

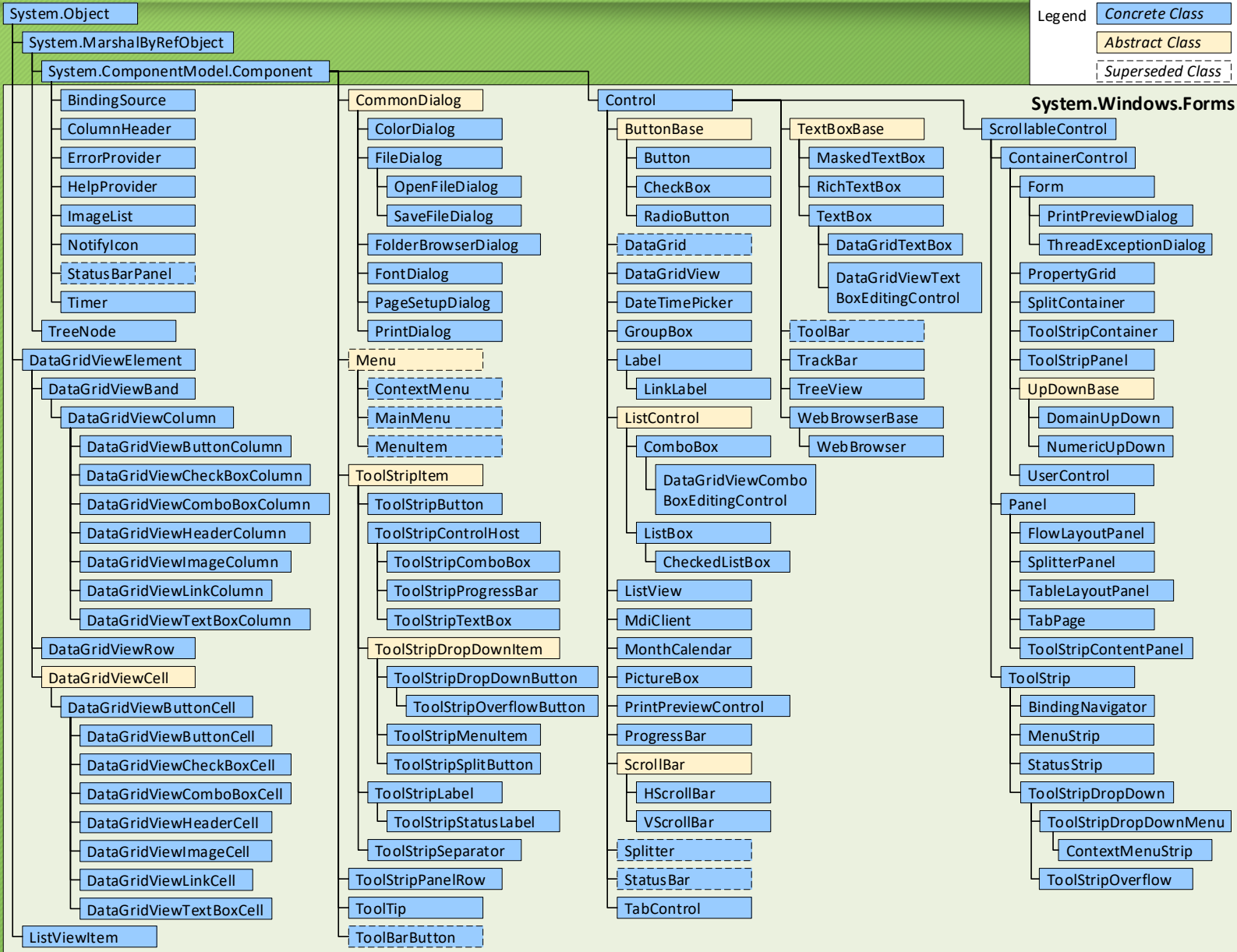
Windows Forms

Szymon Szczepański szymon.szczepanski@gmail.com
Maciej Świechowski m.swiechowski@mini.pw.edu.pl
Paweł Aszklar p.aszklar@mini.pw.edu.pl

Controls - Base classes

- **Component** - base class for (almost) all classes within the **System.Windows.Forms** namespace
- **Control** - message routing, keyboard and mouse, security, size and position, HWND
 - **Controls** property - collection of child controls
- **ScrollableControl** - auto-scrolling
- **ContainerControl** - hosting other controls, focus, tab order
- **UserControl** - composite control consisting of one or more controls

Control Classes Hierarchy
























Control class

- Size and location
 - mostly the same as in **Form**
 - or, actually, the other way round
- Auto-placement and auto-resize
 - **Anchor** – position relative to the edge of its container
 - **Dock**
- Z-order
 - **BringToFront()** ,
SendToBack()
- Styles:
 - **SetStyle()** , **GetStyle()** , **UpdateStyles()**
- **Tag** – allows associating custom data (of any type) with the control
- Tabbing
 - **TabStop**
 - **TabIndex**
- Focus
 - **ControlStyles.Selectable**

Control Class cont'd

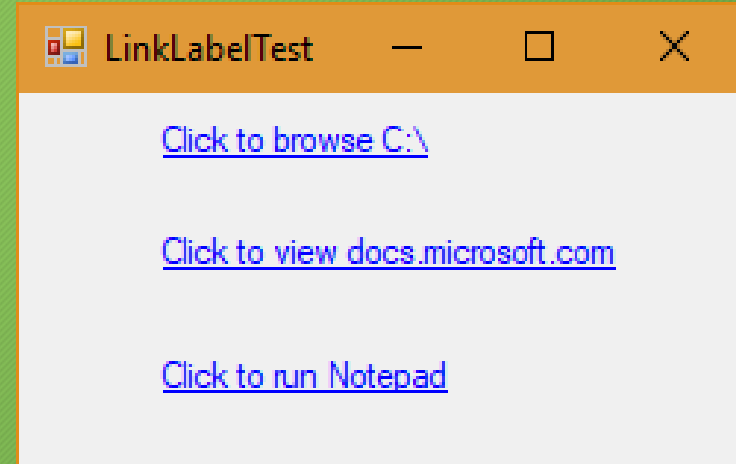
- Parent-child relationships:
 - **Controls** – collection of all child controls
 - **HasChildren** – returns **true** if the control has child controls
 - **Parent** – the control object that contains this control (may be **null**)
 - **TopLevelControl** – control at the very top of the controls hierarchy
- Ambient properties
 - using parent's values if not set
 - e.g. **BackColor**
- To apply operating system visual theme to control
 - **Application.EnableVisualStyles()**
- Accessibility support
 - Aim: application available for users with disabilities
 - **AccessibleXXX**

Common controls - toolbox

Common Controls	
 Button	 NotifyIcon
 CheckBox	 NumericUpDown
 CheckedListBox	 PictureBox
 ComboBox	 ProgressBar
 DateTimePicker	 RadioButton
 Label	 RichTextBox
 LinkLabel	 TextBox
 ListBox	 ToolTip
 ListView	 TreeView
 MaskedTextBox	 WebBrowser
 MonthCalendar	

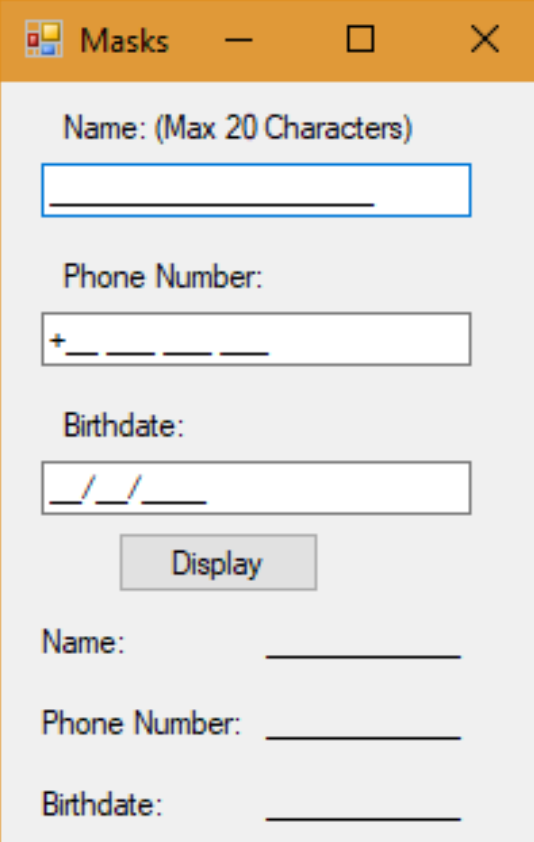
Labels

- Label
 - read only text and/or image
 - usually description of a control or a form
 - in practice – it is used very often
- LinkLabel
 - derived from Label
 - can display hyperlinks
 - in real life – it is hardly used



Text Controls

- Derived From **TextBoxBase**
- Keyboard shortcuts can be used (e.g. Ctrl+C, Ctrl +V...)
- **TextBox**
 - Most frequently used
 - Most used event : OnTextChanged,
 - Multiline
- **MaskedTextBox**
 - Allows us to control input format
 - Often used
 - Has some problems with the mask
- **RichTextBox**
 - Text input control with advanced formatting options
 - Can be saved to rtf files 😊
 - Don't use unless some WYSWIG is needed



The screenshot shows a window titled "Masks" with three masked text input fields. The first field is labeled "Name: (Max 20 Characters)" and contains a blue border. The second field is labeled "Phone Number:" and contains a plus sign followed by three dashes. The third field is labeled "Birthdate:" and contains two slashes followed by three dashes. Below these fields is a "Display" button. At the bottom of the window, there are three unmasked text input fields corresponding to the labels "Name:", "Phone Number:", and "Birthdate:".

Mouse

- Mouse events
 - **MouseMove,MouseDown,MouseUp,MouseClick,MouseDoubleClick**
 - **MouseEnter,MouseHover,MouseLeave,MouseWheel**
 - **Click,DoubleClick**
 - **MouseEventArgs:**
{Button, Clicks, Delta, Location, X, Y}
- **Cursor** class
 - can be loaded from a stream, file, program, or the system's resources
- **Form.Cursor**
- **Cursors** class – standard cursors, e.g. **Cursors.WaitCursor**

Keyboard

- Events:
 - **KeyDown**
 - **KeyEventArgs:**
{KeyCode, KeyData, Modifiers, Alt, Control, Shift, Handled, SuppressKeyPress)
 - **KeyPress**
 - **KeyPressEventArgs:**
{KeyChar, Handled}
 - **KeyUp**
 - **KeyEventArgs**
- **Keys** enum
 - e.g. **Keys.Q**, **Keys.F5**, **Keys.LShiftKey**

Focus

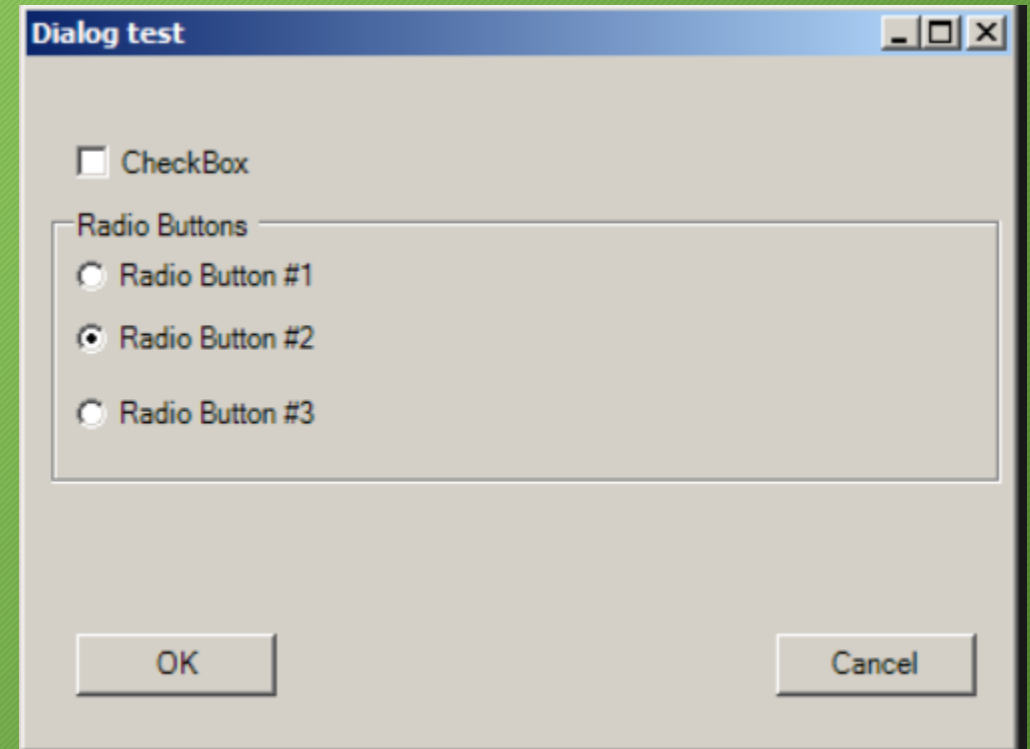
- Current focus:
 - CanFocus, Focused
 - ContainsFocus() (including children)
 - Focus()
- Activating controls:
 - CanSelect
 - Select(), SelectNextControl()
 - Form.ActiveControl
- There always problem with Focus 😊
- Pay attention for default focus on newly opened view
- TabOrder should be good

Focus events - lifetime

- Keyboard / Select...()
 - Enter
 - GotFocus
 - Leave
 - Validating
 - Validated
 - LostFocus
- Mouse / Focus()
 - Enter
 - GotFocus
 - LostFocus
 - Leave
 - Validating
 - Validated

Buttons

- **ButtonBase**
 - base class for **Button**, **CheckBox**, **RadioButton**
- **Button**
 - **PerformClick()**
 - **DialogResult**
 - Mnemonics, e.g. "&Cut && Paste,,
- **CheckBox**
 - Can have 2 or 3 check states (**ThreeState**)
 - Use only when you are certain that it's a yes/no scenario
- **RadioButton**
 - Use every time when there is exclusive choice from a list of options or you are not certain that a new value will not be added (e.g. text alignment or payment type)



List Controls

- Displays lists of items in various graphical formats
- Can be bound to a data source (more details later)
- **ListControl**
 - base class for ListBox, CheckedListBox and ComboBox
- Elements common to all list controls:
 - Items, Text, SelectedItem
 - Sorted
 - FindString(), FindStringExact()



Full Name	Profession	Fav Sport	Hobby
Sandra C. Anschwitz	Singer	HandBall	Beach
Roger A. Miller	Footballer	Tennis	Teaching
Marie-Julie W. Gross	Student	Boxing	Programming
Ella Pius Roger	Architect	Ping-Pong	Songo

ListView

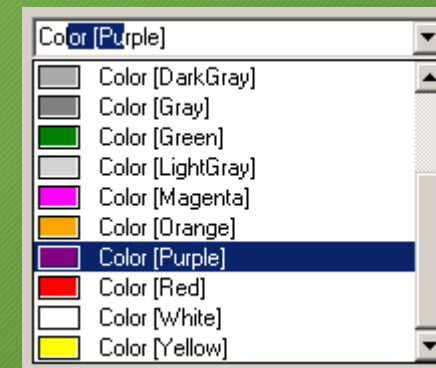
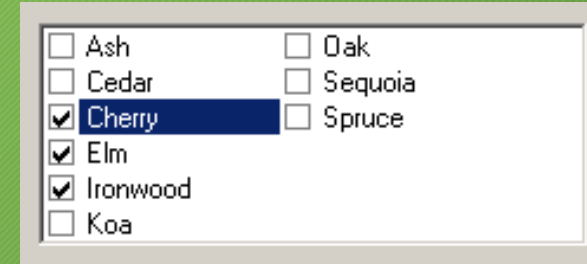
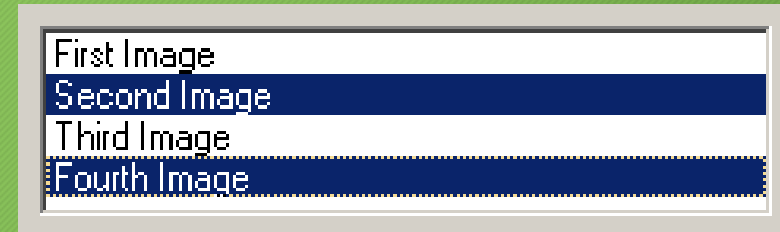
- List of items (**ListViewItem**) + optionally
 - icons
 - check boxes
 - additional information
- Several view modes
 - small icons
 - large icons
 - details
 - ...



Artist	Born	Died	Country
 Botticelli	1445	1510	Italy
 Cezanne	1839	1906	France
 Manet	1832	1883	France
 Manet	1840	1926	France
 Rembrandt	1606	1669	Netherlands

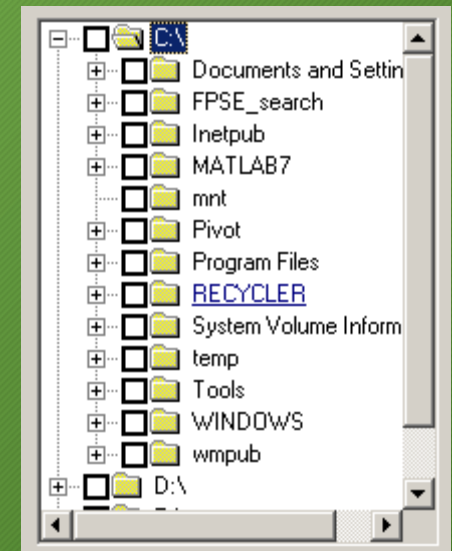
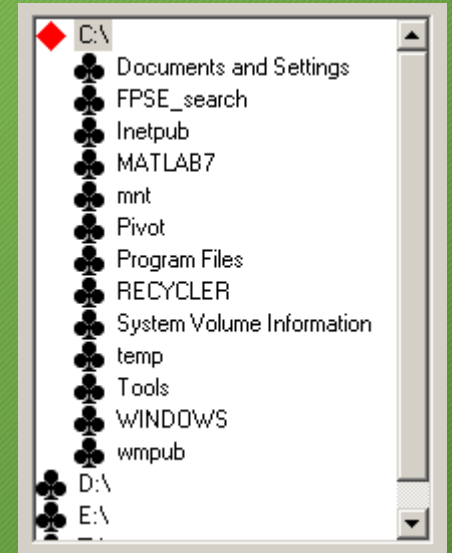
List Controls cont'd

- **ListBox**
 - Single or multiple selection
- **CheckedListBox**
 - derived from ListBox
 - multiple items can be checked
 - can't be bound to a data source
- **ComboBox**
 - single selection
 - possibility to enter a new value
 - used most often



TreeView

- Used for displaying hierarchical data
- Nodes can be expanded/collapsed
- Nodes collection
 - Contains only top-level nodes
 - Each node has a collection of child nodes
- When used to gather data from a tree: create tree on demand



ScrollableControl

- Support for auto-scrolling behaviour
- Enabling auto-scrolling:
 1. `AutoScroll = true`
 2. `AutoScrollMinSize = ...`
- `AutoScrollPosition`
- `VScroll`, `HScroll` – visibility of scroll bars
- `Scroll` event – notification of scrolling

- Usually not used directly:
 - use `Panel` instead

ContainerControl

- A control that can function as a container for other controls
- Are scrollable
- Focus management
- Useful properties:
 - **ActiveControl**
 - **ParentForm**
- Not used directly, prefer Form or UserControl

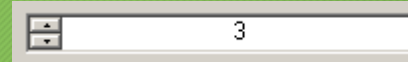
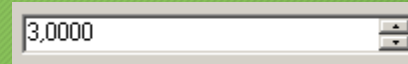
Containers

- **Panels**
 - **Panel**
 - used mostly for grouping controls
 - consider creating UserControl instead
 - **FlowLayoutPanel**
 - dynamically lays out its content horizontally or vertically
 - useful for programmatically created views
 - **TableLayoutPanel**
 - dynamically lays out its contents in a grid
 - behaviour similar to HTML tables
- **GroupBox**
 - frame and caption around a group of related controls
 - often used to group radio buttons
 - consider separating GroupBox and its controls into a UserControl
- **SplitContainer**
 - two panels separated by a movable splitter

UpDownBase (spin boxes)

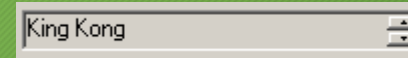
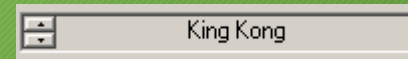
- **NumericUpDown**

- Value
- Minimum, Maximum, Increment
- DecimalPlaces, Hexadecimal, ThousandsSeparator
- UpButton(), DownButton()



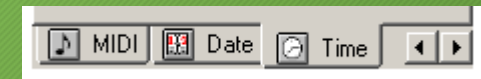
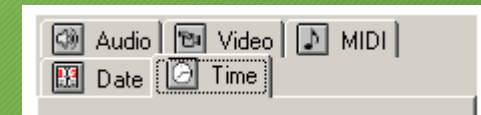
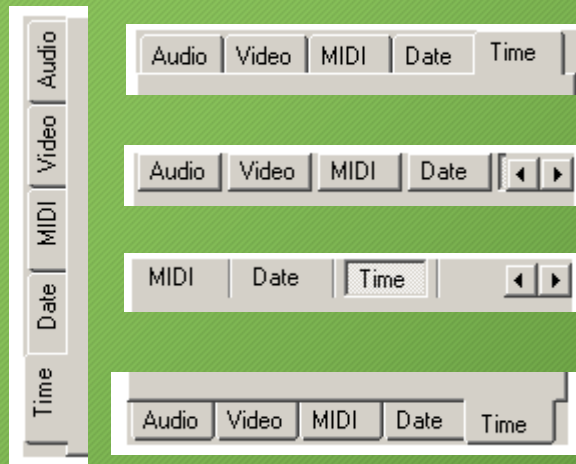
- **DomainUpDown**

- Sorted
- Wrap
- UpButton(), DownButton()
- In real life - barely used



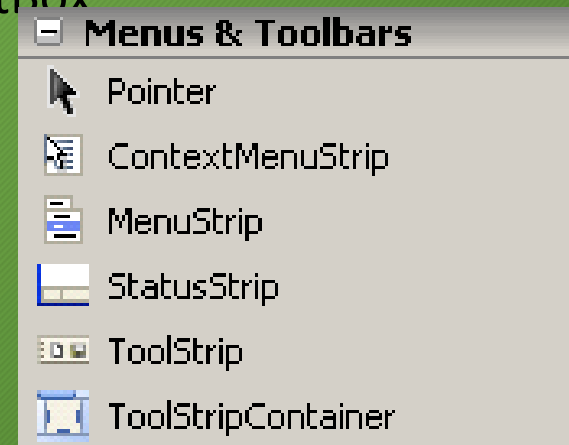
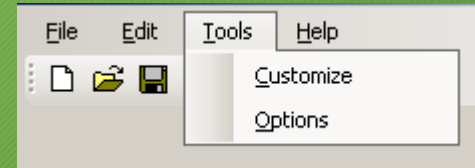
TabControl

- TabPages – collection of TabPage objects
- SelectedIndex, SelectedTab
- SelectTab(), DeselectTab()
- Deselecting, Deselected, Selecting, Selected
- Very good way to simplify create wizard
- Good way of creating more user friendly interface
- Useful for complicated views



Menus & Toolbars

- **ToolStrip** - represents a toolbar
- **StatusStrip** – represents a status bar
- Can host various controls, e.g. dropdown, button, progress bar etc. or custom controls
- Advanced layout capabilities, e.g. overflow, docking and rafting
- **MenuStrip**
 - derived from ToolStrip
 - hosts:
 - ToolStripMenuItem, ToolStripComboBox, ToolStripSeparator, ToolStripTextBox
 - Form.MainMenuStrip
- **ContextMenuStrip**
 - derived from ToolStripDropDownMenu
 - Control.ContextMenuStrip
- Mnemonics
- Accelerators (independent of mnemonics):
 - ShortcutKeys, ShowShortcutKeys, ShortcutKeyDisplayString
- **ToolStripManager, ToolStripRenderer**



Other Useful Controls

- **PictureBox**
 - including various resizing modes
- **ProgressBar**
 - providing various display styles
- **WebBrowser**
 - wrapper for the Internet Explorer's ActiveX control
 - Url, Navigate()
 - GoBack(), GoForward(), GoHome(), GoSearch()
 - Navigating, Navigated, DocumentCompleted
 - C# - Javascript interoperation possible



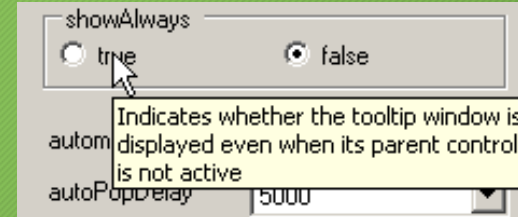
Basic Graphical Components

- **ToolTip**

- SetToolTip(Control, string), GetToolTip
- One tooltip can be assigned to multiple controls

- **NotifyIcon**

- Icon
- ContextMenu
- Text – for icon's tooltip
- Visible
- Tray-only applications are becoming increasingly popular



Date & Time Controls

- **DateTimePicker**

- customizable appearance
- Format, CustomFormat
- MinDate, MaxDate
- ShowCheckBox, ShowUpDown
- Value, Text



- **MonthCalendar**

- customizable appearance
- MinDate, MaxDate, TodayDate
- BoldedDates, MonthlyBoldedDates, AnnuallyBoldedDates
- ShowToday, ShowTodayCircle, ShowWeekNumbers
- SelectionStart, SelectionEnd, SelectionRange



Other Controls & Components

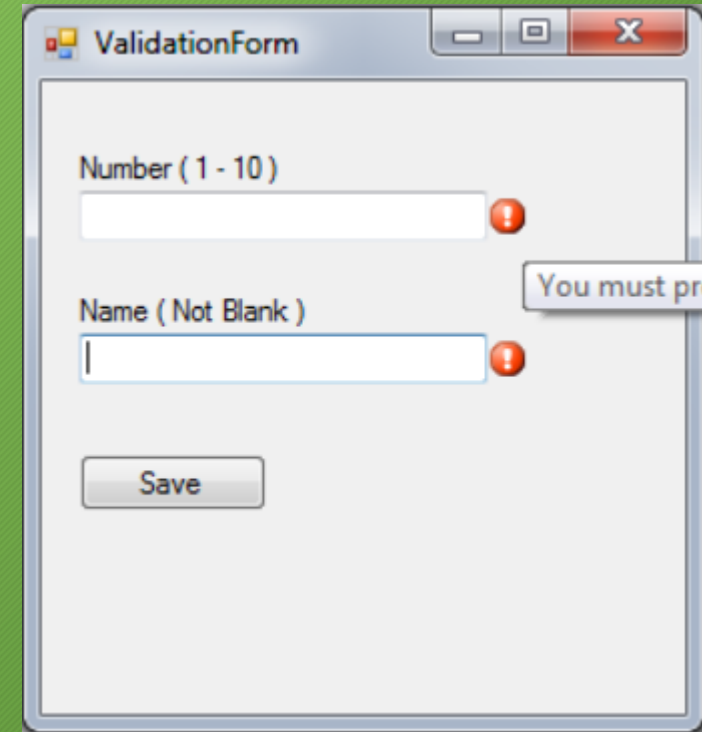
- **Background worker**
 - simplifies executing operations on background threads
 - threading in WindowsForms is not so easy
- **DirectoryEnty, DirectorySearcher**
 - encapsulate ActiveDirectory interactions
- **EventLog**
 - provides access to Windows Event Log
 - warning: needs elevated privilege to create Event Log Source
- **FileSystemWatcher**
 - provides notification about changes in the file system
- **HelpProvider**
 - provides... help 😊
- **ImageList**
 - manages a collection of images

Basic Components

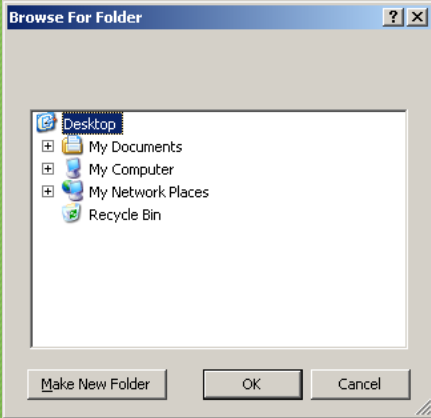
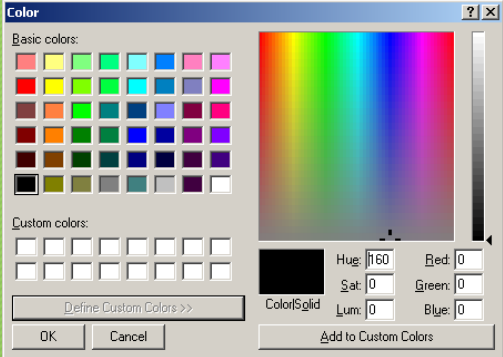
- **PerformanceCounter**
 - represents Windows performance counter
 - rarely used
- **Process**
 - allows processes manipulation (e.g. starting and controlling external applications)
- **SerialPort**
 - represents serial port
 - rarely used
- **ServiceController**
 - allows Windows services manipulation
 - rarely used
- **Timer**
 - one of several timers available
 - be aware that Timer is not the best way to measure time

Validation

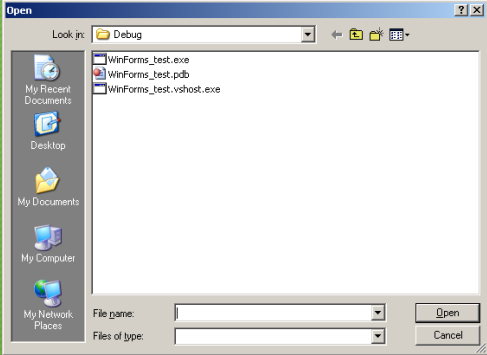
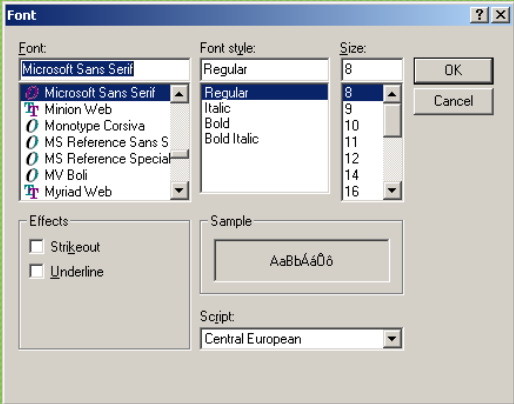
- Validation is one of most often used features of Windows Forms
- For more complex business logic use CustomValidator or create new validation
- Sometimes need custom code to provide validation result in some buttons events
- **Control**
 - CausesValidation
 - Validating (allows cancelling), Validated
- **ContainerControl**
 - AutoValidate
 - Validate(), ValidateChildren()
- **ErrorProvider**
 - SetIconAlignment, SetIconPadding
 - BlinkStyle, BlinkRate
 - ContainerControl
(when used with data-bound control)
 - SetError(control, message)



Dialogs Toolbox



- Dialogs
 - Pointer
 - ColorDialog
 - FolderBrowserDialog
 - FontDialog
 - OpenFileDialog
 - SaveFileDialog



Other Toolbox Groups

- Printing support
- Database support for ADO.NET
- Reporting support
- WPF Interoperability

