

ComboBox ListView TreeView

Windows programming

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In this talk

1. Combobox
2. ListView
3. TreeView

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Combobox

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Creation

```
❑ CreateWindow(L"combobox", L"", WS_CHILD |  
WS_VISIBLE | CBS_DROPDOWN, 10, 10, 100, 30,  
hWnd, (HMENU) ID_CMBCHOICE, hInst, NULL);
```

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Styles

- ☐ CBS_SIMPLE: Always show listbox
- ☐ **CBS_DROPDOWN**: Most seen 
- ☐ CBS_DROPDOWNLIST 
- ☐ CBS_AUTOHSCROLL
- ☐ CBS_DISABLENOSCROLL (vertical)
- ☐ CBS_LOWERCASE / CBS_UPPERCASE / CBS_SORT
- ☐ CBS_OWNERDRAWFIXED: all item same height
- ☐ CBS_OWNERDRAWVARIABLE

Basic operations

- ❑ CB_ADDSTRING
- ❑ CB_DELETESTRING
- ❑ CB_INSERTSTRING

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- ❑ CB_GETCOUNT
- ❑ CB_GETCURSEL
- ❑ CB_SETCURSEL

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- ❑ CB_GETLBTEXT / CB_GETLBTEXTLEN (not in MVC)

Add initial data

- ❑ `ComboBox_AddString(cmbChoice, L"Tiếng Việt");`
- ❑ `SendMessage(cmbChoice, CB_ADDSTRING, NULL, (LPARAM)L"Lựa chọn thứ hai");`

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Basic messages

- ❑ **CBN_SELCHANGE**: selection change

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Sample code

```
case WM_COMMAND:
```

```
{
```

```
    int wmlId = LOWORD(wParam);
```

```
    int notifycode = HIWORD(wParam);
```

```
    HWND combobox = (HWND)lParam;
```

```
    switch (wmlId)
```

```
{
```

```
        case ID_CMBCHOICE:
```

```
        if (notifycode == CBN_SELCHANGE) {
```

```
            int i = ComboBox_GetCurSel(combobox);
```

```
            MessageBox(hWnd, choices[i], L"Lựa chọn",  
                        MB_OK);
```

```
        }
```

```
        break;
```

Helper

```
// Lấy font hệ thống  
LOGFONT lf;  
GetObject(GetStockObject(DEFAULT_GUI_FONT),  
sizeof(LOGFONT), &lf);  
HFONT hFont = CreateFont(lf.lfHeight, lf.lfWidth,  
lf.lfEscapement, lf.lfOrientation, lf.lfWeight,  
lf.lfItalic, lf.lfUnderline, lf.lfStrikeOut, lf.lfCharSet,  
lf.lfOutPrecision, lf.lfClipPrecision, lf.lfQuality,  
lf.lfPitchAndFamily, lf.lfFaceName);  
SetWindowFont
```

Advance operations

- ❑ CB_RESETCONTENT: clear all items in combobox
- ❑ CB_GETITEMDATA
 - wParam: index of item
- ❑ CB_SETITEMDATA
 - wParam: index of item
 - lParam: value to set
- ❑ Note: won't be needed if use mvc

ListView

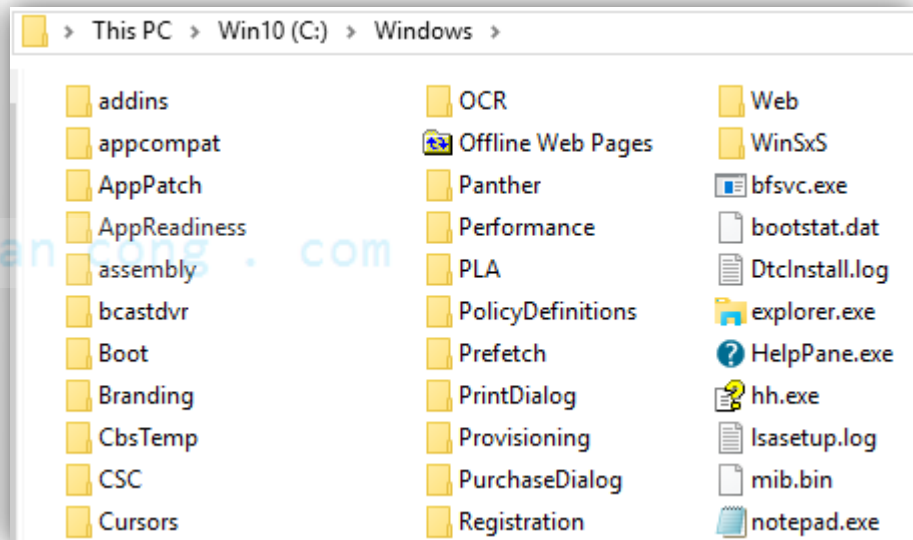
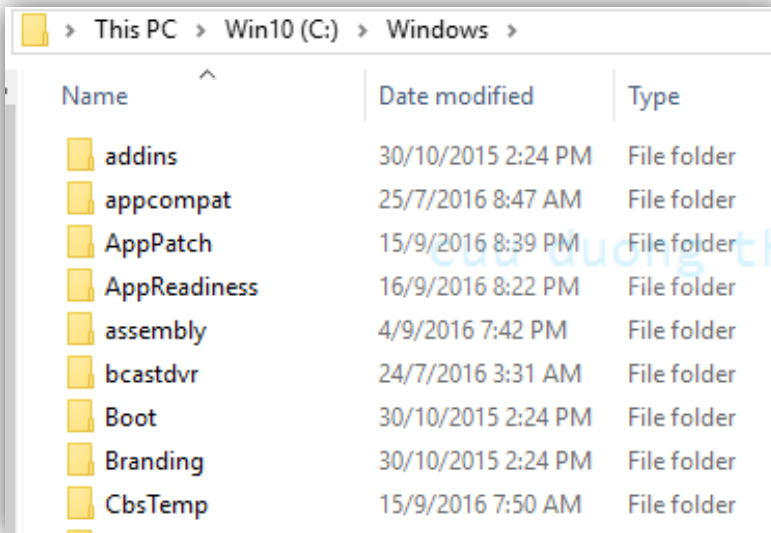
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God mod: <https://www.codeproject.com/Articles/2890/Using-ListView-control-under-Win-API>

4 types of display

- ❑ Icon view LVS_ICON
- ❑ Small icon view LVS_SMALLICON
- ❑ List view LVS_LIST
- ❑ Report view LVS_REPORT



Creation

```
CreateWindow(WC_LISTVIEWW, L"",  
WS_CHILD | WS_VISIBLE |  
WS_VSCROLL | LVS_REPORT | WS_BORDER,  
200, 10, 200, 400,  
hWnd, (HMENU)IDC_LISTVIEW, hInst, NULL);
```

☐ Not successful?

Add instructions

```
#pragma
```

```
comment(linker, "\"/manifestdependency:type='win32'  
name='Microsoft.Windows.Common-Controls'  
version='6.0.0.0' processorArchitecture='*'  
publicKeyToken='6595b64144ccf1df' language='*'\")
```

```
// TreeView & ListView
```

```
#include <commctrl.h>
```

```
#pragma comment(lib, "Comctl32.lib")
```

Init

```
INITCOMMONCONTROLSEX icex;
```

```
// Ensure that the common control DLL is loaded.
```

```
icex.dwSize = sizeof(INITCOMMONCONTROLSEX);
```

```
icex.dwICC = ICC_LISTVIEW_CLASSES |  
ICC_TREEVIEW_CLASSES;
```

```
InitCommonControlsEx(&icex);
```


Column

□ LVCOLUMN

- **pszText**: caption
- **mask**: LVCF_TEXT, LVCF_WIDTH, LVCF_FMT, LVCF_IMAGE
- **fmt**: for the heading
LVCFMT_CENTER, LVCFMT_LEFT, LVCFMT_RIGHT
- **cx**: column width
- **iImage**: index of image in imagelist
- **iSubItem**: subitem index
- **iOrder**: order of column in listview

Sample 4 columns

```
LVCOLUMN lvCol;

lvCol.mask = LVCF_FMT | LVCF_TEXT | LVCF_WIDTH;
lvCol.fmt=LVCFMT_LEFT;

lvCol.cx = 130;
lvCol.pszText = _T("Tên");
ListView_InsertColumn(m_hListView, 0, &lvCol);

lvCol.fmt=LVCFMT_LEFT | LVCF_WIDTH;
lvCol.cx = 100;
lvCol.pszText = _T("Loại");
ListView_InsertColumn(m_hListView, 1, &lvCol);

lvCol.fmt = LVCFMT_RIGHT;
lvCol.pszText = _T("Kích thước");
ListView_InsertColumn(m_hListView, 2, &lvCol);

lvCol.pszText = _T("Mô tả");
ListView_InsertColumn(m_hListView, 3, &lvCol);
```

Tên	Kích thước	Loại tập tin	Ngày chỉnh sửa
Logs		Thư mục	27/04/2016 01:35 Chiều
NVIDIA		Thư mục	22/07/2016 01:24 Chiều
PerfLogs		Thư mục	30/10/2015 01:24 Chiều
Program Files		Thư mục	15/09/2016 07:47 Sáng
Program Files (x86)		Thư mục	19/09/2016 11:21 Sáng
totalcmd		Thư mục	26/08/2016 01:48 Chiều
Users		Thư mục	22/07/2016 01:34 Chiều
Windows		Thư mục	15/09/2016 01:39 Chiều
xampp		Thư mục	27/07/2016 07:45 Sáng

Listview item

□ LVITEM

- **mask:**
LVIF_TEXT, LVIF_IMAGE, LVIF_PARAM
- **iItem:** index of item
- iSubItem: index of sub item
- **pszText**
- iImage
- lParam: tag value










Sample insert listview item

```
//Cột thứ nhất là tên hiển thị của tập tin
lv.mask = LVIF_TEXT | LVIF_IMAGE | LVIF_PARAM;
lv.iItem = nItemCount;
lv.iSubItem = 0;
lv.pszText = fd.cFileName;
lv.lParam = (LPARAM) filePath;
lv.iImage = _GetImageListIconIndex(filePath, fd);
ListView_InsertItem(m_hListView, &lv);

//Cột thứ hai là Size
ListView_SetItemText(m_hListView, nItemCount, 1, _GetSize(fd));
fileSizeCount+= fd.nFileSizeLow;

//Cột thứ ba là Type
ListView_SetItemText(m_hListView, nItemCount, 2, _GetType(fd));

//Cột thứ tư là Date Modified
ListView_SetItemText(m_hListView, nItemCount, 3, _GetDateModified(fd.ftLastWriteTime));
```

Tên	Kích thước	Loại tập tin	Ngày chỉnh sửa
 webdav		Thư mục	22/07/2016 01:31 Chiều
 apache_start.bat	436 bytes	Windows Batch File	07/06/2013 01:15 Chiều
 apache_stop.bat	140 bytes	Windows Batch File	07/06/2013 01:15 Chiều
 catalina_service.bat	9 KB	Windows Batch File	30/03/2013 01:29 Chiều
 catalina_start.bat	2 KB	Windows Batch File	07/06/2013 01:15 Chiều
 catalina_stop.bat	2 KB	Windows Batch File	25/06/2013 01:36 Chiều
 ctlscrip.bat	2 KB	Windows Batch File	22/07/2016 01:31 Chiều
 filezilla_setup.bat	78 bytes	Windows Batch File	30/03/2013 01:29 Chiều
 filezilla_start.bat	150 bytes	Windows Batch File	07/06/2013 01:15 Chiều

Handle click / double click

- ❑ WM_NOTIFY
- ❑ LPNMHDR info = (LPNMHDR)lParam;
- ❑ info->code == NM_CLICK / NM_DBLCLK

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Traverse through selected items

```
int iPos = ListView_GetNextItem(hListView, -1, LVNI_SELECTED);  
while (iPos != -1) {  
    // iPos is the index of a selected item  
    // do whatever you want with it  
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    // Get the next selected item  
    iPos = ListView_GetNextItem(hListView, iPos, LVNI_SELECTED);  
}
```

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Get the data we want

```
LVITEM item;
```

```
item.mask = LVFIF_TEXT;
```

```
item.iItem = index;
```

```
item.iSubItem = 0;
```

```
item.pszText = buffer; // Where to store text?
```

```
item.cchTextMax = 255;
```

```
ListView_GetItem(listview1, &item);
```

Let's add icon

- ❑ First, prepare imagelist of our own

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Simple styles

- ☐ LVS_SORTASCENDING
- ☐ LVS_SORTDESCENDING
- ☐ LVS_SINGLESEL
- ☐ LVS_SHOWSELALWAYS

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Extended style

- ☐ LVS_EX_CHECKBOXES
- ☐ **LVS_EX_FULLROWSELECT**
- ☐ LVS_EX_GRIDLINES
- ☐ LVS_EX_SUBITEMIMAGES
- ☐ LVS_EX_TRACKSELECT
- ☐ LVS_EX_UNDERLINEHOT

Basic messages

- ❑ LVN_ITEMCHANGED / LVN_ITEMCHANGING
- ❑ LVN_BEGINLABELEDIT / LVN_ENDLABELEDIT
- ❑ LVN_COLUMNCLICK
- ❑ LVN_DELETEALLITEMS
- ❑ LVN_DELETEITEM
- ❑ LVN_INSERTITEM
- ❑ NM_RCLICK

Working with columns

- ☐ **LVM_INSERTCOLUMN**
- ☐ LVM_DELETECOLUMN
- ☐ LVM_GETCOLUMN
- ☐ LVM_GETCOLUMNWIDTH
- ☐ **LVM_SETCOLUMN**
- ☐ LVM_SETCOLUMNWIDTH
- ☐ **LVM_GETSELECTEDCOLUMN**
- ☐ **LVM_SETSELECTEDCOLUMN**

Working with item

- ❑ **LVM_GETITEM / LVM_SETITEM**
- ❑ LVM_GETITEMCOUNT
- ❑ LVM_GETITEMPOSITION
- ❑ LVM_GETITEMRECT
- ❑ LVM_GETITEMSTATE
- ❑ **LVM_GETITEMTEXT / LVM_SETITEMTEXT**
- ❑ LVM_GETNEXTITEM
- ❑ LVM_GETSUBITEMRECT
- ❑ LVM_GETSELECTEDCOUNT

Masking technique

□ 10 10 00 11

□ [10 00] → Let's say we want to alter these 4 bit
Only one bit can be activated at a time

□ 00 11 11 00 = **mask** → This is our mask

□ 11 00 00 11 = \sim **mask**

□ 10 11 10 11

□ 10 00 00 11 -> **AND** result (turn off all related bits)

Toggle the bit

```
VOID SetView(HWND hWndListView, DWORD dwView)
{
    // Retrieve the current window style.
    DWORD dwStyle = GetWindowLong(hWndListView, GWL_STYLE);

    // Set the window style only if the view bits changed.
    if ((dwStyle & LVS_TYPEMASK) != dwView)
    {
        SetWindowLong(hWndListView,
            GWL_STYLE,
            (dwStyle & ~LVS_TYPEMASK) | dwView);
    }
}
```

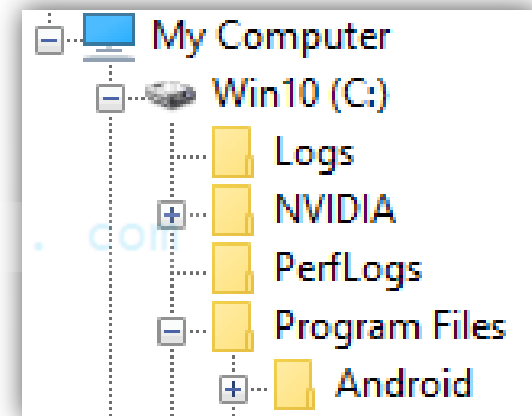
TreeView

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Styles

- ☐ TVS_CHECKBOXES
- ☐ TVS_DISABLEDRAHDROP
- ☐ TVS_EDITLABELS
- ☐ **TVS_HASBUTTONS**
- ☐ **TVS_HASLINES**
- ☐ TVS_LINESATROOT
- ☐ TVS_NOSCROLL
- ☐ TVS_NOHSCROLL
- ☐ **TVS_SINGLEEXPAND**
- ☐ TVS_TRACKSELECT



TreeViewItem

□ TVITEM

- Mask
TVIF_TEXT, TVIF_IMAGE, TVIF_SELECTEDIMAGE, TVIF_PARAM
- pszText [cuu duong than cong . com](http://cuuduongthanhong.com)
- iImage: normal image
- iSelectedImage: image when selected
- cChildren: contain child or not

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How to insert item into treeview?

□ TVINSERTSTRUCT

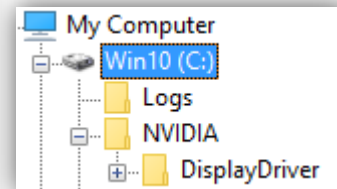
- hParent: handle của item cha
- hInsertAfter:
TVI_FIRST, TVI_LAST, TVI_ROOT, TVI_SORT
- Item: TVITEM to insert

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Sample code

```
TV_INSERTSTRUCT tvInsert;  
tvInsert.hParent = hParent;  
tvInsert.hInsertAfter = TVI_LAST;  
tvInsert.item.mask = TVIF_TEXT | TVIF_IMAGE | TVIF_SELECTEDIMAGE | TVIF_PARAM;  
tvInsert.item.iImage = IDI_FOLDER;  
tvInsert.item.iSelectedImage = IDI_FOLDER_SELECTED;
```

```
tvInsert.item.pszText = fd.cFileName;  
folderPath = new TCHAR[wcslen(path) + wcslen(fd.cFileName) + 2];  
  
StrCpy(folderPath, path);  
if (wcslen(path) != 3)  
    StrCat(folderPath, _T("\\"));  
StrCat(folderPath, fd.cFileName);  
  
tvInsert.item.lParam = (LPARAM) folderPath;  
HTREEITEM hItem = TreeView_InsertItem(m_hTreeView, &tvInsert);
```



Basic message

- ☐ TVN_SELCHANGED / TVN_SELCHANGING
- ☐ TVN_ITEMEXPANDED / **TVN_ITEMEXPANDING**
- ☐ NM_CLICK
- ☐ NM_DBLCLK
- ☐ NM_RCLICK
- ☐ TVN_BEGINLABELEDIT
- ☐ TVN_ENDLABELEDIT
- ☐ TVN_DELETEITEM

- ❑ `threads[i] = CreateThread(0, 0, ThreadFunc, 0, 0, 0);`
- ❑ `DWORD WINAPI ThreadFunc2(LPVOID lpParameter){`
- ❑ `const int TIMEOUT = 1000; // milisecond
LPCWSTR mutexName = L"MyMutex";
ThreadData* p = (ThreadData*)lpParameter;`

Basic operations

- ❑ TVM_INSERTITEM
- ❑ TVM_DELETEITEM
- ❑ TVM_GETITEM
- ❑ TVM_GETITEMRECT
- ❑ TVM_GETITEMSTATE
- ❑ TVM_SETITEM
- ❑ TVM_SELECTITEM
- ❑ TVM_GETNEXTITEM
- ❑ TVM_GETCOUNT

Tree view UI

- ☐ TVM_EXPAND
- ☐ TVM_GETLINECOLOR
- ☐ TVM_SETLINECOLOR
- ☐ TVM_GETTEXTCOLOR
- ☐ TVM_SETTEXTCOLOR
- ☐ TVM_GETBKCOLOR
- ☐ TVM_SETBKCOLOR
- ☐ TVM_GETIMAGELIST
- ☐ TVM_SETIMAGELIST