## UI Design: Ideas, Concepts, Suggestions

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#### Agenda

- 1. Design guidelines for GUIs
- 2. Organization and layout of the screen
- 3. Scaling for different monitor resolutions
- 4. User interface design
- 5. EN ISO 9241



#### **UI:** User Interface

- How user interacts with the program
- First thing the user notices

- "UX": User Experience
  - Sometimes used interchangeably with UI
  - Broader, covers workflow



#### **Design Guidelines**

The Four Ws:

Where am I? Which path got me here? What can I do here? Where To? How can I navigate?





Doptionen	
Kategorie A	Frontpanel
Blockdiagramm Elemente- und Funktionenpalette Umgebung Suchen Pfade Drucken Versionsverwaltung Menüverknüpfungen Versionshistorie Sicherheit Engine für Umgebungsvariablen VI-Server Webserver	Allgemein         Anschlussfeldanschlüsse standardmäßig erforderlich         V Lokales Dezimalzeichen verwenden*         Zahlen in Symbolen neuer VIs verwenden (1 bis 9)         Element-Editor durch Doppelklick öffnen         Blinkpause für Frontpanel-Elemente (in ms)         1000         * Änderungen werden erst bei einem Neustart von LabVIEW wirksam.         Hinweisstreifen und Beschriftung         Ø Tipps an Frontpanel-Elementen anzeigen         Beschriftungsposition: Bedienelemente         Klässisch         Standard-Beschriftungsposition: Anzeigeelemente         Klassisch         Elementdarstellung in neuen VIs         @ Modern
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Contextual relationships should be displayed visually as a unit.

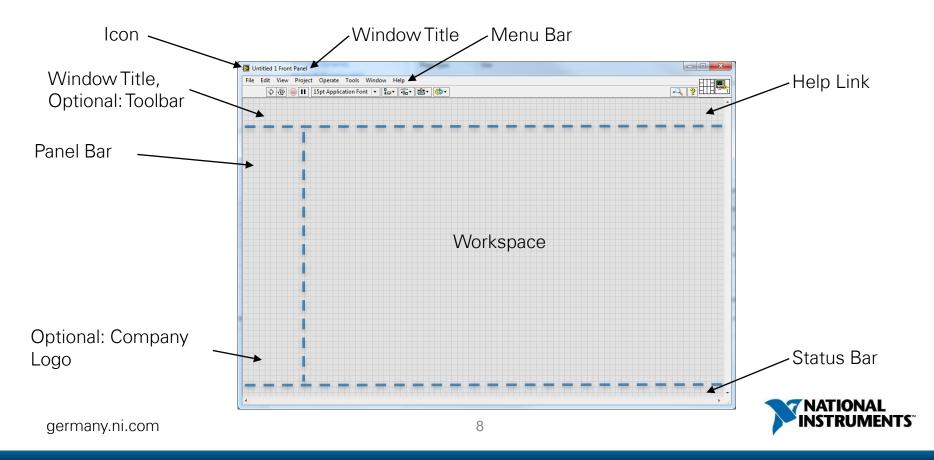


# Organizing Your Screen

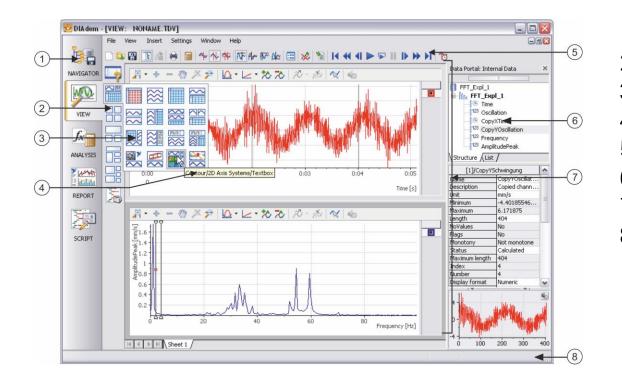


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#### **Typical Screen Layout**



#### Screen Layout: DIAdem Example



- Panel bar
- 2 Group bar
- 3 Function group
- 4 Tooltip
- 5 Toolbar
- 6 Data Portal
  - 7 Workspace

OFFMO TS

8 Status bar

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#### Organizing Your Screen: Splitter Bars

- Window division with horizontal and vertical splitter bars
- Hide scrollbars.
- Narrow splitter bars.
- Splitter bars can be locked or moved.
- Define origin when sizing the window area.

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Right Pane 🕨	Visible Items Find Create Horizontal Scrollb Vertical Scrollbar	→ ar →			
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#### **Splitter Bars**

Divide front panel with splitter bars into several areas.

- Each window area behaves like a separate front panel.
- Each window area can have its own scrollbar.

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Dverview: Demonstrates the use of Splitter Bars to create a resizable panel. instructions:	Load	Clear	Stop		
I. Run the VI.	1-				
<ol> <li>Click the Load button to load a Sine waveform nto the graph.</li> </ol>	0.9-				
<ol> <li>Resize the window by dragging its lower right</li> </ol>	0.8-				
corner. Note that the graph and the string ndicator resize with the window.	0.7 -				
I. Click the Clear button to clear the graph. 5. Click Stop to stop the VI.	0.6-				
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Note: The Display Message string and Waveform	-0.3 -				
Graph indicators are set to Scale Object with Pane in their respective right-click menus. This	-0.4 -				
means that when the pane that owns them is	-0.5 -				
esized, the objects will resize with the pane.	-0.6 -				
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#### Organizing Your Screen: Subpanels

- Add subpanel for workspace.
- Hide labels and frames.
- Chose "Scale Object with Pane" to get a scalable workspace.

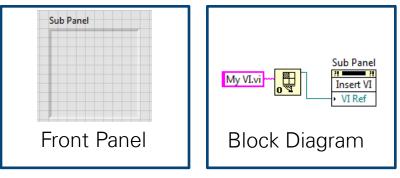
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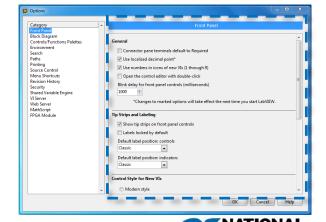


#### Using Subpanels to Display Front Panels

Integrate the front panel of another VI into your UI using subpanels

- Increases scalability and modularity
- You can divide a block diagram into several VIs (cf. Tab Control)







#### How to Organize the Subpanel Workspace

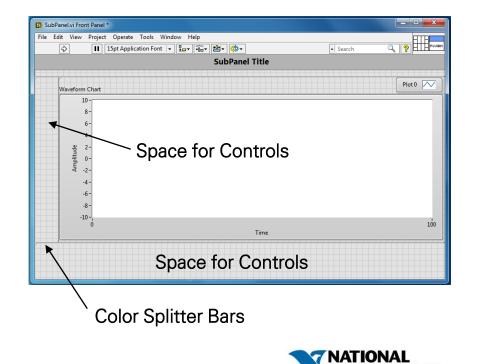
- Separate the subpanel with splitter bars.
- Set minimal window size.
- Define window title.

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#### How to Organize the Subpanel Workspace

- Place control elements in a separate area, since you do not want controls to scale.
- Define scaling origin for control elements.
- You can hide splitter bars during execution by coloring them with the background color.



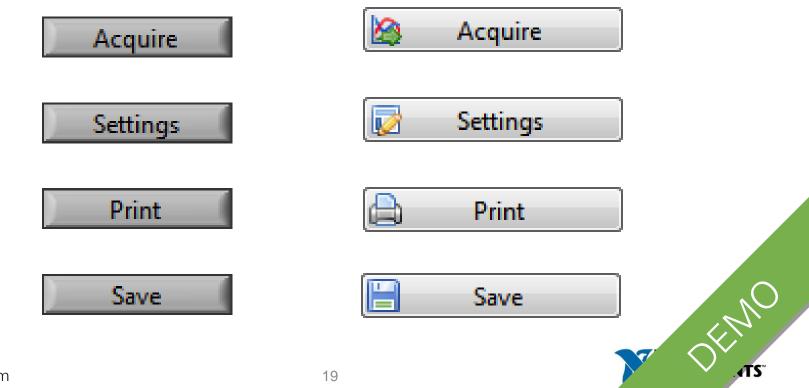
#### Organizing Your Screen: Panel Bar

- Add and arrange controls
- Define mechanical action
- Hide frames and labels

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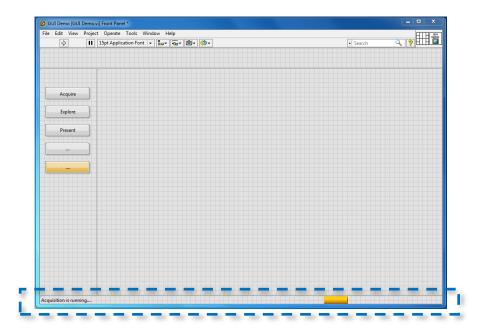
#### Add Decals to Buttons



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#### Organizing Your Screen: Status Bar

 Add string indicator and a state bar to the progress bar





#### Organizing Your Screen: Other Elements

- Application name
- Company logo (optional)
- Help button (optional)

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### Window Size & Scaling



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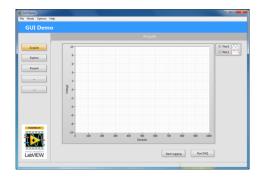
#### Setting Window Size

- Hide scrollbars
- Set minimal window size
- Set window position during run-time

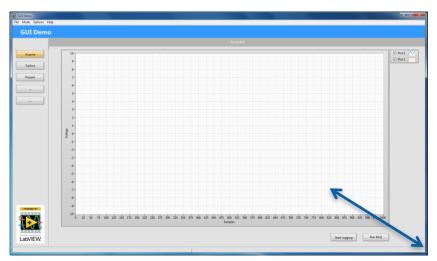
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VI Properties			
Category Window Size			
Minimum Panel Size			
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Maintain proportions of window for diffe Scale all objects on front panel as the win *Applies only to single pane panels Monitor Primary •	Top 0 Left 0 Panel Size	Window Position	

#### Scaling Example

- Only the diagram scales with the window size, controls keep their size.
- A front panel with 1024x768 pixels fits on almost any screen and can be enlarged as required.



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# **UI Design Elements**

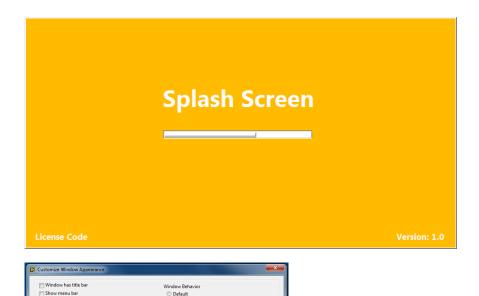


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#### Startup Screen (Splash Screen)

The startup screen informs the user about a program being loaded

- Usually, the startup screen does not fill the whole screen
- Customize window appearance



Floating

Modal

Window runs transparently

Allow user to resize window

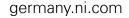
Highlight Enter boolean

Allow user to minimize window

Allow default run-time shortcut menus

OK Cancel Help

**7 NATION** 



Show vertical scroll bar\*

Show toolbar when running

Show Run Continuously button

Show front panel when called Close afterwards if originally closed Show front panel when loaded

Show Abort button

Show Run button

\*Applies only to single pane panels

#### Front Panel Object Styles

Display options for controls and indicators: "Silver", "Modern", "Classic", and "System"

Page 1 Page 2	Page 1 Page 2	Page 1 Page 2	Page 1 Page 2
Numeric Select a File	Numeric 0 Select a File	Numeric D Select a File D D D D D D D D D D D D D	Numeric 0 Select a File
Multicolumn Listbox	Multicolumn Listbox	Multicolumn Listbox	Multicolumn Listbox
OK Cancel Stop	OK Cancel STOP	OK Cancel STOP	OK Cancel STOP



Use to overlap several elements in a small front panel area

Note: The block diagram becomes confusing if the whole application is divided using tabs

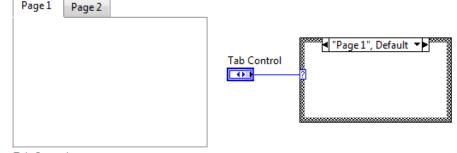
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	^ 784 examples match your search criteria	^ ^	*	Description:
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bouble click keyword(3)	Passing Command Line Parameters.vi	Ð		Shows how to programmatically
control	Arbitrary Wave Display.vi	Ð		manipulate the appearance of a
controllability	Count RTSI Events with DAQmx.vi	Ð		tab control. Specific examples
controller	Display Logfile as Frames.vi	E CAN		include changing the names of the pages, changing the page
controlling	Generate RTSI Events with DAQmx.vi			enabled state, hiding pages, and
controls	Get Names with Waveform Input.vi	🔁 ដូរ		coloring individual pages
	Net Interface Logging.vi	🔁 ភ្នំអ		different colors.
	Waveform Input.vi	E CAN		
	CDEx Design PID Controller for Stability and Performance (Margins).vi			
	CDEx Quadruple Tank Model Conversion.vi	Ð		· · ·
	CDEx State-Space Analysis.vi	Ð		Requirements
	PID Design for Second Order Continuous System.vi	Ð		
	PID Design for Second Order Discrete System.vi			
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#### Tab Control

Tip:

- You can wire the enumerated control terminal of the tab control to the selector of a Case structure to produce cleaner block diagrams.
- It is easier to structure a complete front panel with subpanels.



Tab Control



#### Tables

A lot of information can be displayed in a small space using a table

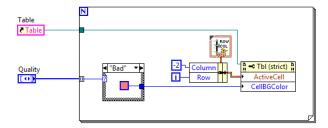
Coloring the cells helps to better categorize data

Table

Sample	Channel 0	Channel 1	Channel 2	Channel 3	
0	2.762	3.454	3.804	4.306	
1	3.255	3.681	4.139	4.632	
2	3.510	3.994	4.498	4.634	
3	3.782	4.345	4.387	4.753	
4	2.820	3.290	3.962	4.369	
5	2 244	2 581	/ 255	1 168	

Table

Sample	Channel 0	Channel 1	Channel 2	Channel 3	4
0	2.762	3.454	3.804	4.306	
1	3.255	3.681	4.139	4.632	
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5	2 244	2 581	// 255	1 168	

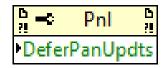




#### **Defer Panel Updates**

Enabling front panel objects can be suspended.

 Increases the execution rate and avoids lagging when modifying large tables and graphs.



#### Table

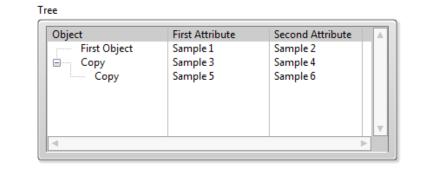
Sample	Channel 0	Channel 1	Channel 2	Channel 3	
0	2.762	3.454	3.804	4.306	
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5	2 244	2 591	/ 255	1 168	

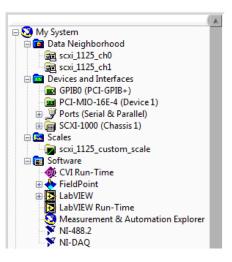


#### Tree Controls

For complex UIs, you can use tree controls instead of a panel bar

- Entries of tree controls are grouped in categories.
- You can add custom symbols to the tree controls.







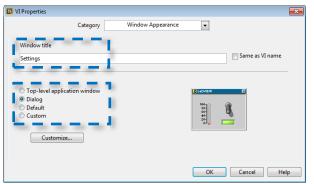
#### Dialog

Dialog boxes stay in the foreground and do not have menu bars, scrollbars, or toolbars.

Windows cannot be resized

Note: The calling loop of the dialog is being blocked until the dialog is closed again.

Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit Scaled Unit	Gain	Offset	





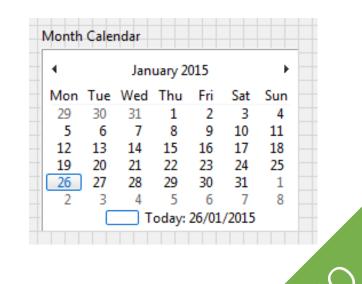
#### .NET Control

#### Benefit

- Greatly reduces programming time
- Very powerful

#### Disadvantage

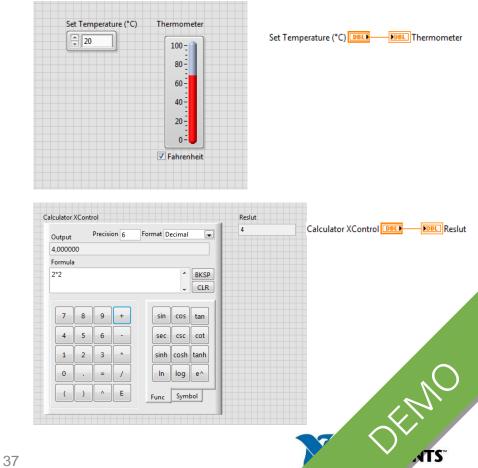
- Only supported on Windows platform
- Compatibility between different .NET not guaranteed



#### **XControl**

XControls add functionality to indicators or controls.

 You can create complex controls and indicators, without the user having to understand the underlying functionality.



#### Customize Menu

Edit >> Run-Time Menu

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		Settings	
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→ Mode → Options	File	
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Configure Hardware in MAX	APP_FILE	
Help GUI Demo Help	Enabled     Checked	
About GUI Demo	Shortcut (Press key combination):	
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Short descriptions that pop up when you move your cursor over an object during VI execution

🔄 GUI Demo		
File Mode Options	Help	
GUI Dem	0	
Acquire Explore Explore Dat Present 	ta	File Path C:\Users\NI\Desktop  File Browser  File Name Demo_2014_09_18_14_55_25.tdms Demo_2014_09_18_16_22_0.tdms Demo_2014_09_18_16_22_0.tdms Demo_2014_09_18_16_22_0.tdms Demo_2014_09_18_16_22_0.tdms Demo_2014_09_18_16_22_5.tdms Demo_2014_09_18_16



#### Decorations

Decorations group or separate front panel objects without any impact on the function of a VI

> Decorations include frames, lines, and arrows

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# Program should support the user by offering help

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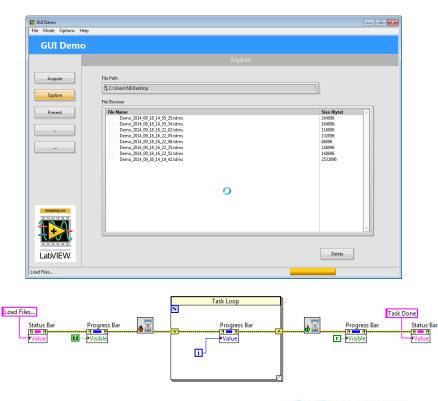


ettings										
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Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit	Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit	Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit	Scaled Unit	Gain	Offset	
Physical Channel	Channel Name	Min	Max	Terminal Configuration	Unit	Pre-Scaled Unit	Scaled Unit	Gain	Offset	



#### Status Information for Users

Status bars, progress bars, and cursors inform users about the status of the application.





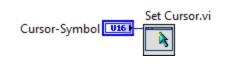
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# Hourglass cursor informs user to wait



Cursor symbol informs user about required action.





#### Fonts and Text Characteristics

Standard fonts vary depending on the platform

Limit VI to the three standard fonts:

- Application
- System
- Dialog

Text size

- Leave room for font to expand or contract
- Set the label/text box to Size to Text



10 -

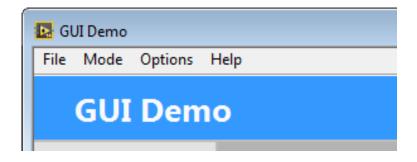
n –

Numeric Label



### Using Colors

- Use colors sparingly
- Favor pastel shades
- Do not use saturated colors
- Use a maximum of 5 meaningful colors
- Be careful when using contrasting colors





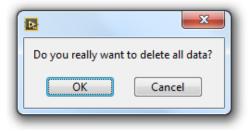


#### Formulate Dialogs Properly

When a dialog describes an action, the user is enticed to execute that action without considering the consequences

Better: Describe the "effect" of the action.







#### **Touchpanel User Interface**

- Controls should be easy to use with fingers.
- Ensure sufficient spacing between controls to avoid wrong choices.







#### EN ISO 9241

The standard EN ISO 9241 contains regulations for human-computer interaction and is made up of multiple parts.



#### EN ISO 9241

#### EN ISO 9241

Visual display requirements (part 3)

Requirements for displayed colors (part 8)

Presentation of information (part 12)

User guidance (part 13)

Menu dialogs (part 14)

Dialog principles (part 110)

Guidance on software individualization (part 129)



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