

Evaluation Topics

Chromium based Edge usage in WPF



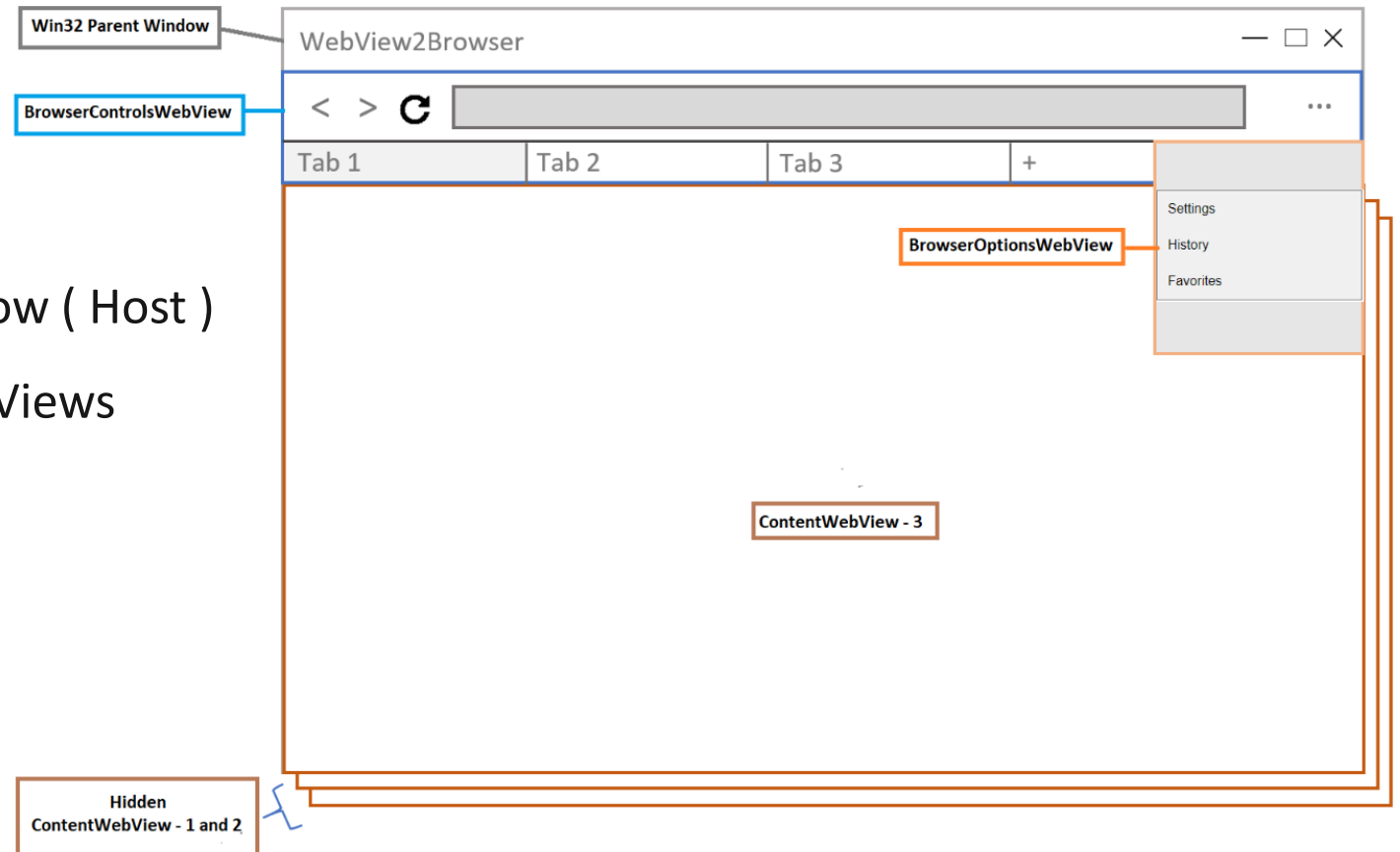
Chromium based Edge Control - Webview2

Current state from Microsoft

Developer preview is first available for Win32 C++ on Windows 10.

WebView2 Developer preview:

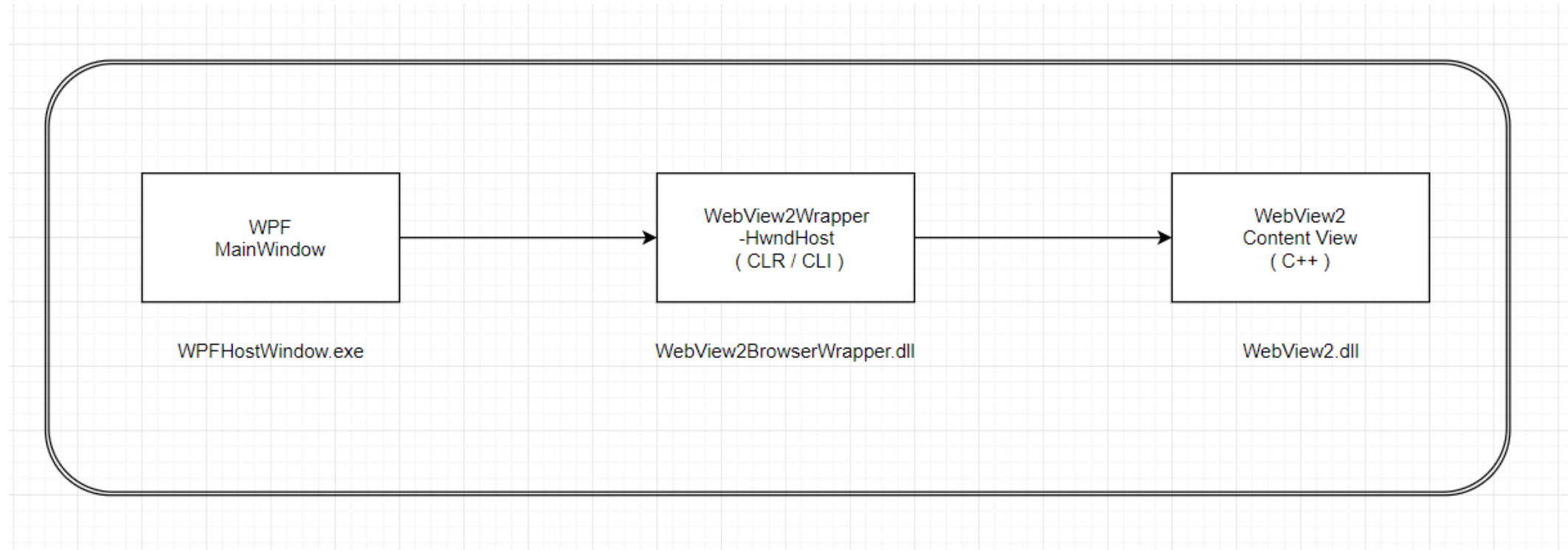
- A single window win32 app
- Multiple WebViews within Parent Window (Host)
- Communication between host and WebViews
- Navigate API in WebView2 to Load Page
(IWebView2WebView::Navigate)



Link:

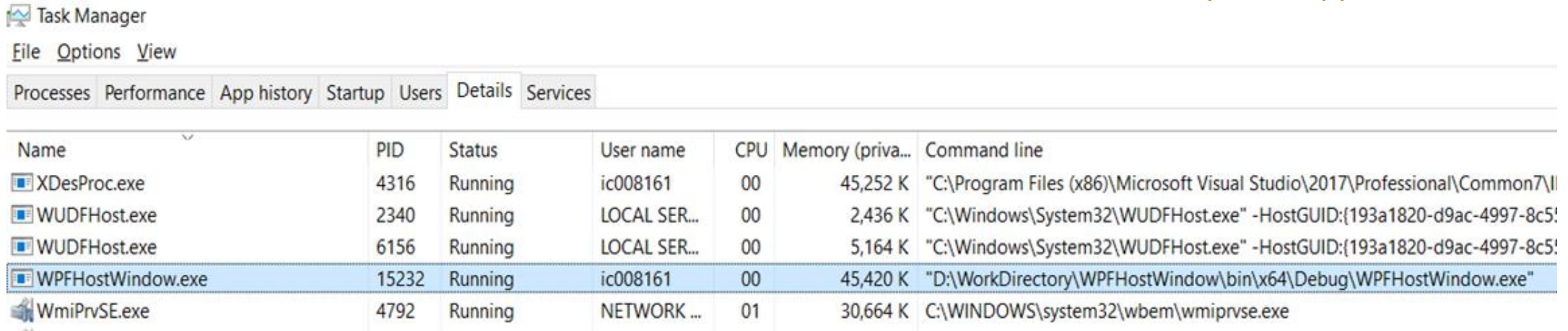
<https://blogs.windows.com/msedgedev/2019/08/15/webview2browse-sample-for-webview2/#PYmmq2UhbdOyjRPV.97>

Hosting Of Webview2 in WPF Window



Process View – Before & After WebView2 Hosting in WPF

Before Webview2 instantiation, only WPF Application exists



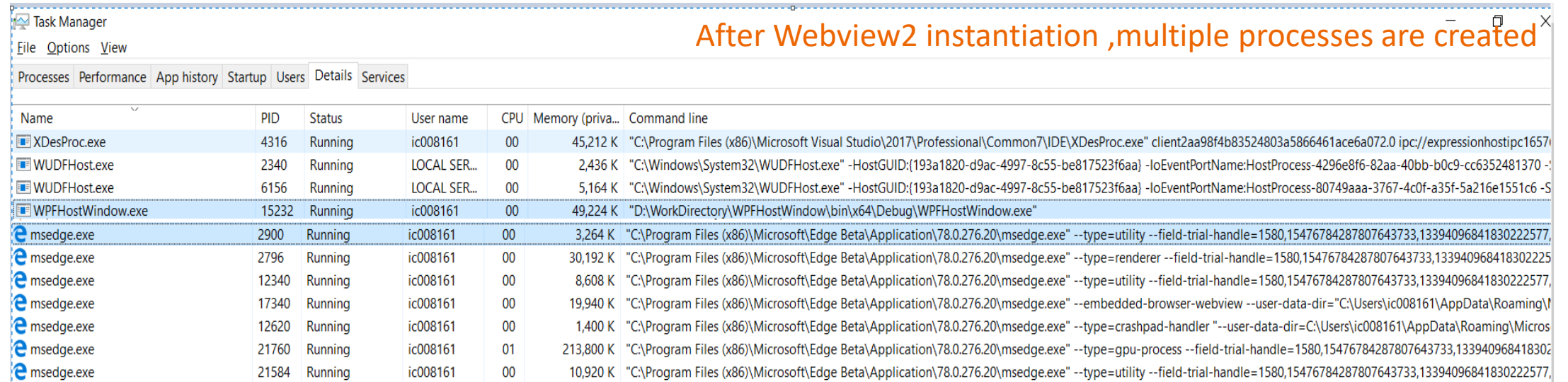
Task Manager

File Options View

Processes Performance App history Startup Users Details Services

Name	PID	Status	User name	CPU	Memory (private)	Command line
XDesProc.exe	4316	Running	ic008161	00	45,252 K	"C:\Program Files (x86)\Microsoft Visual Studio\2017\Professional\Common7\IDE\XDesProc.exe" client2aa98f4b83524803a5866461ace6a072.0 ipc://expressionhostipc1657
WUDFHost.exe	2340	Running	LOCAL SER...	00	2,436 K	"C:\Windows\System32\WUDFHost.exe" -HostGUID:{193a1820-d9ac-4997-8c55-be817523f6aa} -IoEventPortName:HostProcess-4296e8f6-82aa-40bb-b0c9-cc6352481370 -S
WUDFHost.exe	6156	Running	LOCAL SER...	00	5,164 K	"C:\Windows\System32\WUDFHost.exe" -HostGUID:{193a1820-d9ac-4997-8c55-be817523f6aa} -IoEventPortName:HostProcess-80749aaa-3767-4c0f-a35f-5a216e1551c6 -S
WPFFHostWindow.exe	15232	Running	ic008161	00	45,420 K	"D:\WorkDirectory\WPFFHostWindow\bin\x64\Debug\WPFFHostWindow.exe"
WmiPrvSE.exe	4792	Running	NETWORK ...	01	30,664 K	C:\WINDOWS\system32\wbem\wmiprvse.exe

After Webview2 instantiation ,multiple processes are created



Task Manager

File Options View

Processes Performance App history Startup Users Details Services

Name	PID	Status	User name	CPU	Memory (private)	Command line
XDesProc.exe	4316	Running	ic008161	00	45,212 K	"C:\Program Files (x86)\Microsoft Visual Studio\2017\Professional\Common7\IDE\XDesProc.exe" client2aa98f4b83524803a5866461ace6a072.0 ipc://expressionhostipc1657
WUDFHost.exe	2340	Running	LOCAL SER...	00	2,436 K	"C:\Windows\System32\WUDFHost.exe" -HostGUID:{193a1820-d9ac-4997-8c55-be817523f6aa} -IoEventPortName:HostProcess-4296e8f6-82aa-40bb-b0c9-cc6352481370 -S
WUDFHost.exe	6156	Running	LOCAL SER...	00	5,164 K	"C:\Windows\System32\WUDFHost.exe" -HostGUID:{193a1820-d9ac-4997-8c55-be817523f6aa} -IoEventPortName:HostProcess-80749aaa-3767-4c0f-a35f-5a216e1551c6 -S
WPFFHostWindow.exe	15232	Running	ic008161	00	49,224 K	"D:\WorkDirectory\WPFFHostWindow\bin\x64\Debug\WPFFHostWindow.exe"
msedge.exe	2900	Running	ic008161	00	3,264 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=utility --field-trial-handle=1580,15476784287807643733,1339409684183022577,
msedge.exe	2796	Running	ic008161	00	30,192 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=renderer --field-trial-handle=1580,15476784287807643733,1339409684183022577,
msedge.exe	12340	Running	ic008161	00	8,608 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=utility --field-trial-handle=1580,15476784287807643733,1339409684183022577,
msedge.exe	17340	Running	ic008161	00	19,940 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --embedded-browser-webview --user-data-dir="C:\Users\ic008161\AppData\Roaming\I
msedge.exe	12620	Running	ic008161	00	1,400 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=crashpad-handler --user-data-dir="C:\Users\ic008161\AppData\Roaming\Micros
msedge.exe	21760	Running	ic008161	01	213,800 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=gpu-process --field-trial-handle=1580,15476784287807643733,133940968418302
msedge.exe	21584	Running	ic008161	00	10,920 K	"C:\Program Files (x86)\Microsoft\Edge Beta\Application\78.0.276.20\msedge.exe" --type=utility --field-trial-handle=1580,15476784287807643733,1339409684183022577,

Planned Activities

- WebView2 hosted WPF Vs Electron desktop app Performance Evaluation
(with Table Data in various scenarios)
- WebView2 Resize handling
- Key Input handling (Ex: Tab)
- Demo - WebOrganizer integrated to WPF
- Demo - SHUI Image Segment integrated to WPF
- Communication from WPF to WebView2 (Using ExecuteScript API)
- WebView2 Events
- Enabling / Disabling DevTools by Context Menu or Shortcuts
- WebView2 Zoomfactor
- Kiosk mode behavior

Performance Evaluation

Performance Values are measured for

- WPF Data Grid (100 Rows)
- WPF – WebView2
 - Static HTML Table (100 Rows)
 - Angular 9 HTML Table (100 Rows)
 - Angular 9 Material Table (100 Rows)
- Electron
 - Static HTML Table (100 Rows)
 - Angular 9 HTML Table (100 Rows)
 - Angular 9 Material Table (100 Rows)

Performance Evaluation Scenarios are,

- Application Startup + Content Rendering
- WebView2 Navigate API (Upon User Interaction)

Performance Evaluation Setup

1. WebView2 C++ Layer, C# Wrapper and all Applications are built on Debug x64
2. Angular 9 Served with Production Build (AOT Enabled => Ahead-Of-Time)
3. Angular 9 Ivy compilation Enabled and Disabled scenarios are considered.

Demo - Snapshots

WPF Window

WPF Data Grid

Id	Company	Contact	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Centro comercial Moctezuma	Francisco Chang	Mexico
3	Ernst Handel	Roland Mendel	Austria
4	Island Trading	Helen Bennett	UK
5	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
6	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
7	Alfreds Futterkiste	Maria Anders	Germany
8	Centro comercial Moctezuma	Francisco Chang	Mexico
9	Ernst Handel	Roland Mendel	Austria
10	Island Trading	Helen Bennett	UK
11	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
12	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
13	Alfreds Futterkiste	Maria Anders	Germany
14	Centro comercial Moctezuma	Francisco Chang	Mexico
15	Ernst Handel	Roland Mendel	Austria
16	Island Trading	Helen Bennett	UK
17	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
18	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
19	Alfreds Futterkiste	Maria Anders	Germany
20	Centro comercial Moctezuma	Francisco Chang	Mexico
21	Ernst Handel	Roland Mendel	Austria
22	Island Trading	Helen Bennett	UK
23	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
24	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy

WPF Host Window - HTML Table

Id	Company	Contact	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Centro comercial Moctezuma	Francisco Chang	Mexico
3	Ernst Handel	Roland Mendel	Austria
4	Island Trading	Helen Bennett	UK
5	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
6	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
7	Alfreds Futterkiste	Maria Anders	Germany
8	Centro comercial Moctezuma	Francisco Chang	Mexico
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14	Centro comercial Moctezuma	Francisco Chang	Mexico
15	Ernst Handel	Roland Mendel	Austria
16	Island Trading	Helen Bennett	UK
17	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
18	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
19	Alfreds Futterkiste	Maria Anders	Germany
20	Centro comercial Moctezuma	Francisco Chang	Mexico
21	Ernst Handel	Roland Mendel	Austria

WPF Host Window - Angular 9 Material Table

Angular - 9 - Material Table

Id	Company	Contact	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Centro comercial Moctezuma	Francisco Chang	Mexico
3	Ernst Handel	Roland Mendel	Austria
4	Island Trading	Helen Bennett	UK
5	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
6			Italy
7			Germany
8			Mexico
9	Ernst Handel	Roland Mendel	Austria
10	Island Trading	Helen Bennett	UK
11	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
12	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
13	Alfreds Futterkiste	Maria Anders	Germany
14	Centro comercial Moctezuma	Francisco Chang	Mexico

MaterialDataTable

File Edit View Window Help

Angular - 9 - Material Table

Id	Company	Contact	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Centro comercial Moctezuma	Francisco Chang	Mexico
3	Ernst Handel	Roland Mendel	Austria
4	Island Trading	Helen Bennett	UK
5	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
6			
7			
8	Centro comercial Moctezuma	Francisco Chang	Mexico
9	Ernst Handel	Roland Mendel	Austria
10	Island Trading	Helen Bennett	UK
11	Laughing Bacchus Winecellars	Yoshi Tannamuri	Canada
12	Magazzini Alimentari Riuniti	Giovanni Rovelli	Italy
13	Alfreds Futterkiste	Maria Anders	Germany

Performance Evaluation Results

Scenario – I Application Startup + Content Rendering	WPF DataGrid (With 100 Rows)	WebView2 With Static HTML Table (With 100 Rows) Application Loading	WebView2 With Angular HTML Table (With 100 Rows) Application Loading		WebView2 With Angular Material Table (With 100 Rows) Application Loading	
			Ivy Disabled	Ivy Enabled	Ivy Disabled	Ivy Enabled
Cold Startup	150 ms	360 ms	1028 ms	850 ms	1615 ms	1503 ms
Warm Startup	147 ms	345 ms	850 ms	850 ms	1523 ms	1502 ms
		Electron With Static HTML Table (With 100 Rows)	Electron With Angular HTML Table (With 100 Rows)		Electron With Angular Material Table (With 100 Rows)	
			Ivy Disabled	Ivy Enabled	Ivy Disabled	Ivy Enabled
Cold Startup		291 ms	1369 ms	963 ms	1670 ms	1544 ms
Scenario – II WebView2 Navigate API (Upon User Interaction)		WebView2 With Static HTML Table (With 100 Rows) WebView2 - Navigate API	WebView2 With Angular HTML Table (With 100 Rows) WebView2 - Navigate API		WebView2 With Angular Material Table (With 100 Rows) WebView2 - Navigate API	
			Ivy Disabled	Ivy Enabled	Ivy Disabled	Ivy Enabled
Cold Startup		96 ms	337 ms	290 ms	368 ms	268 ms
Warm Startup		92 ms	300 ms	272 ms	300 ms	232 ms

**Based on the values WebView2 Initialization consume considerable amount of time during application startup.

WebView2 Resize Handling

To make Resize proper as expected, WM_SIZE message has to be handled in C# Wrapper.

In the Wrapper (inheriting from HwndHost) we have to override WndProc method and resize WebView2 by API provided by Microsoft.

```
System::IntPtr WndProc(System::IntPtr hwnd, int msg, System::IntPtr wParam, System::IntPtr lParam, bool% handled) override
{
    handled = false;
    switch (msg)
    {
        case WM_SIZE:
        {
            if (myBrowserWindow != nullptr)
            {
                RECT bounds;
                GetClientRect((HWND)hwnd.ToPointer(), &bounds);
                int newWidth = LOWORD((DWORD)lParam.ToPointer());
                int newHeight = HIWORD((DWORD)lParam.ToPointer());
                MoveWindow((HWND)myWin32Window.ToPointer(), bounds.left + 5, bounds.top + 5, newWidth, newHeight, TRUE);
                myBrowserWindow->ResizeTabWebViews();
            }
        }
        break;
    }
    return System::IntPtr::Zero;
}
```

Key Input Handling

To make Tab proper as expected, TabInto method has to be handled in C# Wrapper.

In the Wrapper (inheriting from HwndHost), we have to override **TabInto** method and set focus WebView2 by API provided by Microsoft.

```
virtual bool TabInto(TraversalRequest^ request) override
{
    if (request->FocusNavigationDirection == FocusNavigationDirection::First)
    {
        myBrowserWindow->SetFocus();
    }

    return true;
}
```

Communication-WPF->WebView2(Using ExecuteScript API)

Code Snippet to Inject JavaScript to WebView2 as per previous Demo.

```
1 reference
private void OnPostScriptClick(object sender, RoutedEventArgs e)
{
    var script1 = "var canvas = document.getElementById(\"ImageCanvas1\");" +
        "var ctx = canvas.getContext(\"2d\");" +
        "var img = document.getElementById(\"source1\");" +
        "ctx.drawImage(img, 0, 0);";

    var script2 = "var canvas = document.getElementById(\"ImageCanvas2\");" +
        "var ctx = canvas.getContext(\"2d\");" +
        "var img = document.getElementById(\"source2\");" +
        "ctx.drawImage(img, 0, 0);";

    myWebView2BrowserWrapper1.PostScript(script1);
    myWebView2BrowserWrapper1.PostScript(script2);
}
```

PS:

If multiple instance of WebView2 is hosted in a WPF window, we can use ExecuteScript as a communication mechanism across WebView2 instances via WPF.

Enabling / Disabling DevTools by Context Menu or Keyboard Shortcuts

WebView2 provides API to control the Visibility of DevTools(either by Context menu or Keyboard Shortcuts) by interface IWebView2Settings.

You can disable as shown in below code snippet in our end C++ layer (Dll).

```
wil::com_ptr<IWebView2Settings> settings;  
m_TabStates.at(m_ContentWebViewId)->m_contentWebView.Get()->get_Settings(&settings);  
settings->put_AreDevToolsEnabled(FALSE);
```

PS:

Unfortunately disabling of DevTools is not working in the version of WebView2 which we are currently working. We have to test it in latest WebView2 SDK's.