Child Window Controls

Child Window Controls

- Windows created by a parent window
- An app uses them in conjunction with parent
- Normally used for simple I/O tasks
- Let user choose commands, view status, view/edit text, etc.
- Properties, appearance, behavior determined by predefined class definitions
  - But behavior can be customized
  - Easy to set them up as common Windows objects
    - buttons, scroll bars, etc.

- Allow user to display/select info in standard ways
- Windows Environment does most of work in:
  - painting/updating a Control's screen area
  - determining what user is doing
- Can do the "dirty work" for the main window
- Often used as input devices for parent window
- Are the "working components" of dialog boxes
- Windows OS contains each control's ***WinProc***
  - so messages to controls are processed in predefined way
- Parent window communicates with controls by sending/receiving messages

Six "Classic" Control Types

- Go back to first versions of Windows
- Implemented in User.exe

Type	Window Class	MFC Class
Static Text	"STATIC"	CStatic
Button	"BUTTON"	CButton
Edit Control	"EDIT"	CEdit
List Box	"LISTBOX"	CListBox
Combo Box	"COMBOBOX"	CComboBox
Scroll Bar	"SCROLLBAR"	CScrollBar

- All are windows

- Windows Environment automatically repaints a Control upon exposure
- Example: WordPad ("File"|"Open")
  - Conatains most of "classic" controls
  - There are 20 other predefined "Common Controls"
  - Most first appeared in Windows 95
  - Some came with Internet Explorer
  - Implemented in Comctl32.dll

The Common Controls

TYPE	WINDOW CLASS	MFC CLASS
Animation	"SysAnimate32"	CAnimateCtrl
ComboBoxEx	"ComboBoxEx32"	CComboBoxEx
Date-Time	"SysDateTimePick32"	CDateTimeCtrl
Header	"SysHeader"	CHeaderCtrl
Hotkey	"msctls_hotkey32"	CHotKeyCtrl
Image List	N/A	CImageList
IP Address	"SysIPAdress32"	CIPAddressCtrl
List View	"SysListView32"	CListCtrl
Month Calendar	"SysMonthCal32"	CMonthCalCtrl
Progress	"msctls_progress32"	CProgressCtrl
Property Sheet	N/A	CPropertySheet
ReBar	"ReBarWindows32"	CReBarCtrl

TYPE	WINDOW CLASS	MFC CLASS
Rich Edit	"RichEdit20A"	CRichEditCtrl
Slider	"msctls_trackbar32"	CSliderCtrl
Spin Button	"msctls_updown32"	CSpinButtonCtr
Status Bar	"msctls_statusbar32"	CStatusBarCtrl
Tab	"SysTabControl32"	CTabCtrl
Toolbar	"ToolbarWindow32"	CToolBarCtrl
ToolTip	"tooltips_class32"	CToolTipCtrl
Tree View	"SysTreeView32"	CTreeCtrl

Classic Window Controls

- **Static**
  - Primarily to display text
  - Can also display icon images and rectangles
  - Automatically redrawn if exposed
  - Often used as labels for other controls
- **Button**
  - "Clicked" by user to indicate desired actions or choices made
  - Lots of different styles (e.g., pushbutton, check, radio, group)
  - Typically notify parent window when user chooses the button

- **List Box**
  - Contains lists of items that can be selected
  - Entire list is shown
  - User selects items
  - Selected item is highlighted
- **Combo Box**
  - Edit box combined with a list box
  - List box can be displayed at all times or pulled down
  - User selects item from list & item is copied to edit box
  - One type allows user to type into edit box
    - If text matches item in list, it is highlighted & scrolled into view
  - Another type doesn't allow user to type in edit box

- **Scroll Bar**
  - Lets user choose direction/distance to move a "thumb"
  - Two types:
    - Control attached to edge of a parent window
    - Allows user to "scroll" the information in a parent window's client area
  - Stand-alone child window control
    - Allows user to enter/change a value by moving scroll bar "thumb"
- **Edit**
  - To enter/view/edit/delete text
  - Single or multiline control
  - Lots of word processing capability
  - Also Clear/Copy/Cut/Paste/Undo capability

Creating Controls--Win32 API

- ***CreateWindow()***
  - ***F***or any kind of window, including a control
  - Typically called in response to WM_CREATE
- Parameters:
  - 1. Predefined control class names:
    - "STATIC", "BUTTON", "EDIT", "LISTBOX", "COMBOBOX", "SCROLLBAR", others
  - 2. Name of the window
    - BUTTON, EDIT, STATIC classes:
      - text in center of control
    - COMBOBOX, LISTBOX, SCROLLBAR:
      - ignored (use "")

- 3. Window style

  WS_, SS_, BS_, ES_, LBS_, CBS_, SBS_ (see CreateWindow help)
  - Several styles can be combined with the bitwise or operator (|)
  - All controls should include WS_CHILD style
- Parameters 4-7:
  - X,Y position (Relative to the upper left corner of parent window client area)
  - Width & Height
- 8. Handle to the parent window

- 9. Handle to "menu"
  - Controls don't have menus
  - So hMenu parameter used to hold control's integer ID
  - ID value passed with WM_COMMAND message generated when user interacts with the control
  - Allows program to identify which control was activated
- 10. Handle to instance of program creating control
  - ***GetWindowLong()*** usually used to get this value
- 11. Pointer to window creation data
  - Normally NULL

Example (Win32 API)

- In response to WM_CREATE in Main Window's WndProc():

```
HWND hMyButton;
HINSTANCE hInstance;
hInstance = (HINSTANCE) GetWindowLong (hWnd,
GWL_HINSTANCE);
hMyButton = CreateWindow ("BUTTON", "Push Me",
WS_CHILD | BS_PUSHBUTTON, 10, 10, 130, 60, hWnd,
(HMENU)ID_MYBUTTON, hInstance, NULL);
ShowWindow (hMyButton, SW_SHOWNORMAL);
```

Creating Controls -- MFC

- CWnd is the parent class of controls
- Define control in a related class or handler, eg.:

```
CStatic myCtrl;
```

- Use the control's override of CWnd::Create() to create the control (typically in OnCreate() handler)
  - Mostly same parameters as CreateWindow(), e.g.:

```
RECT r;
r.left = r.right = 10; r.right = 200; r.bottom = 30;
myCtrl.Create ("Hello", WS_CHILD | WS_VISIBLE |
SS_LEFT, r, this, ID_MYSTATIC);
```

  - Last parameter the control ID (defined in a .h file)

Using a Child Window Control, MFC

- Manipulate the control using its (and CWnd parent class) member functions
  - See Online help
- When finished with the control, use CWnd::DestroyWindow() to destroy the control

Messages from Controls

- Most work as follows:
  - User interacts with the control
  - WM_COMMAND message sent to parent window
  - LOWORD(wParam) = Control ID
  - lParam = control's window handle
  - HIWORD(wParam) = notification code
    - identifies what the user action was
- Scroll Bars are a bit different

Win32 API Control Message Handlers

- Put Control message handlers in same switch/case statement with menu handlers (WM_COMMAND)
- Done just as for menu handlers

MFC Control Message Handlers

- Set up message macro for each notification code of interest
  - e.g., for button's BN_CLICKED notification. code:
    - ON_BN_CLICKED (ID, OnClickHandler)
- Declare the handler functions in the .h file
- Write the handler functions in .cpp file, e.g.

```
void CMyProgView::OnClickHandler()
{ // code goes here };
```

Sending Messages to Controls, Win32 API

- ***SendMessage()*** --sends message to a window's WinProc()
- Doesn't return until message has been processed
- Parameters:
  - Handle of destination window
  - ID of message to send
  - wParam and lParam values containing message data, if any

Example, Win32 API

- **Send a message to hMyControl**

  SendMessage (hMyControl, WM_SETTEXT, 0, (LPARAM) "Hello") ;
  - Here message is WM_SETTEXT
  - When received, control's ***WndProc()*** changes control's window name (text string displayed)
  - For this message wParam must be 0;
- There are many messages that can be sent to a control
- Depend on type of control, See online help

Sending Messages to Controls, MFC

- Use the Control's SendMessage() function to send the control a message
- For example, assume m_myStatic is a CStatic object that has been created
- To change the text displayed:

```
char cBuf[] = "Hello";
m_myStatic.SendMessage (WM_SETTEXT, 0,
  (LPARAM) cBuf );
```

Alternatives to SendMessage()

- Could use other class member functions
- For most messages that can be sent to a control, there is a corresponding function
- Most are members of CWnd parent class
- Example sending WM_SETTEXT to a static control
  - SetWindowText(), for example:

```
m_myStatic.SetWindowText("Hello");
```

- Could also use PostMessage()
  - Returns immediately

Static Controls

- Lots of styles, see online help on "Static Control Styles". Some examples:
  - SS_BITMAP, SS_CENTER, SS_GRAYFRAME, SS_ICON, SS_SIMPLE, SS_WHITEFRAME, etc.
- Change text with WM_SETTEXT message or SetWindowText()
  - May need to format values with wsprintf()
- Retrieve text with WM_GETTEXT message or GetWindowText()
- Program examples: static, static_mfc

Button Controls

- Some Styles: BS_PUSHBUTTON, BS_RADIOBUTTON, BS_CHECKBOX, BS_OWNERDRAW, BS_GROUPBOX, etc.
- Button notification codes:
  - BN_CLICK, BN_DOUBLECLICK
- Some messages you can send to buttons:
  - BM_SETCHECK, BM_GETCHECK, BM_SETSTATE, BM_GETSTATE, etc.
- Corresponding CButton member functions:
  - SetCheck(), GetCheck(), SetState(), GetState()
- Program examples: button, button_mfc

Graphical Push Buttons

- One way: use CBitmapButton class
- Assume we have a CBitmapButton object called m_bitmapbut and two bitmaps in the resources:
  - IDB_BMUP: "up state" bitmap
  - IDB_BMDOWN: "down state" bitmap
- Some code:

```
m_bitmapbut.Create ("",WS_CHILD | WS_VISIBLE |
   BS_OWNERDRAW, rect, this,
   BITMAP_BUTTON);
m_bitmapbut.LoadBitmaps (IDB_BMUP,
   IDB_BMDOWN, 0, 0);
```

- Program Example: button_bitmap_mfc

List Box Controls

- Lots of styles: see on-line help on LBS_
  - LBS_STANDARD very common
    - can send messages to parent
- Program communicates with list box by sending it messages; some common button messages:
  - LB_RESETCONTENTS, LB_ADDSTRING, LB_GETCURSEL, LB_GETTEXT, LB_DELETESTRING
- Some List Box Notification codes:
  - LBN_SELCHANGE, LBN_DBLCLK
- Combo boxes much like list boxes (CBS_, CB_, CBN_)
- Program examples: listbox, combo