# SECURE CODING

# CSE-2010

# LAB ASSIGNMENT -11

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**Reg.No :** 18BCN7133

**Slot :** L25+26

**Lab experiment – Creating secure and safe executable**

**Download and install visual studio (recent edition)**

**Write a C++ code of your own to build an executable and run the same.**

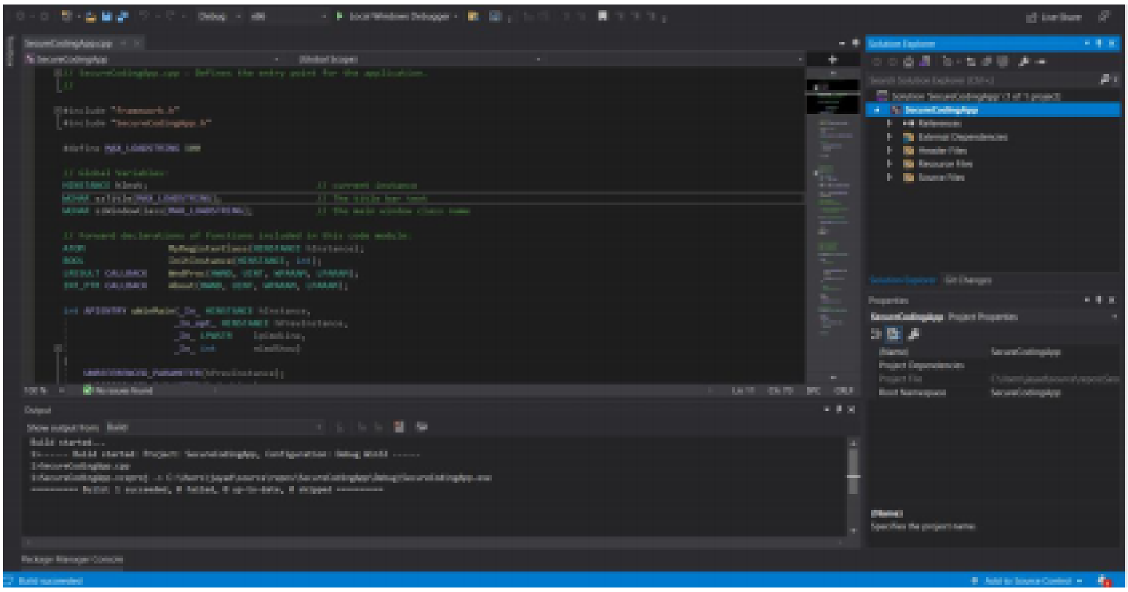
**Download process explorer and verify the DEP & ASLR status**

**Enable software DEP, ASLR and SEH in the visual studio and rebuild the same executable**

**Again, verify the DEP & ASLR status in the process explorer**

**Report the same with separate screenshot - before and after enabling DEP & ASLR.**

Generating .exe



```
// SecureCodingApp.cpp : Defines the entry point for the application.
//

#include "framework.h"
#include "SecureCodingApp.h"

#define MAX_LOADSTRING 100

// Global Variables:
HINSTANCE hInst;                                // current instance
WCHAR szTitle[MAX_LOADSTRING];                  // The title bar text
WCHAR szWindowClass[MAX_LOADSTRING];            // the main window class name

// Forward declarations of functions included in this code module:
ATOM                MyRegisterClass(HINSTANCE hInstance);
BOOL                InitInstance(HINSTANCE, int);
LRESULT CALLBACK    WndProc(HWND, UINT, WPARAM, LPARAM);
INT_PTR CALLBACK    About(HWND, UINT, WPARAM, LPARAM);

int APIENTRY wWinMain(_In_ HINSTANCE hInstance,
                     _In_opt_ HINSTANCE hPrevInstance,
                     _In_ LPWSTR    lpCmdLine,
                     _In_ int       nCmdShow)
{
    UNREFERENCED_PARAMETER(hPrevInstance);
```

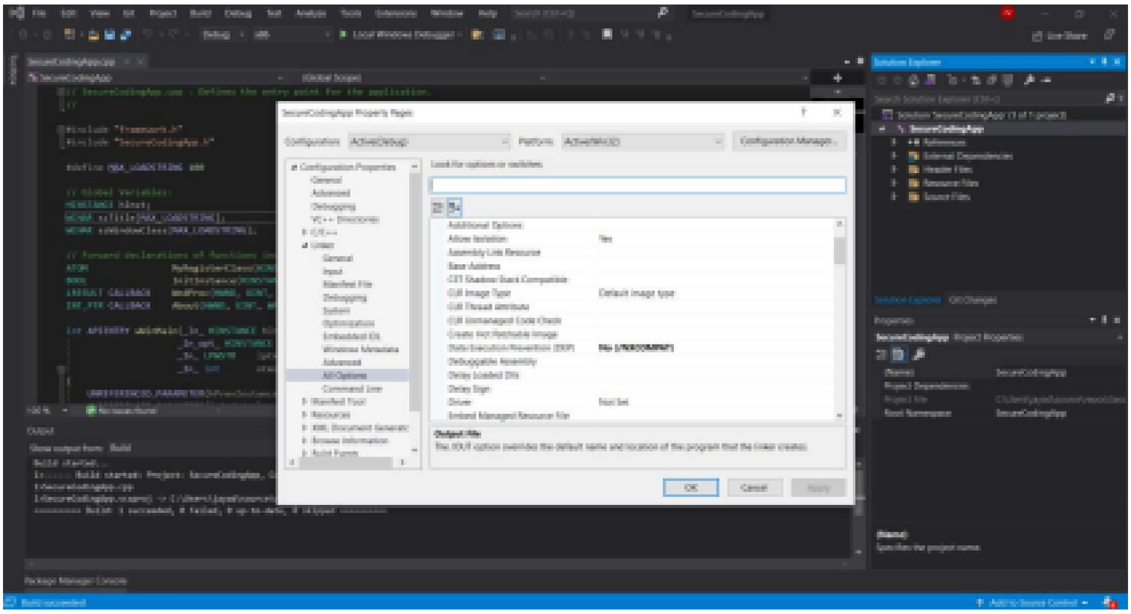
```
Build started...
1>------ Build started: Project: SecureCodingApp, Configuration: Debug Win32 ------
1>SecureCodingApp.cpp
1>SecureCodingApp.vcxproj -> C:\Users\[illegible]\source\repos\SecureCodingApp\Debug\SecureCodingApp.exe
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

Build succeeded

| | |
|---|---|
| (Name) | SecureCodingApp |
| Project Dependencies | |
| Project File | C:\Users\[illegible]\source\repos\SecureC |
| Root Namespace | SecureCodingApp |

(Name)
Specifies the project name.

## Disabling DER and ASLR



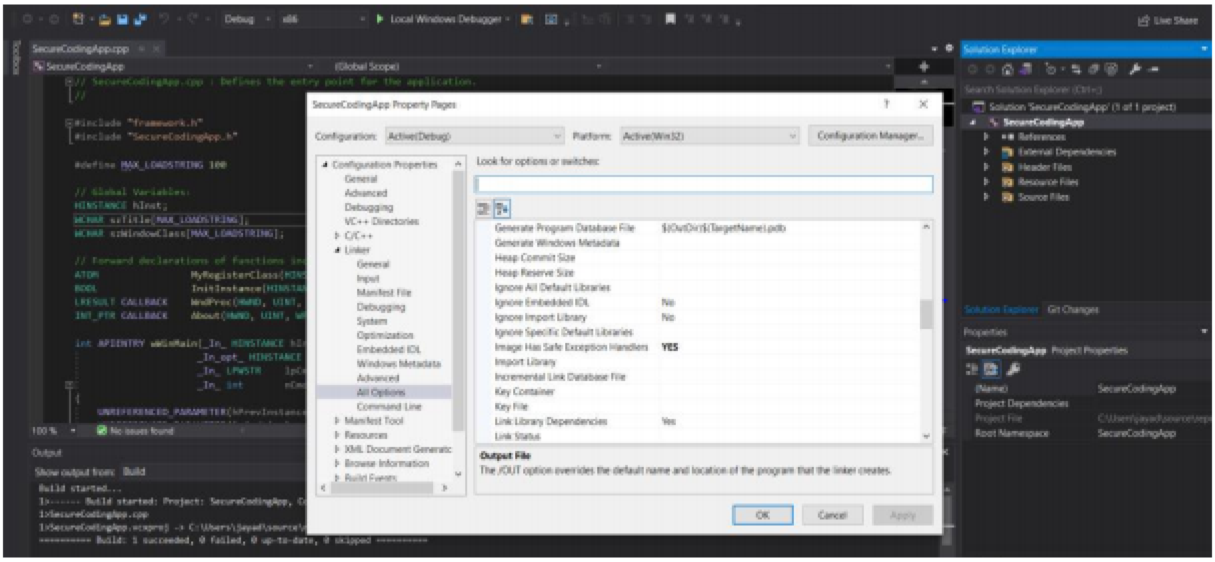
SecureCodingApp Property Pages

Configuration: Active(Debug) Platform: Active(Win32)

Configuration Properties > Linker > All Options

| | |
|---|---|
| Additional Options | |
| Allow Isolation | Yes |
| Assembly Link Resource | |
| Base Address | |
| CET Shadow Stack Compatible | |
| CLR Image Type | Default image type |
| CLR Thread Attribute | |
| CLR Unmanaged Code Check | |
| Create Hot Patchable Image | |
| Data Execution Prevention (DEP) | No (/NXCOMPAT:NO) |
| Debuggable Assembly | |
| Delay Loaded Dlls | |
| Delay Sign | |
| Driver | Not Set |
| Embed Managed Resource File | |

Output File
The /OUT option overrides the default name and location of the program that the linker creates.



SecureCodingApp Property Pages

Configuration: Active(Debug)  Platform: Active(Win32)

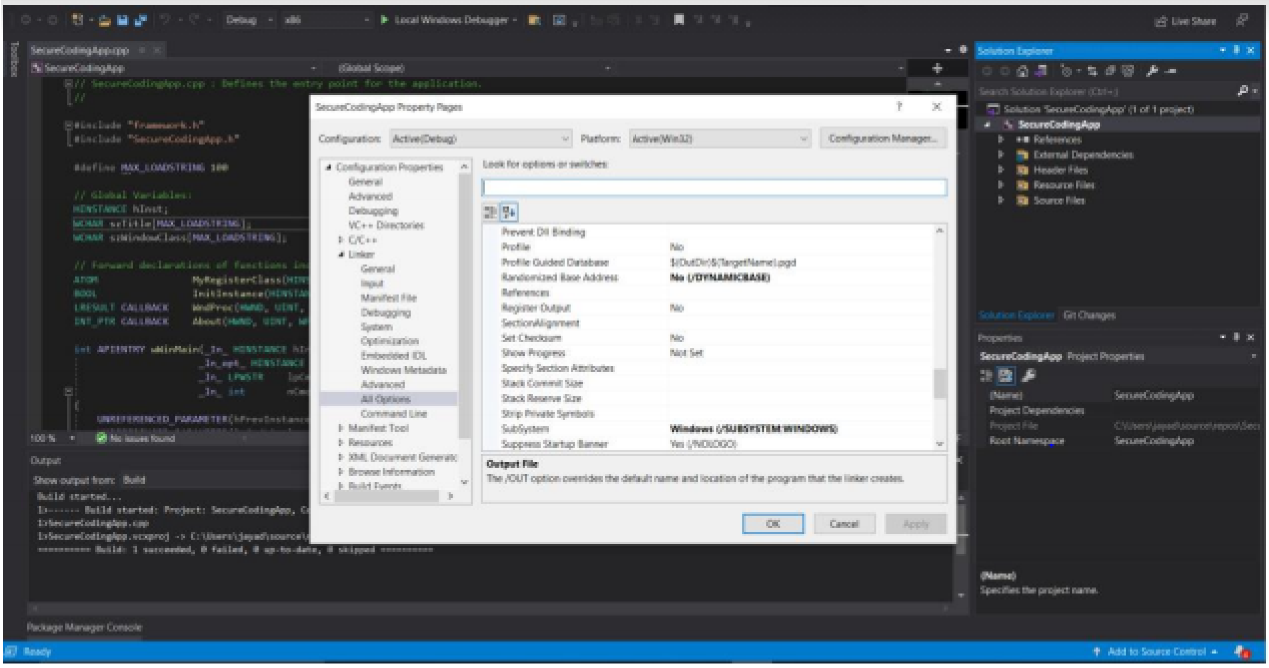
Configuration Properties > Linker > All Options

| | |
|---|---|
| Generate Program Database File | $(OutDir)$(TargetName).pdb |
| Generate Windows Metadata | |
| Heap Commit Size | |
| Heap Reserve Size | |
| Ignore All Default Libraries | |
| Ignore Embedded IDL | No |
| Ignore Import Library | No |
| Ignore Specific Default Libraries | |
| Image Has Safe Exception Handlers | **YES** |
| Import Library | |
| Incremental Link Database File | |
| Key Container | |
| Key File | |
| Link Library Dependencies | Yes |
| Link Status | |

**Output File**
The /OUT option overrides the default name and location of the program that the linker creates.

```
// SecureCodingApp.cpp : Defines the entry point for the application.
//

#include "framework.h"
#include "SecureCodingApp.h"

#define MAX_LOADSTRING 100

// Global Variables:
HINSTANCE hInst;
WCHAR szTitle[MAX_LOADSTRING];
WCHAR szWindowClass[MAX_LOADSTRING];
```

```
Build started...
1>------ Build started: Project: SecureCodingApp, C
1>SecureCodingApp.cpp
1>SecureCodingApp.vcxproj -> C:\Users\jayad\source\
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```



SecureCodingApp Property Pages

Configuration: Active(Debug)  Platform: Active(Win32)

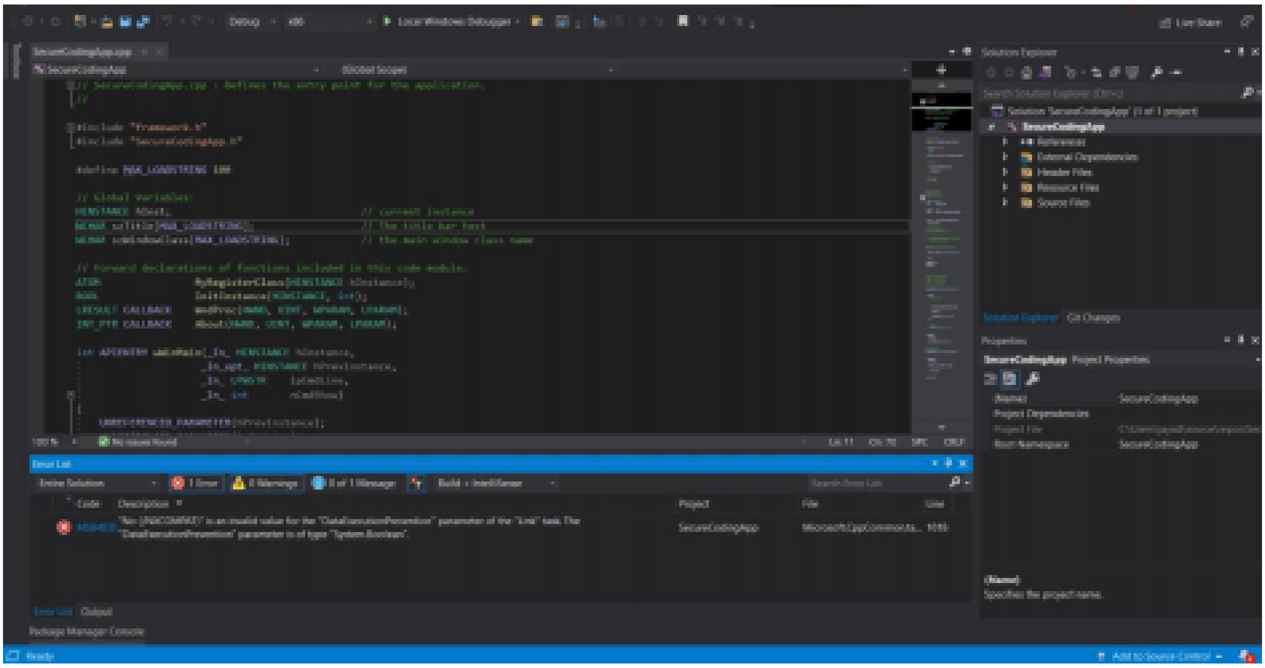
Configuration Properties > Linker > All Options

| | |
|---|---|
| Prevent Dll Binding | |
| Profile | No |
| Profile Guided Database | $(OutDir)$(TargetName).pgd |
| Randomized Base Address | **No (/DYNAMICBASE)** |
| References | |
| Register Output | No |
| SectionAlignment | |
| Set Checksum | No |
| Show Progress | Not Set |
| Specify Section Attributes | |
| Stack Commit Size | |
| Stack Reserve Size | |
| Strip Private Symbols | |
| SubSystem | **Windows (/SUBSYSTEM:WINDOWS)** |
| Suppress Startup Banner | Yes (/NOLOGO) |

**Output File**
The /OUT option overrides the default name and location of the program that the linker creates.

```
Build started...
1>------ Build started: Project: SecureCodingApp, C
1>SecureCodingApp.cpp
1>SecureCodingApp.vcxproj -> C:\Users\jayad\source\
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

.exe file not created

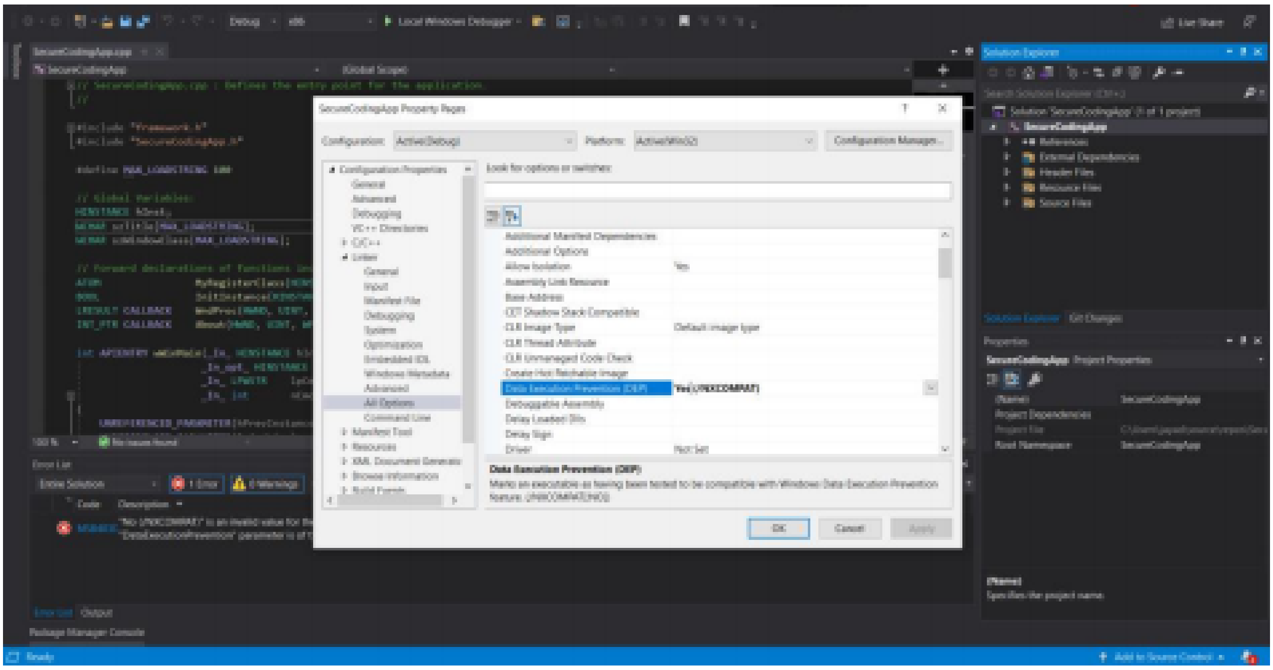


```
// SecureCodingApp.cpp : Defines the entry point for the application.
//

#include "framework.h"
#include "SecureCodingApp.h"

#define MAX_LOADSTRING 100

// Global Variables:
HINSTANCE hInst;                                // current instance
WCHAR szTitle[MAX_LOADSTRING];                  // The title bar text
WCHAR szWindowClass[MAX_LOADSTRING];            // the main window class name

// Forward declarations of functions included in this code module:
ATOM                MyRegisterClass(HINSTANCE hInstance);
BOOL                InitInstance(HINSTANCE, int);
LRESULT CALLBACK    WndProc(HWND, UINT, WPARAM, LPARAM);
INT_PTR CALLBACK    About(HWND, UINT, WPARAM, LPARAM);

int APIENTRY wWinMain(_In_ HINSTANCE hInstance,
                     _In_opt_ HINSTANCE hPrevInstance,
                     _In_ LPWSTR    lpCmdLine,
                     _In_ int       nCmdShow)
{
    UNREFERENCED_PARAMETER(hPrevInstance);
```

Error List: Entire Solution | 1 Error | 0 Warnings | 0 of 1 Message | Build + IntelliSense

| | Code | Description | Project | File | Line |
|---|---|---|---|---|---|
| ⊗ | MSB4030 | "No (/NXCOMPAT)" is an invalid value for the "DataExecutionPrevention" parameter of the "Link" task. The "DataExecutionPrevention" parameter is of type "System.Boolean". | SecureCodingApp | Microsoft.CppCommon.ta... | 1090 |

After enabling and running the app



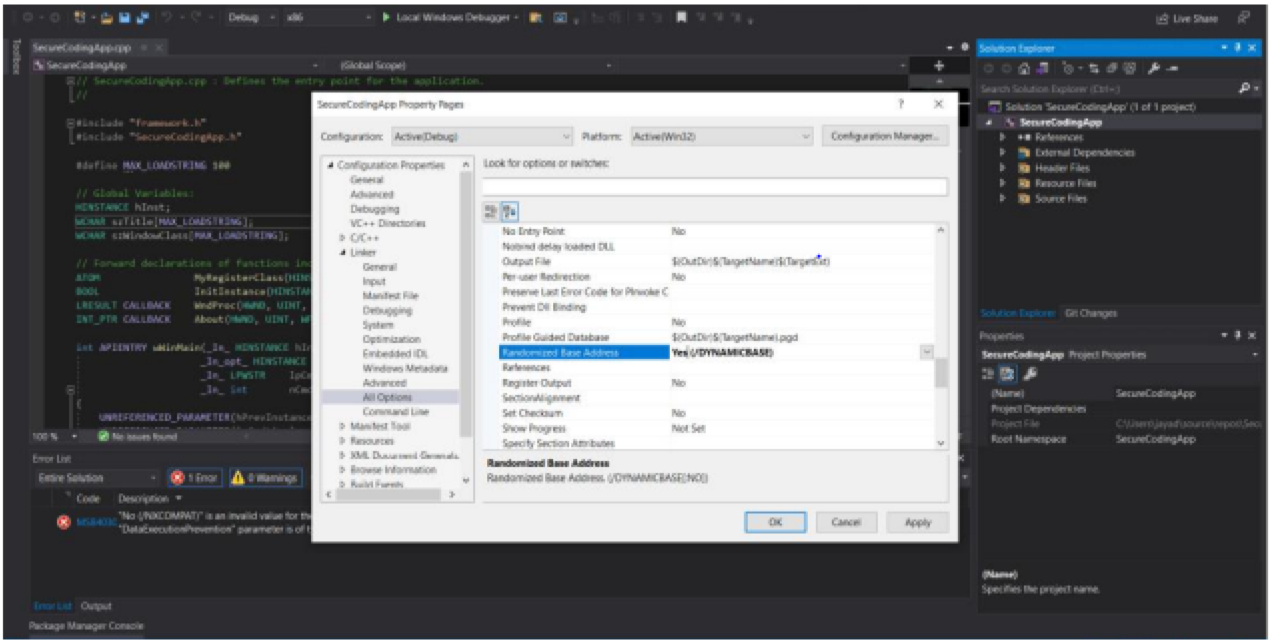
SecureCodingApp Property Pages

Configuration: Active(Debug) Platform: Active(Win32)

| | |
|---|---|
| Additional Manifest Dependencies | |
| Additional Options | |
| Allow Isolation | Yes |
| Assembly Link Resource | |
| Base Address | |
| CET Shadow Stack Compatible | |
| CLR Image Type | Default image type |
| CLR Thread Attribute | |
| CLR Unmanaged Code Check | |
| Create Hot Patchable Image | |
| Data Execution Prevention (DEP) | Yes (/NXCOMPAT) |
| Debuggable Assembly | |
| Delay Loaded Dlls | |
| Delay Sign | |
| Driver | Not Set |

**Data Execution Prevention (DEP)**

Marks an executable as having been tested to be compatible with Windows Data Execution Prevention feature. (/NXCOMPAT[:NO])



```
// SecureCodingApp.cpp : Defines the entry point for the application.
//

#include "framework.h"
#include "SecureCodingApp.h"

#define MAX_LOADSTRING 100

// Global Variables:
HINSTANCE hInst;
WCHAR szTitle[MAX_LOADSTRING];
WCHAR szWindowClass[MAX_LOADSTRING];

// Forward declarations of functions inc
ATOM                MyRegisterClass(HIN
BOOL                InitInstance(HINSTAN
LRESULT CALLBACK    WndProc(HWND, UINT,
INT_PTR CALLBACK    About(HWND, UINT, WP

int APIENTRY wWinMain(_In_ HINSTANCE hIn
                     _In_opt_ HINSTANCE
                     _In_ LPWSTR    lpCm
                     _In_ int       nCmd
{
    UNREFERENCED_PARAMETER(hPrevInstance
```

SecureCodingApp Property Pages

Configuration: Active(Debug) Platform: Active(Win32)

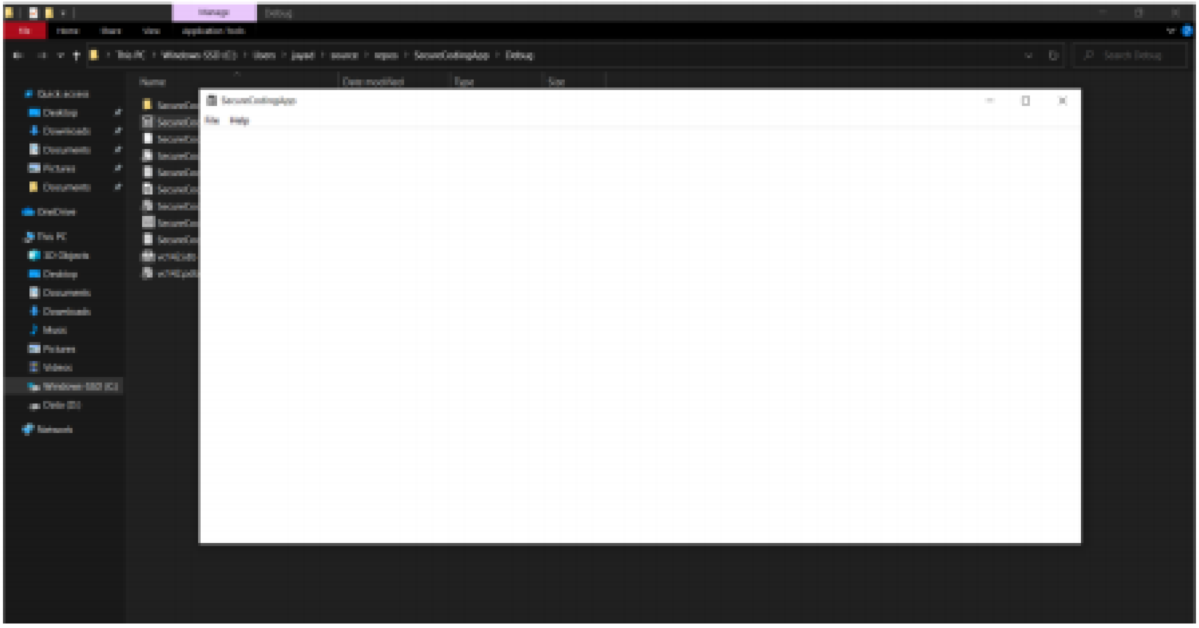
Configuration Properties > Linker > All Options

| | |
|---|---|
| No Entry Point | No |
| Nobind delay loaded DLL | |
| Output File | $(OutDir)$(TargetName)$(TargetExt) |
| Per-user Redirection | No |
| Preserve Last Error Code for PInvoke C | |
| Prevent Dll Binding | |
| Profile | No |
| Profile Guided Database | $(OutDir)$(TargetName).pgd |
| Randomized Base Address | Yes (/DYNAMICBASE) |
| References | |
| Register Output | No |
| SectionAlignment | |
| Set Checksum | No |
| Show Progress | Not Set |
| Specify Section Attributes | |

**Randomized Base Address**
Randomized Base Address. (/DYNAMICBASE[:NO])

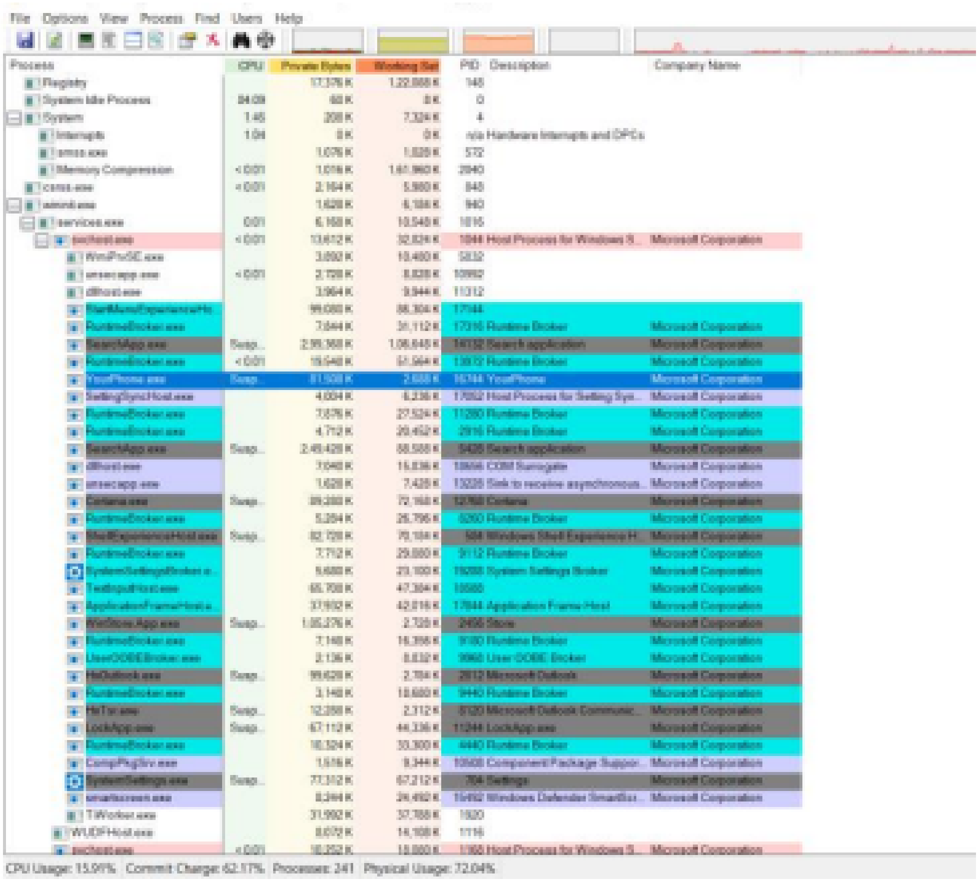
Error List: Entire Solution — 1 Error, 0 Warnings

MSB4030 "No (/NXCOMPAT)" is an invalid value for the "DataExecutionPrevention" parameter is of t



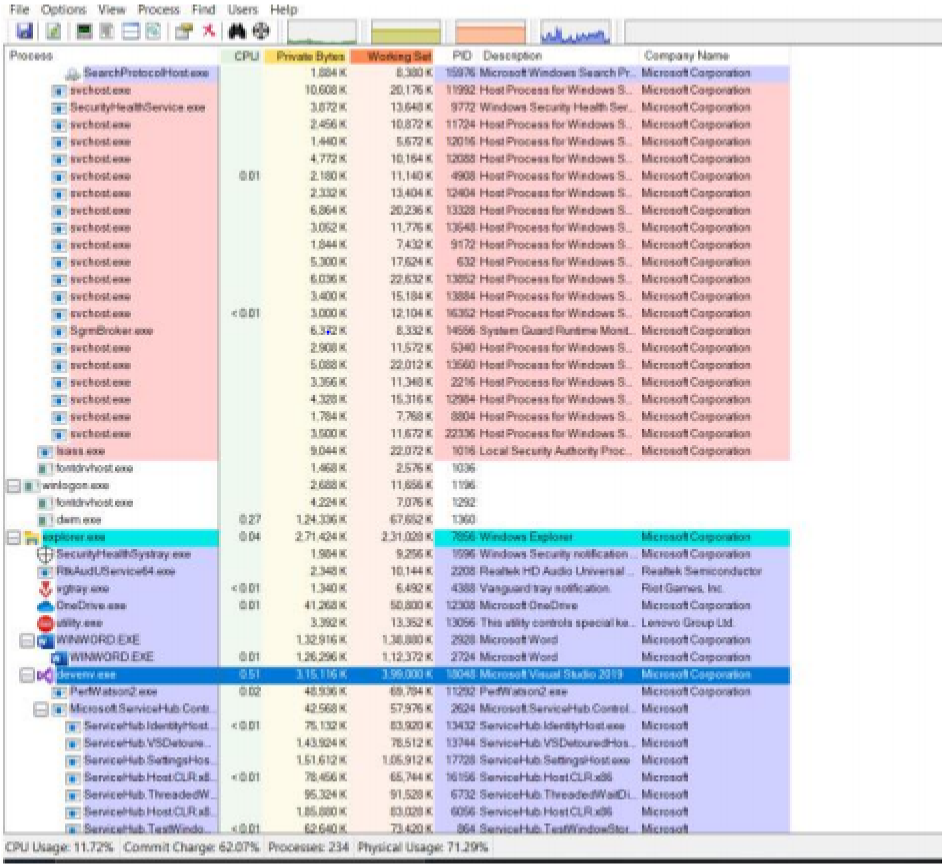
This PC › Windows SSD (C:) › Users › jayad › source › repos › SecureCodingApp › Debug
SecureCodingApp
File
Help
Name
Date modified
Type
Size

Downloading, installing and analysing through Process Explorer



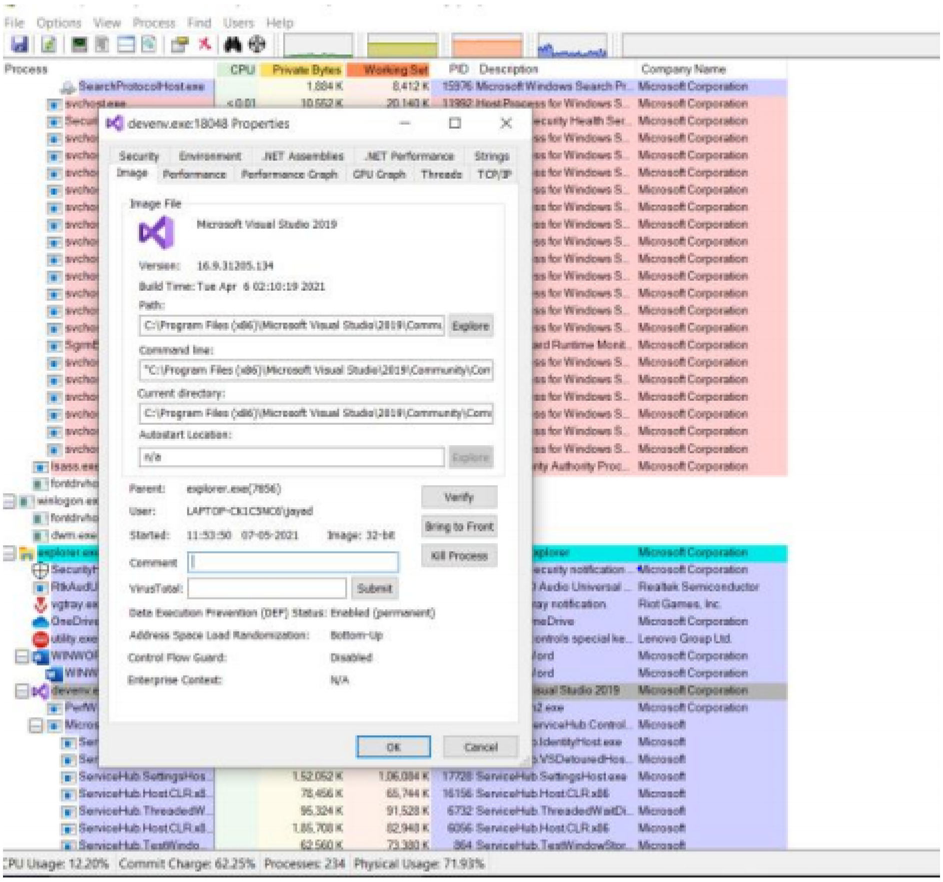
| Process | CPU | Private Bytes | Working Set | PID | Description | Company Name |
|---|---|---|---|---|---|---|
| Registry | | 17,376 K | 1,22,088 K | 148 | | |
| System Idle Process | 84.09 | 60 K | 0 K | 0 | | |
| System | 1.45 | 208 K | 7,324 K | 4 | | |
| Interrupts | 1.04 | 0 K | 0 K | n/a | Hardware Interrupts and DPCs | |
| smss.exe | | 1,076 K | 1,028 K | 572 | | |
| Memory Compression | < 0.01 | 1,016 K | 1,61,960 K | 2040 | | |
| csrss.exe | < 0.01 | 2,164 K | 5,980 K | 848 | | |
| wininit.exe | | 1,628 K | 6,188 K | 940 | | |
| services.exe | 0.01 | 6,160 K | 10,548 K | 1016 | | |
| svchost.exe | < 0.01 | 13,612 K | 32,824 K | 1044 | Host Process for Windows S... | Microsoft Corporation |
| WmiPrvSE.exe | | 3,692 K | 10,460 K | 5832 | | |
| unsecapp.exe | < 0.01 | 2,728 K | 8,828 K | 10992 | | |
| dllhost.exe | | 3,964 K | 9,944 K | 11312 | | |
| StartMenuExperienceHo... | | 99,080 K | 88,304 K | 17144 | | |
| RuntimeBroker.exe | | 7,844 K | 31,112 K | 17316 | Runtime Broker | Microsoft Corporation |
| SearchApp.exe | Susp... | 2,99,368 K | 1,06,648 K | 14132 | Search application | Microsoft Corporation |
| RuntimeBroker.exe | < 0.01 | 19,548 K | 51,564 K | 13872 | Runtime Broker | Microsoft Corporation |
| YourPhone.exe | Susp... | 81,508 K | 2,688 K | 16744 | YourPhone | Microsoft Corporation |
| SettingSyncHost.exe | | 4,004 K | 6,236 K | 17052 | Host Process for Setting Syn... | Microsoft Corporation |
| RuntimeBroker.exe | | 7,676 K | 27,524 K | 11280 | Runtime Broker | Microsoft Corporation |
| RuntimeBroker.exe | | 4,712 K | 20,452 K | 2916 | Runtime Broker | Microsoft Corporation |
| SearchApp.exe | Susp... | 2,49,428 K | 88,588 K | 5428 | Search application | Microsoft Corporation |
| dllhost.exe | | 7,048 K | 15,836 K | 10656 | COM Surrogate | Microsoft Corporation |
| unsecapp.exe | | 1,628 K | 7,428 K | 13228 | Sink to receive asynchronous... | Microsoft Corporation |
| Cortana.exe | Susp... | 89,280 K | 72,168 K | 12768 | Cortana | Microsoft Corporation |
| RuntimeBroker.exe | | 5,264 K | 26,796 K | 5260 | Runtime Broker | Microsoft Corporation |
| ShellExperienceHost.exe | Susp... | 82,728 K | 70,184 K | 508 | Windows Shell Experience H... | Microsoft Corporation |
| RuntimeBroker.exe | | 7,712 K | 29,080 K | 9112 | Runtime Broker | Microsoft Corporation |
| SystemSettingsBroker.e... | | 5,680 K | 23,100 K | 15088 | System Settings Broker | Microsoft Corporation |
| TextInputHost.exe | | 65,708 K | 47,304 K | 10588 | | Microsoft Corporation |
| ApplicationFrameHost.e... | | 37,932 K | 42,016 K | 17844 | Application Frame Host | Microsoft Corporation |
| WinStore.App.exe | Susp... | 1,05,276 K | 2,728 K | 2456 | Store | Microsoft Corporation |
| RuntimeBroker.exe | | 7,148 K | 16,356 K | 9180 | Runtime Broker | Microsoft Corporation |
| UserOOBEBroker.exe | | 2,136 K | 8,832 K | 9960 | User OOBE Broker | Microsoft Corporation |
| HxOutlook.exe | Susp... | 99,628 K | 2,784 K | 2812 | Microsoft Outlook | Microsoft Corporation |
| RuntimeBroker.exe | | 3,148 K | 18,680 K | 9440 | Runtime Broker | Microsoft Corporation |
| HxTsr.exe | Susp... | 12,288 K | 2,312 K | 8120 | Microsoft Outlook Communic... | Microsoft Corporation |
| LockApp.exe | Susp... | 67,112 K | 44,336 K | 11244 | LockApp.exe | Microsoft Corporation |
| RuntimeBroker.exe | | 16,324 K | 33,300 K | 4440 | Runtime Broker | Microsoft Corporation |
| CompPkgSrv.exe | | 1,516 K | 8,344 K | 10508 | Component Package Suppor... | Microsoft Corporation |
| SystemSettings.exe | Susp... | 77,312 K | 67,212 K | 704 | Settings | Microsoft Corporation |
| smartscreen.exe | | 8,244 K | 24,492 K | 15492 | Windows Defender SmartScr... | Microsoft Corporation |
| TiWorker.exe | | 31,992 K | 37,788 K | 1920 | | |
| WUDFHost.exe | | 8,072 K | 14,108 K | 1116 | | |
| svchost.exe | < 0.01 | 16,252 K | 19,880 K | 1168 | Host Process for Windows S... | Microsoft Corporation |

CPU Usage: 15.91% Commit Charge: 62.17% Processes: 241 Physical Usage: 72.04%



| Process | CPU | Private Bytes | Working Set | PID | Description | Company Name |
|---|---|---|---|---|---|---|
| SearchProtocolHost.exe | | 1,884 K | 8,380 K | 15976 | Microsoft Windows Search Pr... | Microsoft Corporation |
| svchost.exe | | 10,608 K | 20,176 K | 11992 | Host Process for Windows S... | Microsoft Corporation |
| SecurityHealthService.exe | | 3,872 K | 13,648 K | 9772 | Windows Security Health Ser... | Microsoft Corporation |
| svchost.exe | | 2,456 K | 10,872 K | 11724 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 1,440 K | 5,672 K | 12016 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 4,772 K | 10,164 K | 12088 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | 0.01 | 2,180 K | 11,140 K | 4908 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 2,332 K | 13,404 K | 12404 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 6,864 K | 20,236 K | 13328 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 3,052 K | 11,776 K | 13648 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 1,844 K | 7,432 K | 9172 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 5,300 K | 17,624 K | 632 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 6,036 K | 22,632 K | 13852 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 3,400 K | 15,184 K | 13884 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | < 0.01 | 3,000 K | 12,104 K | 16352 | Host Process for Windows S... | Microsoft Corporation |
| SgrmBroker.exe | | 6,372 K | 8,332 K | 14556 | System Guard Runtime Monit... | Microsoft Corporation |
| svchost.exe | | 2,908 K | 11,572 K | 5340 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 5,088 K | 22,012 K | 13560 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 3,356 K | 11,348 K | 2216 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 4,328 K | 15,316 K | 12984 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 1,784 K | 7,768 K | 8804 | Host Process for Windows S... | Microsoft Corporation |
| svchost.exe | | 3,500 K | 11,672 K | 22336 | Host Process for Windows S... | Microsoft Corporation |
| lsass.exe | | 9,044 K | 22,072 K | 1016 | Local Security Authority Proc... | Microsoft Corporation |
| fontdrvhost.exe | | 1,468 K | 2,576 K | 1036 | | |
| winlogon.exe | | 2,688 K | 11,656 K | 1196 | | |
| fontdrvhost.exe | | 4,224 K | 7,076 K | 1292 | | |
| dwm.exe | 0.27 | 1,24,336 K | 67,652 K | 1360 | | |
| explorer.exe | 0.04 | 2,71,424 K | 2,31,028 K | 7856 | Windows Explorer | Microsoft Corporation |
| SecurityHealthSystray.exe | | 1,984 K | 9,256 K | 1596 | Windows Security notification ... | Microsoft Corporation |
| RtkAudUService64.exe | | 2,348 K | 10,144 K | 2208 | Realtek HD Audio Universal ... | Realtek Semiconductor |
| vgtray.exe | < 0.01 | 1,340 K | 6,492 K | 4388 | Vanguard tray notification | Riot Games, Inc. |
| OneDrive.exe | 0.01 | 41,268 K | 50,800 K | 12308 | Microsoft OneDrive | Microsoft Corporation |
| utility.exe | | 3,392 K | 13,352 K | 13056 | This utility controls special ke... | Lenovo Group Ltd. |
| WINWORD.EXE | | 1,32,916 K | 1,38,880 K | 2928 | Microsoft Word | Microsoft Corporation |
| WINWORD.EXE | 0.01 | 1,26,296 K | 1,12,372 K | 2724 | Microsoft Word | Microsoft Corporation |
| devenv.exe | 0.51 | 3,15,116 K | 3,59,000 K | 18048 | Microsoft Visual Studio 2019 | Microsoft Corporation |
| PerfWatson2.exe | 0.02 | 48,936 K | 69,784 K | 11292 | PerfWatson2.exe | Microsoft Corporation |
| Microsoft.ServiceHub.Contr... | | 42,568 K | 57,976 K | 2624 | Microsoft.ServiceHub.Control... | Microsoft |
| ServiceHub.IdentityHost... | < 0.01 | 75,132 K | 83,920 K | 13432 | ServiceHub.IdentityHost.exe | Microsoft |
| ServiceHub.VSDetoure... | | 1,43,924 K | 78,512 K | 13744 | ServiceHub.VSDetouredHos... | Microsoft |
| ServiceHub.SettingsHos... | | 1,51,612 K | 1,05,912 K | 17728 | ServiceHub.SettingsHost.exe | Microsoft |
| ServiceHub.Host.CLR.x8... | < 0.01 | 78,456 K | 65,744 K | 16156 | ServiceHub.Host.CLR.x86 | Microsoft |
| ServiceHub.ThreadedW... | | 95,324 K | 91,528 K | 6732 | ServiceHub.ThreadedWaitDi... | Microsoft |
| ServiceHub.Host.CLR.x8... | | 1,85,080 K | 83,028 K | 6056 | ServiceHub.Host.CLR.x86 | Microsoft |
| ServiceHub.TestWindo... | < 0.01 | 62,640 K | 73,420 K | 864 | ServiceHub.TestWindowStor... | Microsoft |

CPU Usage: 11.72% Commit Charge: 62.07% Processes: 234 Physical Usage: 71.29%



| Process | CPU | Private Bytes | Working Set | PID | Description | Company Name |
|---|---|---|---|---|---|---|
| SearchProtocolHost.exe | | 1,884 K | 8,412 K | 15976 | Microsoft Windows Search Pr... | Microsoft Corporation |
| svchost.exe | < 0.01 | 10,552 K | 20,140 K | 11992 | Host Process for Windows S... | Microsoft Corporation |
| ServiceHub.SettingsHos... | | 1,52,052 K | 1,06,084 K | 17728 | ServiceHub.SettingsHost.exe | Microsoft |
| ServiceHub.Host.CLR.x8... | | 78,456 K | 65,744 K | 16156 | ServiceHub.Host.CLR.x86 | Microsoft |
| ServiceHub.ThreadedW... | | 95,324 K | 91,528 K | 6732 | ServiceHub.ThreadedWaitDi... | Microsoft |
| ServiceHub.Host.CLR.x8... | | 1,85,708 K | 82,940 K | 6056 | ServiceHub.Host.CLR.x86 | Microsoft |
| ServiceHub.TestWindo... | | 62,560 K | 73,380 K | 864 | ServiceHub.TestWindowStor... | Microsoft |

devenv.exe:18048 Properties

Security Environment .NET Assemblies .NET Performance Strings
Image Performance Performance Graph GPU Graph Threads TCP/IP

Image File

Microsoft Visual Studio 2019

Version: 16.9.31205.134

Build Time: Tue Apr 6 02:10:19 2021

Path:

C:\Program Files (x86)\Microsoft Visual Studio\2019\Comm

Command line:

"C:\Program Files (x86)\Microsoft Visual Studio\2019\Community\Con

Current directory:

C:\Program Files (x86)\Microsoft Visual Studio\2019\Community\Com

Autostart Location:

n/a

Parent: explorer.exe(7856)

User: LAPTOP-CK1C5MC6\jayed

Started: 11:53:50 07-05-2021 Image: 32-bit

Comment:

VirusTotal:

Data Execution Prevention (DEP) Status: Enabled (permanent)

Address Space Load Randomization: Bottom-Up

Control Flow Guard: Disabled

Enterprise Context: N/A

CPU Usage: 12.20% Commit Charge: 62.25% Processes: 234 Physical Usage: 71.93%