Interface Builders (IB) and Interface Description Languages (IDL) enable Drag and Drop construction of GUI's and are part of many Visual Studio (2013) WPF / C# Designer interface.
IB History

1979 to 1985 Steamer Hollan, Hutchins, Weitzman @ BBN, probably the first OO graphics system.

1981 Trillium D.A. Henderson @ Xerox PARC

1965 MenuLay B. Buxton @ U. Toronto

1984 "Resource Editor" Apple, Macintosh place and edited widgets (UI objects), resources are properties of UI objects

1984 SOS Interface J. Hullot @ INRIA, Macintosh first modern “interface builder”

1988 Interface Builder J. Hullot, Next part of the Mac OS/X development tool set

Apple developer IB tutorial
<table>
<thead>
<tr>
<th>Year</th>
<th>Tool</th>
<th>Vendor/Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>X-Designer</td>
<td>Motif X11 IB</td>
</tr>
<tr>
<td>??</td>
<td>UIL</td>
<td>Motif X11 User Interface Language part of Mrm</td>
</tr>
<tr>
<td>1997</td>
<td>GUI design tool</td>
<td>Staněk, Oracle's Netbeans IDE for Java (1999 acquired by Sun / Oracle)</td>
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<tr>
<td>1998</td>
<td>Glade</td>
<td>GTK+ Interface Designer</td>
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<tr>
<td></td>
<td>GtkBuilder</td>
<td>XML for Glade (IDL)</td>
</tr>
<tr>
<td>2007</td>
<td>Qt Creator</td>
<td>Digia, in Qt cross platform GUI framework QML Qt Meta (or Modeling) Language (IDL)</td>
</tr>
<tr>
<td>2002</td>
<td>Designer</td>
<td>Microsoft, in Visual Studio IDE</td>
</tr>
<tr>
<td>2008</td>
<td>XAML</td>
<td>XML based IDL</td>
</tr>
</tbody>
</table>
Application building

select windows, menu, control and text widgets from pallets
draw wiring of events between outlets and inlets
write behaviors for events and other necessary code
make application

Objective C
classes for widgets
Inspectors
connections
attributes
Interface Builder
Test Interface
Unix (Mach kernel)
Postscript display fonts
updated and in Mac OSX
Pallets

window

menu

control

text
connections

To connect widgets select source widget and control drag the mouse to the destination widget.

The slider value is sent to the Scribble window. A value from the Scribble window is sent to the text field.

Methods are defined to process values sent along connection paths.
IB components

GUI development requires management of:

- **code**
  - editor, compiler, debugger, versions
- **geometry**
  - UI controls: place, size, drawing
- **events**
  - event properties, handler, generating

IDEs (Integrated Development Environment) technology manages code for application development.

Graphics editors (Paint, CAD, ...) technology can provide drag and drop "designing" of UI Controls.

- Select from pallets of UI controls
- Copy, cut, paste UI controls
- Align, distribute UI controls
- Group, replicate UI controls
- Set attributes: title, name, colors, fonts, menmonics, layout rules
Code generation

Code generation (4th generation programming APIs) technology can be used to generate "stubs" ("patterns", "templates") for methods that respond to events.

- create method declaration and signature
- generate "first draft" method documentation
- facilitate editing method definition

An interface builder is a tool, not a solution.

Use of an interface builder is not design, it is construction.

Productivity
uni or bi directional interface layout

Create IDL code that declares and constructs UI controls

Create IDL code that sets values for attributes of UI controls

Create code that associates an event with a UI control's event listener attribute and bind an event handler method to listener.

Create code for the associated event handler

Developer builds application.

Interface Builder generates IDL / XML for User Interface
IDE compiles (IDL and code) and executes program

Can the developer edit IB generated code and build again?
Beginner Beware!

Developer may have to separate their code from the IB's generated code to avoid code loss (IB blocks maybe regenerated every build, older IBs).

Beginning users of IDEs with IBs must be wary of:

IB code generation naming and style may not fit developers

IDE provides interface to code
  code style might become less structured
  developers may loses "big picture" of source

Does IB produce source code built with the use of composition and not support developer inheritance?
  Can only drag and drop what is provided.
    Subclassing is not as visual.
  Can developer's classes (custom controls) be added to pallet?
Visual programming languages (VPLs) also exist. Many for teaching introduction to programming.

Alice Pauch CMU
Greenfoot Kolling U of Kent
Scratch Resnick MIT
Getting started with WPF
VS 2013 new project | Visual C# | Windows Desktop | WPF Application
Open the toolbox

Open the toolbox of UI controls
Add a button

Drag a button onto the window. If your Toolbox is "auto-hide" it will disappear when the button is in the window.
Change the button's properties

Select the button in the MainWindow
In the Property window select the following Categories
  - Brush | change Background color
  - Layout | play with size, alignment, margins
  - Common | change Content text, add a tooltip string
  - Text | change the font and size
add an Event handler

With the button selected in the MainWindow, set Property window to Event handlers
For the Click event enter an event handler name.
This will cause the view to switch to MainWindow.xaml
code for buttonPressed(...) 

For the buttonPressed method add code to change the content of the button.

```csharp
using System.Windows.Shapes;

class MainWindow : Window {
    public MainWindow() {
        InitializeComponent();
    }

    private void buttonPressed(object sender, RoutedEventArgs e) {
        ((Button)sender).Content = "Ouch, do it again";
    }
}
```
<Window x:Name="Hello_585" x:Class="Hello585_WPF.MainWindow"

xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
Title="Hello 585" Height="350" Width="525" ShowInTaskbar="False">

<Grid>
<Button Content="Click Me !" HorizontalAlignment="Center"
Margin="0" VerticalAlignment="Center" Width="305" Height="191"
FontFamily="Tahoma" FontSize="24"
ToolTip="really I want to be clicked." Background="#FF2ACDBE"
Click="buttonPressed"/>
</Grid>

</Window>
How would you change the application's window title to "Hello 585"

Compile project
Build | Build Project or Rebuild Project

Run application (will also build)
Debug | Start without debugging