theme	Theme applied for the button
Alpha	Adjust the transparency

Font	Fonts used in the button. Same as bitmap handle defined in EVE
Font resource	Sets the font resource.
Text	The text content of the button. By default, "Button"
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Width of the widget
Height	Height of the widget

Table 14 - ESD Web Outline Button Properties

Output / Signal	Description
Pushed	Output signal when the push button is in pushed state

Table 15 - ESD Web Outline Button Output/Signal

It is also possible to achieve a rounded button style by adjusting the radius parameter that is provided. The height and width shall be the same while the radius would approximately be half of the width.

ESD Web Text Button Widget

The *ESD Web Text Button* displays a text button that changes the text and background color when activated.

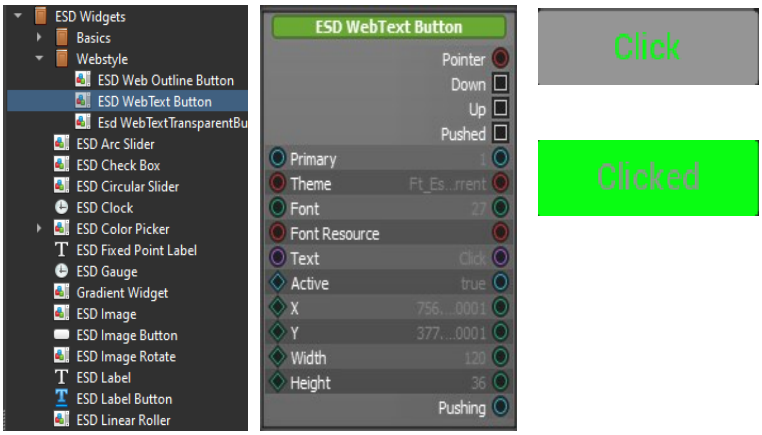


Figure 15 - ESD Web Text Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Primary	Primary state of the button – Set to True to use the Primary color from theme Set to False to use the default color from theme
Theme	Theme applied for the button
Font	Fonts used in the button. Same as bitmap handle defined in EVE
Font resource	Sets the font resource
Text	The text displayed on the button
Active	Active state of the button, set to true to appear on the screen
X	x coordinate of top-left point, in pixels
Y	y coordinate of top-left point, in pixels
Width	Button width, in pixels
Height	Button height, in pixels

Table 16 - ESD Web Text Button Properties

Output / Signal	Description
Down / Up / Pushed	Output signal when the push button is Down/Up or Pushed state
Pushed	Output signal when the push button is in pushed state

Table 17 - ESD Web Text Button Output/Signal

ESD Web Text Transparent Button Widget

The *ESD Web Text Transparent Button* displays a text button with a transparent background. Upon activation, the specified background color will be shown as an indication of 'clicked'.

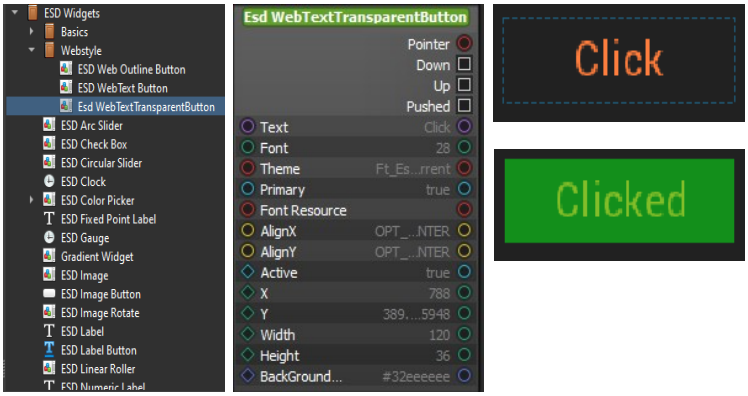


Figure 16 - ESD Web Text Transparent Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Text	The text displayed on the button
Font	Fonts used in the button. Same as bitmap handle defined in EVE
Theme	Theme applied for the button
Primary	Primary state of the button – Set to True to use the Primary color from theme Set to False to use the default color from theme
Font resource	Sets the font resource to use custom font. Example: Arial, Times New Roman,…
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: RIGHT*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
Active	Active state of the button, set to true to appear on the screen
X	x coordinate of top-left point, in pixels
Y	y coordinate of top-left point, in pixels
Width	Button width, in pixels
Height	Button height, in pixels
Background	Sets the background color used

Table 18 - ESD Web Text Transparent Button Properties

Output / Signal	Description
Down / Up / Pushed	Output signal when the push button is in Down/Up or Pushed state
Pushed	Output signal when the push button is in pushed state

Table 19 - ESD Web Text Transparent Button Output/Signal

Other Widgets

This section describes more complex widgets which may be composed of the basic widgets and uses other utilities provided by the ESD. These widgets serve as the guide for user to create custom widgets.

ESD Arc Slider

The *ESD Arc Slider* displays the arc line and, in addition, allows the user to control the value by dragging the slider. It also supports configurable border width and color.

Figure 17 - ESD Arc Slider Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Clockwise	The Boolean to set the arc's direction. Set true as clockwise direction.
Origin	The origin direction of the ring, range from 0 to 360.
Ring width	Defines the ring width
Inner border	Defines the inner border width, set -1 to disable it
Outer border	Defines the outer border width, set -1 to disable it
Border color	Set the ring's inner and outer border color in RGB
Selection color	Set the ring's selection color in RGB
Background color	Set the ring's background color in RGB
Active	Set true if this widget is active.
X	Coordinate of button, top-left, in pixels
Y	Coordinate of button, top-left, in pixels
Width	Widget width, in pixels
Height	Widget height, in pixels
Max angle	Defines the max angle of the selection, range from 1 to 360.
Value	Indicates the current value of the slider
Max value	Indicates the maximum value allowed for the slider, range from 10 to 1024.

Table 20 - ESD Arc Slider Widget Button Properties

ESD Check Box

The *ESD Check Box* is a widget which has two states and toggles its own state based on user's touch input.

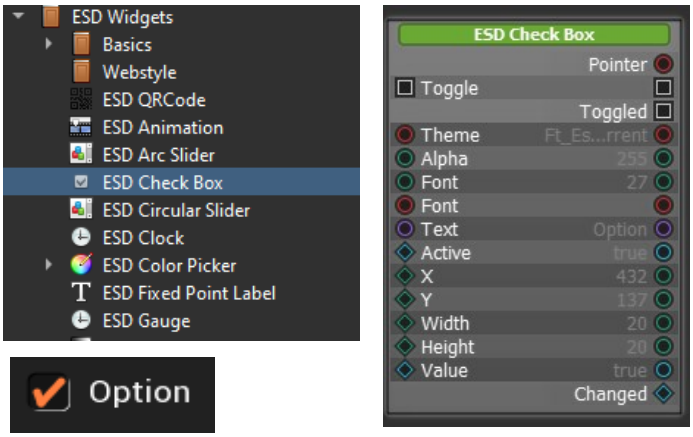


Figure 18 - ESD Check Box Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Toggle	Slot function to toggle the state of check box
Theme	Get theme (background/text/default/… color)
Font	Fonts used in the label. Same as bitmap handle defined in EVE
Font Resource	Sets the font resource
X	Absolute X position on the horizontal axis
Y	Absolute Y position on the vertical axis
Width	Widget width
Height	Widget height
Alpha	Adjust the transparency
Text	The display label next to the check box
Value	Checked/Unchecked

Table 21 - ESD Check Box Widget Properties

Users can connect the *ESD Check Box* with other widgets in order to get user's input via a signal mechanism.

Please note that the 'Toggled' signal of the widget should not be connected to its own 'Toggle' slot because this will cause the widget not to function properly.

ESD Circular Slider

The ESD Circular Slider functions are similar to the ESD Arc Slider widget, except that it allows for the sliding of a complete circle instead of just a portion of it. The colour of the inner border will reflect the value of the slider.

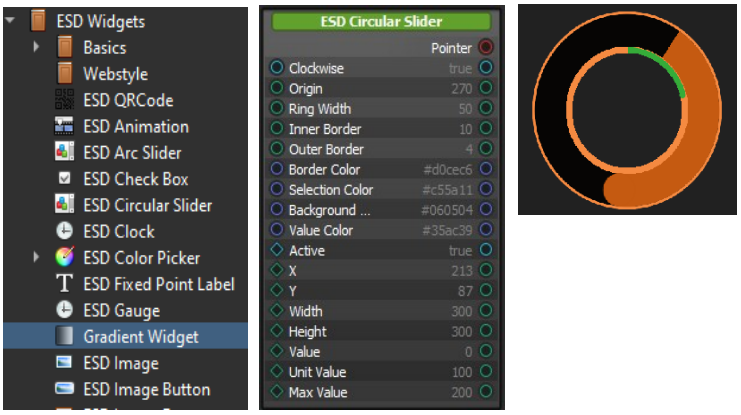


Figure 19 - ESD Circular Slider Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Clockwise	The Boolean flag to set the direction. Set true as clockwise direction.
Origin	The origin direction of the ring, range from 0 to 360.
Ring width	Defines the ring width
Inner border	Defines the inner border width, set -1 to disable it.
Outer border	Defines the outer border width, set -1 to disable it.
Border color	Set the ring's inner and outer border color in RGB
Selection color	Set the ring's selection color in RGB
Background color	Set the ring's background color in RGB
Value color	Set the display value color in RGB
Active	Set true if this widget is active.
X	Coordinate of button, top-left, in pixels
Y	Coordinate of button, top-left, in pixels
Width	Widget width, in pixels
Height	Widget height, in pixels
Value	Indicates the current value of the slider
Unit value	Unit value for one complete round of the selection circle
Max value	Indicates the maximum value allowed for the slider, range from 10 to 1024.

Table 22 - ESD Circular Slider Widget Properties

ESD Circular Gradient Slider

The ESD Circular Slider displays the arc gradient line in a complete circle. In addition, it allows the user to control the value by dragging the slider.

Figure 20 - ESD Circular Gradient Slider Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Origin	The origin direction of the ring, range from 0 to 360.
Border	Defines the border width
Color1	Select the starting colour of the gradient effect
Color2	Select the ending colour of the gradient effect
Active	Set true if this widget is active.
X	Coordinate of button, top-left, in pixels
Y	Coordinate of button, top-left, in pixels
Width	Widget width, in pixels
Height	Widget height, in pixels
Angle	The arc segment angle value, range from 0 to 360

Table 23 - ESD Circular Gradient Slider Widget Properties

ESD Clock

The *ESD Clock* is a basic widget based on **EVE** built-in widget. It can be accessed from the library browser under the ESD Widgets folder.

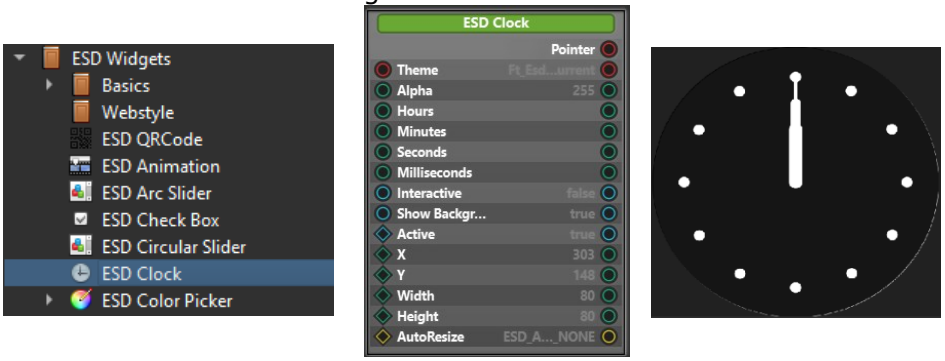


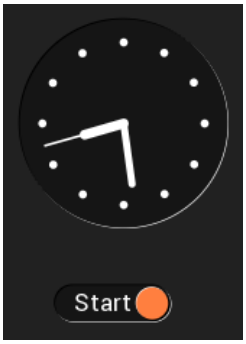
Figure 21 - ESD Clock Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied on the widget

Alpha	Adjust the transparency
Hours	The Hour hand position
Minutes	The Minute hand position
Seconds	The Second-hand position
Milliseconds	The time expressed in milliseconds unit
Interactive	Currently not in use
Active	Set true if this widget is active.
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height
AutoResize	Set Widget Auto resize mode
Show Background	Set true to show background

Table 24 - ESD Clock Widget Properties

Users can connect the ESD clock with other widgets, such as ESD toggle or ESD timer via hours/minutes/seconds or milliseconds properties. The figures here depict the process of using an ESD Toggle widget to start or stop a clock, along with the relevant logic node connection.



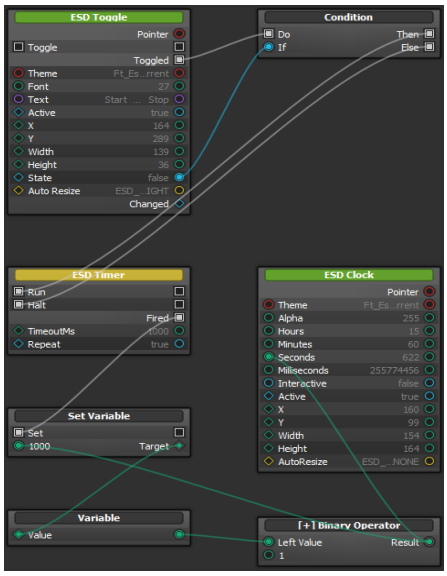


Figure 22 - ESD Clock Widget Use Case - Logic Node Editor

ESD Color Picker

The ESD Color Picker widget features a circular-style color picker that is linked to a circular bitmap. It enables users to interact with the widget through touch and generates an RGB color value as output based on the corresponding touch point. By adding the "circular_colorwheel.png" bitmap from the "Ft_Esd_Widget" library into their project, users can easily connect the widget. Although the bitmap can be replaced, it must maintain the same style and only differ in radius, which can be modified using the Property Editor. Additionally, users can decrease the brightness of the RGB value output by adjusting the Lightness property.

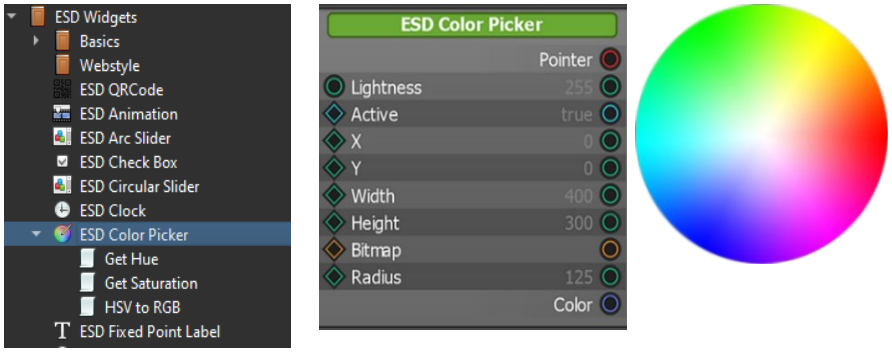


Figure 23 - ESD Color Picker Widget

Property Name	Description
Pointer	The pointer reference of the widget object
X	x coordinate of the top-left point, in pixels
Y	y coordinate of the top-left point, in pixels
Width	Widget width
Height	Widget height
Bitmap	The bitmap cell used in the colour picker
Radius	The radius of the circular image (in pixels)
Lightness	Select the brightness for the output color

Table 25 - ESD Color Picker Widget Properties

Output / Signal	Description
Color	The current colour based on the user's touch and selected bitmap

Table 26 - ESD Color Picker Widget Output/Signal

The "colorpicker" example project showcases how to use ESD Color Picker widget. In the Figure 24 - Color Picker Example Project, the Hue and Saturation (H, S) of rectangle color come from the color picker widget, while the lightness (L) comes from the value of slider bar. Upon touching the color wheel, the color of the rectangle will change accordingly.

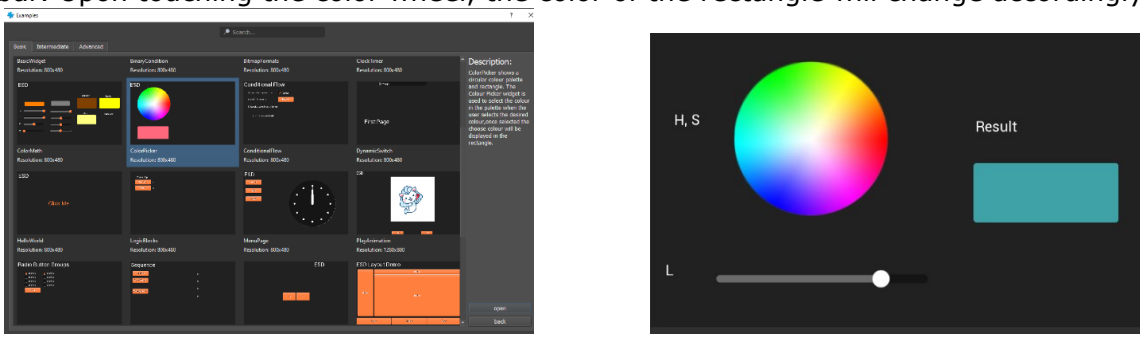


Figure 24 - Color Picker Example Project

ESD Gauge

The *ESD Gauge* is a circular widget which is based on the **EVE** built-in widget. The needle within the gauge is a visual representation of the input value. The widget is not designed to interact with touch input from the user.

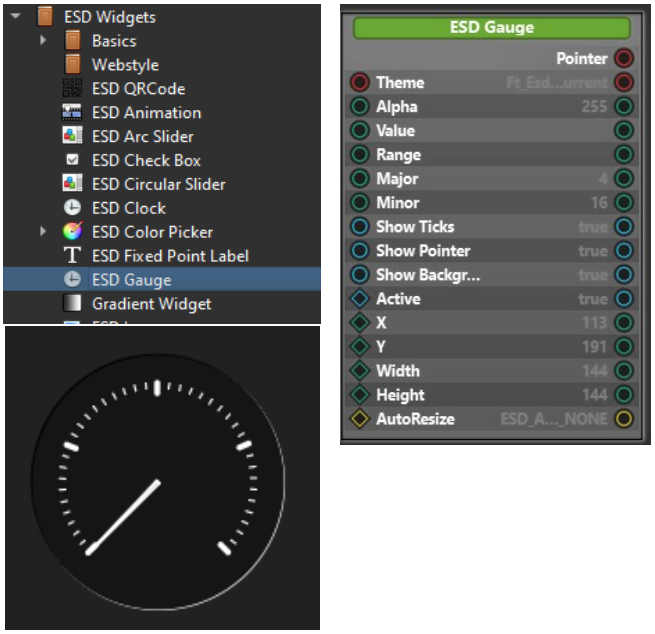


Figure 25 - ESD Gauge

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Alpha	Adjust the transparency
Value	Current value that the needle is pointing to
Range	Value range
Major	Major Division
Minor	Minor Division
Show Ticks	Set true to show ticks and vice versa
Show Pointer	Set true to show needle and vice versa
Show Background	Set true to show background and vice versa
X	x coordinate of the top-left point, in pixels
Y	y coordinate of the top-left point, in pixels
Width	Widget width
Height	Widget height
AutoResize	Set Widget Auto resize mode

Table 27 - ESD Gauge Widget Properties

ESD Gradient Widget

The *ESD Gradient Widget* allows the user to display gradient rectangle as widget instead of a render function on the screen.

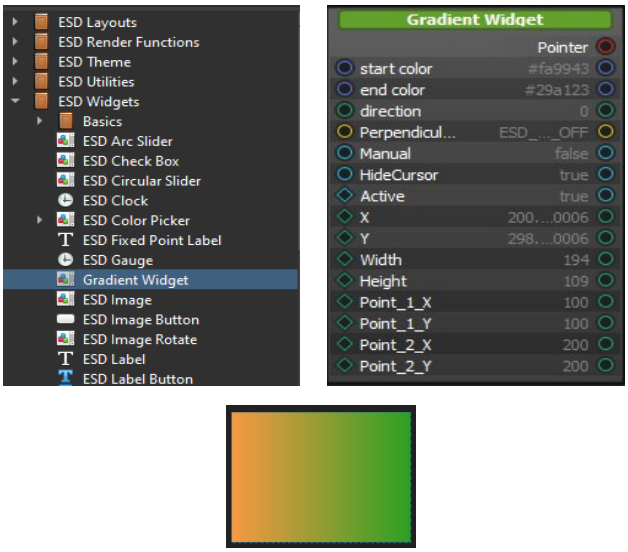


Figure 26 - ESD Gradient Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Start color	Select the starting colour of the gradient effect
End color	Select the ending colour of the gradient effect
Direction	Set the gradient effect's direction in degrees. The degree and value range are from 0 to 359
Active	Set true to activate this widget
x	x coordinate of central point, in pixels
y	y coordinate of central point, in pixels
Width	Width of the widget
Height	Height of the widget
Perpendicular Style	Set the gradient effect's direction based on the selected options. When turned on, it shall overwrite the above direction stated and employs a different calculation for the gradient effect. *ESD_PERPENDIDULAR_STYLE_OFF: Off,* *ESD_PERPENDIDULAR_STYLE_0: 0,* *ESD_PERPENDIDULAR_STYLE_90: 90,* *ESD_PERPENDIDULAR_STYLE_180: 180,* *ESD_PERPENDIDULAR_STYLE_270: 270*
Manual	Manual mode control. This feature takes precedence over the above settings when activated
Hide Cursor	Show anchor point for manual mode control
Point_1_X	x-coordinate of Point 1
Point_1_Y	y-coordinate of Point 1
Point_2_X	x-coordinate of Point 2
Point_2_Y	y-coordinate of Point 2

Table 28 - ESD Gradient Widget Properties

To use the manual mode feature, the user is required to enable the 'Manual' option in the property editor. Disabling the 'Hide Cursor' option will display the anchor points at the specified location specified by Point 1 and 2 coordinates. The corresponding coordinates will also be displayed.

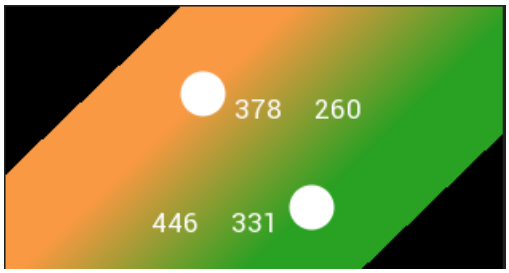


Figure 27 - Gradient Widget Manual Mode

It is required to run the simulation to adjust the anchor points. Click and drag the individual point to adjust the gradient effect. Once done, the user will need to manually enter the value of the coordinates into the corresponding fields (Point_1 and Point_2) in the property editor. The settings will be saved after the user saves the project.

ESD Image Widget

The *ESD Image widget* is the standard image widget that allows users to display a bitmap resource. To rotate an image, use the ESD Image widget.

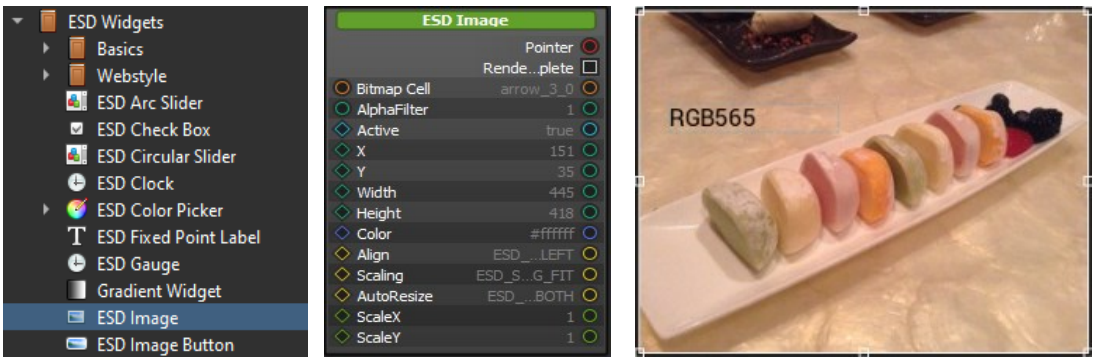


Figure 28 - ESD Image Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Bitmap Cell	The bitmap cell to be displayed on the widget
Alpha Filter	Alpha Filter setting, set 0 to disable it, or 1-255 for alpha function filtering
Active	Set true if this widget is active.
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
Color	Default colour
Align	Set Image alignment mode
Scaling	Set Image scaling mode
AutoResize	Set Widget Auto resize mode
ScaleX	X Scale value for the image
ScaleY	Y Scale value for the image

Table 29 - ESD Image Properties

Output / Signal	Description
RenderComplete	Output signal when bitmap render is completed

Table 30 - ESD Image Output/Signal

ESD Image Button Widget

The *ESD Image Button* widget allows the user to add a button in the form of a bitmap.

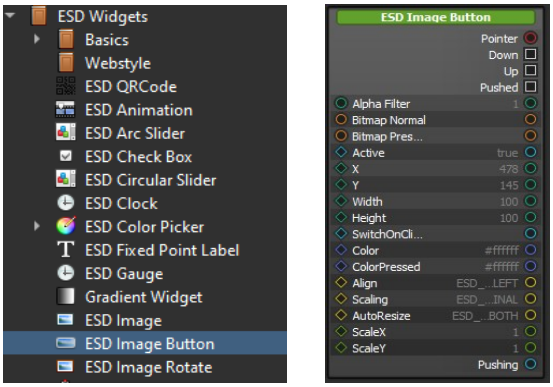


Figure 29 - ESD Image Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Alpha Filter	Alpha Filter setting. Set 0 to disable it, or 1-255 for alpha function filtering
Bitmap Normal	Bitmap cell to display in the normal state
Bitmap Pressed	Bitmap cell to display in the pressed state
Active	Active state of the image button, set to true to appear on the screen
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
SwitchOnClicked	When the button is clicked, toggle Bitmap Normal and Bitmap Pressed
Color	Default colour
ColorPressed	Colour of button when button is pressed.
Align	Set Image alignment mode
Scaling	Set Image scaling mode
AutoResize	Set Widget Auto resize mode
ScaleX	Scale X ratio to the original for the image
ScaleY	Scale Y ratio to the original for the image

Table 31 - ESD Image Button Properties

Output / Signal	Description
Down / Up / Pushed	Output signal when image button is in Down/Up or Pushed state
Pushing	Output value indicated (true) if the image button is in pressed state

Table 32 - ESD Image Button Output/Signal

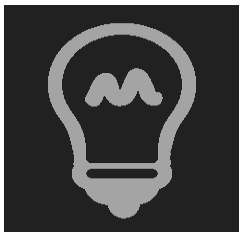
The following example illustrates how to add/ use an image button.

Add new image buttons and assign *"Bulb Off Image"* and *"Bulb On Image"* (refer to the bitmap pictures below) to "*Bitmap Normal"* and *"Bitmap Pressed"* properties.

Bulb Off image
(bitmap cell name is
bulb1Off_0)

Bulb On image
(bitmap cell name is
bulb1On_0)

Property	Value
(ESD Image Button)	
Name	ESD Image Button
Active	✓ True
Theme	Ft_Esd_Theme_GetCurrent
X	400
Y	200
Bitmap Normal	bulb1Off_0
Bitmap Pressed	bulb1On_0

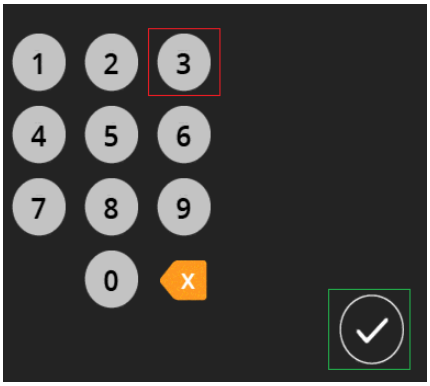


Normal State

Pressed State

Figure 30 - ESD Image Button Example

The following examples illustrate the use case of Alpha Filter.



All the available images (numerals, tick sign etc) are available as image resources (e.g., Bitmap, PNG etc.). These image resources are typically available in two-dimensional rectangular image containers/files.

Use case 1: Image in red (numeral 3)

When a user draws a numeral (say, numeral 3) image resource, all the pixels in the red box are painted. Thus, all the drawn pixels are identified with the tag associated with the number 3. Such an approach has a drawback. The non-colour portion of the image are also drawn and are associated with the tag, thus even clicking on the black portion of the numeral 3 will trigger the associated tag for numeral 3 which is not desired.
Solution: Since tagging is associated with the pixels that are drawn, ESD Image/ ESD Image Button can be configured to draw only pixels which are above *Alpha Filter* value. The black portion of the image resource can be set to alpha value 0. With an *Alpha Filter* value set to 255, only the portion with alpha greater than or equal to 255 will be rendered and can be tagged.

Use case 2: Image in green (tick sign)

This can be achieved by
(i) Selectively applying alpha to the image resource
(ii) Setting the *Alpha Filter*

For example, alpha can be set to below 200 for portions outside the circle, and above 200 for inside the circle. With an *Alpha Filter* value set to 200, only the inner portion of the circle will be rendered and it can be associated with a tag. This can help achieve a desired alpha blend along with the desired tagging behaviour.

ESD Image Rotate Widget

The *ESD Image Rotate widget* is similar to the ESD Image widget that allows the user to display a bitmap resource with the rotation angle.

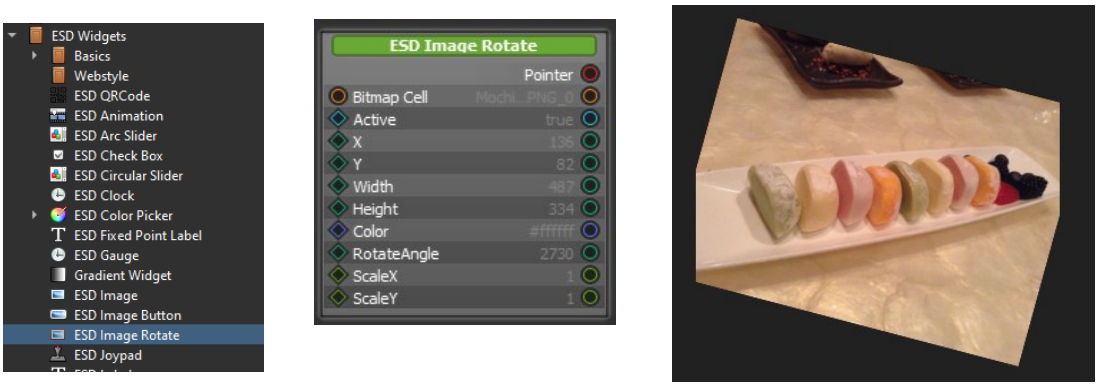


Figure 31 - ESD Image Rotate Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Bitmap Cell	The bitmap cell to be displayed on the widget
Active	Set true if this widget is active.
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
Colour	Default colour
Rotate Angle	The Rotation Angle, range: 0 to 65535
ScaleX	Scale X ratio to original.
ScaleY	Scale Y ratio to original.

Table 33 - ESD Image Rotate Properties

ESD Joypad Widget

The *ESD Joypad* widget allows the user to control the movement/direction of elements that are connected to the output of the widget. It supports 360° direction movement achievable by using the control knob which is at the centre of the widget.

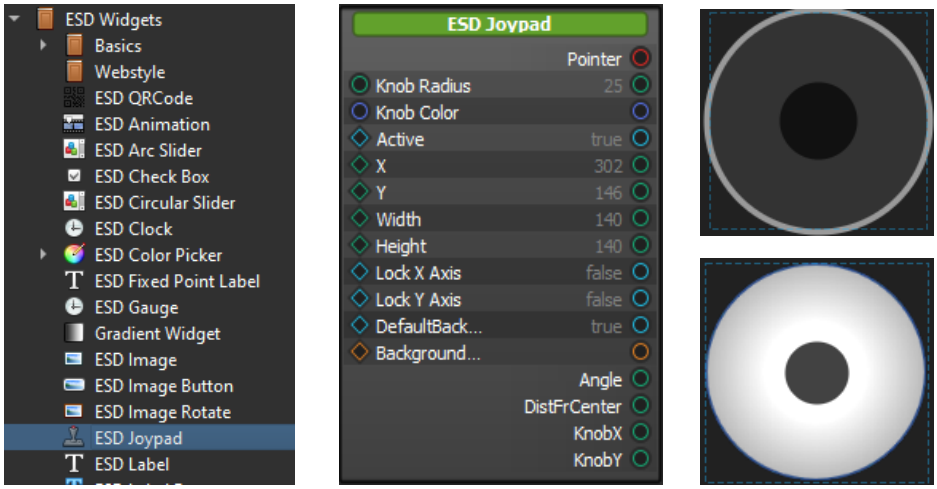


Figure 32 - ESD Joypad Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Knob Radius	The radius of the control knob
Knob Color	The color of the control knob
Active	Set true if this widget is active.
X	x coordinate of the Joypad, top-left, in pixels
Y	y coordinate of the Joypad, top-left, in pixels
Width	Joypad width, in pixels
Height	Joypad height, in pixels
Lock X Axis	Locked the X axis for a better control in Y axis only
Lock Y Axis	Locked the Y axis for a better control in X axis only
DefaultBackground	Display default background of the widget
BackgroundImage	Display user's selected image as background

Table 34 - ESD Joypad Properties

Output / Signal	Description
Angle	Angle of control knob from centre, range from 0 to 359
DistFrCenter	Distance of control knob from centre, range from 0 to size of Joypad
KnobX	x coordinate of knob, centre, in pixels
KnobY	y coordinate of knob, centre, in pixels

Table 35 - ESD Joypad Output/Signal

ESD Label Widget

The *ESD Label* widget allows the user to add a Text Label with customized size and text.

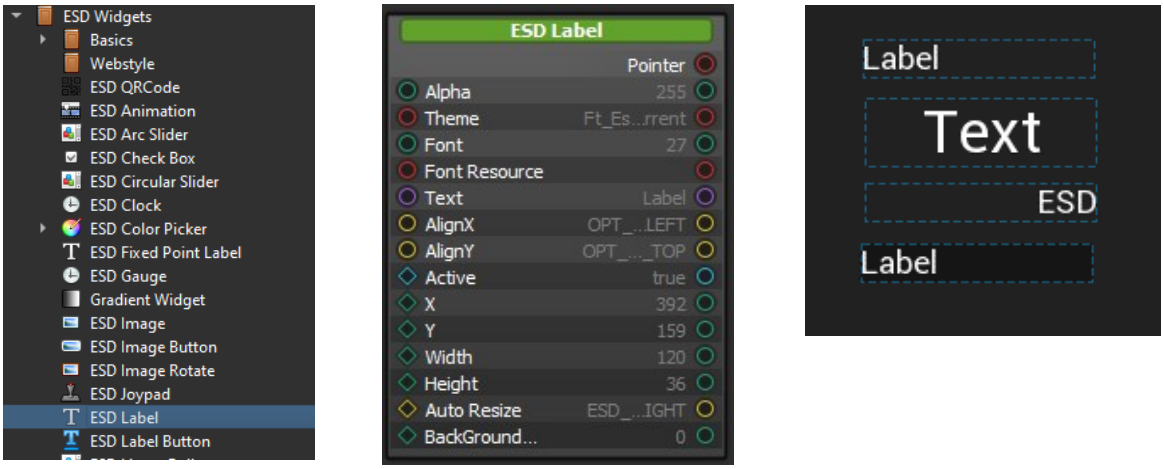


Figure 33 - ESD Label Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme applied on the label
Alpha	Adjust the transparency
Font	Fonts used in the label. Same as bitmap handle defined in EVE
Font resource	Sets the font resource.
Text	The text content of the label. By default, "Label"
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
Active	Active state of the label. Set to true to appear on the screen
X	x coordinate of label, top-left, in pixels
Y	y coordinate of label, top-left, in pixels
Width	Label width, in pixels
Height	Label height, in pixels
AutoResize	Set Widget Auto resize mode
BackGroundAlpha	Adjust background transparency of the label

Table 36 - ESD Label Properties

ESD Numeric Label Widget

The *ESD Numeric Label* widget allows the user to add a numeric label i.e., with value in **integer**. ESD Numeric Label outputs are similar to C printf("%d") and printf("%x") functions.

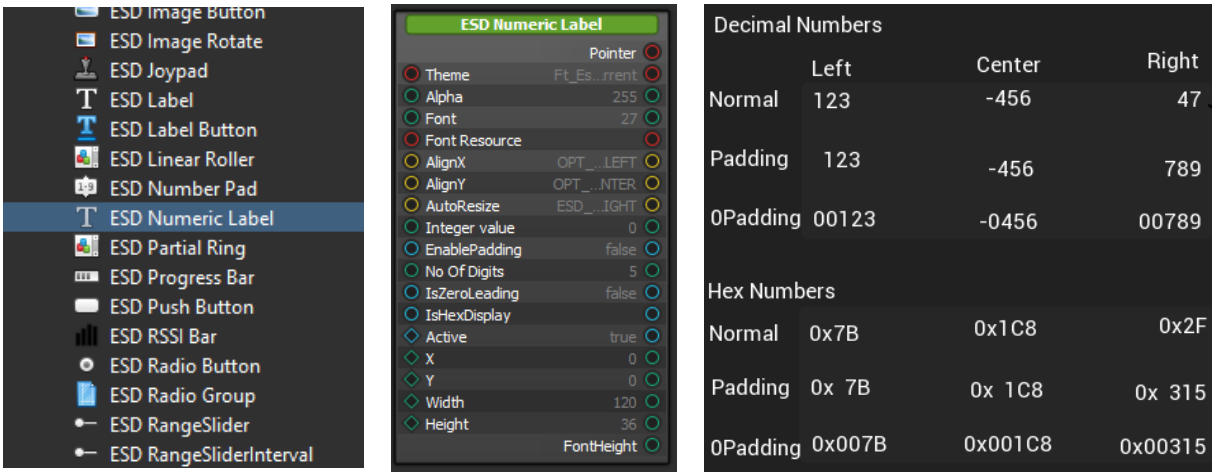


Figure 34 - ESD Numeric Label

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme applied on the label
Font	Fonts used in the label. Same as bitmap handle defined in EVE
Font resource	Set the font resource.
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
AutoResize	Set Widget Auto resize mode
Integer Value	The integer value of the numeric label.
EnablePadding	Set true to enable padding
No Of Digits	Number of digits, padding will be applied when the number of digits is less.
IsZeroLeading	Set true to enable '0' leading characters as padding
IsHexDisplay	Set true to enable Hexadecimal display format
Active	Active state of the label, set to true to appear on the screen
X	x coordinate of label, top-left, in pixels
Y	y coordinate of label, top-left, in pixels
Width	Label width, in pixels
Height	Label height, in pixels

Table 37 - ESD Numeric Label Properties

ESD Number Pad Widget

The *ESD Number Pad* widget allows the user to input numbers/digits. The value of the key input is sent out immediately after detection.

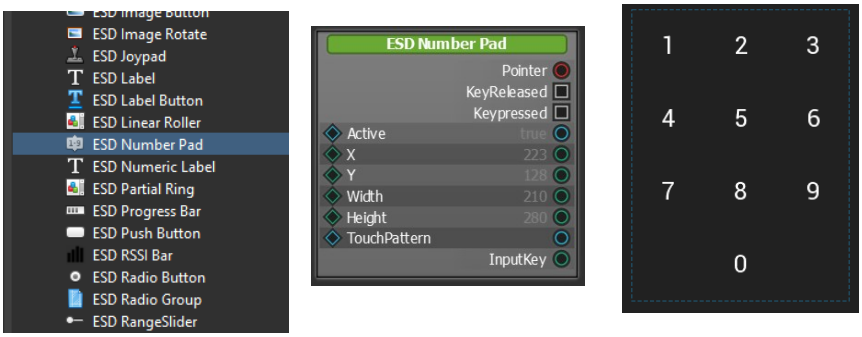
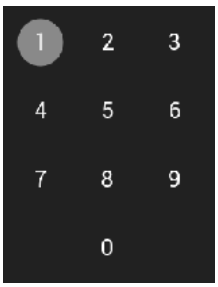


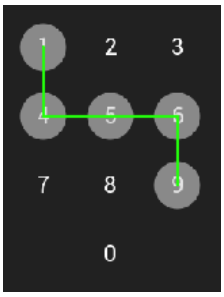
Figure 35 - ESD Number Pad Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Font	Fonts used in the widget. Same as bitmap handle defined in EVE
Font resource	Set the font resource.
Active	Set true if this widget is active.
X	x coordinate of the Number pad, top-left, in pixels
Y	y coordinate of the Number pad, top-left, in pixels
Width	Number pad's width, in pixels
Height	Number pad's height, in pixels
TouchPattern	When activated, connecting lines will be shown when user presses and drags between the numbers. Multi-input detection is allowed via swiping. When it is turned off, multi-input detection is not allowed via swiping. Only the first selected input is highlighted. **Note:** This is only graphical display and input detection mode. The numbers are sent out individually upon input detection in both cases.

Table 38 - ESD Numberpad Properties



TouchPattern Off



TouchPattern On

Output / Signal	Description
KeyReleased	Signal will be sent when touch is released from the number pad
KeyPressed	Signal will be sent when there is a valid input on the number pad
InputKey	The touched key value. User should rely on the 'Keypressed' signal to register the valid touched input value. Value read from this field is only valid if 'Keypressed' signal is detected.

Table 39 - ESD Numberpad Output/Signal

ESD Fixed Point Label Widget

The *ESD Fixed Point Label* Widget allows the user to add a fixed-point label with value in fixed point. ESD Fixed Point Label outputs are similar to C function printf("%f").

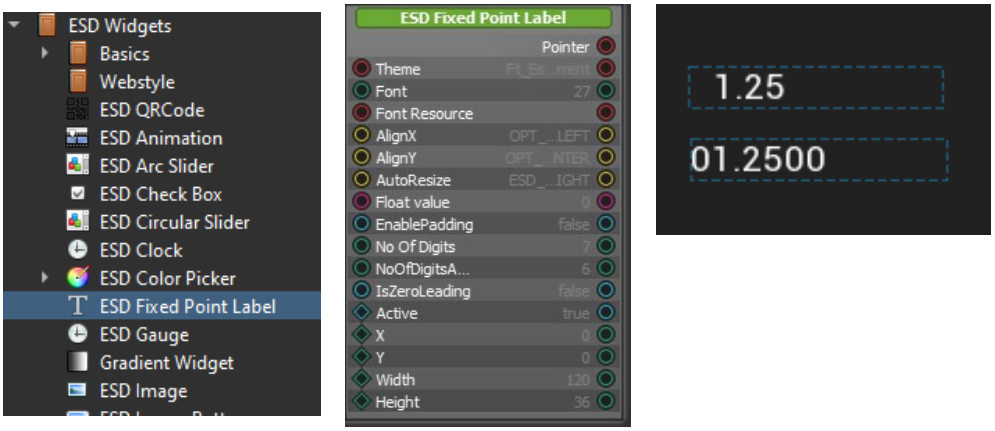


Figure 36 - ESD Fixed Point Label Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme applied on the label
Font	Fonts used in the label. Same as bitmap handle defined in EVE
Font resource	Sets the font resource.
Align X	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
Align Y	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
AutoResize	Set Widget Auto resize mode
Float Value	The float value of the fixed-point label.
EnablePadding	Set true to enable padding
No Of Digits	Number of digits, padding will be applied when the number of digits is less.
NoOfDigitsAfterDot	Number of digits after the dot.
IsZeroLeading	Set true to enable '0' leading character as padding
Active	Active state of the label, set to true to appear on the screen
X	x coordinate of label, top-left, in pixels
Y	y coordinate of label, top-left, in pixels
Width	Label width, in pixels
Height	Label height, in pixels

Table 40 - ESD Fixed Point Label Properties

ESD Label Button Widget

The *ESD Label Button* widget allows the user to add a button in the form of a label.

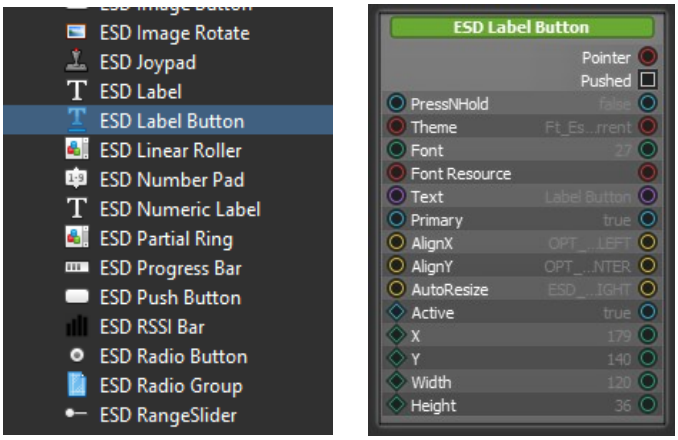


Figure 37 - ESD Label Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme applied on the label button
Font	Font used in the label button. Same as bitmap handle defined in EVE
Font resource	Set the font resource.
Text	The text content of the label button. By default, "Label"
Primary	Primary state of the label button – Set to True to use the Primary colour from theme Set to False to use the default colour from theme
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
AutoResize	Set auto resize mode: *ESD_AUTORESIZE_NONE* *ESD_AUTORESIZE_WIDTH* *ESD_AUTORESIZE_HEIGHT* *ESD_AUTORESIZE_BOTH*
Active	Active state of the label. Set to true to appear on the screen
X	x coordinate of label button, top-left, in pixels
Y	y coordinate of label button, top-left, in pixels
Width	Label button width, in pixels
Height	Label button height, in pixels
PressNHold	To maintain 'Pressed' state after clicked when set to true

Table 41 - ESD Label Button Properties

The logic node connection in Figure 38 shows how a toggle changes the state upon pushing the label button. When label button is pushed, the corresponding output signal is **"Pushed"**.

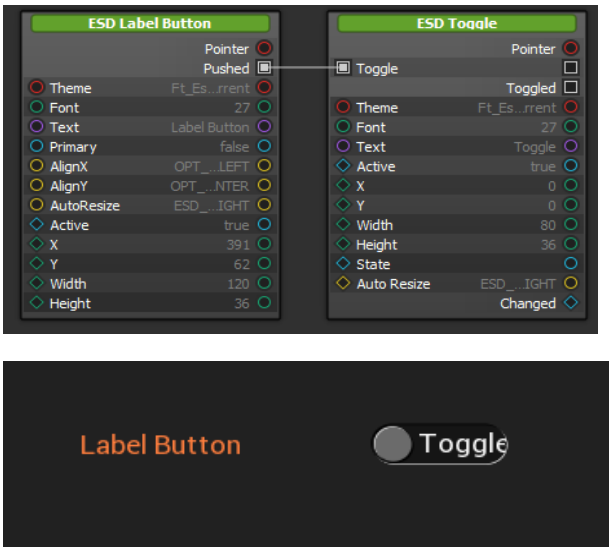


Figure 38 - ESD Label Button Example

ESD Radio Button and ESD Radio Group Widgets

The *ESD Radio Button* widget is used to choose options. The *ESD Radio Button Group* widget is a utility widget which is not rendered to display. It enables multiple radio buttons to form a single group; only one radio button can be selected at a time.

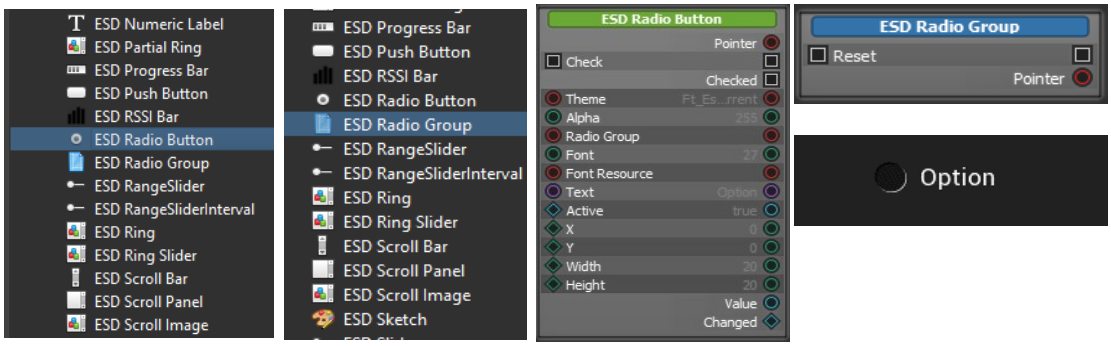
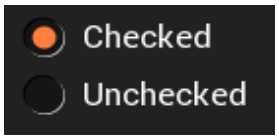


Figure 39 - ESD Radio Button & ESD Radio Group

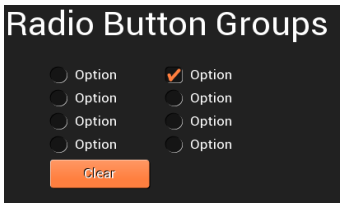
Property Name	Description
Pointer	The pointer reference of the widget object
Check	Selected or not selected
Theme	Theme to be applied to this widget
Alpha	Adjust the transparency
Radio Group	Pointer to a radio group
Font	Font Size
Font resource	Set the font resource
Text	The display label beside the radio button
Active	Enable or disable displaying this widget
X	Absolute X position on the horizontal axis
Y	Absolute Y position on the vertical axis
Width	Widget width
Height	Widget height

Table 42 - ESD Radio Button Properties

An ESD Radio Button has 2 states: *Checked* or *Unchecked*. *Checked* state is selected by clicking an empty box, or by receiving an external signal from other sources (Push Button, Image Button, Checkbox, etc.).



Each Radio Button has a pointer to an ESD Radio Group; it shares the same context. Only one Radio Button can be checked at a time. When an ESD Radio Group receives a Reset signal, it will reset all states of its children Radio Buttons. Refer to Figure 40.



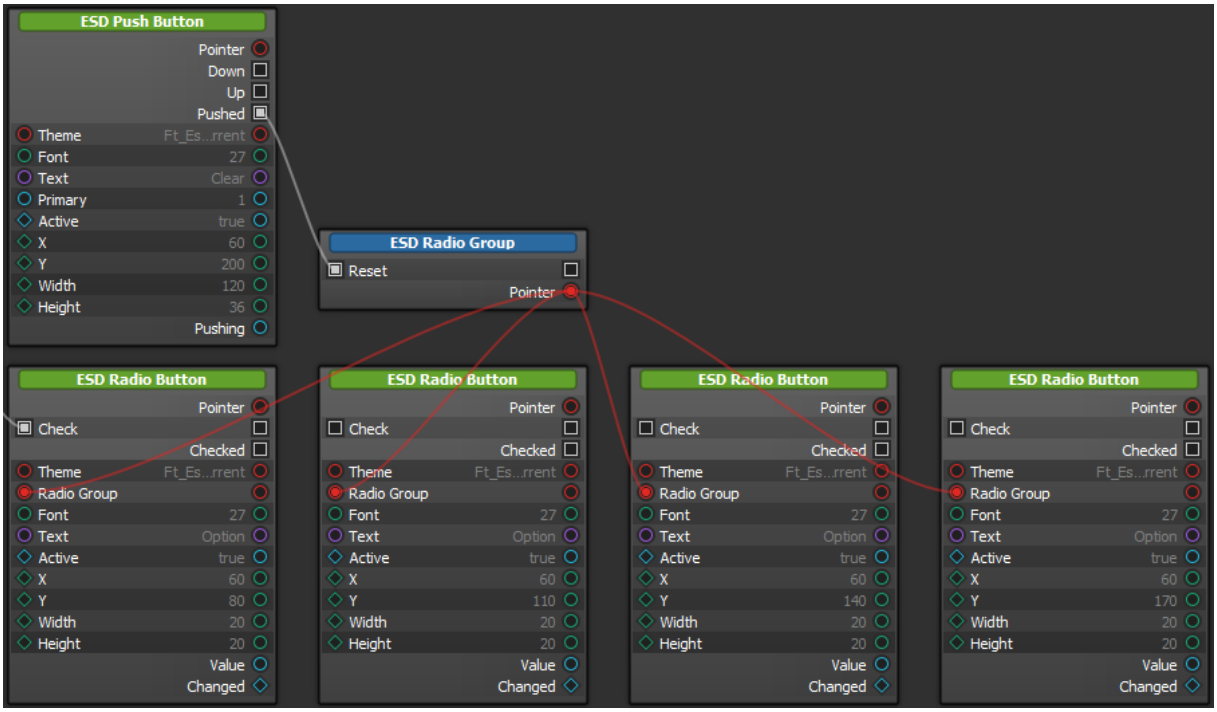


Figure 40 - ESD Radio Button & ESD Radio Group Example

Please note that the 'Checked' signal of the widget should not be connected to its own 'Check' slot. This will cause the widget not to function properly.

ESD Push Button

The *ESD Push Button* widget allows the user to add a 3D effect rectangle button with customized size and text label.

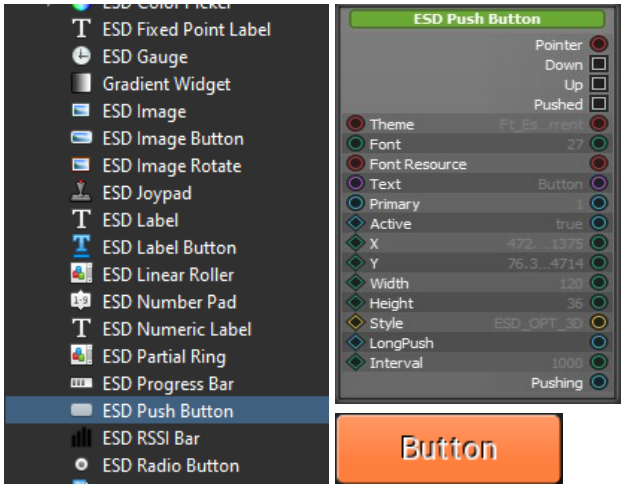


Figure 41 - ESD Push Button Widget

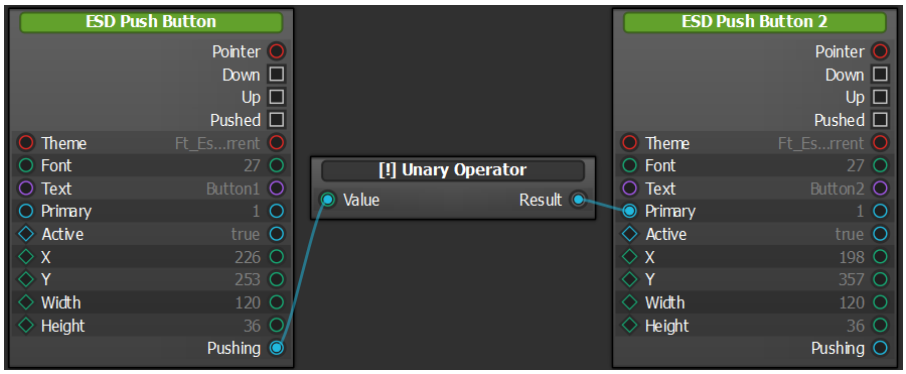
Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme applied for the button
Font	Fonts used in the label
Font Resource	Set the font resource
Text	The label displayed on the button
Primary	Primary state of the button: Set to True to use the Primary color from theme Set to False to use the default color from theme
Active	Active state of the button. Set to true to appear on the screen
X	Coordinate of button, top-left, in pixels
Y	Coordinate of button, top-left, in pixels
Width	Button width, in pixels
Height	Button height, in pixels
Style	Display Style of button ESD_OPT_3D ESD_OPT_FLAT
LongPush	When activated, 'Pushed' signal will be sent out continuously based on the set interval while button is in 'pushed' state
Interval	Interval between each 'Pushed' signal when button is pushed while 'LongPush' is activated

Table 43 - ESD Push Button Properties

Output / Signal	Description
Down / Up / Pushed	Output signal when the push button is in Down/Up or Pushed state
Pushing	Output value due to pushing/not pushing of the button

Table 44 - ESD Push Button Output/Signal

The logic node connection in Figure 42 shows how a Push Button ("Button1") is created to toggle the primary state of another Push Button ("Button 2").



Here is the output:

Normal State Pushing State

Figure 42 - ESD Push Button Example

ESD Linear Roller Widget

The *ESD Linear Roller* widget allows the user to display linear roller. This is useful for roller style of control widgets.

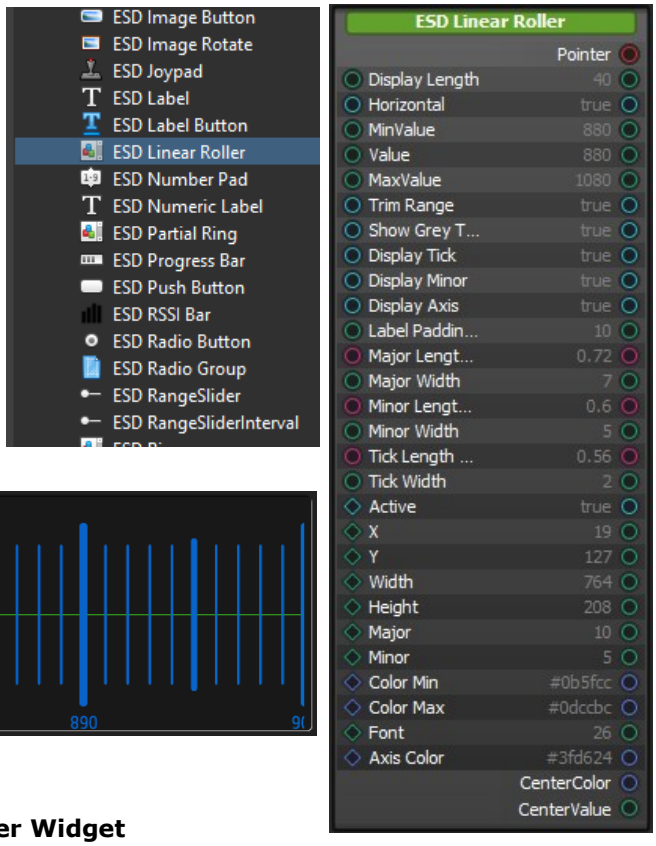


Figure 43 - ESD Linear Roller Widget

Property Name	Description

Display Length	The display length in ticks for the displaying window
Horizontal	The Boolean flag to set the orientation of the roller. Set true as horizontal roller.
MinValue	The minimum value of the roller
Value	The current value of the roller
MaxValue	The maximum value of the roller
Trim Range	The Boolean flag for trimming according to the range
Show Grey Trim Range	The Boolean flag for showing the trimmed range as grey scales
Display Tick	The Boolean flag for displaying the tick scale
Display Minor	The Boolean flag for displaying the minor scale
Display Axis	The Boolean flag for displaying the axis of the roller
Label Padding	Defines the label padding for displaying the major label
Major Length	Defines the length of the major scale, range from 0.0 to 1.0
Major Width	Defines the line width of the major scale in pixels
Minor Length	Defines the length of the minor scale, range from 0.0 to 1.0
Minor Width	Defines the line width of the minor scale in pixels
Tick Length	Defines the length of the tick scale, range from 0.0 to 1.0
Tick Width	Defines the line width of the tick scale in pixels
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height
Major	Defines major count in ticks
Minor	Defines minor count in ticks
Color Min	The minimum color for minimum value of the roller
Color Max	The maximum color for maximum value of the roller
Font	Defines the font for the label
Axis Color	Set axis color of the widget in RGB

Table 45 - ESD Linear Roller Widget Properties

Output / Signal	Description
Pointer	The pointer reference of the widget object
CenterColor	Output the value of the centre's color
CenterValue	Output the current value at the centre of the roller

Table 46 - ESD Linear Roller Widget Output/Signal

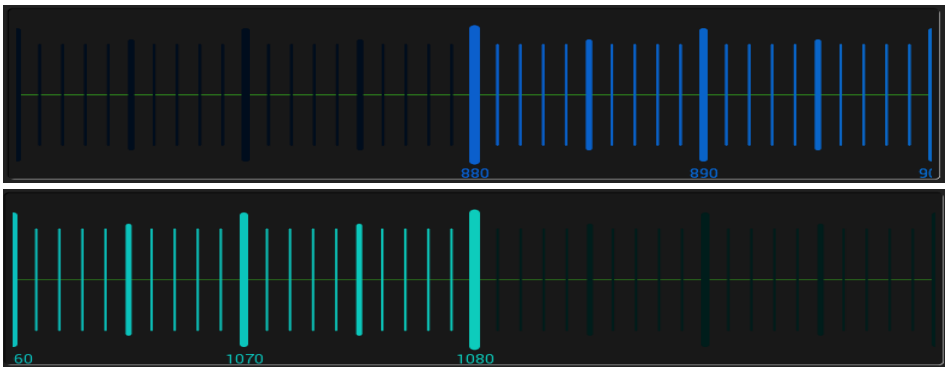


Figure 44 - Sample of Linear Roller Widget

In Figure 44, the roller has minimum value = 880, maximum value = 1080, display length = 40 ticks, major = 10 ticks, minor = 5 ticks. It displays major scales, minor scales and

tick scales, while each type of them has different widths and lengths. It also displays roller axis line, display trimmed range as grey scales. Lastly, there are gradient color effects in the scales, both minimum and maximum colors are configured (from blue to cyan).

ESD Progress Bar Widget

The ESD Progress Bar widget allows user visualize the progression of an operation, such as a download, file transfer, machine running,

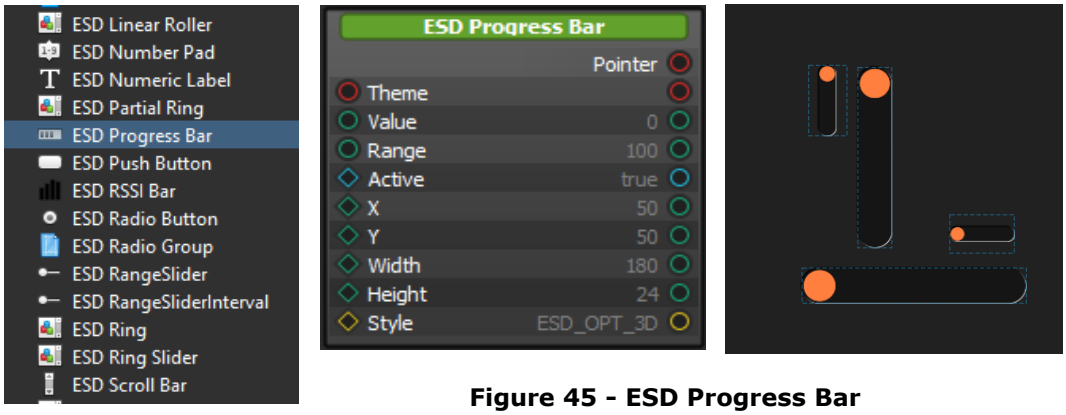


Figure 45 - ESD Progress Bar

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied on the progress bar
Value	Indicates the progress level and displayed as the filled portion of the progress bar. It should be within the range defined by "Range"
Range	Progress bar's values range, 0-65535
Active	Active state of the progress bar, set to true to appear on the screen
X	X coordinate of the progress bar, top-left, in pixels
Y	Y coordinate of the progress bar, top-left, in pixels
Style	Display Style of progress bar ESD_OPT_3D ESD_OPT_FLAT
Width	Progress bar width, in pixels
Height	Progress bar height, in pixels

Table 47 - ESD Progress Bar Properties

The logic node connection in Figure 46 shows the creation of a continuous progress bar with a range from 0 to 1000, taking its input from the built-in "GetMilliseconds" function node.

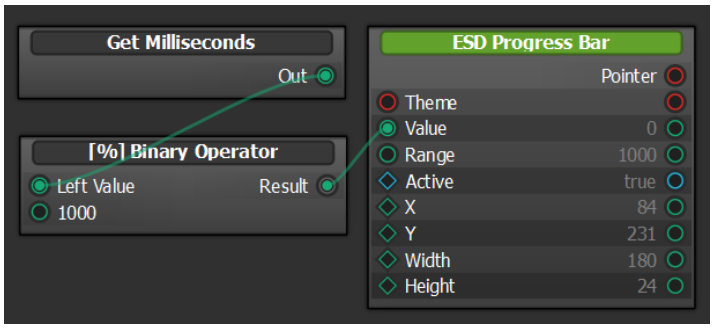


Figure 46 - ESD Progress Bar Example

ESD RSSI Bar Widget

The *ESD RSSI Bar* widget is used to add a RSSI Bar and show signal strength between the bars.

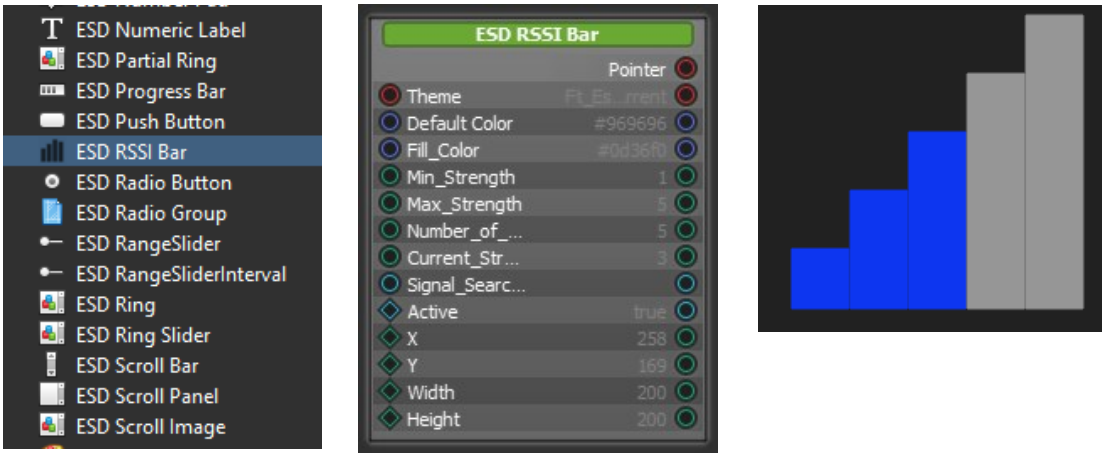


Figure 47 - ESD RSSI Bar

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Default Color	Default Color to be applied to this widget
Fill_Color	Color to be filled in bar when strength is captured
Min_Strength	Minimum value for signal strength
Max_Strength	Maximum value for signal strength
Number_of_Bars	Number of Bars to be displayed
Current_Strength	Input to current signal strength
Signal_Search_Mode	Set true to override the current signal strength and current signal strength loops from min strength to max strength repeatedly
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height

Table 48 - ESD RSSI Bar Widget Properties

ESD Scroll Bar Widget

The *ESD Scroll Bar* widget is used to scroll a value between minimum and maximum which is often used together with a panel forming as scrollable panel.

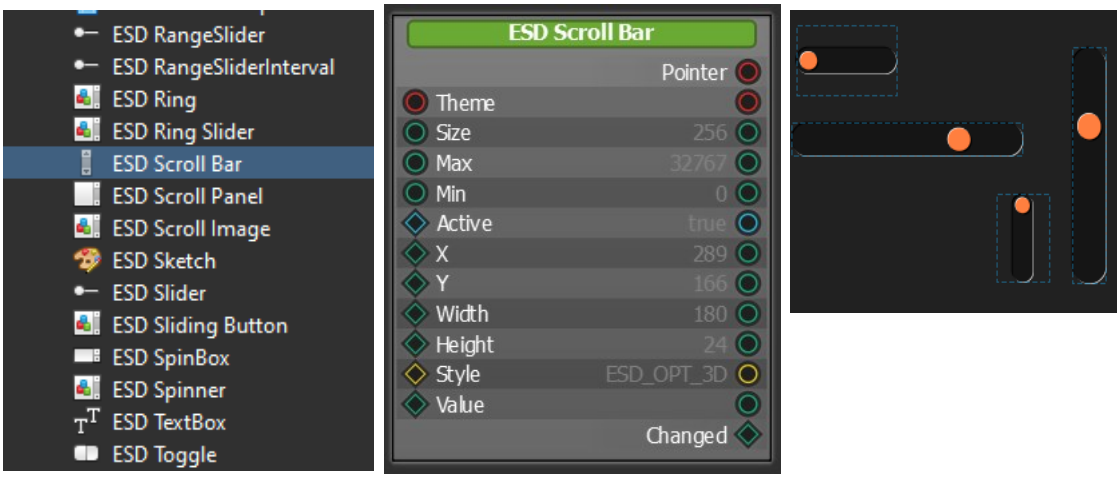


Figure 48 - ESD Scroll Bar Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Size	Set knob size of the ESD Scrollbar
Max	Maximum Value of the slider
Min	Minimum Value of the slider
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height
Value	Value of the slider
Style	Display style of scroll bar ESD_OPT_3D ESD_OPT_FLAT

Table 49 - ESD Scroll Bar Widget Properties

Output / Signal	Description
Changed	Output signal when the scroll bar has changed

Table 50 - ESD Scroll Bar Output/Signal

ESD Scroll Panel Widget

The *ESD Scroll Panel* widget is a scrollable panel. *ESD Scroll Panel* widget requires a linear layout to function properly. Refer to "ScrollPanel" example project for details.

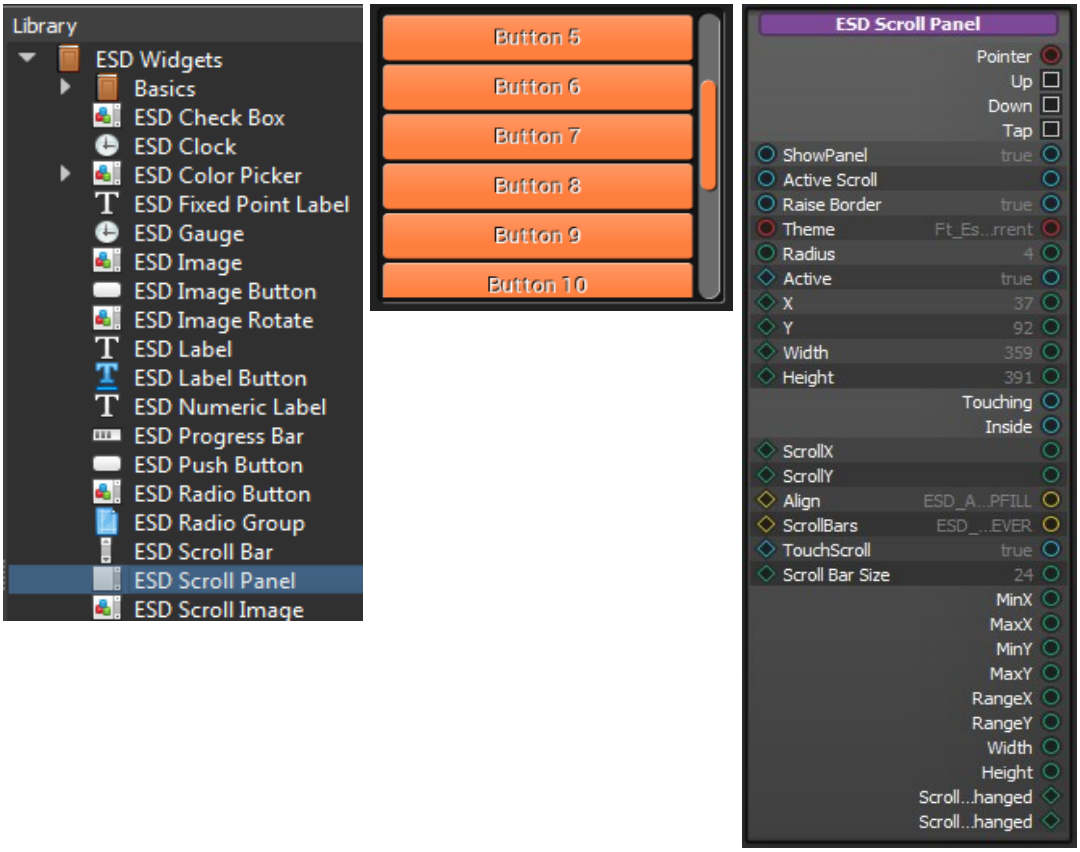


Figure 49 - ESD Scroll Panel Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Up	Touch up event
Down	Touch down event
Tap	Touch tap event
ShowPanel	Set true to display background panel
Active Scroll	Set true to override default touch tag (255)
Raise Border	Set background panel with raise border
Touching	Boolean for Touching status
Inside	Boolean for Touch inside status
Theme	Theme to be applied to this widget
Radius	The radius of the ESD Scroll Panel (in pixels)
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height
ScrollX	Scroll-to x coordinate (in pixels)
ScrollY	Scroll-to y coordinate (in pixels)
Align	Set alignment mode
ScrollBars	Set scroll bar mode:

	ESD_VISIBLE_NEVER ESD_VISIBLE_WHENNEEDED ESD_VISIBLE_ALWAYS
TouchScroll	Set true to enable touch scroll
Scroll Bar size	Set the size of scroll bar if it is applicable

Table 51 - ESD Scroll Panel Widget Properties

Output / Signal	Description
MinX	Minimum X for local X coordinate in scroll panel
MinY	Minimum Y for local Y coordinate in scroll panel
MaxX	Maximum X for local X coordinate in scroll panel
MaxY	Maximum Y for local Y coordinate in scroll panel
RangeX	X Range for local X coordinate in scroll panel
RangeY	Y Range for local Y coordinate in scroll panel
Width	Local width of scroll panel
Height	Local height of scroll panel
ScrollXChanged	Signal when X has changed
ScrollYChanged	Signal when Y has changed

Table 52 - ESD Scroll Panel Output/Signal

ESD Scroll Image

The *ESD Scroll Image* widget supports scrollable image effect by both touch and slider controls. Refer to the example project **"ScrollImageWidget"** under the **"Examples -> Intermediate"** in ESD installation directory.

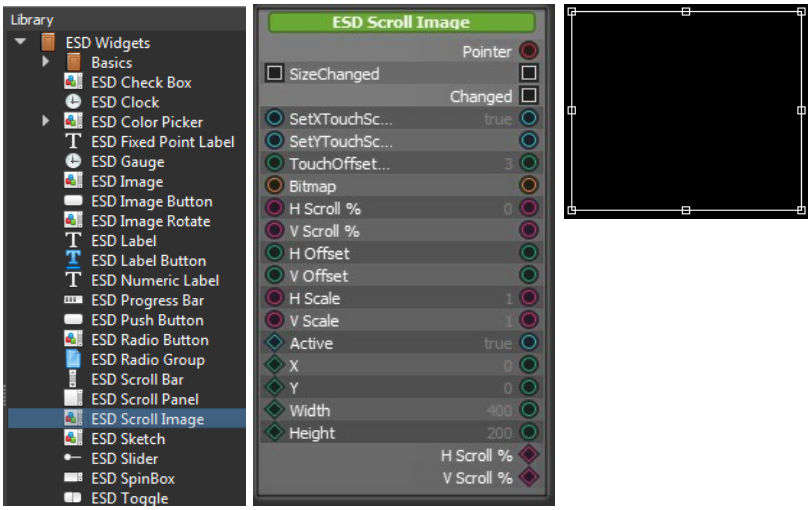


Figure 50 - ESD Scrollable Image

Property Name	Description
Pointer	The pointer reference of the widget object
SetXTouchScroll	Set true to enable X axis touch scroll
SetYTouchScroll	Set true to enable Y axis touch scroll
TouchOffsetThreshold	The offset threshold for activating and touch scroll. This is used to stabilize the noise in touch input.
Bitmap	Image object reference for display
H Scroll %	Set horizontal scroll's initial value in percentage
V Scroll %	Set vertical scroll's initial value in percentage
H Offset	Set image's horizontal offset

V Offset	Set image's vertical offset
H Scale	Set image's horizontal scale
V Scale	Set image's vertical scale
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height

Table 53 - ESD Scroll Image Widget Properties

Output / Signal	Description
SizeChanged	Trigger to update scrollable image's touch area after size was changed by its parent widget
Changed	Signal for scroll value changes from the scrollable image widget
H Scroll %	Horizontal scroll percentage value writer. Use it to update external scroll bar if there is
V Scroll %	Vertical scroll percentage value writer. Use it to update external scroll bar if there is

Table 54 - ESD Scrollable Image Output/Signal

ESD Sketch Widget

The *ESD Sketch* widget provides a canvas area that may be used to do free sketch by touch.

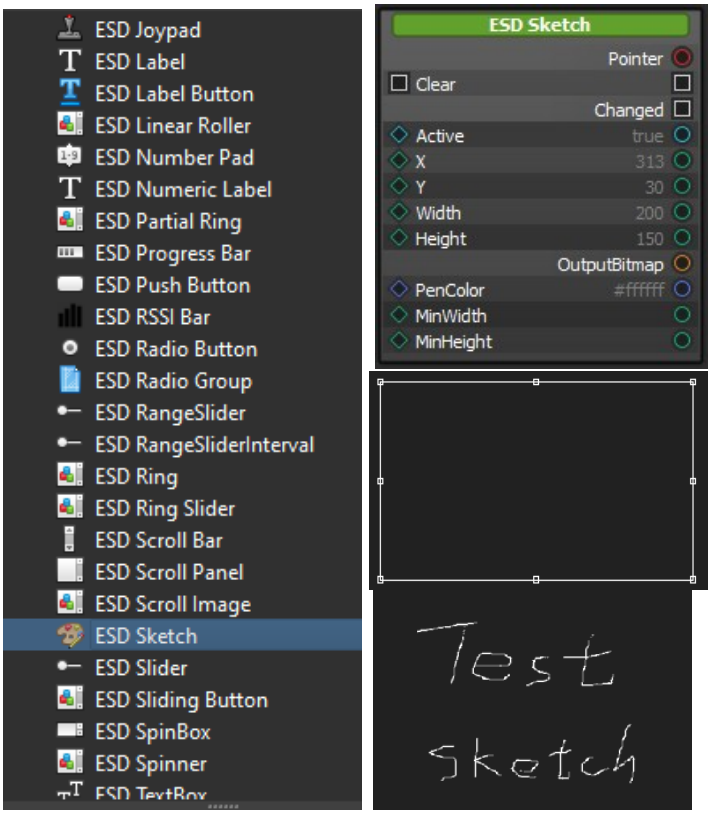


Figure 51 - ESD Sketch Widget

Property Name	Description
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width

Height	Widget height
PenColor	Color that is used to draw the trace
MinWidth	Minimum Widget width when resizing the bitmap
MinHeight	Minimum Widget height when resizing the bitmap

Table 55 - ESD Sketch Widget Properties

Output / Signal/ Slot	Description
Pointer	The pointer reference of the widget object
OutputBitmap	Output the drawing as bitmap cell
Clear	Slot for clear sketch
Changed	Signal for change event

Table 56 - ESD Sketch Widget Output/Signal/ Slot

ESD Slider Widget

The *ESD Slider* widget is used to adjust the value by dragging a slider.

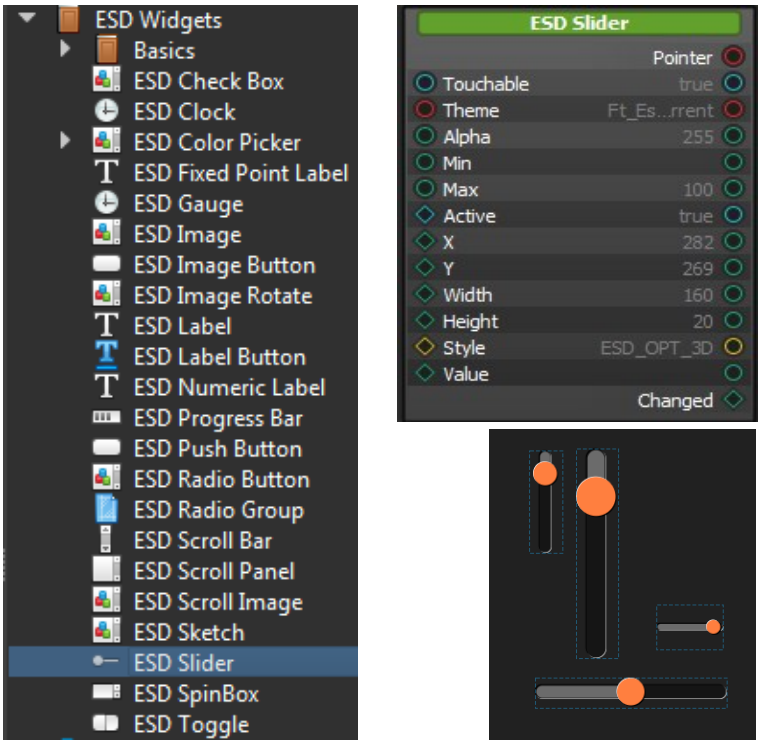


Figure 52 - ESD Slider Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Alpha	Adjust the transparency
Min	Minimum Value of the slider
Max	Maximum Value of the slider
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget Height
Value	Value of slider

Touchable	Specify whether slider responds to touch event
Style	Display Style of slider: ESD_OPT_3D ESD_OPT_FLAT

Table 57 - ESD Slider Widget Properties

Output / Signal	Description
Changed	Output signal when the slider has changed

Table 58 - ESD Slider Output/Signal

The alpha value is adjusted by the slider and then combined with the RGB color to produce the color of the ESD Rectangle. When the value is changed, the connected variable is updated to reflect the new value. The images below demonstrate this process.

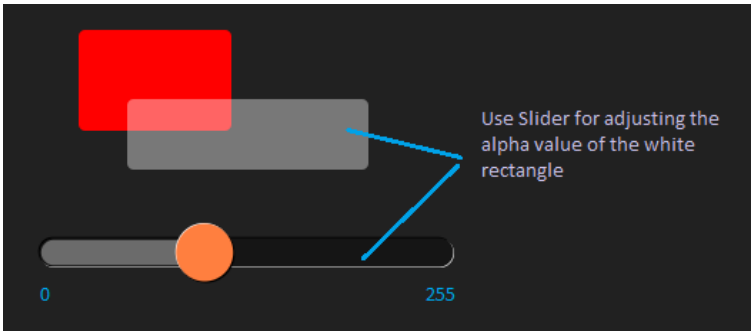


Figure 53 - ESD Slider Example

Figure 54 shows the logic node connection in the logic note editor.

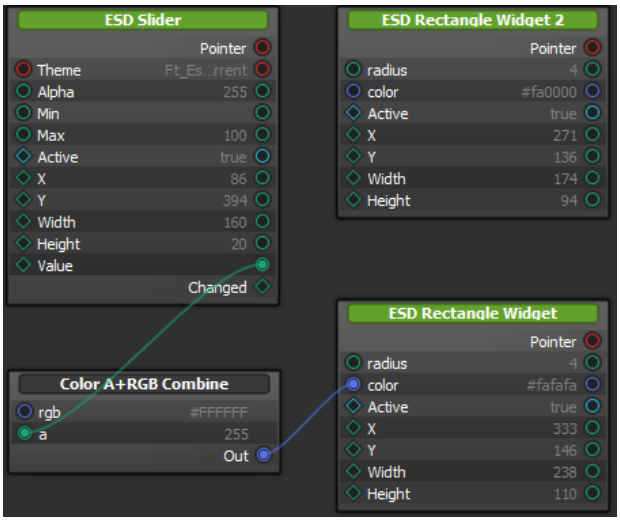


Figure 54 - ESD Slider Logic Node Connection Example

ESD Sliding Button Widget

The ESD Sliding Button widget offers users an alternative method for confirming or activating an action, distinct from the traditional approach of pressing the button.

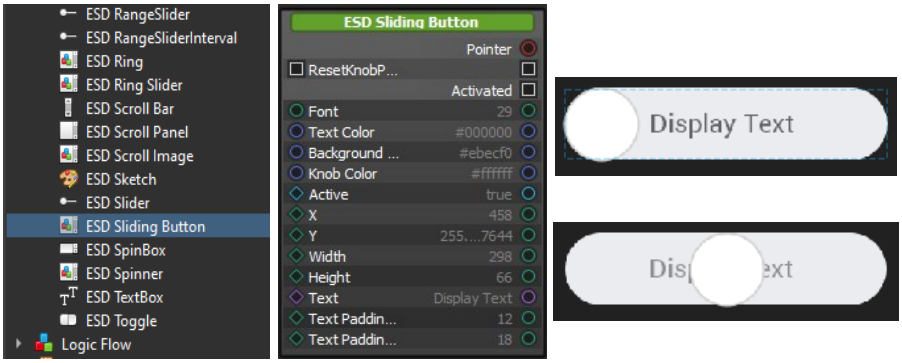


Figure 55 - ESD Sliding Button Widget

Property Name	Description
Pointer	The pointer reference of the widget object
ResetKnobPosition	Slot function to reset the control knob to default position after activated
Font	Fonts used in the display text
Text Color	Display color of the text
Background Color	Display color of the background
Knob Color	Display color of the control knob
Active	Active state of the button, set to true to appear on the screen
X	Coordinate of widget, top-left, in pixels
Y	Coordinate of widget, top-left, in pixels
Width	Widget width, in pixels
Height	Widget height, in pixels
Text	Display text
Text Padding X	X axis padding of the display text from the left
Text Padding Y	Y axis padding of the display text from the top

Table 59 - ESD Sliding Button Properties

Output / Signal	Description
Activated	Output signal when the control knob is activated by sliding fully to the right. **Note:** Upon activation, the control knob shall remain at the activated position until 'ResetKnobPosition' has been triggered.

Table 60 - ESD Sliding Button Output/Signal

ESD Spin Box Widget

The ESD Spin Box widget allows users to input a numerical value within a predefined range. It consists of a text box and two small arrow buttons (up and down) adjacent to the box.

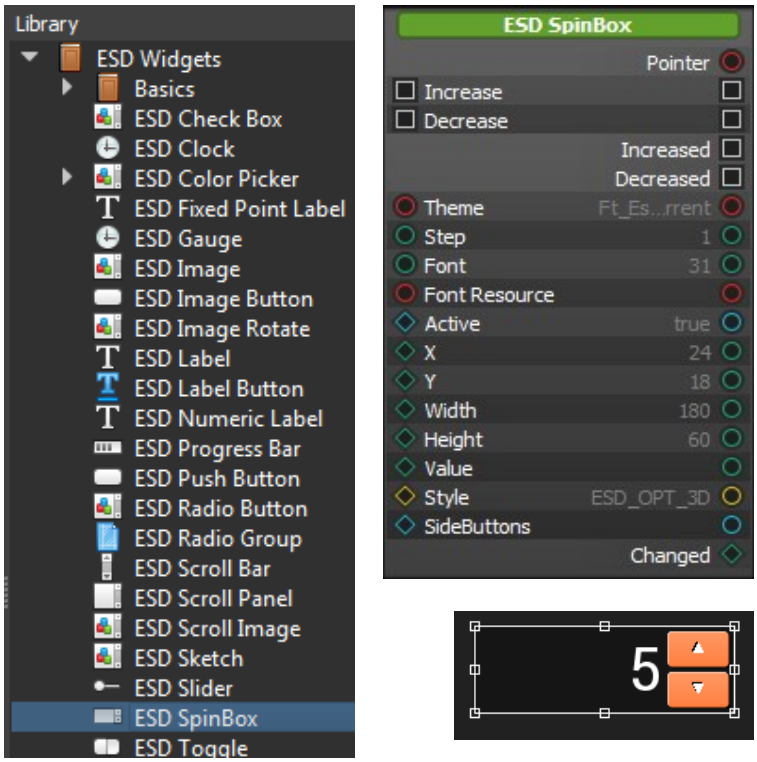


Figure 56 - ESD Spin Box Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Increase	Input slot to trigger the increase (up) event
Decrease	Input slot to trigger the decrease (down) event
Theme	Theme to be applied on the spin box
Step	When arrows are used to change the spin box's value, the value will be incremented/decremented by the amount of step
Font	Font Size
Font resource	Set the font resource
Active	Active state of the spin box. Set to true to appear on the screen
X	x coordinate of the spin box, top-left, in pixels
Y	y coordinate of the spin box, top-left, in pixels
Width	Spin box width, in pixels
Height	Spin box height, in pixels
Value	Value of the spin box
Style	Display style of spin box: ESD_OPT_3D ESD_OPT_FLAT
SideButtons	Denotes the Spin box style  False (Default)  True

Table 61 - ESD Spin Box Properties

Output / Signal	Description
Increased/Decreased	Output signal when the spin box is in Up (Increased)/ Down (Decreased) state
Changed	Output signal, the changed value of spin box that is written out

Table 62 - ESD Spin Box Output/Signal

The logic node connection in Figure 57 shows the interconnection of two different styles of ESD Spin box widgets that will increase or decrease simultaneously.

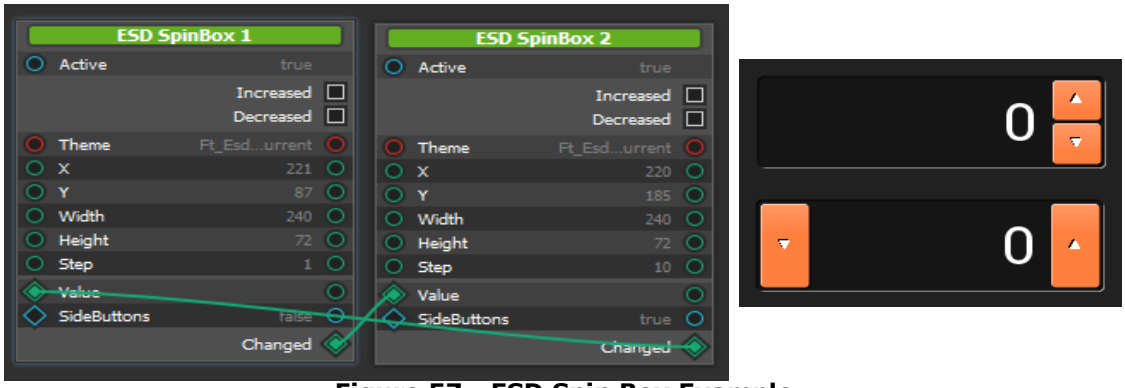


Figure 57 - ESD Spin Box Example

ESD Spinner Widget

The *ESD Spinner* widget allows the user to show the spinner display as per required. It supports 4 different display styles with 4 different display scales for each style.

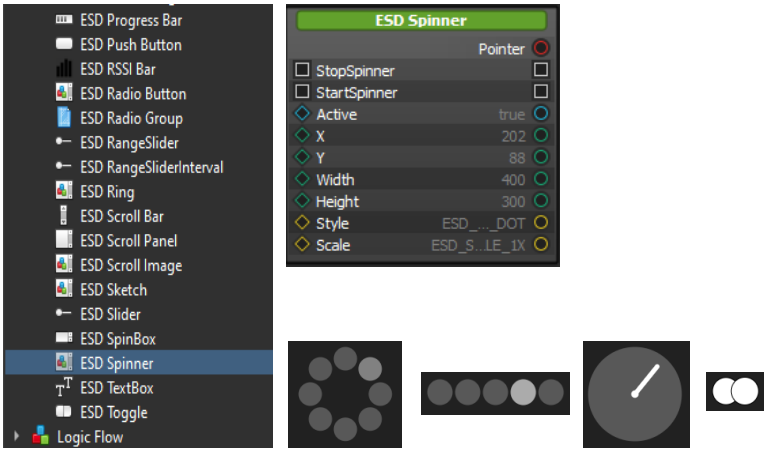


Figure 58 - ESD Spinner Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height
Style	Display Style of the Spinner: ESD_SPINNER_CYCLE_DOT ESD_SPINNER_LINE_DOT ESD_SPINNER_ROTATE_CLOCK ESD_SPINNER_ORBIT_DOT
Scale	Display Scale of the Spinner:

	ESD_SPINNER_SCALE_1X ESD_SPINNER_SCALE_2X ESD_SPINNER_SCALE_4X ESD_SPINNER_SCALE_8X

Table 63 - ESD Spinner Properties

Output / Signal	Description
StopSpinner/StartSpinner	Trigger to stop/start the spinner display

Table 64 - ESD Spinner Output/Signal

ESD Text Box Widget

The *ESD Text Box* widget provides the user with multi-line editable text box. In order to change the line, user needs to input '\' followed by 'n', which also means that Text Box cannot display '\n'.

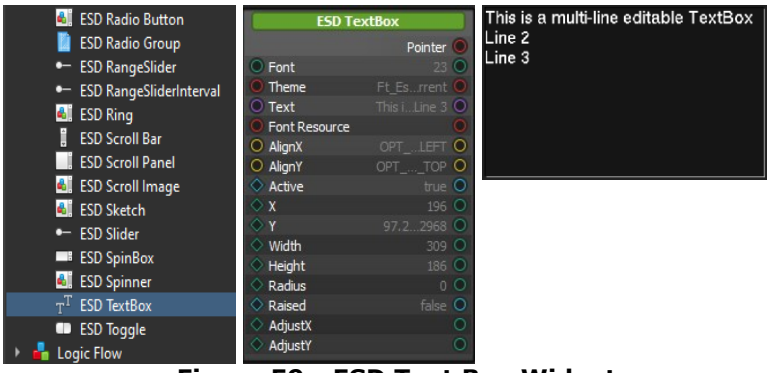


Figure 59 - ESD Text Box Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Font	Fonts used in the text box. Same as bitmap handle defined in EVE
Theme	Theme applied on the widget
Text	The text content of the text box
Font resource	Set the font resource
AlignX	Horizontal alignment of text *OPT_ALIGN_LEFT: Left,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_RIGHT: Right*
AlignY	Vertical alignment of text *OPT_ALIGN_TOP: Top,* *OPT_ALIGN_CENTER: Center,* *OPT_ALIGN_BOTTOM: Bottom*
Active	Enable or disable displaying this widget
X	x coordinate of the top-left of the widget, in pixels
Y	y coordinate of the top-left of the widget, in pixels
Width	Widget width
Height	Widget height
Radius	Radius of the vertex point
Raised	Set true for raised border, else it will be sunken border
AdjustX	Adjust the x coordinate of the text
AdjustY	Adjust the y coordinate of the text

Table 65 - ESD Text Box Properties

ESD Toggle Widget

The *ESD Toggle* widget provides the toggle switch functionality with user touch enabled.

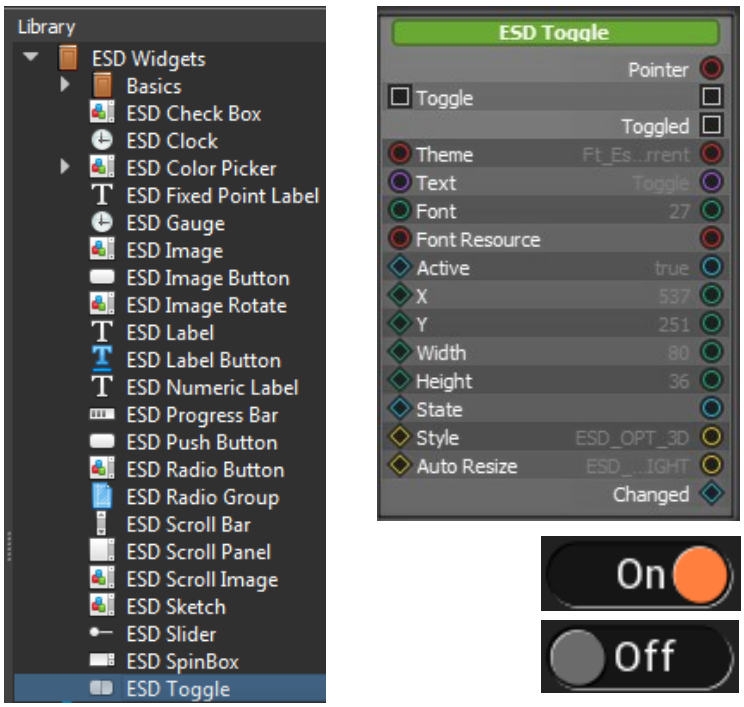


Figure 60 - ESD Toggle Widget

Property Name	Description
Theme	Theme to be applied to this widget
Font	The font handle used by label inside the widget
Text	Toggle label
Font	Font Size
Font resource	Set the font resource
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height
State	The current state of the toggle widget
Style	Display Style of spin box: ESD_OPT_3D ESD_OPT_FLAT
AutoResize	Set true to enable auto resize the toggle widget

Table 66 - ESD Toggle Widget Properties

Output / Signal	Description
Pointer	The pointer reference of the widget object
Toggled	Output signal triggered by toggle action
Changed	Output value of the changed state

Table 67 - ESD Toggle Widget Output/Signal

Figure 61 displays the creation of two toggle widgets, *"Toggle1"* and *"Toggle2"* which are connected with the same state.

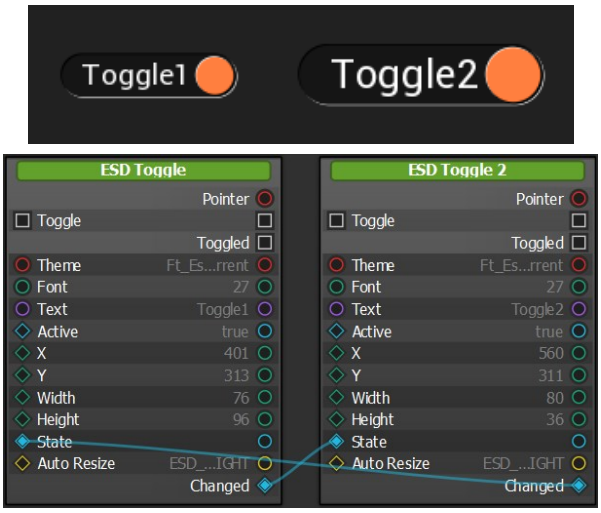


Figure 61 - ESD Toggle Widget Example

Please note that the 'Toggled' signal of the widget should not be connected to its own 'Toggle' slot. This will cause the widget not to function properly.

ESD Ring Widget

The *ESD Ring* widget allows the user to display a ring widget. It is useful for displaying circular widgets such as circular progress bar.

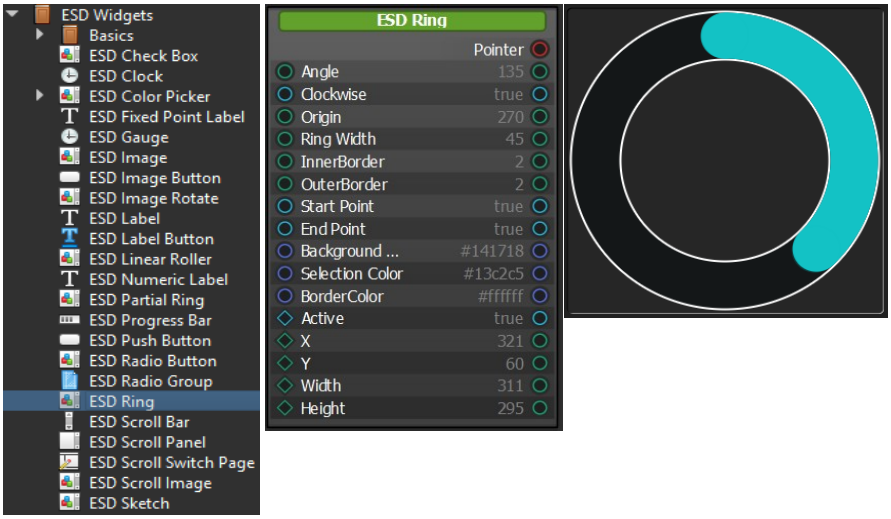


Figure 62 - ESD Ring Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Angle	The angle value of the ring is displaying, range from 0 to 360.
Clockwise	The Boolean flag to set as clockwise direction.
Origin	The origin direction of the ring, range from 0 to 360.
Ring width	Defines the ring width
Inner border	Defines the inner border width, set -1 to disable it.
Outer border	Defines the outer border width, set -1 to disable it.
Start point	The Boolean flag to set whether to display start point
End point	The Boolean flag to set whether to display end point
Background Color	Set the ring's background color in RGB
Selection Color	Set the ring's selection color in RGB
Border Color	Set the ring's inner and outer border color in RGB

Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height

Table 68 - ESD Ring Widget Properties

ESD Partial Ring Widget

The *ESD Partial Ring* widget allows user to display a partial ring widget. It is similar to ESD Ring widget except it does not require the angle range to be 360 degrees.

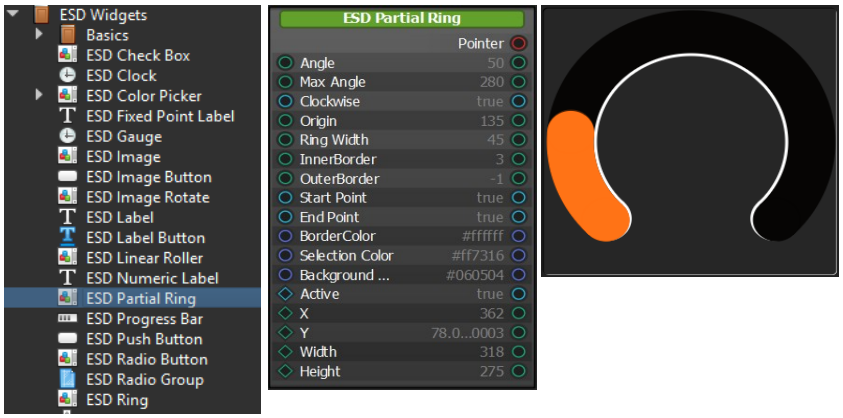


Figure 63 - ESD Partial Ring Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Angle	The angle value of the ring is displaying, range from 0 to 360.
Max Angle	Defines the max angle of the selection, range from 1 to 360.
Clockwise	The Boolean flag to set as clockwise direction.
Origin	The origin direction of the ring, range from 0 to 360
Ring width	Defines the ring width
Inner border	Defines the inner border width, set -1 to disable it
Outer border	Defines the outer border width, set -1 to disable it
Start point	The Boolean flag to set whether to display start point
End point	The Boolean flag to set whether to display end point
Background Color	Set the ring's background color in RGB
Selection Color	Set the ring's selection color in RGB
Border Color	Set the ring's inner and outer border color in RGB
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height

Table 69 - ESD Partial Ring Widget Properties

ESD Ring Slider Widget

The *ESD Ring Slider* widget allows user to display a partial ring with knob control. It is similar to ESD Partial Ring widget except it allows the user to control the value by dragging the control knob.

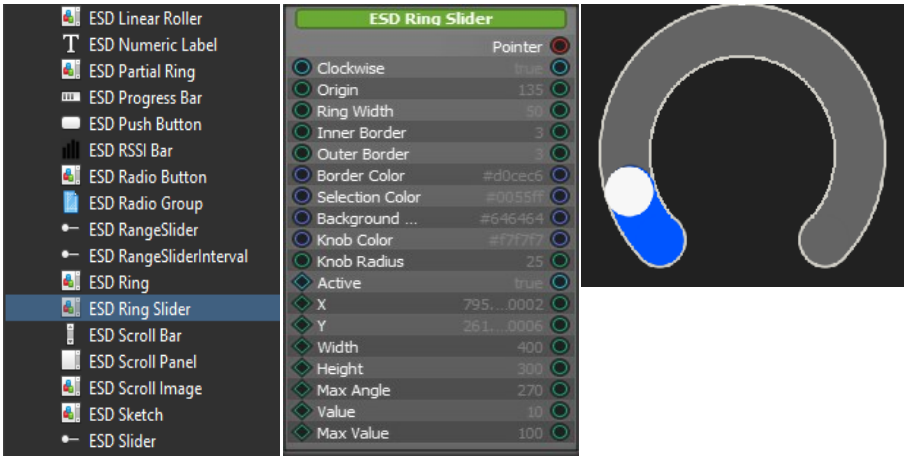


Figure 64 - ESD Ring Slider Widget

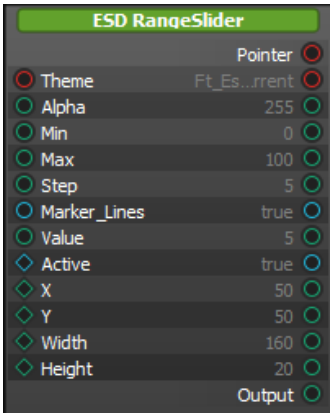
Property Name	Description
Pointer	The pointer reference of the widget object
Clockwise	The Boolean flag to set as clockwise direction.
Origin	The origin direction of the ring, range from 0 to 360.
Ring width	Defines the ring width
Inner border	Defines the inner border width, set -1 to disable it.
Outer border	Defines the outer border width, set -1 to disable it.
Border Color	Set the ring's inner and outer border color in RGB
Selection Color	Set the ring's selection color in RGB
Background Color	Set the ring's background color in RGB
Knob Color	Defines the color of the control knob
Knob Radius	Defines the radius of the control knob
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height
Max Angle	Defines the max angle of the selection, range from 1 to 360.
Value	Indicates the current value of the slider
Max Value	Indicates the maximum value allowed for the slider, range from 10 to 1024.

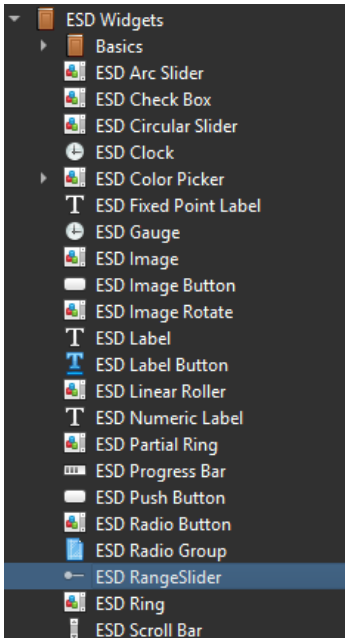
Table 70 - ESD Ring Slider Widget Properties

ESD Range Slider Widget

The *ESD Range Slider* widget allows the user to set a value by dragging a handle within a configured range. It is used to control a variable value via simple and interactive user input.

Figure 65 - ESD Range Slider Widget





Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Alpha	Adjust the transparency
Min	Slider's minimum value
Max	Slider's maximum value
Step	Slider moves in increments of Step. If Step is 10, the slider will go from 0 to 10, to 20, to 30, etc.
Marker_Lines	Sets the visibility of marker lines
Value	Default value for initialization of Range Slider
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height
Output	Output value when the slider has changed

Table 71 - ESD Range Slider Widget Properties

ESD Range Slider Interval Widget

The *ESD Range Slider* Interval is a custom range-type input control. It allows user to select a value or range of values between a specified min and max.

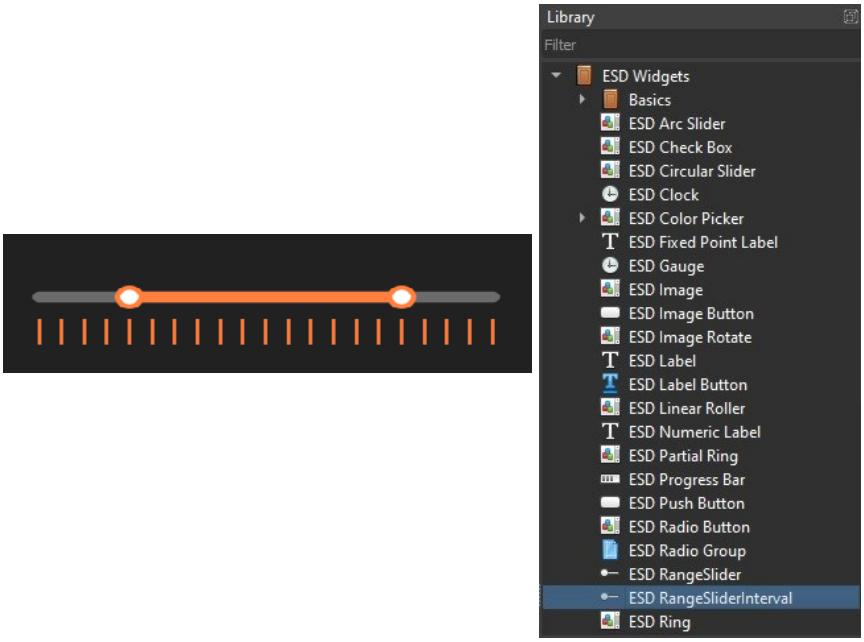


Figure 66 - ESD Range Slider Interval Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Theme	Theme to be applied to this widget
Min	Slider's minimum value
Max	Slider's maximum value
Step	Slider moves in increments of Step in both directions. If Step value is 10, the slider handle will go 10, 20, 30, etc.
Marker_Lines	Sets the visibility of marker lines
Active	Enable or disable displaying this widget
X	X coordinate of the top-left, in pixels
Y	Y coordinate of the top-left, in pixels
Width	Toggle widget width
Height	Toggle widget height
StartValue	Start value when the slider has changed
EndValue	End value when the slider has changed
Interval	Output value between Start value and End Value

Table 72 - ESD Range Slider Interval Widget Properties

ESD QR Code Widget

The ESD QR Code widget allows the user to generate a QR code in Eve bitmap format L1. It allows user to do scaling (enlarge or reduce) the size of QR code image.

Figure 67 - ESD QR Code Widget

Property Name	Description
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Widget width
Height	Widget height
URL	Website URL Link
Scale	Used to enlarges or reduce the size of QR code image

Table 73 - ESD QRCode Widget Properties

ESD Animation Widget

The *ESD Animation Widget* allows the user to play an animation resource (i.e., anim file).

".anim" file is an EVE-compatible animation file. We use EVE Asset Builder (EAB) to convert a GIF file or a list of PNG/JPEG/BMP files into Anim file.
Animation is supported by the BT81X chip and above.

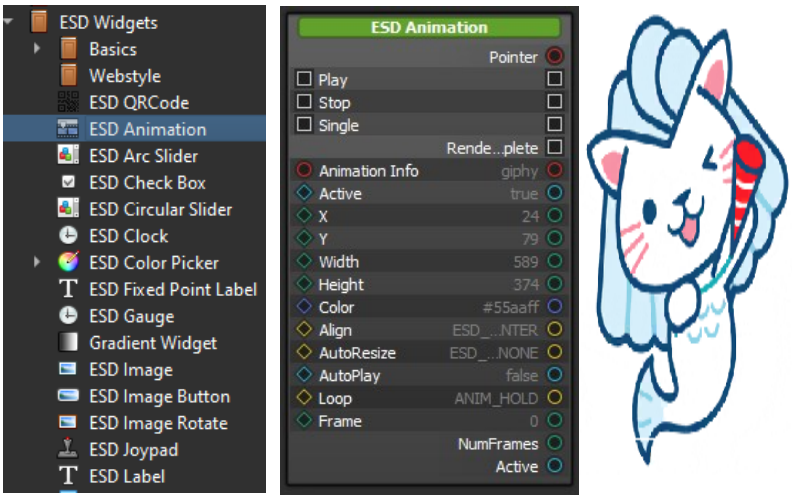


Figure 68 - ESD Animation Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Animation Info	The animation information to be displayed on the widget
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Widget width
Height	Widget height
Color	Choose colour effect for the Animation Widget
Align	Set alignment mode
AutoResize	Set true to enable auto resize the toggle widget
AutoPlay	Auto play animation when the widget is started
Loop	Set true to repeat play animation
Frame	Set a frame to display, with a range from 0 to NumFrames.

Table 74 - ESD Animation Widget Properties

Output / Signal/ Slot	Description
Play/Stop	Input to control the start and end of animation
Single	Slot to select single frame mode
RenderComplete	Output signal when animation render is completed
NumFrames	Output value is total frame of animation
Active	Output value is whether the widget is active or not

Table 75 - ESD Animation Widget Output/Signal

ESD FontIcon Widget

The ESD Font Icon widget is an enhanced version of the ESD Image widget, encompassing all the properties of the ESD Image widget. It introduces an additional feature called "Font Icon," allowing users to choose an icon from the integrated icon library and incorporate it into their projects. Upon importing the icon, a PNG file is automatically included in the "Resource" folder of the project, enabling users to manipulate it in a manner similar to the ESD Image widget.

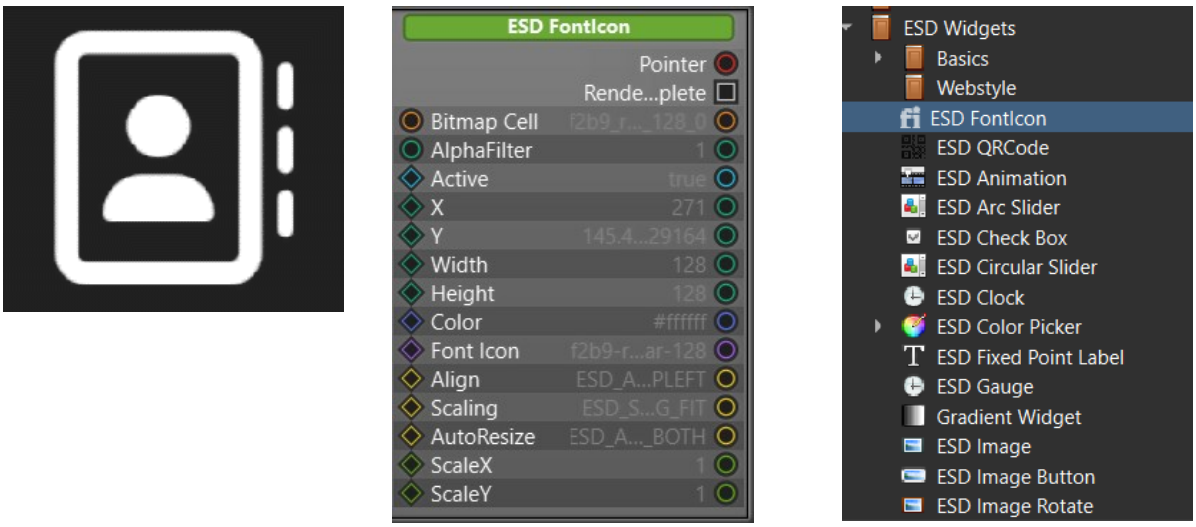


Figure 69 - ESD FontIcon Widget

The integrated icon library boasts 1856 diverse icons sourced from Font Awesome. Users can locate their desired icon by Unicode or description, customize the icon size, and then import it into their projects. Just like the ESD Image widget, users need to configure the "Bitmap Cell" property to bind it with the imported icon.

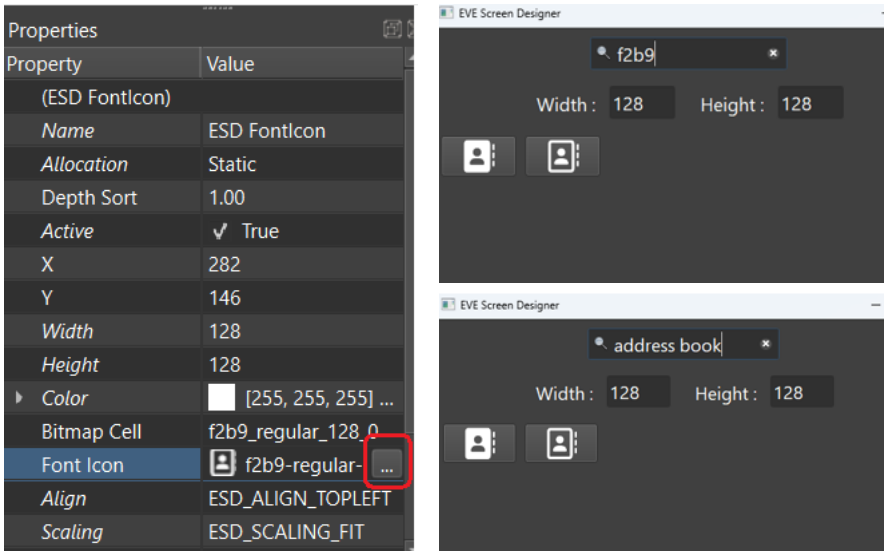


Figure 70 - Usage of ESD FontIcon Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Bitmap Cell	The bitmap cell to be displayed on the widget
Alpha Filter	Alpha Filter setting. Set 0 to disable it, or 1-255 for alpha function filtering
Active	Set to true if this widget is active
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
Color	Default colour
FontIcon	Choose FontIcon to display on the widget
Align	Set Image alignment mode
Scaling	Set Image scaling mode
AutoResize	Set Widget Auto resize mode
ScaleX	X Scale value for the image
ScaleY	Y Scale value for the image

Table 76 - ESD FontIcon Widget Properties

ESD Scrolling Text Widget

A Scrolling Text Widget displays text content within a confined area, allowing the text to scroll horizontally. Scrolling Text Widgets are commonly used in applications like news tickers, stock market updates, notifications, and banners to present information dynamically and efficiently. The user can customize in terms of speed, direction of the text content.

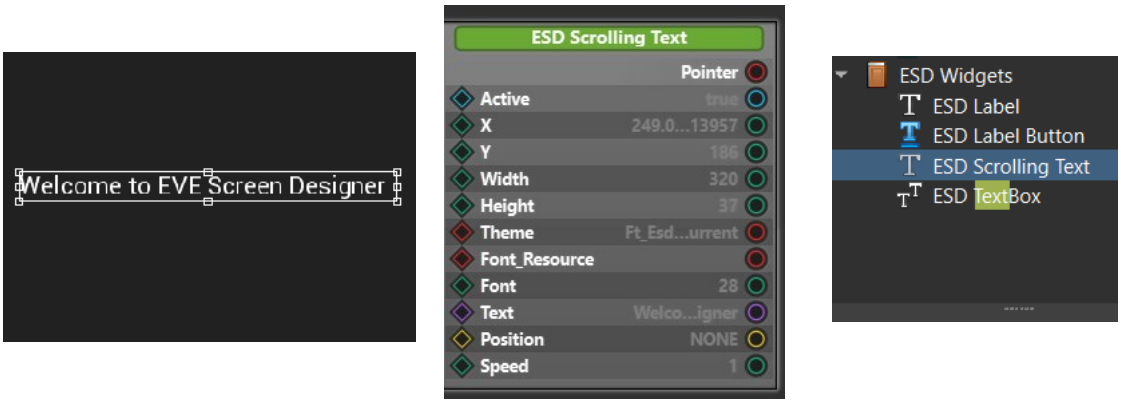


Figure 71 – ESD Scrolling Text Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set to true if this widget is active
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
Theme	Theme to be applied to this widget
Font	Fonts used in the label. Same as bitmap handle defined in EVE
Font resource	Sets the font resource.
Text	The text content of the label. By default, "Welcome to EVE Screen Designer"
Position	Choose the scrolling direction for the text content: RIGHT_TO_LEFT, LEFT_TO_RIGHT, or NONE
Speed	Set fast/slow scrolling of the text content

Table 77 – ESD Scrolling Text Widget Properties

ESD Image Slide Show Widget

An Image Slide Show Widget displays a series of images in a sequential or automated manner within a designated area.

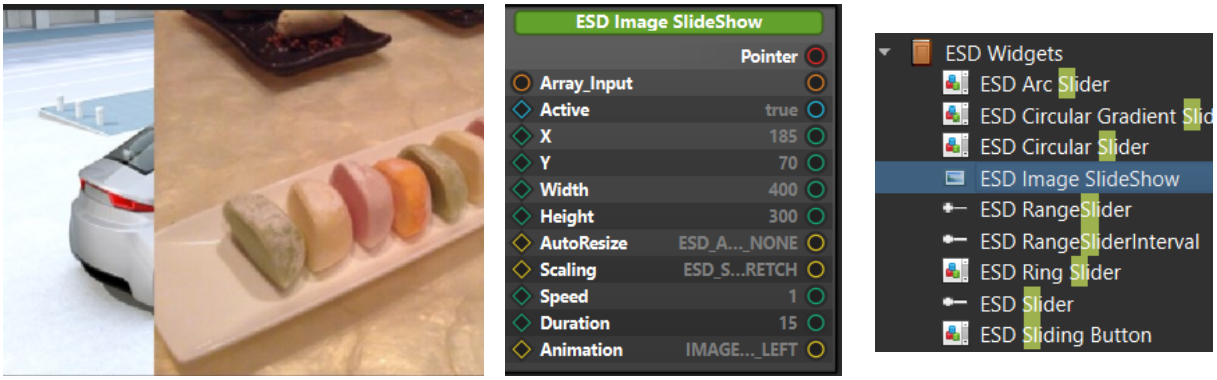


Figure 72 - ESD Image Slide Show Widget

Property Name	Description
Pointer	The pointer reference of the widget object
Active	Set to true if this widget is active
X	x coordinate of the image button, top-left, in pixels
Y	y coordinate of the image button, top-left, in pixels
Width	Image button width, in pixels
Height	Image button height, in pixels
Scaling	Set Image scaling mode
AutoResize	Set widget auto resize mode
Speed	Set fast/slow scrolling of the text content
Duration	The duration of the image change in seconds
Animation	Select animation type: IMAGE_RIGHT_TO_LEFT IMAGE_LEFT_TO_RIGHT IMAGE_BOTTOM_TO_TOP IMAGE_TOP_TO_BOTTOM IMAGE_FADE_IN IMAGE_FADE_OUT

Table 78 - ESD Image Slide Show Widget Properties

Render Forwarder

The *Render Forwarder* is an advanced layout. Purpose of this widget is forwards "Update", "Render" "Idle" slots. It's an advanced feature when developing custom widget. In the examples project dialog of ESD, you can find "RenderForwarderExample" project.

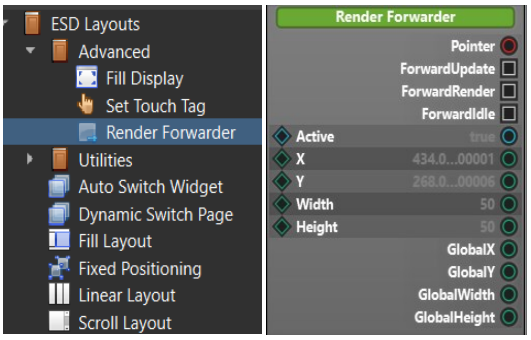


Figure 73 - ESD Render Forwarder

Property Name	Description
Active	Set to true if this widget is active
X	x coordinate of the widget, top-left, in pixels
Y	y coordinate of the widget, top-left, in pixels
Width	Widget width, in pixels
Height	Widget height, in pixels

Table 79 – Render Forwarder Properties.

Slots/Outputs Name	Description
ForwarderUpdate	Forward Update slot.
ForwarderRender	Forward Render slot.
ForwarderIdle	Forward Idle slot.
GlobalX	Output global x coordinate of the widget
GlobalY	Output global y coordinate of the widget
GlobalWidth	Output global width of the widget
GlobalHeight	Output global height the widget

Table 80 – Render Forwarder slots/outputs.

Example use Render forwarder for text rendering.

1. Define a method for rendering text.

```
ESD_METHOD(FirstPage_Render_Mothod, Context = FirstPage)
void FirstPage_Render_Mothod(FirstPage *context)
{
    EVE_HalContext *phost = Esd_GetHost();
    EVE_CoCmd_text_ex(phost, 100, 100, 29, OPT_CENTER, 0, 0, 0, 0, "Text");
}
```

2. The establishment of a connection between the ForwarderRender slot and the Render Method defined earlier is shown in Figure 74.

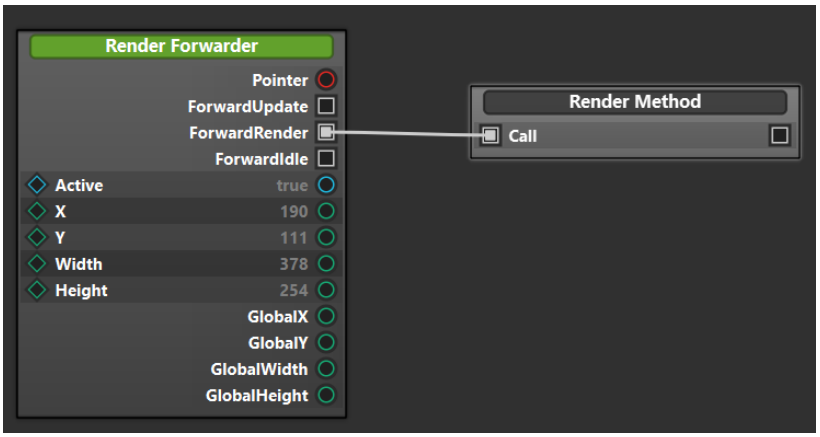


Figure 74 - FowarderRender slot

3. The Text rendering result is shown in Figure 75.

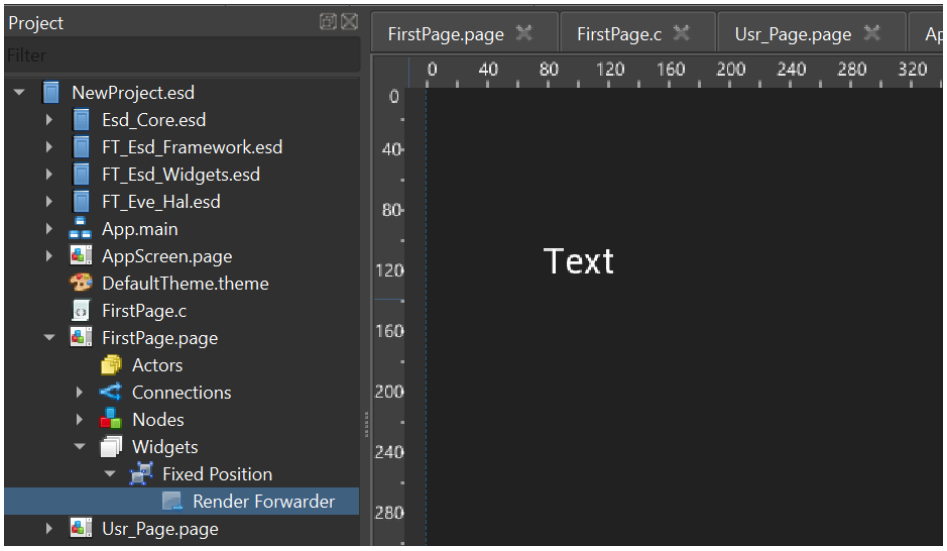


Figure 75 - RenderForwarder text rendering results

C. Custom Widgets

The ESD framework architecture allows the user to create *Custom Widgets (User-defined Widgets)* and to edit them just like you may do with standard built-in *ESD Widgets*. The *Custom Widget's* features include widget properties, outputs, signals, and slots. User can create *Custom Widget* based on standard built-in ESD Widgets or a completely new one.

How to Create a Custom Widget

1. On Project right menu, select New->Widget:

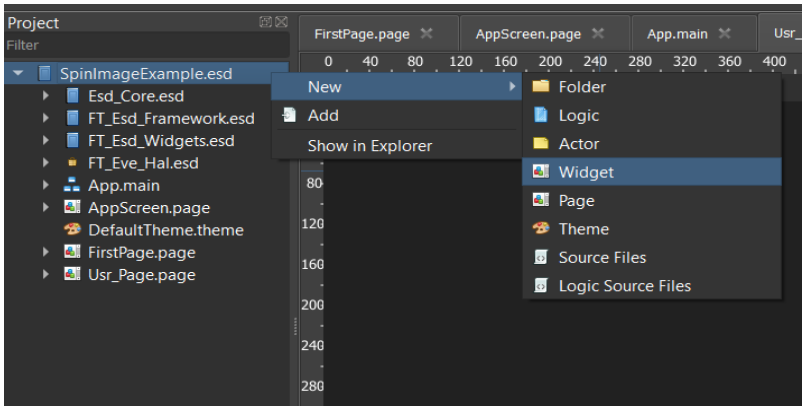


Figure 76 - Create New Widget

2. Rename the file "Usr_Widget.widget" to a name that you prefer.

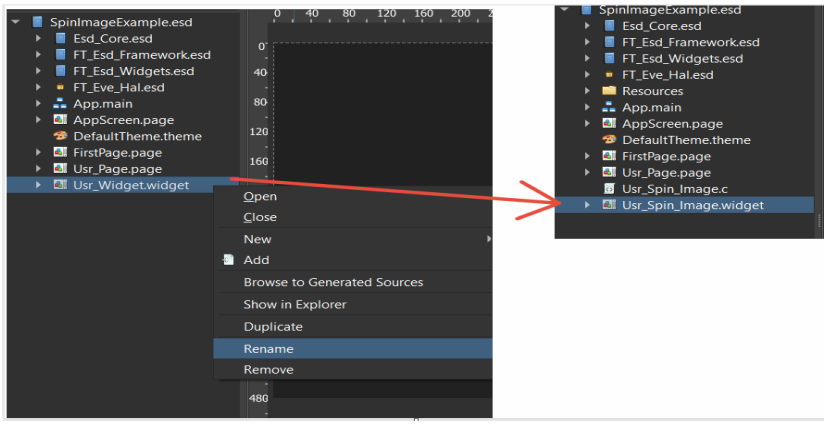


Figure 77 - Rename New Widget

3. You can either include pre-existing ESD widgets or develop new ones to the rendering objects. Furthermore, you may integrate inputs, variables, logical flows, and user-defined functions to manage the widget's logic processing.

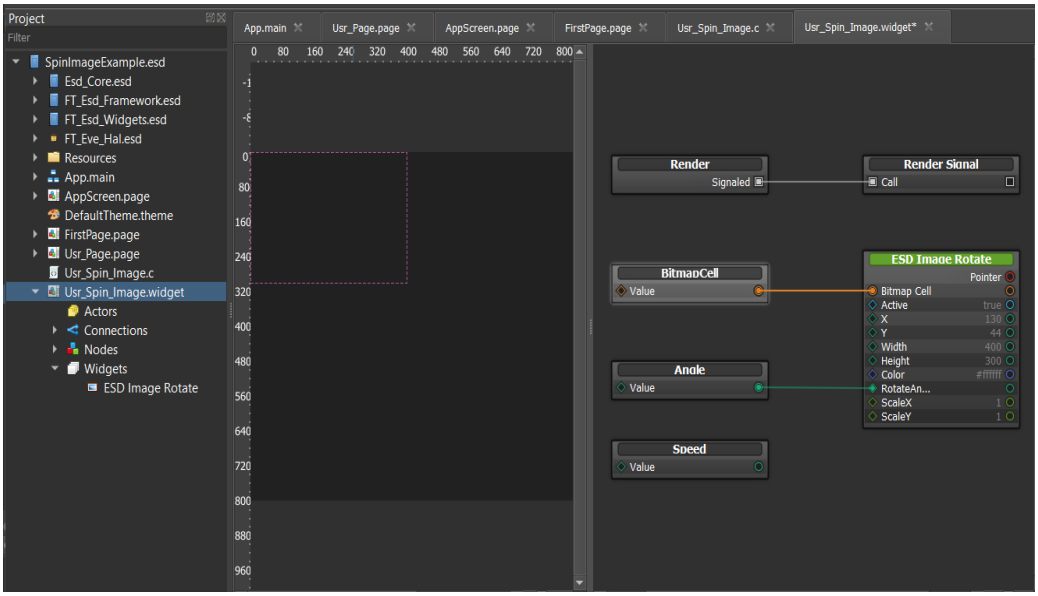


Figure 78 - Add Widgets, Property, Logic Flow to New Custom Widget

4. Add the Custom Widget to ESD page to preview and test:

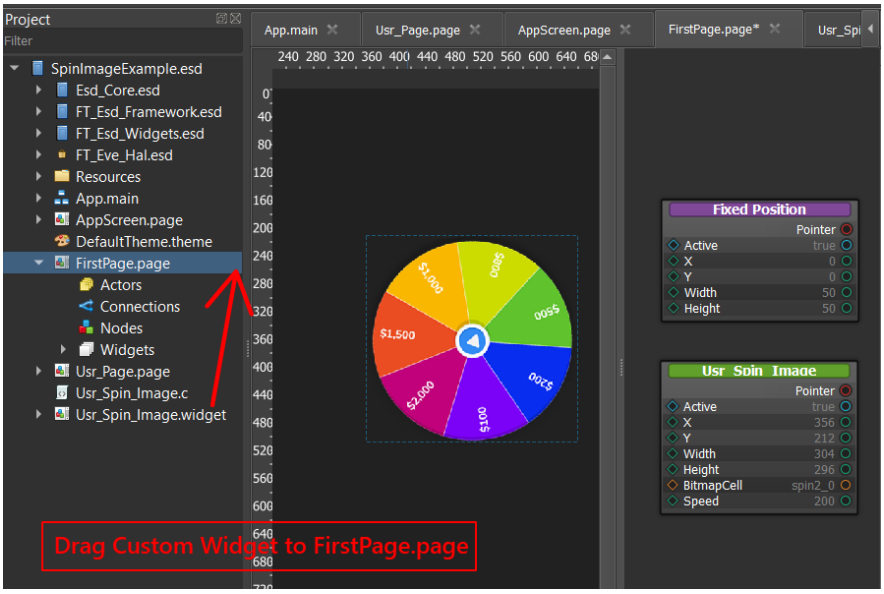


Figure 79 - Spin Image Widget Example

We will explain the details of creating the Custom widget in next section Custom Widget Example.

Custom Widget Example

In this section, we will try to create a simple Custom Widget named *Spin Image*. This *Custom Widget* uses *ESD Image Rotate widget* (a standard built-in ESD widget). In the example project dialog of ESD, you can find the "SpinImageWidget" project.

The *Spin Image Widget* follows this workflow: The user provides a Bitmap Cell and a Speed value as input, which the *Spin Image Widget* then uses to spin the Bitmap at the specified speed.

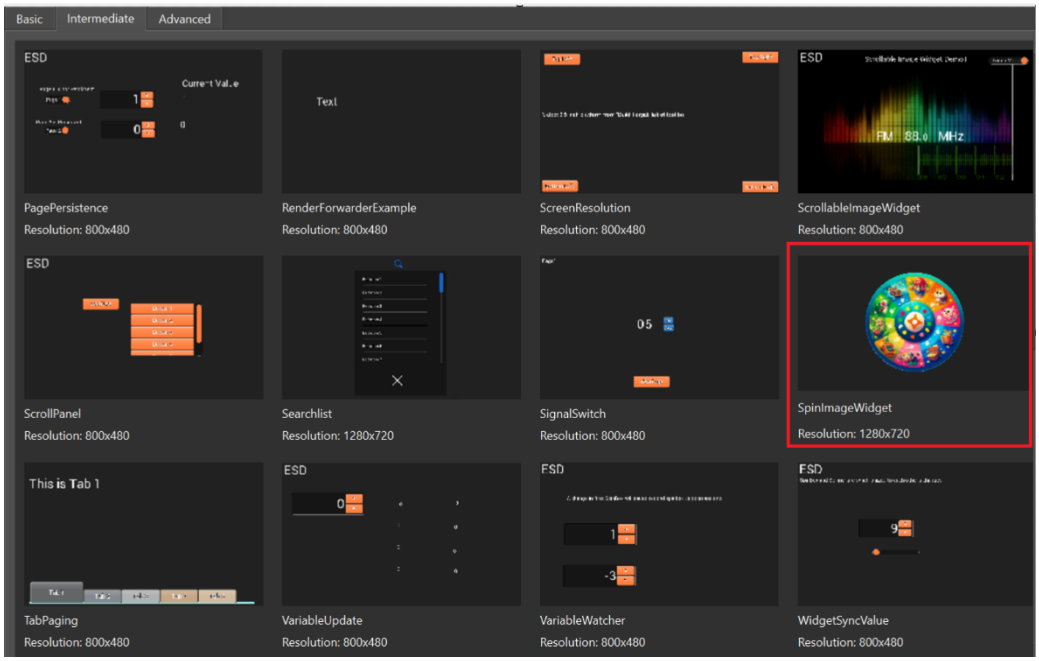


Figure 80 - Custom Widget Example

Property Name	Description
Active	Enable or disable displaying this widget
X	x coordinate of the top-left, in pixels
Y	y coordinate of the top-left, in pixels
Width	Widget width
Height	Widget height
BitmapCell	The bitmap cell to be displayed on the widget
Speed	Set fast/slow spin bitmap

Table 81 - Spin Image Widget Properties

In Figure 81 - Spin Image components, we can see all components of *Spin Image Widget*:

- *Spin Image Widget* uses an *ESD Image Rotate Widget to* display and rotate the bitmap.
- The BitmapCell property of the *Spin Image* is linked to the Bitmap Cell property of the *ESD Image Rotate*. This property is user-input dependent.
- The Angle variable of the *Spin Image* is linked to the Rotate Angle property of the *ESD Image Rotate*.
- Public property Speed receives input from the user.

- A render slot is used to handle render event.

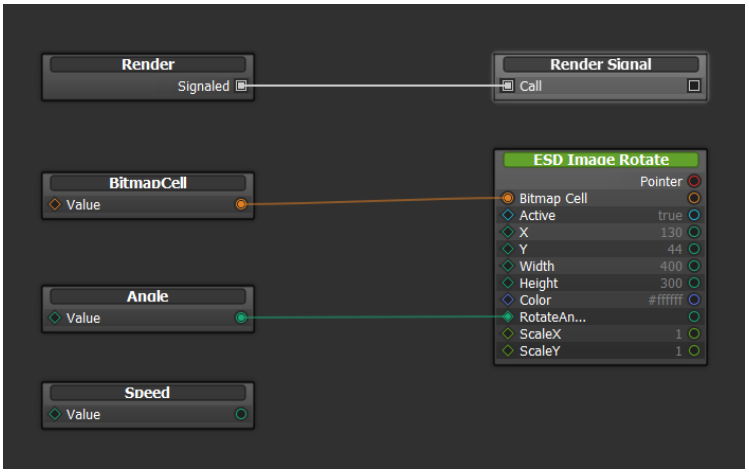


Figure 81 - Spin Image components

The render slot contains code that modifies the Angle variable. The value of Angle variable depends on the speed. As the Angle variable of the Spin Image is updated, the Angle of the Image Rotate is also updated accordingly.

```
ESD_METHOD(Usr_Spin_Image_Render_Signal, Context = Usr_Spin_Image)
void Usr_Spin_Image_Render_Signal(Usr_Spin_Image *context)
{
    context->Angle = context->Angle + context->Speed;
    if(context->Angle > 65535)
    {
        context->Angle = context->Angle%65535;
    }
}
```

Figure 82 - Change Angle Property in Render Signal Handler of Spin Image Widget

Building Custom Widgets Using C Code

The ESD framework also allows user to create Custom Widgets in programmatical approach, using C code. This approach needs developer to have a certain understanding of the C programming language and the ESD framework.

How to Create a Custom Widget Using C code

On project right menu, select New->Widget (in C only):

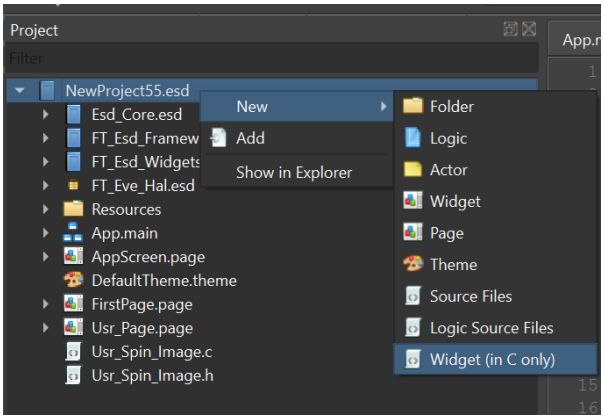


Figure 83 - Create New Widget in C Only

The template files "Usr_Widget.h" and "Usr_Widget.c" will be generated

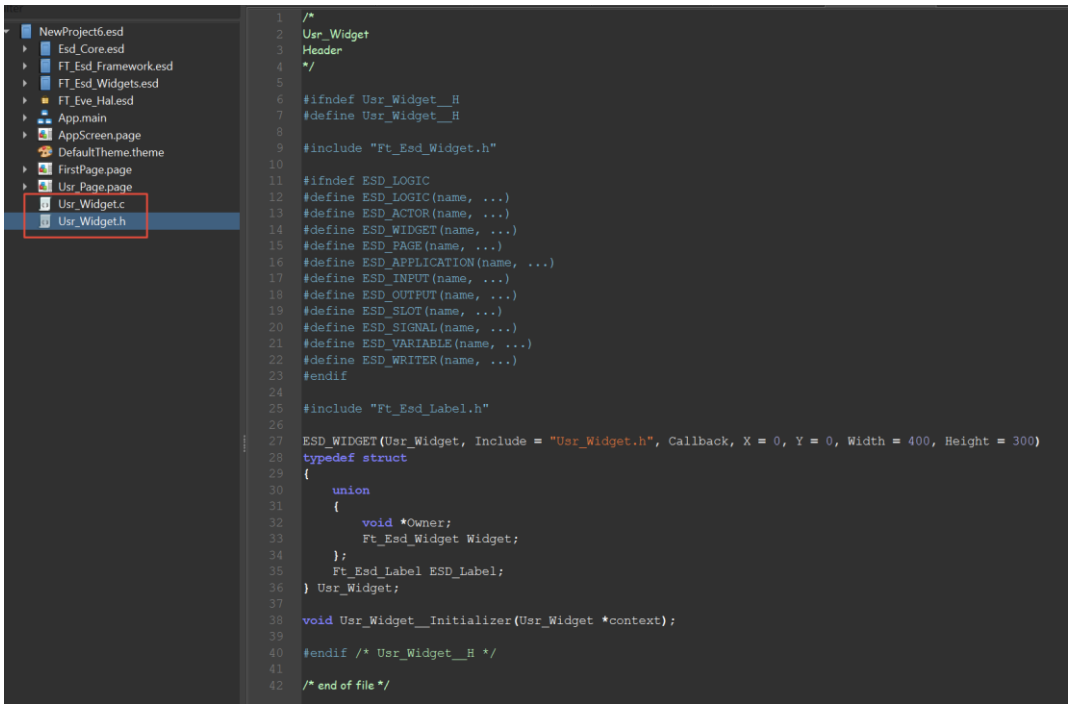


Figure 84 - Custom Widget Template files

We will explain the content of the template files.

In header file **Usr_Wiget.h**, define a struct **Usr_Widget**.

```
/*
Usr_Widget
Header
*/

#include "Ft_Esd_Widget.h"

ESD_WIDGET(Usr_Widget, Include = "Usr_Widget.h", Callback, X = 0, Y = 0, Width =
400, Height = 300)
typedef struct
{
    union
    {
        void *Owner;
        Ft_Esd_Widget Widget;
    };
} Usr_Widget;
```

In the source code of Usr_Widget.c, add default slots for Usr_Widget and initialize Usr_Widget object.

```
/*
Usr_Widget
C Source
*/
static Ft_Esd_WidgetSlots s_Usr_Widget_Slots = {
    (void (*)(void *))Ft_Esd_Widget_Initialize,
    (void (*)(void *))Ft_Esd_Widget_Start,
    (void (*)(void *))Ft_Esd_Widget_Enable,
    (void (*)(void *))Ft_Esd_Widget_Update,
    (void (*)(void *))Ft_Esd_Widget_Render,
    (void (*)(void *))Ft_Esd_Widget_Idle,
    (void (*)(void *))Ft_Esd_Widget_Disable,
    (void (*)(void *))Ft_Esd_Widget_End,
};

void Usr_Widget__Initializer(Usr_Widget *context)
{
    Ft_Esd_Widget__Initializer((Ft_Esd_Widget *)context);
    context->Widget.Slots = &s_Usr_Widget_Slots;
    context->Widget.LocalX = 0;
    context->Widget.LocalY = 0;
    context->Widget.LocalWidth = 400;
    context->Widget.LocalHeight = 300;
}
```

Next, add an ESD Label to Custom Widget:

In Usr_Widget.h, declare an ESD Label in `Usr_Widget struct`

```
/*
Usr_Widget
Header
*/

#include "Ft_Esd_Label.h"

ESD_WIDGET(Usr_Widget, Include = "Usr_Widget.h", Callback, X = 0, Y = 0, Width =
400, Height = 300)
typedef struct
{
    union
    {
        void *Owner;
        Ft_Esd_Widget Widget;
    };
    Ft_Esd_Label ESD_Label;
} Usr_Widget;
```

Next, create a Label with function **Usr_Widget__ESD_Label__Initializer.** Label should be detached when **Usr_Widget_End** slot is called:

```
/*
Usr_Widget
C Source
*/
static Ft_Esd_WidgetSlots s_Usr_Widget__Slots = {
    (void (*)(void *))Usr_Widget_End,
};
void Usr_Widget__ESD_Label__Initializer(Usr_Widget *context)
{
    Ft_Esd_Label *object = (Ft_Esd_Label *)&context->ESD_Label;
    Ft_Esd_Label__Initializer(object);
    object->Owner = (void *)context;
    object->Widget.Active = 1;
    object->Widget.LocalX = 0;
    object->Widget.LocalY = 0;
    object->Widget.LocalWidth = 120;
    object->Widget.LocalHeight = 36;
    Ft_Esd_Widget_InsertBottom((Ft_Esd_Widget *)object, (Ft_Esd_Widget *)context);
}

void Usr_Widget__Initializer(Usr_Widget *context)

{
    Usr_Widget__ESD_Label__Initializer(context);
}

void Usr_Widget_End(Usr_Widget *context)
{
    void *owner = context->Owner;
    Ft_Esd_Widget_End((Ft_Esd_Widget *)context);
    Ft_Esd_Widget_Detach((Ft_Esd_Widget *)&context->ESD_Label);
}
```

Next, drag the newly created custom widget from the User Widgets folder of Library window to the page of layout editor window:

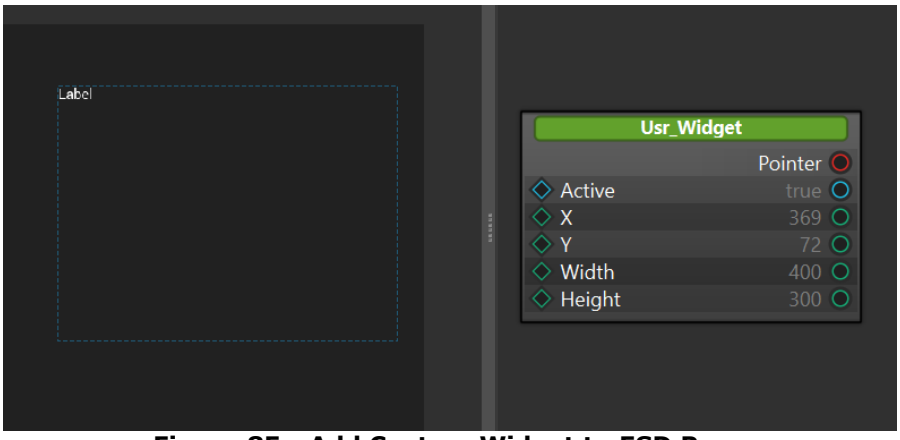


Figure 85 - Add Custom Widget to ESD Page

D. Appendix A – List of Figures

E. Appendix B – List of Tables

F. Appendix C – Revision History

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Revision	Changes	Date
Version 1.0	Initial Release	11-04-2023
Version 1.1	Updated as per ESD V.4.17 release	01-11-2023
Version 1.2	Updated as per ESD V.4.18 release	06-03-2024
Version 1.3	Updated as per ESD V.4.19 release	29-07-2024