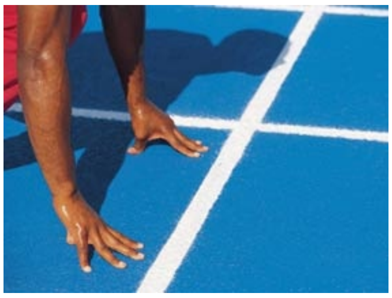
maXbox



maXbox Starter 37

Start API Coding V2

1.1 A Programming Interface

Today we step through the API Coding of Windows.

Although, you probably wondered how they get those nice and fancy graphical user interfaces (GUI) in windows programs that don't have just a black screen. Well, these GUI[1] programs are called Win32 API programs. Learn how to make API calls with a black screen and other GUI objects in Win 32 programming.

Lets start with our first function of a API call:

```
if FConnect then
   Result:= WNetConnectionDialog(GetForegroundWindow,
                              RESOURCETYPE_DISK) = NO_ERROR
```

The `WNetConnectionDialog` function starts a general browsing dialog box for connecting to network resources. The function requires a handle to the owner window for the visual dialog box.
Syntax in C++

```
DWORD WNetConnectionDialog(
              _In_ HWND  hwnd,
              _In_ DWORD dwType);
```

You do have 2 parameters: A handle to the owner window for the dialog box and `dwType` as a resource type to allow connections to.

Also the return value as DWORD has to be considered:
If the function succeeds, the return value is NO_ERROR. If the user cancels the dialog box, the function returns –1 as the boolean result above.

[1]Non Graphical are called CLI (Command Line Interface) or just Console

If the function fails, the return value is a defined system error code, such as one of the following values:

ERROR_EXTENDED_ERROR

A network-specific error occurred. To obtain a description of the error, call the `WNetGetLastError` function.

ERROR_INVALID_PASSWORD

The specified password is invalid.

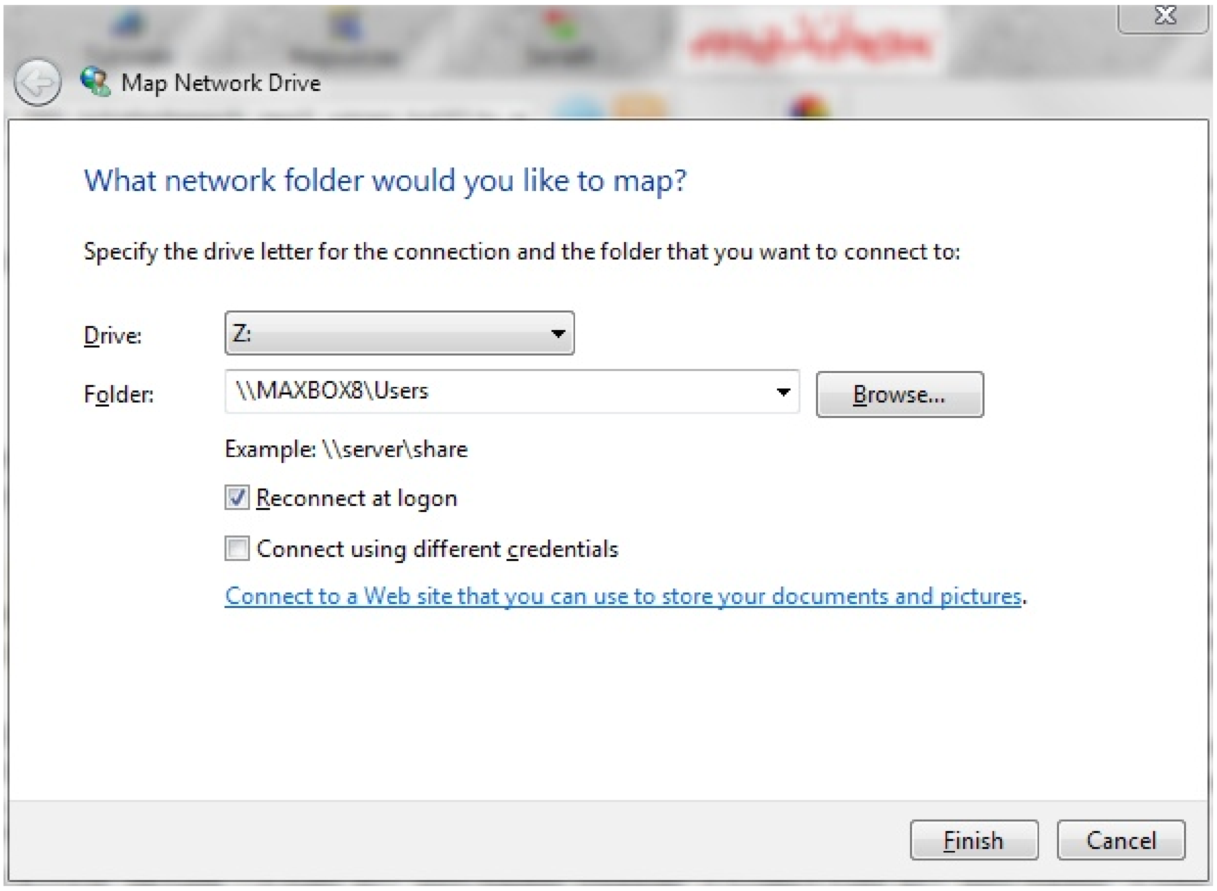
ERROR_NO_NETWORK

The network is unavailable.

ERROR_NOT_ENOUGH_MEMORY

There is insufficient memory to start the dialog box.

If the user clicks OK in the dialog box, the requested network connection will have been made when the `WNetConnectionDialog` function returns.


Map Network Drive

What network folder would you like to map?

Specify the drive letter for the connection and the folder that you want to connect to:

Drive: Z:

Folder: \\MAXBOX8\Users

Example: \\server\share

[✓] Reconnect at logon

[ ] Connect using different credentials

Connect to a Web site that you can use to store your documents and pictures.

What about a password to connect in the dialogue of the API call?

If the function attempts to make a connection and the network provider returns the message ERROR_INVALID_PASSWORD, the system prompts the user to enter a password. The system uses the new password in another attempt to make the net share connection.

But where does this function come from?
They use the windows 32-bit application programming interface, which basically means interacting with Win operating systems and libraries such as Win XP or 7 or 8 and the concerning DLL.
So the same call is valuable from a DLL:

```
function  MyNETConnect(hw: hwnd; dw: dword): Longint;
     external 'WNetConnectionDialog@Mpr.dll stdcall';
```

In this tutorial, you will learn how to use an external function with the Win32 API to make wonderful and wise applications. You see the library is called `Mpr.dll` as the external DLL.

And this is how we call the external function:

```
if MyNETConnect(GetForegroundWindow, RESOURCETYPE_DISK)
                                = NO_ERROR then  writeln('connect dialog success');
```

You do not always need to know the following datatypes in order to use Win32 API, the lesson here is, that most Win32 types are similar, if not the same as C++ or Object Pascal datatypes. You are free to use standard C++ or Pascal datatypes to express any Win32 types.
A lot of the types in Win32 API, are synonyms and are not really that important to know or to learn cause you can search for type mapping.

☝ It is important to declare your globals and definitions at the top of your program. You can also wrap an API function like this:

```
function TJvNetworkConnect_Execute: Boolean;
var fconnect: boolean;
begin
  //RESOURCETYPE_DISK
  //WNetDisconnectDialog
  fconnect:= true;
  if fconnect then
    Result:= WnetConnectionDialog(GetForegroundWindow,
                                              RESOURCETYPE_DISK) = NO_ERROR
  else
    Result:= WnetDisconnectDialog(GetForegroundWindow,
                                              RESOURCETYPE_DISK) = NO_ERROR;
end;
```

HWNDs (window handles) are usually used for GUI elements; they represent the actual window or window elements of a program. UINT is an unsigned integer and WPARAM and LPARAM are parameter messages that windows uses to add more data into a message.
In our example it is the first parameter: `GetForegroundWindow`.
But be carefully it is also a function itself to get or pass the HWND!

`GetForegroundWindow()` retrieves a handle to the foreground window (the window with which the user is currently working). The system assigns a slightly higher priority to the thread that creates the foreground window than it does to other threads.

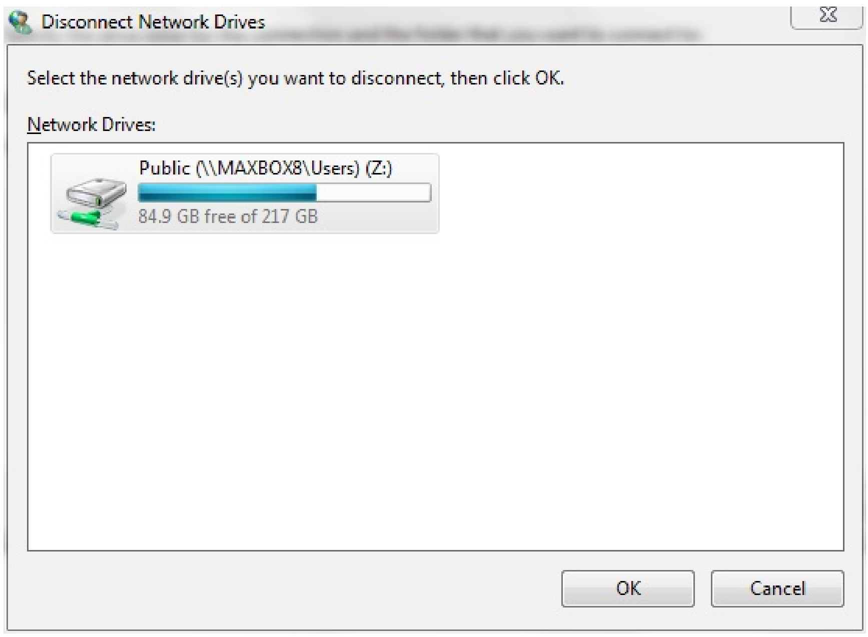
HWND WINAPI GetForegroundWindow(void);

The return value is a handle to the foreground window. The foreground window can be NULL in certain circumstances, such as when a window is losing activation. So we use in fact 2 API functions:

```
WnetConnectionDialog(GetForegroundWindow,
                           RESOURCETYPE_DISK) = NO_ERROR
WnetConnectionDialog(GetForegroundWindow,
                           RESOURCETYPE_DISK) = NO_ERROR
```

```
Lib: Mpr.dll      → WnetConnectionDialog
Lib: User32.dll   → GetForegroundWindow
```

Then in the end the system uses the new password in another attempt to make a connection.
The `WNetCancelConnection2` function or `WnetDisconnectDialog` cancels an existing network connection. You can also call the function to remove remembered network connections that are not currently connected.

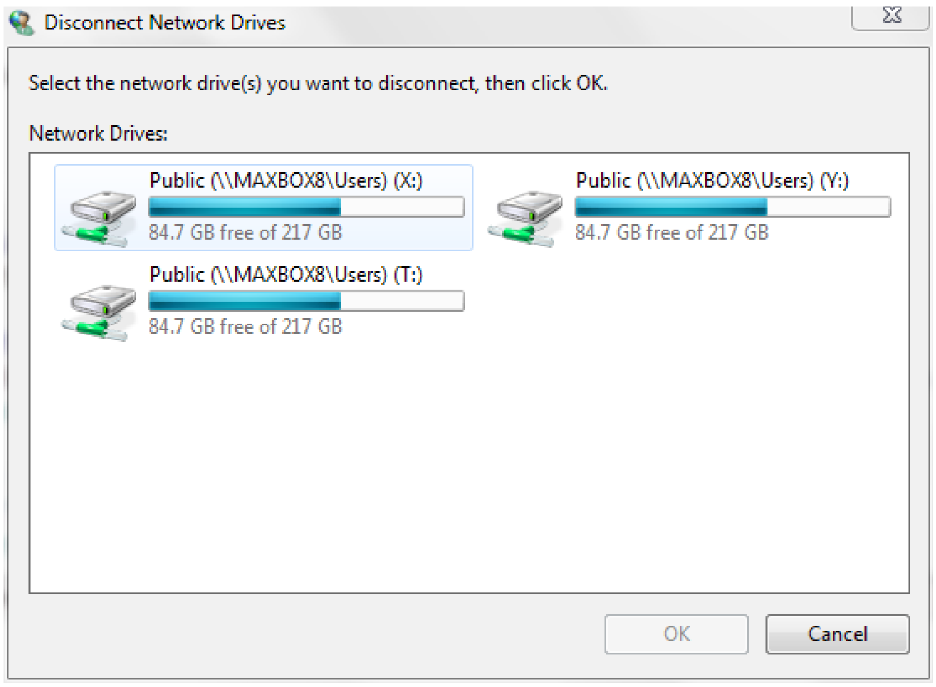

Disconnect Network Drives

Select the network drive(s) you want to disconnect, then click OK.

Network Drives:

Public (\\MAXBOX8\Users) (Z:)
84.9 GB free of 217 GB

The cancel function closes a handle and the object associated with that handle. After being closed, the handle is of course no longer valid. This closes handles associated with access tokens, communications devices, console inputs, console screen buffers, events, files, file mappings, jobs, mail-slots, mutexes, named pipes, processes, semaphores, sockets, and threads.
This is so important cause resources or handles evolves in hundreds of numbers:


Disconnect Network Drives

Select the network drive(s) you want to disconnect, then click OK.

Network Drives:

Public (\\MAXBOX8\Users) (X:)
84.7 GB free of 217 GB

Public (\\MAXBOX8\Users) (Y:)
84.7 GB free of 217 GB

Public (\\MAXBOX8\Users) (T:)
84.7 GB free of 217 GB

So a next call to an API function is the Object-oriented call:

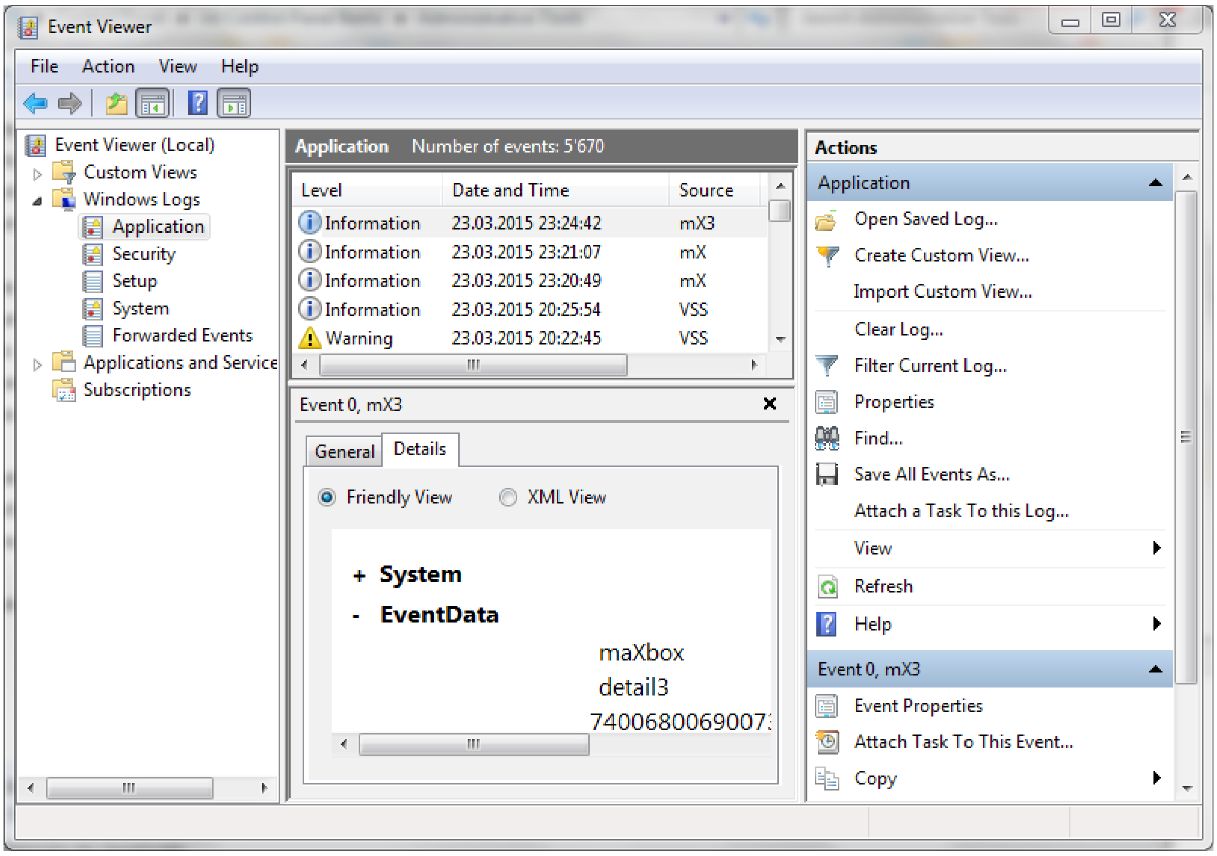
```
// OO API Call:
  with TJvConnectNetwork.Create(self) do begin
    Execute;
    Free;
  end;
```

The method `Execute` waits till the user responds and then the object is freed to save memory and consistency. Such interactions of users are mostly logged in an application log.
The application log (see picture) contains those API or other events logged by applications or programs. For example, a database program might record a file error in the application log or the new connected share. You as a developer decide which events to log.

To log a sound in a multimedia app for e.g. you have to set a song first:

```
playMP3(mp3path);
closeMP3;
DebugOutputString('closeMP3: '+ mp3path);
```

In a shortlink `%windir%\system32\eventvwr.msc /s` you start a log:



Application Number of events: 5'670

Level	Date and Time	Source
Information	23.03.2015 23:24:42	mX3
Information	23.03.2015 23:21:07	mX
Information	23.03.2015 23:20:49	mX
Information	23.03.2015 20:25:54	VSS
Warning	23.03.2015 20:22:45	VSS

Event 0, mX3

```
+ System
- EventData
        maXbox
        detail3
        7400680069007:
```

Analytic or test events are published in high volume. They describe program operation and indicate problems that can't be handled by user tasks or intervention.

Finally, if a high-resolution performance counter exists on the system, you can use the `QueryPerformanceFrequency` Win API function to express the frequency, in counts per second. The value of the count is processor dependent!
`QueryPerformanceFrequency` returns the number of "ticks" per seconds - it is the amount that the counter, `QueryPerformanceCounter`, will increment in a second.
In maXbox you can also map (connect) or disconnect a network drive without a dialog as console or shell call!:
`ConnectDrive('Z:', '\\Servername\C', True, True);`

```
 Const SHARENAME = '\\MAXBOX8\Users\Public';

  if ConnectDrive('Z:','\\MAXBOX8\Users\Public', True,True) = NO_ERROR then
       writeln('Net Share Z:\ Connected');  //see appendix with const

  DisconnectNetDrive('Z:', True, True, True);
```

Test the script with **F9** / F2 or press Compile. So far now we'll open the API-function example: `580_indystacksearch_geo2_winapi_tut37.txt`
This is the huge test driven script, a better and smaller demo script to start is the following:

```
617_API_coding_tut37.txt
```

`http://www.softwareschule.ch/examples/617_API_coding_tut37.txt`

Hope you did already work with the Starter 28 on DLL Code topics:

http://www.softwareschule.ch/download/maxbox_starter28.pdf

http://www.softwareschule.ch/download/maxbox_starter37.pdf

Conclusion Stepping through code is one of the most basic debugging operations, yet it still needs to be mentioned here. Several principles are commonly used to govern the process of designing APIs. They proposed the concept of information hiding in 1972. The principle of information hiding is that one may divide software into modules, each of which has a specified interface.
The interfaces hide the implementation details of the modules so that users of modules need not understand the complexities inside the modules.
These interfaces are APIs, and as a result, APIs should be designed in order to expose only those details of modules that are necessary for clients to know in order to use the modules effectively.
Win programs register themselves on the operating system OS and work with one loop for messages. In addition, the message loop goes through a process function that handles all the windows messages and delivers what the user or operating system demands.

“If the brain were so simple we could understand it, we would be so simple we couldn't.” Lyall Watson

Feedback @ max@kleiner.com
Literature: Kleiner et al., Patterns konkret, 2003, Software & Support

http://www.softwareschule.ch/download/codesign_2015.pdf

http://www.rosseeld.be/DRO/Delphi/Delphi%20WinAPI.htm

https://github.com/maxkleiner/maXbox3/releases

1.2 Appendix Main Code and Event Log Study with Assert

```
// DLL Declaration of LIB Mpr.dll to call it direct:
// TODO: Copy a file in a connected share path

  Function MyNETConnect(hw: hwnd; dw: dword): Longint;
      External 'WNetConnectionDialog@Mpr.dll stdcall';

  Const SHARENAME = '\\MAXBOX8\Users\Public';

 // OO Call:
  with TJvConnectNetwork.Create(self) do begin
   Execute;
   free;
  end;

  // API Call function:
   TJvNetworkConnect_Execute;

  // DLL Call: MyNETConnect(GetForegroundWindow, RESOURCETYPE_DISK)
   if MyNETConnect(GetForegroundWindow, RESOURCETYPE_DISK) =
        NO_ERROR then
       writeln('connect dialog of DLL call');

  // without Dialog:
   if ConnectDrive('Z:',SHARENAME, True,True) = NO_ERROR then
       writeln('Net Share '+SHARENAME+' on Z:\ Connected');

   if DisconnectNetDrive('Z:', True, True, True) = NO_ERROR then
       writeln('Net Share '+SHARENAME+' on Z:\ Disconnected!');


PROCEDURE Assert(Cond: boolean; const Msg: string);
var
 progSeg,
 progOfs: word;
begin
 asm
    mov ax, [bp+04]
    mov es, ax
    mov ax, word ptr es:0
    mov progSeg, ax
    mov ax, [bp+02]
    mov progOfs, ax
 end;
```

```
  if (Cond = FALSE) then begin
    mmDebug.Lines.Add(Msg + ' at location ' +
                          IntToHex(progSeg, 4) +':' +IntToHex(progOfs, 4) );
    ShowModal;
  end;
end;

// WriteToOSEventLog//
procedure WriteToOSEventLog(const logName, logCaption, logDetails : UnicodeString;
                         const logRawData : String = '');
var
  eventSource : THandle;
  detailsPtr : array [0..1] of PWideChar;
begin
   if logName<>'' then
      eventSource:=RegisterEventSourceW(nil, PWideChar(logName))
   else eventSource:=RegisterEventSourceW(nil,
PWideChar(ChangeFileExt(ExtractFileName(ParamStr(0)), '')));
   if eventSource>0 then begin
      try
         detailsPtr[0]:=PWideChar(logCaption);
         detailsPtr[1]:=PWideChar(logDetails);
         ReportEventW(eventSource, EVENTLOG_INFORMATION_TYPE, 0, 0, nil,
                     2, Length(logRawData),
                     @detailsPtr, Pointer(logRawData));
      finally
         DeregisterEventSource(eventSource);
      end;
   end;
end;
```

Check the script! Script Example: maxbox3\examples\318_excel_export3