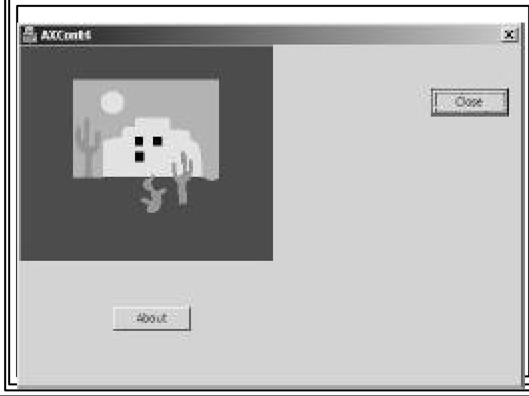
Creating and using a Custom ActiveX Control

AXCtrl and AXCont: Example ActiveX control and Container

- AXCrtl displays a picture
- User clicks on picture (event), it switches to another picture & beeps
- Properties allow AXCont container app to set control's background color
- Container can call an About() method in control that gives info about the control



Creating the ActiveX Control

- File | New | "Projects" tab
- "MFC ActiveX Control" Template
- Name it AXCtrl
- "Control Names": Take Defaults
- "Finish"

Creating the Bitmaps

- Project | Add Resource | Bitmap | New
- Draw bitmap (about 150 X 150 pixels)
- Keep defaults
  - ID: IDB_BITMAP1
  - Filename: DAY.BMP
- Repeat with second bitmap
  - ID: IDB_BITMAP2
  - Filename: NIGHT.BMP

Loading the Bitmaps

- Add public variables to CAXCtrlCtrl class
  - CBitmap* m_CurrentBitmap
  - CBitmap m_BitmapNight
  - CBitmap m_BitmapDay
- Add code to constructor:

```
m_BitmapNight.LoadBitmap(IDB_BITMAP2);
m_BitmapDay.LoadBitmap(IDB_BITMAP1);
m_CurrentBitmap=&m_BitmapDay;
```

Adding a Click Message Handler

- In CAXCtrlCtrl Properties Box
  - "Message Maps"
  - WM_LBUTTONUP in "Messages" List
  - Add following code to OnLButtonUp():

```
if (m_CurrentBitmap == &m_BitmapNight)
    m_CurrentBitmap=&m_BitmapDay;
else
    m_CurrentBitmap=&m_BitmapNight;
InvalidateControl();    // force call to OnDraw()
```

Defining Properties

- BackColor Stock Property
  - A predefined property
  - Lets container app change control's background color

Enabling BackColor Property

- Expand CAXctrlLib node in Class View
- Right click on _DAXCtrl node
  - Add | Add Property
  - Brings up "Add Property Wizard" Dialog Box
  - Select BackColor stock property from "Property Name" list
  - "Stock" option should be selected
  - "Finish" button
- MFC stores value of BackColor property & initializes it to background color of any container the control is in
- If property is changed, control is invalidated, forcing OnDraw() to redraw it

Coding for OnDraw()

- Replace default ellipse-drawing code in OnDraw()

```
void CAXCtrlCtrl::OnDraw(CDC* pdc, const CRect& rcBounds,
                         const CRect& rcInvalid)
{
  // TODO: Replace the following code with your own drawing code.
  BITMAP BM;
  CDC MemDC;

  CBrush Brush (TranslateColor(GetBackColor())); // get color from control &
                                                 // translate to COLORREF
  pdc->FillRect(rcBounds,&Brush);
  MemDC.CreateCompatibleDC(NULL);
  MemDC.SelectObject(*m_CurrentBitmap);
  m_CurrentBitmap->GetObject(sizeof(BM), &BM);
  pdc->BitBlt((rcBounds.right - BM.bmWidth)/2, (rcBounds.bottom -
  BM.bmHeight)/2, BM.bmWidth, BM.bmHeight, &MemDC, 0, 0, SRCCOPY);
}
```

Property Pages

- For developers so they can work with the new control
- Provides users of control with a way to set its properties
  - Select Resource View & expand dialog folder
    - Click on control to open its property box
    - Change the value of the property
    - (Illustrate with AXCont4)
- In "Test Container" app that comes with Visual Studio, you can display the properties pages of a control
  - Each property page is displayed as a tab of the Control Properties Dialog Box
  - Each page contains a property of the control
  - Properties can be modified
- Container app can assign initial values to the control's properties
- A new ActiveX control has a single property page
  - Defined in IDD_PROPPAGE_AXCTRL dialog resource

Adding a Background Color Property Page to AXCtrl App

- The Stock Color property page
- Used to set value of Control's BackColor property when container app is designed
- In CAXCtrlCtrl class (Property pages section)
- Change 1 to 2 in macro:

  BEGIN_PROPPAGEIDS(CAXCrtlCtrl, 2);
- Add second PROPPAGEID:

  PROPPAGEID(CLSID_CColorPropPage)
  - Macro will link Color property page with BackColor property

Defining Methods

- We'll use the predefined AboutBox method
- When a container calls it, the control displays an "About" dialog box
  - Defined in IDD_ABOUTBOX_AXCTRL dialog resource
- To add other Methods you would:
  - Select _DAXCtrl interface node in Class View
  - Right click and select Add | Add Method
  - Specify the Method Name & return type,
  - Parameters, etc.
  - Edit new method adding your code

Defining Events

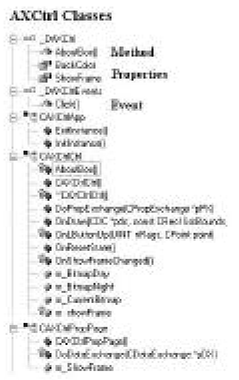
- Once defined, control can call an associated Fire function
  - e.g., FireClick() for click action on control
- Calling the Fire function called "firing an event"
- Causes an event handling function in container to be called
- For stock events MFC provides Fire functions & calling code
- For custom events ClassWizard can generate Fire function.
  - We must write calling code when event is to be fired

Defining a Click stock event for AXCtrl App

- Right click on CAXCtrlCtrl class
  - "Add" | "Add Event"
    - "Add Event Wizarad" opens up
  - Select Event Name "Click" & Event type "Stock"
  - "Finish
- FireClick is defined in COleControl base class
- MFC adds code to call it to fire the Click event whenever user clicks on the control
  - So no calls to FireClick() need to be added

Building / Registering the Control

- Build as usual
  - Generates the file AXCtrl.ocx
  - Also registers the control on the system being used
    - So it can be accessed by containers you write



AXCtrl Classes

```
_DAXCtrl
    AboutBox()        Method
    BackColor         Properties
    ShowFrame
_DAXCtrlEvents
    Click()           Event
CAXCtrlApp
    ExitInstance()
    InitInstance()
CAXCtrlCtrl
    AboutBox()
    CAXCtrlCtrl()
    ~CAXCtrlCtrl()
    DoPropExchange(CPropExchange *pPX)
    OnDraw(CDC *pdc, const CRect &rcBounds,
    OnLButtonUp(UINT nFlags, CPoint point)
    OnResetState()
    OnShowFrameChanged()
    m_BitmapDay
    m_BitmapNight
    m_CurrentBitmap
    m_showFrame
CAXCtrlPropPage
    CAXCtrlPropPage()
    DoDataExchange(CDataExchange *pDX)
    m_ShowFrame
```

Making the Control usable to other apps

- Should provide an installation program
  - To register the control on the user's system
- See online help
- Done automatically when ActiveX control is built on the machine Visual Studio is running on

Testing the Control

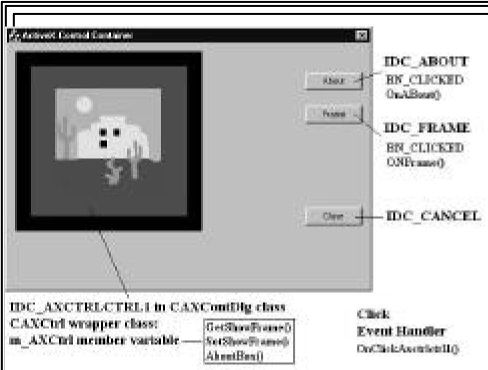
- Use “Test Container” program that comes with VC++
  - “Tools” / “ActiveX Control Test Container”
    - Brings up the Test Container
  - “Edit” / “Insert New Control”
  - Select “AXCtrl Control” & click “OK”
    - Brings the control into the Test Container (enlarge it)
    - Now Properties can be tested
      - “Edit” / “Properties” –> Properties Page
        - Try changing Background color property
    - Methods can also be invoked
      - “Control” / “Invoke Methods” / Invoke AboutBox(Method)
    - Click Event can also be fired
      - Click on the control

Creating the ActiveX Control Container Application

- New MFC AppWizard (exe) application
  - Choose Dialog-based application type
- Advanced Features: leave “ActiveX Controls” option selected
- User Interface Features: Dialog title: “ActiveX Control Container Demo”

Adding the ActiveX Control to the Project

- Right click on App’s dialog box
  - Click “Insert ActiveX control”
  - “Insert ActiveX Control” dialog box appears
- Scroll through ActiveX controls registered on system
  - Select AXCtrl
- Click “OK”
- Increase size of control



Designing the App’s Dialog Box

- Open IDD_AXCONT_DIALOG
- Delete static text “TODO” & “OK” button
- Change caption of Cancel button to “Close”
- Add an “About” button
  - IDC_ABOUT

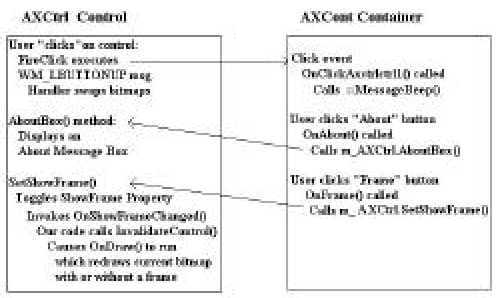
Customizing Initial Properties

- Right click on the ActiveX Control, select “Properties”
  - Note “BackColors” property page
- Open “Color” property page (click on down arrow)
  - Click on Red button to set background color to red

Attach ActiveX Control to a Wrapper Class Object

- Want code in dialog box class to be able to access functions in the control
  - To change properties & call its methods
- Add member variable to CAXContDlg class
  - (Right click on control, Add | Add member variable)
  - Name: m_AXCtrl, Category: Control (default), Variable Type: CAxctrctrl1 (only choice)
- “Finish”

Interaction Between Control & Container


AXCtrl Control
AXCont Container
User “clicks” on control:
FireClick executes
WM_LBUTTONUP msg
Handler swaps bitmaps
AboutBox() method:
Displays an
About Message Box
SetShowFrame()
Toggles ShowFrame Property
Invokes OnShowFrameChanged()
Our code calls InvalidateControl()
Causes OnDraw() to run
which redraws current bitmap
with or without a frame
Click event
OnClickAxctrlctrl1() called
Calls ::MessageBeep()
User clicks “About” button
OnAbout() called
Calls m_AXCtrl.AboutBox()
User clicks “Frame” button
OnFrame() called
Calls m_AXCtrl.SetShowFrame()

Adding Button Click Handler for “About” Button

- Class: CAXContDlg
- Properties Box | “Events”
- Select IDC_ABOUT
  - BN_CLICKED, “Add Function” --> OnBnClickedAbout()
  - Edit Code:

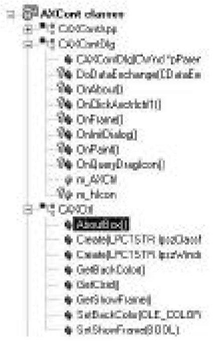
    m_AXCtrl.AboutBox();

Adding a Click (on control) Event Handler

- Class: CAXContDlg
- Properties Box | “Events”
- Select IDC_AXCTRLCTRL1
  - Select “Click” Message (only event fired)
- Add code:

  ::MessageBeep(MB_OK);

Build and run the application



```
AXCont classes
  CAXContApp
  CAXContDlg
    CAXContDlg(CWnd *pParen
    DoDataExchange(CDataEx
    OnAbout()
    OnClickAxctrlctrl1()
    OnFrame()
    OnInitDialog()
    OnPaint()
    OnQueryDragIcon()
    m_AXCtrl
    m_hIcon
  CAXCtrl
    AboutBox()
    Create(LPCTSTR lpszClassN
    Create(LPCTSTR lpszWindo
    GetBackColor()
    GetChild()
    GetShowFrame()
    SetBackColor(OLE_COLOR
    SetShowFrame(BOOL)
```