



Defect

Detect

.NET Core  
Memory Dump Analysis  
**Accelerated**

**Revised Version**

Dmitry Vostokov  
Software Diagnostics Services

Published by OpenTask, Republic of Ireland

Copyright © 2022 by OpenTask

Copyright © 2022 by Software Diagnostics Services

Copyright © 2022 by Dmitry Vostokov

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the publisher's prior written permission.

Product and company names mentioned in this book may be trademarks of their owners.

OpenTask books and magazines are available through booksellers and distributors worldwide. For further information or comments, send requests to [press@opentask.com](mailto:press@opentask.com).

A CIP catalog record for this book is available from the British Library.

ISBN-13: 978-1-912636-64-8 (Paperback)

Revision 1.10 (October 2022)

# Contents

About the Author.....	5
Introduction.....	7
Practice Exercises .....	25
Exercise 0: Download, setup, and verify your WinDbg Preview or WinDbg installation, or Docker Debugging Tools for Windows image .....	30
Exercise PNC1: Analysis of an application process dump (ApplicationA, 64-bit).....	45
Exercise PNC2: Analysis of an application process dump (ApplicationA, 32-bit).....	62
Exercise PNC3: Analysis of an application process dump (LINQPadB, 64-bit) .....	80
Exercise PNC4: Analysis of an application process dump (LINQPadC, 64-bit).....	106
Exercise PNC5: Analysis of an application process dump (ApplicationD, 64-bit).....	123
Exercise PNC6: Analysis of an application process dump (LINQPadD, 64-bit).....	138
Exercise PNC7: Analysis of an application process dump (LINQPadE, 64-bit).....	152
Exercise PNC8: Analysis of an application process dump (LINQPadF, 64-bit).....	159
Conclusion .....	183
Application Source Code .....	191
ApplicationA .....	193
LinqB.....	194
LinqC.....	195
ApplicationD .....	197
LinqD.....	199
LinqE .....	201
LinqF .....	203

## Exercise PNC1: Analysis of an application process dump (ApplicationA, 64-bit)

**Goal:** Learn how to use the SOS WinDbg extension to analyze managed space for the presence of exceptions.

**Patterns:** Stack Trace Collection (Unmanaged Space); CLR Thread; Software Exception; Exception Stack Trace; Managed Code Exception; Managed Stack Trace; Stack Trace Collection (Managed Space); Invalid Pointer; NULL Pointer (Data).

**Commands:** .logopen, version, !peb, ~\*k, ~\*kL, .load, !pe, ~\*e, !mv, .chain, .unload, !analyze -v, !CLRStack, !help, .logclose

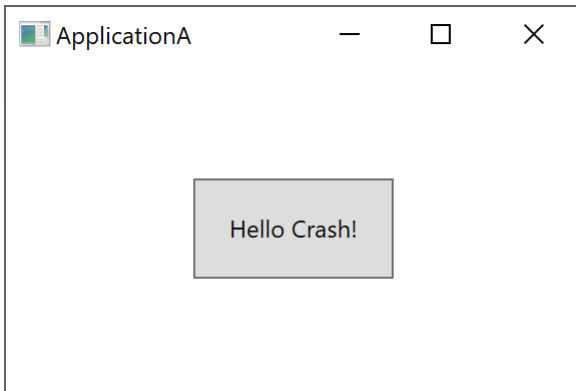
1. Launch WinDbg Preview.
2. Open \ANETCMDA-Dumps\Windows\x64\ApplicationA.exe.9152.dmp
3. We get the dump file loaded:

```
Microsoft (R) Windows Debugger Version 10.0.25136.1001 AMD64
Copyright (c) Microsoft Corporation. All rights reserved.

Loading Dump File [C:\ANETCMDA-Dumps\Windows\x64\ApplicationA.exe.9152.dmp]
User Mini Dump File with Full Memory: Only application data is available

Symbol search path is: srv*
Executable search path is:
Windows 10 Version 19042 MP (2 procs) Free x64
Product: WinNt, suite: SingleUserTS Personal
Edition build lab: 19041.1.amd64fre.vb_release.191206-1406
Machine Name:
Debug session time: Thu Apr 1 23:15:28.000 2021 (UTC + 0:00)
System Uptime: 0 days 0:12:42.262
Process Uptime: 0 days 0:01:43.000
.....
.....
Loading unloaded module list
.
This dump file has an exception of interest stored in it.
The stored exception information can be accessed via .ecxr.
(23c0.106c): Access violation - code c0000005 (first/second chance not available)
For analysis of this file, run !analyze -v
ntdll!NtWaitForMultipleObjects+0x14:
00007ffe`99cccb04 c3          ret
```

**Note:** ApplicationA shows this window when launched:



When we click on a button, it crashes and, if the *LocalDumps* registry key is set up<sup>1</sup>, the crash dump is saved.

4. Open a log file using the **.logopen** command:

```
0:000> .logopen C:\ANETCMDA-Dumps\Windows\x64\ApplicationA.log
Opened log file 'C:\ANETCMDA-Dumps\Windows\x64\ApplicationA.log'
```

**Note:** The WinDbg output may be slightly different on your system if you have a different WinDbg version, a different SOS extension version, you don't have .NET 5.0.5 installed, or you have a .NET version different from versions 5.0.3 and 5.0.6 that were on a virtual machine where all the dumps were saved.

5. WinDbg **version** command shows information about the operating system and when the dump was taken:

```
0:000> version
Windows 10 Version 19042 MP (2 procs) Free x64
Product: WinNt, suite: SingleUserTS Personal
Edition build lab: 19041.1.amd64fre.vb_release.191206-1406
Machine Name:
Debug session time: Thu Apr 1 23:15:28.000 2021 (UTC + 0:00)
System Uptime: 0 days 0:12:42.262
Process Uptime: 0 days 0:01:43.000
Kernel time: 0 days 0:00:00.000
User time: 0 days 0:00:01.000
Full memory user mini dump: C:\ANETCMDA-Dumps\Windows\x64\ApplicationA.exe.9152.dmp
[...]
```

6. We can get the computer name from where the dump was taken using **!peb** command:

```
0:000> !peb
PEB at 000000dc0fac8000
  InheritedAddressSpace: No
  ReadImageFileExecOptions: No
  BeingDebugged: No
  ImageBaseAddress: 00007ff63aed0000
  NtGlobalFlag: 400
  NtGlobalFlag2: 0
  Ldr: 00007ffe99d9b4c0
  Ldr.Initialized: Yes
  Ldr.InInitializationOrderModuleList: 0000024a38df24f0 . 0000024a5d220890
  Ldr.InLoadOrderModuleList: 0000024a38df2660 . 0000024a5d220870
  Ldr.InMemoryOrderModuleList: 0000024a38df2670 . 0000024a5d220880
```

<sup>1</sup> Collecting User-Mode Dumps <https://docs.microsoft.com/en-us/windows/win32/wer/collecting-user-mode-dumps>

```

[...]
```

SubSystemData:	0000000000000000
ProcessHeap:	0000024a38df0000
ProcessParameters:	0000024a38df1c50
CurrentDirectory:	'C:\ANETMDA-Core-Examples\'
WindowTitle:	'C:\ANETMDA-Core-Examples\ApplicationA.exe'
ImageFile:	'C:\ANETMDA-Core-Examples\ApplicationA.exe'
CommandLine:	'"C:\ANETMDA-Core-Examples\ApplicationA.exe" '
DllPath:	'< Name not readable >'
Environment:	0000024a38df0fe0

```

=::=:\
ALLUSERSPROFILE=C:\ProgramData
APPDATA=C:\Users\dumpa\AppData\Roaming
CommonProgramFiles=C:\Program Files\Common Files
CommonProgramFiles(x86)=C:\Program Files (x86)\Common Files
CommonProgramW6432=C:\Program Files\Common Files
COMPUTERNAME=DESKTOP-OGPC0LO
ComSpec=C:\WINDOWS\system32\cmd.exe
DriverData=C:\Windows\System32\Drivers\DriverData
FPS_BROWSER_APP_PROFILE_STRING=Internet Explorer
FPS_BROWSER_USER_PROFILE_STRING=Default
HOMEDRIVE=C:
HOMEPATH=\Users\dumpa
LOCALAPPDATA=C:\Users\dumpa\AppData\Local
LOGONSERVER=\\DESKTOP-OGPC0LO
NUMBER_OF_PROCESSORS=2
OneDrive=C:\Users\dumpa\OneDrive
OS=Windows_NT

Path=C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\wbem;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\WINDOWS\System32\OpenSSH\;C:\Program
Files\dotnet\;C:\Users\dumpa\AppData\Local\Microsoft\WindowsApps;C:\Users\dumpa\.dotnet\tools
PATHEXT=.COM;.EXE;.BAT;.CMD;.VBS;.VBE;.JS;.JSE;.WSF;.WSH;.MSC
PROCESSOR_ARCHITECTURE=AMD64
PROCESSOR_IDENTIFIER=Intel64 Family 6 Model 142 Stepping 10, GenuineIntel
PROCESSOR_LEVEL=6
PROCESSOR_REVISION=8e0a
ProgramData=C:\ProgramData
ProgramFiles=C:\Program Files
ProgramFiles(x86)=C:\Program Files (x86)
ProgramW6432=C:\Program Files
PSModulePath=C:\Program
Files\WindowsPowerShell\Modules;C:\WINDOWS\system32\WindowsPowerShell\v1.0\Modules
PUBLIC=C:\Users\Public
SESSIONNAME=Console
SystemDrive=C:
SystemRoot=C:\WINDOWS
TEMP=C:\Users\dumpa\AppData\Local\Temp
TMP=C:\Users\dumpa\AppData\Local\Temp
USERDOMAIN=DESKTOP-OGPC0LO
USERDOMAIN_ROAMINGPROFILE=DESKTOP-OGPC0LO
USERNAME=Training
USERPROFILE=C:\Users\dumpa
windir=C:\WINDOWS

```

7. Type `~*kL` command to verify the correctness of all stack traces (the command execution time may be longer for the first time because symbol files need to be downloaded from the Microsoft symbol server). The `~*k` command output includes references to the .NET Core CLR source code, and we use the `~*kL` command variant to reduce output clutter.

```
0:000> ~*kL

. 0 Id: 23c0.106c Suspend: 0 Teb: 000000dc`0fac9000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`0fd7b558 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`0fd7b560 00007ffe`976b0c3e KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`0fd7b850 00007ffe`994cf6aa KERNELBASE!WaitForMultipleObjects+0xe
03 000000dc`0fd7b890 00007ffe`994cf0e6 kernel32!WerpReportFaultInternal+0x58a
04 000000dc`0fd7b9b0 00007ffe`9776c439 kernel32!WerpReportFault+0xbe
05 000000dc`0fd7b9f0 00007ffe`99cd4b63 KERNELBASE!UnhandledExceptionFilter+0x3d9
06 000000dc`0fd7bb10 00007ffe`99cbbb16 ntdll!RtlUserThreadStart$filt$0+0xa2
07 000000dc`0fd7bb50 00007ffe`99cd130f ntdll!_C_specific_handler+0x96
08 000000dc`0fd7bbc0 00007ffe`99c7b5e4 ntdll!RtlpExecuteHandlerForException+0xf
09 000000dc`0fd7bbf0 00007ffe`99c7b335 ntdll!RtlDispatchException+0x244
0a 000000dc`0fd7c300 00007ffe`9768d759 ntdll!RtlRaiseException+0x185
0b 000000dc`0fd7caf0 00007ffe`6986b259 KERNELBASE!RaiseException+0x69
0c 000000dc`0fd7cbd0 00007ffe`6986b28b coreclr!NakedThrowHelper2+0x9
0d 000000dc`0fd7cc00 00007ffe`6986b295 coreclr!NakedThrowHelper_RspAligned+0x1e
0e 000000dc`0fd7d128 00007ffe`0a6a9609 coreclr!NakedThrowHelper_FixRsp+0x5
0f 000000dc`0fd7d130 00007ffe`0a548023 0x00007ffe`0a6a9609
10 000000dc`0fd7d170 00007ffe`0a547734 0x00007ffe`0a548023
11 000000dc`0fd7d230 00000000`627311e5 0x00007ffe`0a547734
12 000000dc`0fd7d290 00007ffe`62b50fe7 PresentationCore+0x4011e5
13 000000dc`0fd7d2d0 00007ffe`62a35840 PresentationFramework+0xbb0fe7
14 000000dc`0fd7d310 00007ffe`62b51a60 PresentationFramework+0xa95840
15 000000dc`0fd7d350 00000000`62732e22 PresentationFramework+0xbb1a60
16 000000dc`0fd7d390 00000000`62757c42 PresentationCore+0x402e22
17 000000dc`0fd7d3d0 00007ffe`0a5448f3 PresentationCore+0x427c42
18 000000dc`0fd7d410 00007ffe`0a548023 0x00007ffe`0a5448f3
19 000000dc`0fd7d450 00000000`62740e19 0x00007ffe`0a548023
1a 000000dc`0fd7d510 00000000`62732b6a PresentationCore+0x410e19
1b 000000dc`0fd7d580 00000000`62757c42 PresentationCore+0x402b6a
1c 000000dc`0fd7d5c0 00007ffe`0a5448f3 PresentationCore+0x427c42
1d 000000dc`0fd7d600 00007ffe`0a548023 0x00007ffe`0a5448f3
1e 000000dc`0fd7d640 00007ffe`0a547734 0x00007ffe`0a548023
1f 000000dc`0fd7d700 00007ffe`0a550211 0x00007ffe`0a547734
20 000000dc`0fd7d760 00007ffe`0a558efd 0x00007ffe`0a550211
21 000000dc`0fd7d7a0 00007ffe`0a55ebb1 0x00007ffe`0a558efd
22 000000dc`0fd7d860 00007ffe`0a564474 0x00007ffe`0a55ebb1
23 000000dc`0fd7d8b0 00007ffe`0a550eff 0x00007ffe`0a564474
24 000000dc`0fd7d9e0 00007ffe`0a550692 0x00007ffe`0a550eff
25 000000dc`0fd7da70 00007ffe`0a54967d 0x00007ffe`0a550692
26 000000dc`0fd7dae0 00007ffe`0a549596 0x00007ffe`0a54967d
27 000000dc`0fd7db70 00007ffe`0a548ac7 0x00007ffe`0a549596
28 000000dc`0fd7dbc0 00007ffe`0a5488f5 0x00007ffe`0a548ac7
29 000000dc`0fd7dc20 00007ffe`0a54920c 0x00007ffe`0a5488f5
2a 000000dc`0fd7dc70 00007ffe`0a548f07 0x00007ffe`0a54920c
2b 000000dc`0fd7dd00 00007ffe`09d2d772 0x00007ffe`0a548f07
2c 000000dc`0fd7de00 00007ffe`995ae858 0x00007ffe`09d2d772
2d 000000dc`0fd7de80 00007ffe`995ae299 user32!UserCallWinProcCheckWow+0x2f8
2e 000000dc`0fd7e010 00007ffe`0a18011b user32!DispatchMessageWorker+0x249
2f 000000dc`0fd7e090 00007ffe`69557ec3 0x00007ffe`0a18011b
30 000000dc`0fd7e150 00007ffe`695553a1 WindowsBase+0x197ec3
31 000000dc`0fd7e1e0 00007ffe`6955534e WindowsBase+0x1953a1
32 000000dc`0fd7e210 00007ffe`6276966c WindowsBase+0x19534e
33 000000dc`0fd7e240 00007ffe`62767ccd PresentationFramework+0x7c966c
34 000000dc`0fd7e270 00007ffe`62764c5c PresentationFramework+0x7c7ccd
35 000000dc`0fd7e2c0 00007ffe`09d1618e PresentationFramework+0x7c4c5c
36 000000dc`0fd7e2f0 00007ffe`6986a2f3 0x00007ffe`09d1618e
37 000000dc`0fd7e340 00007ffe`697a2fcc coreclr!CallDescrWorkerInternal+0x83
```

```

38 000000dc`0fd7e380 00007ffe`697c22b3 coreclr!MethodDescCallSite::CallTargetWorker+0x268
39 (Inline Function) -----`----- coreclr!MethodDescCallSite::Call+0xb
3a 000000dc`0fd7e4c0 00007ffe`697c207e coreclr!RunMainInternal+0x11f
3b 000000dc`0fd7e5f0 00007ffe`697c1be1 coreclr!RunMain+0xd2
3c 000000dc`0fd7e6a0 00007ffe`697c1908 coreclr!Assembly::ExecuteMainMethod+0x1cd
3d 000000dc`0fd7ea30 00007ffe`69789ad2 coreclr!CorHost2::ExecuteAssembly+0x1c8
3e 000000dc`0fd7eba0 00007ffe`7d502c72 coreclr!coreclr_execute_assembly+0xe2
3f (Inline Function) -----`----- hostpolicy!coreclr_t::execute_assembly+0x2b
40 000000dc`0fd7ec40 00007ffe`7d502ed7 hostpolicy!run_app_for_context+0x3be
41 000000dc`0fd7edd0 00007ffe`7d503b6b hostpolicy!run_app+0x37
42 000000dc`0fd7ee10 00007ffe`7d5839ea hostpolicy!corehost_main+0xfb
43 000000dc`0fd7efd0 00007ffe`7d587358 hostfxr!execute_app+0x206
44 (Inline Function) -----`----- hostfxr!A0x83a23e19::read_config_and_execute+0x10a
45 000000dc`0fd7f0c0 00007ffe`7d585b5f hostfxr!fx_muxer_t::handle_exec_host_command+0x214
46 000000dc`0fd7f1b0 00007ffe`7d582029 hostfxr!fx_muxer_t::execute+0x39b
47 000000dc`0fd7f2f0 00007ffe`3aedeb0 hostfxr!hostfxr_main_startupinfo+0x89
48 000000dc`0fd7f3f0 00007ffe`3aed418 ApplicationA_exe!exe_start+0x620
49 000000dc`0fd7f5d0 00007ffe`3aedfef8 ApplicationA_exe!wmain+0x124
4a (Inline Function) -----`----- ApplicationA_exe!invoke_main+0x22
4b 000000dc`0fd7f740 00007ffe`99477034 ApplicationA_exe!__scrt_common_main_seh+0x10c
4c 000000dc`0fd7f780 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
4d 000000dc`0fd7f7b0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

1 Id: 23c0.2278 Suspend: 1 Teb: 000000dc`0facb000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`0feff7f8 00007ffe`99c423d7 ntdll!NtWaitForWorkViaWorkerFactory+0x14
01 000000dc`0feff800 00007ffe`99477034 ntdll!TppWorkerThread+0x2f7
02 000000dc`0feffb00 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
03 000000dc`0feffb30 00000000`00000000 ntdll!RtlUserThreadStart+0x21

2 Id: 23c0.1058 Suspend: 1 Teb: 000000dc`0facd000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`1007f7f8 00007ffe`99c423d7 ntdll!NtWaitForWorkViaWorkerFactory+0x14
01 000000dc`1007f800 00007ffe`99477034 ntdll!TppWorkerThread+0x2f7
02 000000dc`1007fb00 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
03 000000dc`1007fb30 00000000`00000000 ntdll!RtlUserThreadStart+0x21

3 Id: 23c0.1edc Suspend: 1 Teb: 000000dc`0facf000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`101ff558 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`101ff560 00007ffe`976b0c3e KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`101ff850 00007ffe`6981a66e KERNELBASE!WaitForMultipleObjects+0xe
03 000000dc`101ff890 00007ffe`6981a2bd coreclr!IpcStream::DiagnosticsIpc::Poll+0x132
04 000000dc`101ff910 00007ffe`69819ff2 coreclr!IpcStreamFactory::GetNextAvailableStream+0x2a5
05 000000dc`101ffbe0 00007ffe`99477034 coreclr!DiagnosticServer::DiagnosticsServerThread+0x92
06 000000dc`101ffca0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
07 000000dc`101ffcd0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

4 Id: 23c0.43c Suspend: 1 Teb: 000000dc`0fad1000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`1037f558 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`1037f560 00007ffe`69858c61 KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`1037f850 00007ffe`69858b71 coreclr!DebuggerRCThread::MainLoop+0xe9
03 000000dc`1037f910 00007ffe`69858a2e coreclr!DebuggerRCThread::ThreadProc+0x139
04 000000dc`1037f970 00007ffe`99477034 coreclr!DebuggerRCThread::ThreadProcStatic+0x3e
05 000000dc`1037f9a0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`1037f9d0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

5 Id: 23c0.ab4 Suspend: 1 Teb: 000000dc`0fad3000 Unfrozen ".NET Finalizer"
# Child-SP RetAddr Call Site
00 000000dc`104ff788 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`104ff790 00007ffe`697f628c KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`104ffa80 00007ffe`697f5e0a coreclr!FinalizerThread::WaitForFinalizerEvent+0x78
03 000000dc`104ffac0 00007ffe`697c7063 coreclr!FinalizerThread::FinalizerThreadWorker+0x3a
04 (Inline Function) -----`----- coreclr!ManagedThreadBase_DispatchInner+0xd
05 000000dc`104ffa0 00007ffe`697c6f47 coreclr!ManagedThreadBase_DispatchMiddle+0x8f
06 000000dc`104ffc00 00007ffe`69819eee coreclr!ManagedThreadBase_DispatchOuter+0xb3

```



```

07 (Inline Function) -----`----- coreclr!ManagedThreadBase_NoADTransition+0x28
08 (Inline Function) -----`----- coreclr!ManagedThreadBase::FinalizerBase+0x28
09 000000dc`104ffcb0 00007ffe`99477034 coreclr!FinalizerThread::FinalizerThreadStart+0x9e
0a 000000dc`104ffdc0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
0b 000000dc`104ffd0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

 6 Id: 23c0.210c Suspend: 1 Teb: 000000dc`0fad5000 Unfrozen ".NET Timer"
# Child-SP RetAddr Call Site
00 000000dc`1053f5f8 00007ffe`976ad84e ntdll!NtDelayExecution+0x14
01 000000dc`1053f600 00007ffe`697c63a5 KERNELBASE!SleepEx+0x9e
02 000000dc`1053f6a0 00007ffe`697c6330 coreclr!ThreadPoolMgr::TimerThreadFire+0x71
03 000000dc`1053f740 00007ffe`99477034 coreclr!ThreadPoolMgr::TimerThreadStart+0x90
04 000000dc`1053f770 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
05 000000dc`1053f7a0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

 7 Id: 23c0.2238 Suspend: 1 Teb: 000000dc`0fad9000 Unfrozen ".NET ThreadPool Worker"
# Child-SP RetAddr Call Site
00 000000dc`106bfc78 00007ffe`976bfb0f ntdll!NtRemoveIoCompletion+0x14
01 000000dc`106bfc80 00007ffe`697fb229 KERNELBASE!GetQueuedCompletionStatus+0x4f
02 000000dc`106bfce0 00007ffe`697fa25e coreclr!CLRLifoSemaphore::WaitForSignal+0x31
03 000000dc`106bfd30 00007ffe`697fac72 coreclr!CLRLifoSemaphore::Wait+0x46
04 000000dc`106bfd60 00007ffe`99477034 coreclr!ThreadPoolMgr::WorkerThreadStart+0x4a2
05 000000dc`106bfef0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`106bfef0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

 8 Id: 23c0.808 Suspend: 1 Teb: 000000dc`0fadd000 Unfrozen ".NET ThreadPool Worker"
# Child-SP RetAddr Call Site
00 000000dc`1087f738 00007ffe`976bfb0f ntdll!NtRemoveIoCompletion+0x14
01 000000dc`1087f740 00007ffe`697fb229 KERNELBASE!GetQueuedCompletionStatus+0x4f
02 000000dc`1087f7a0 00007ffe`697fb183 coreclr!CLRLifoSemaphore::WaitForSignal+0x31
03 000000dc`1087f7f0 00007ffe`697faa81 coreclr!CLRLifoSemaphore::Wait+0x113
04 000000dc`1087f830 00007ffe`99477034 coreclr!ThreadPoolMgr::WorkerThreadStart+0x2b1
05 000000dc`1087f980 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`1087f9b0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

 9 Id: 23c0.1c4 Suspend: 1 Teb: 000000dc`0fadf000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`109ffc18 00007ffe`9767a34e ntdll!NtWaitForSingleObject+0x14
01 000000dc`109ffc20 00007ffe`67aa0d76 KERNELBASE!WaitForSingleObjectEx+0x8e
02 000000dc`109ffcc0 00007ffe`67aa1263 wpgfx_cor3!CPartitionManager::GetWork+0x196
03 000000dc`109ffd10 00007ffe`67aa0fc3 wpgfx_cor3!CPartitionThread::Run+0x23
04 000000dc`109ffd40 00007ffe`99477034 wpgfx_cor3!CPartitionThread::ThreadMain+0x23
05 000000dc`109ffd70 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`109ffda0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

10 Id: 23c0.fae Suspend: 1 Teb: 000000dc`0fae1000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`10b7fad8 00007ffe`99c423d7 ntdll!NtWaitForWorkViaWorkerFactory+0x14
01 000000dc`10b7fae0 00007ffe`99477034 ntdll!TppWorkerThread+0x2f7
02 000000dc`10b7fde0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
03 000000dc`10b7fe10 00000000`00000000 ntdll!RtlUserThreadStart+0x21

11 Id: 23c0.222c Suspend: 1 Teb: 000000dc`0fae3000 Unfrozen "Stylus Input"
# Child-SP RetAddr Call Site
00 000000dc`10cff228 00007ffe`995c078e win32u!NtUserMsgWaitForMultipleObjectsEx+0x14
01 000000dc`10cff230 00007ffe`7b6d74a1 user32!RealMsgWaitForMultipleObjectsEx+0x1e
02 000000dc`10cff270 00007ffe`7b6d78b9 PenIMC_cor3!CPimcContext::GetPenEvent+0xb1
03 000000dc`10cff330 00007ffe`0a511174 PenIMC_cor3!GetPenEvent+0x69
04 000000dc`10cff380 00000000`628f0881 0x00007ffe`0a511174
05 000000dc`10cff480 00007ffe`633fb3ef PresentationCore+0x5c0881
06 000000dc`10cff540 00007ffe`63404990
System_Private_CoreLib!System.Threading.ThreadHelper.ThreadStart_Context(System.Object)$$$60025B7+0x2f
07 000000dc`10cff570 00007ffe`633fb4fb
System_Private_CoreLib!System.Threading.ExecutionContext.RunInternal(System.Threading.ExecutionContext,
System.Threading.ContextCallback, System.Object)$$$6002785+0x80
08 000000dc`10cff5e0 00007ffe`6986a2f3
System_Private_CoreLib!System.Threading.ThreadHelper.ThreadStart()$$$60025BA+0x2b

```

```

09 000000dc`10cff620 00007ffe`697a2fcc coreclr!CallDescrWorkerInternal+0x83
0a 000000dc`10cff660 00007ffe`6985763c coreclr!MethodDescCallSite::CallTargetWorker+0x268
0b 000000dc`10cff7a0 00007ffe`697c7063 coreclr!ThreadNative::KickOffThread_Worker+0x10c
0c (Inline Function) -----`----- coreclr!ManagedThreadBase_DispatchInner+0xd
0d 000000dc`10cff900 00007ffe`697c6f47 coreclr!ManagedThreadBase_DispatchMiddle+0x8f
0e 000000dc`10cffa10 00007ffe`6984a877 coreclr!ManagedThreadBase_DispatchOuter+0xb3
0f (Inline Function) -----`----- coreclr!ManagedThreadBase_FullTransition+0x28
10 (Inline Function) -----`----- coreclr!ManagedThreadBase::KickOff+0x28
11 000000dc`10cffac0 00007ffe`99477034 coreclr!ThreadNative::KickOffThread+0x97
12 000000dc`10cffb40 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
13 000000dc`10cffb70 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

12 Id: 23c0.698 Suspend: 1 Teb: 000000dc`0fae5000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`10e7f398 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`10e7f3a0 00007ffe`9987a776 KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`10e7f690 00007ffe`9987a5f0 combase!WaitCoalesced+0xa6
03 000000dc`10e7f920 00007ffe`9987a400 combase!CROIDTable::WorkerThreadLoop+0x50
04 000000dc`10e7f970 00007ffe`9987a389 combase!CRpcThread::WorkerLoop+0x4c
05 000000dc`10e7f9d0 00007ffe`99477034 combase!CRpcThreadCache::RpcWorkerThreadEntry+0x29
06 000000dc`10e7fa00 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
07 000000dc`10e7fa30 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

13 Id: 23c0.15e0 Suspend: 1 Teb: 000000dc`0fae7000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`10fff538 00007ffe`99c423d7 ntdll!NtWaitForWorkViaWorkerFactory+0x14
01 000000dc`10fff540 00007ffe`99477034 ntdll!TppWorkerThread+0x2f7
02 000000dc`10fff840 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
03 000000dc`10fff870 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

14 Id: 23c0.5c8 Suspend: 1 Teb: 000000dc`0fae9000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`1117f9e8 00007ffe`99c423d7 ntdll!NtWaitForWorkViaWorkerFactory+0x14
01 000000dc`1117f9f0 00007ffe`99477034 ntdll!TppWorkerThread+0x2f7
02 000000dc`1117fcf0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
03 000000dc`1117fd20 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

15 Id: 23c0.217c Suspend: 1 Teb: 000000dc`0faeb000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`112ffc38 00007ffe`995c1b3e win32u!NtUserGetMessage+0x14
01 000000dc`112ffc40 00007ffe`9984def0 user32!GetMessageW+0x2e
02 000000dc`112ffcfa0 00007ffe`9984de28 combase!CDllHost::STAWorkerLoop+0x64
03 000000dc`112fffd20 00007ffe`9987a400 combase!CDllHost::WorkerThread+0xd4
04 000000dc`112fffd60 00007ffe`9987a389 combase!CRpcThread::WorkerLoop+0x4c
05 000000dc`112fffdc0 00007ffe`99477034 combase!CRpcThreadCache::RpcWorkerThreadEntry+0x29
06 000000dc`112ffdf0 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
07 000000dc`112ffe20 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

16 Id: 23c0.22a8 Suspend: 1 Teb: 000000dc`0faed000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`1147f2e8 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`1147f2f0 00007ffe`9987a776 KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`1147f5e0 00007ffe`9987a4cd combase!WaitCoalesced+0xa6
03 000000dc`1147f870 00007ffe`9987a389 combase!CRpcThread::WorkerLoop+0x119
04 000000dc`1147f8d0 00007ffe`99477034 combase!CRpcThreadCache::RpcWorkerThreadEntry+0x29
05 000000dc`1147f900 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`1147f930 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

17 Id: 23c0.1cd0 Suspend: 1 Teb: 000000dc`0faef000 Unfrozen
# Child-SP RetAddr Call Site
00 000000dc`115ff7a8 00007ffe`995c078e win32u!NtUserMsgWaitForMultipleObjectsEx+0x14
01 000000dc`115ff7b0 00007ffe`64bda880 user32!RealMsgWaitForMultipleObjectsEx+0x1e
02 000000dc`115ff7f0 00007ffe`992daf5a wisp!CServiceModule::WispInputThreadProc+0x360
03 000000dc`115ff8b0 00007ffe`992db02c msvcrt!_callthreadstartex+0x1e
04 000000dc`115ff8e0 00007ffe`99477034 msvcrt!_threadstartex+0x7c
05 000000dc`115ff910 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`115ff940 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

```

18 Id: 23c0.22ec Suspend: 1 Teb: 000000dc`0faf1000 Unfrozen
# Child-SP          RetAddr           Call Site
00 000000dc`1177f5e8 00007ffe`976b0d40 ntdll!NtWaitForMultipleObjects+0x14
01 000000dc`1177f5f0 00007ffe`9987a776 KERNELBASE!WaitForMultipleObjectsEx+0xf0
02 000000dc`1177f8e0 00007ffe`9987a4cd combase!WaitCoalesced+0xa6
03 000000dc`1177fb70 00007ffe`9987a389 combase!CRpcThread::WorkerLoop+0x119
04 000000dc`1177fbd0 00007ffe`99477034 combase!CRpcThreadCache::RpcWorkerThreadEntry+0x29
05 000000dc`1177fc00 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`1177fc30 00000000`00000000 ntdll!RtlUserThreadStart+0x21

19 Id: 23c0.1c30 Suspend: 1 Teb: 000000dc`0faf3000 Unfrozen
# Child-SP          RetAddr           Call Site
00 000000dc`118ffd78 00007ffe`995c078e win32u!NtUserMsgWaitForMultipleObjectsEx+0x14
01 000000dc`118ffd80 00007ffe`7b6db254 user32!RealMsgWaitForMultipleObjectsEx+0x1e
02 000000dc`118ffdc0 00007ffe`99477034 PenIMC_cor3!CPimcManager::HookThreadProc+0x74
03 000000dc`118ffe50 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
04 000000dc`118ffe80 00000000`00000000 ntdll!RtlUserThreadStart+0x21

20 Id: 23c0.2364 Suspend: 1 Teb: 000000dc`0faf7000 Unfrozen ".NET ThreadPool Worker"
# Child-SP          RetAddr           Call Site
00 000000dc`11a7fa08 00007ffe`976bfb0f ntdll!NtRemoveIoCompletion+0x14
01 000000dc`11a7fa10 00007ffe`697fb229 KERNELBASE!GetQueuedCompletionStatus+0x4f
02 000000dc`11a7fa70 00007ffe`697fb183 coreclr!CLRLifoSemaphore::WaitForSignal+0x31
03 000000dc`11a7fac0 00007ffe`697faa81 coreclr!CLRLifoSemaphore::Wait+0x113
04 000000dc`11a7fb00 00007ffe`99477034 coreclr!ThreadPoolMgr::WorkerThreadStart+0x2b1
05 000000dc`11a7fc50 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
06 000000dc`11a7fc80 00000000`00000000 ntdll!RtlUserThreadStart+0x21

21 Id: 23c0.2128 Suspend: 1 Teb: 000000dc`0faf9000 Unfrozen ".NET ThreadPool Gate"
# Child-SP          RetAddr           Call Site
00 000000dc`106ff778 00007ffe`9767a34e ntdll!NtWaitForSingleObject+0x14
01 000000dc`106ff780 00007ffe`697fa46f KERNELBASE!WaitForSingleObjectEx+0x8e
02 (Inline Function) -----`----- coreclr!GateThreadTimer::Wait+0x15
03 000000dc`106ff820 00007ffe`99477034 coreclr!ThreadPoolMgr::GateThreadStart+0x1ef
04 000000dc`106ff980 00007ffe`99c7d0d1 kernel32!BaseThreadInitThunk+0x14
05 000000dc`106ff9b0 00000000`00000000 ntdll!RtlUserThreadStart+0x21

```

**Note:** We see that threads #0, #3 - #8, #11, #20 - #21 have **coreclr** module on their stack traces (the previous versions of .NET Framework used **clr** module and **mscorlib** module). We also see signs of software exception (in red) and exception stack trace #0, which has signs of managed code exception processing (in yellow). Finally, the stack trace fragment from our *ApplicationA* module is shown in green.

8. We check if there is a .NET exception on the current thread 0:

```

0:000> !pe
Exception object: 0000024a3abff418
Exception type: System.NullReferenceException
Message: Object reference not set to an instance of an object.
InnerException: <none>
StackTrace (generated):
SP          IP          Function
000000DC0FD7D130 00007FFE0A6A9609 ApplicationA!ApplicationA.MainWindow.Button_Click(System.Object, System.Windows.RoutedEventArgs)+0x39
000000DC0FD7D170 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)+0x143
000000DC0FD7D230 00007FFE0A547734 PresentationCore!System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject, System.Windows.RoutedEventArgs)+0xf4
000000DC0FD7D290 00000000627311E5 PresentationCore!System.Windows.UIElement.RaiseEvent(System.Windows.RoutedEventArgs)+0x35
000000DC0FD7D2D0 00007FFE62B50FE7 PresentationFramework!System.Windows.Controls.Primitives.ButtonBase.OnClick()+0x37
000000DC0FD7D310 00007FFE62A35840 PresentationFramework!System.Windows.Controls.Button.OnClick()+0x50
000000DC0FD7D350 00007FFE62B51A60 PresentationFramework!System.Windows.Controls.Primitives.ButtonBase.OnMouseLeftButtonUp(System.Windows.Input.MouseButtonEventArgs)+0xa0
000000DC0FD7D390 0000000062732E22 PresentationCore!System.Windows.UIElement.OnMouseLeftButtonUpThunk(System.Object, System.Windows.Input.MouseButtonEventArgs)+0x62
000000DC0FD7D3D0 0000000062757C42 PresentationCore!System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)+0x22
000000DC0FD7D410 00007FFE0A5448F3 PresentationCore!System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)+0x33
000000DC0FD7D450 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)+0x143
000000DC0FD7D510 0000000062740E19 PresentationCore!System.Windows.UIElement.ReRaiseEventAs(System.Windows.DependencyObject, System.Windows.RoutedEventArgs, System.Windows.RoutedEvent)+0x169
000000DC0FD7D580 0000000062732B6A PresentationCore!System.Windows.UIElement.OnMouseUpThunk(System.Object, System.Windows.Input.MouseButtonEventArgs)+0xba
000000DC0FD7D5C0 0000000062757C42 PresentationCore!System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)+0x22
000000DC0FD7D600 00007FFE0A5448F3 PresentationCore!System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)+0x33

```

```

000000DC0FD7D640 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs,
Boolean)+0x143
000000DC0FD7D700 00007FFE0A547734 PresentationCore!System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject,
System.Windows.RoutedEventArgs)+0xf4
000000DC0FD7D760 00007FFE0A550211 PresentationCore!System.Windows.UIElement.RaiseTrustedEvent(System.Windows.RoutedEventArgs)+0x31
000000DC0FD7D7A0 00007FFE0A558EFD PresentationCore!System.Windows.Input.InputManager.ProcessStagingArea()+0x45d
000000DC0FD7D860 00007FFE0A55EBB1 PresentationCore!System.Windows.Input.InputProviderSite.ReportInput(System.Windows.Input.InputReport)+0x61
000000DC0FD7D8B0 00007FFE0A564474 PresentationCore!System.Windows.Interop.HwndMouseInputProvider.ReportInput(IntPtr, System.Windows.Input.InputMode,
IntPtr, System.Windows.Input.RawMouseActions, IntPtr, IntPtr, IntPtr, IntPtr)+0x444
000000DC0FD7D9E0 00007FFE0A550EFF PresentationCore!System.Windows.Interop.HwndMouseInputProvider.FilterMessage(IntPtr, MS.Internal.Interop.WindowMessage,
IntPtr, IntPtr, Boolean ByRef)+0x33f
000000DC0FD7DA70 00007FFE0A550692 PresentationCore!System.Windows.Interop.HwndSource.InputFilterMessage(IntPtr, IntPtr, IntPtr, IntPtr, Boolean ByRef)+0xa2
000000DC0FD7DAE0 00007FFE0A54967D WindowsBase!MS.Win32.HwndWrapper.WndProc(IntPtr, IntPtr, IntPtr, IntPtr, Boolean ByRef)+0xbd
000000DC0FD7DB70 00007FFE0A549596 WindowsBase!MS.Win32.HwndSubclass.DispatcherCallbackOperation(System.Object)+0x86
000000DC0FD7DBC0 00007FFE0A548AC7 WindowsBase!System.Windows.Threading.ExceptionWrapper.InternalRealCall(System.Delegate, System.Object, IntPtr)+0x107
000000DC0FD7DC20 00007FFE0A5488F5 WindowsBase!System.Windows.Threading.ExceptionWrapper.TryCatchWhen(System.Object, System.Delegate, System.Object, IntPtr,
System.Delegate)+0x35
000000DC0FD7DC70 00007FFE0A54920C WindowsBase!System.Windows.Threading.Dispatcher.LegacyInvokeImpl(System.Windows.Threading.DispatcherPriority,
System.TimeSpan, System.Delegate, System.Object, IntPtr)+0x1bc
000000DC0FD7DD00 00007FFE0A548F07 WindowsBase!MS.Win32.HwndSubclass.SubclassWndProc(IntPtr, IntPtr, IntPtr, IntPtr)+0x277
000000DC0FD7E090 0000000000000001 WindowsBase!MS.Win32.UnsafeNativeMethods.DispatchMessage(System.Windows.Interop.MSG ByRef)+0x2
000000DC0FD7E150 00007FFE69557E33 WindowsBase!System.Windows.Threading.Dispatcher.PushFrameImpl(System.Windows.Threading.DispatcherFrame)+0xc3
000000DC0FD7E1E0 00007FFE695553A1 WindowsBase!System.Windows.Threading.Dispatcher.PushFrame(System.Windows.Threading.DispatcherFrame)+0x41
000000DC0FD7E210 00007FFE6955534E WindowsBase!System.Windows.Threading.Dispatcher.Run()+0x3e
000000DC0FD7E240 00007FFE6276966C PresentationFramework!System.Windows.Application.RunDispatcher(System.Object)+0x1c
000000DC0FD7E270 00007FFE62767CCD PresentationFramework!System.Windows.Application.RunInternal(System.Windows.Window)+0x15d
000000DC0FD7E2C0 00007FFE62764C5C PresentationFramework!System.Windows.Application.Run()+0x2c
000000DC0FD7E2F0 00007FFE09D1618E Application!ApplicationA.App.Main()+0x5e

StackTraceString: <none>
HRESULT: 00004003

```

**Note:** We also double-check that no other threads have exceptions by executing `!pe` command for each thread using `~*e` command:

```

0:000> ~*e !pe
Exception object: 0000024a3abff418
Exception type: System.NullReferenceException
Message: Object reference not set to an instance of an object.
InnerException: <none>
StackTrace (generated):
   SP      IP      Function
000000DC0FD7D130 00007FFE0A6A9609 Application!ApplicationA.MainWindow.Button_Click(System.Object, System.Windows.RoutedEventArgs)+0x39
000000DC0FD7D170 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs,
Boolean)+0x143
000000DC0FD7D230 00007FFE0A547734 PresentationCore!System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject,
System.Windows.RoutedEventArgs)+0xf4
000000DC0FD7D290 00000000627311E5 PresentationCore!System.Windows.UIElement.RaiseEvent(System.Windows.RoutedEventArgs)+0x35
000000DC0FD7D2D0 00007FFE62850FE7 PresentationFramework!System.Windows.Controls.Primitives.ButtonBase.OnClick()+0x37
000000DC0FD7D310 00007FFE62A35840 PresentationFramework!System.Windows.Controls.Button.OnClick()+0x50
000000DC0FD7D350 00007FFE62B51A60 PresentationFramework!System.Windows.Controls.Primitives.ButtonBase.OnMouseLeftButtonUp(System.Windows.Input.MouseButtonEventArgs)+0xa0
000000DC0FD7D390 0000000062732E22 PresentationCore!System.Windows.UIElement.OnMouseLeftButtonUpThunk(System.Object,
System.Windows.Input.MouseButtonEventArgs)+0x62
000000DC0FD7D3D0 0000000062757C42 PresentationCore!System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)+0x22
000000DC0FD7D410 00007FFE0A5448F3 PresentationCore!System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)+0x33
000000DC0FD7D450 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs,
Boolean)+0x143
000000DC0FD7D510 0000000062740E19 PresentationCore!System.Windows.UIElement.ReRaiseEventAs(System.Windows.DependencyObject,
System.Windows.RoutedEventArgs, System.Windows.RoutedEventArgs)+0x169
000000DC0FD7D580 0000000062732B6A PresentationCore!System.Windows.UIElement.OnMouseUpThunk(System.Object, System.Windows.Input.MouseButtonEventArgs)+0xba
000000DC0FD7D5C0 0000000062757C42 PresentationCore!System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)+0x22
000000DC0FD7D600 00007FFE0A5448F3 PresentationCore!System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)+0x33
000000DC0FD7D640 00007FFE0A548023 PresentationCore!System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs,
Boolean)+0x143
000000DC0FD7D700 00007FFE0A547734 PresentationCore!System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject,
System.Windows.RoutedEventArgs)+0xf4
000000DC0FD7D760 00007FFE0A550211 PresentationCore!System.Windows.UIElement.RaiseTrustedEvent(System.Windows.RoutedEventArgs)+0x31
000000DC0FD7D7A0 00007FFE0A558EFD PresentationCore!System.Windows.Input.InputManager.ProcessStagingArea()+0x45d
000000DC0FD7D860 00007FFE0A55EBB1 PresentationCore!System.Windows.Input.InputProviderSite.ReportInput(System.Windows.Input.InputReport)+0x61
000000DC0FD7D8B0 00007FFE0A564474 PresentationCore!System.Windows.Interop.HwndMouseInputProvider.ReportInput(IntPtr, System.Windows.Input.InputMode,
IntPtr, System.Windows.Input.RawMouseActions, IntPtr, IntPtr, IntPtr, IntPtr)+0x444
000000DC0FD7D9E0 00007FFE0A550EFF PresentationCore!System.Windows.Interop.HwndMouseInputProvider.FilterMessage(IntPtr, MS.Internal.Interop.WindowMessage,
IntPtr, IntPtr, Boolean ByRef)+0x33f
000000DC0FD7DA70 00007FFE0A550692 PresentationCore!System.Windows.Interop.HwndSource.InputFilterMessage(IntPtr, IntPtr, IntPtr, IntPtr, Boolean ByRef)+0xa2
000000DC0FD7DAE0 00007FFE0A54967D WindowsBase!MS.Win32.HwndWrapper.WndProc(IntPtr, IntPtr, IntPtr, IntPtr, Boolean ByRef)+0xbd
000000DC0FD7DB70 00007FFE0A549596 WindowsBase!MS.Win32.HwndSubclass.DispatcherCallbackOperation(System.Object)+0x86
000000DC0FD7DBC0 00007FFE0A548AC7 WindowsBase!System.Windows.Threading.ExceptionWrapper.InternalRealCall(System.Delegate, System.Object, IntPtr)+0x107
000000DC0FD7DC20 00007FFE0A5488F5 WindowsBase!System.Windows.Threading.ExceptionWrapper.TryCatchWhen(System.Object, System.Delegate, System.Object, IntPtr,
System.Delegate)+0x35
000000DC0FD7DC70 00007FFE0A54920C WindowsBase!System.Windows.Threading.Dispatcher.LegacyInvokeImpl(System.Windows.Threading.DispatcherPriority,
System.TimeSpan, System.Delegate, System.Object, IntPtr)+0x1bc
000000DC0FD7DD00 00007FFE0A548F07 WindowsBase!MS.Win32.HwndSubclass.SubclassWndProc(IntPtr, IntPtr, IntPtr, IntPtr)+0x277
000000DC0FD7E090 0000000000000001 WindowsBase!MS.Win32.UnsafeNativeMethods.DispatchMessage(System.Windows.Interop.MSG ByRef)+0x2
000000DC0FD7E150 00007FFE69557E33 WindowsBase!System.Windows.Threading.Dispatcher.PushFrameImpl(System.Windows.Threading.DispatcherFrame)+0xc3
000000DC0FD7E1E0 00007FFE695553A1 WindowsBase!System.Windows.Threading.Dispatcher.PushFrame(System.Windows.Threading.DispatcherFrame)+0x41
000000DC0FD7E210 00007FFE6955534E WindowsBase!System.Windows.Threading.Dispatcher.Run()+0x3e
000000DC0FD7E240 00007FFE6276966C PresentationFramework!System.Windows.Application.RunDispatcher(System.Object)+0x1c
000000DC0FD7E270 00007FFE62767CCD PresentationFramework!System.Windows.Application.RunInternal(System.Windows.Window)+0x15d
000000DC0FD7E2C0 00007FFE62764C5C PresentationFramework!System.Windows.Application.Run()+0x2c
000000DC0FD7E2F0 00007FFE09D1618E Application!ApplicationA.App.Main()+0x5e

```

```

StackTraceString: <none>
HRESULT: 80004003
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
There is no current managed exception on this thread
There is no current managed exception on this thread
There is no current managed exception on this thread
There is no current managed exception on this thread
The current thread is unmanaged
The current thread is unmanaged
There is no current managed exception on this thread
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
The current thread is unmanaged
There is no current managed exception on this thread
The current thread is unmanaged

```

9. We now check the version of .NET Core used when ApplicationA was running:

```

0:000> !mvm coreclr
Browse full module list
start          end                module name
00007ffe`69730000 00007ffe`69c34000  coreclr (private pdb symbols)
C:\ProgramData\dbg\sym\coreclr.pdb\2A82CA4B09484FE5A6D67946EDE8CF521\coreclr.pdb
  Loaded symbol image file: coreclr.dll
  Image path: C:\Program Files\dotnet\shared\Microsoft.NETCore.App\5.0.0\coreclr.dll
  Image name: coreclr.dll
  Browse all global symbols functions data
  Timestamp:      Mon Oct 19 19:30:48 2020 (5F8DDB58)
  CheckSum:       004EDC30
  ImageSize:      00504000
  File version:   5.0.20.51904
  Product version: 5.0.20.51904
  File flags:     0 (Mask 3F)
  File OS:        4 Unknown Win32
  File type:      0.0 Unknown
  File date:      00000000.00000000
  Translations:  0409.04b0
  Information from resource tables:
    CompanyName:  Microsoft Corporation
    ProductName:  Microsoft® .NET
    InternalName: CoreCLR.dll
    OriginalFilename: CoreCLR.dll
    ProductVersion: 5,0,20,51904 @Commit: cf258a14b70ad9069470a108f13765e0e5988f51
    FileVersion: 5,0,20,51904 @Commit: cf258a14b70ad9069470a108f13765e0e5988f51
    FileDescription: Microsoft .NET Runtime
    LegalCopyright: © Microsoft Corporation. All rights reserved.
    Comments:     Flavor=Retail

```

**Note:** The SOS version can also be checked by listing all loaded WinDbg extensions ([sos.dll](#) is used for .NET analysis):

```

0:000> .chain
Extension DLL search Path:
[...]
Extension DLL chain:
  sos: image 5.0.160202+5734230e3ee516339a4b0e4729def135027aa255, API 2.0.0, built Thu Dec 3
03:15:02 2020
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\sos\sos.dll]
  ELFBinComposition: image 10.0.22000.194, API 0.0.0,
  [path: C:\Program Files (x86)\Windows
Kits\10\Debuggers\x64\winext\ELFBinComposition.dll]

```

```

dbghelp: image 10.0.22000.194, API 10.0.6,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\dbghelp.dll]
ext: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\ext.dll]
exts: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\WINXP\exts.dll]
uext: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\uext.dll]
ntsdexts: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\WINXP\ntsdexts.dll]

```

**Note:** if this extension is not loaded, all commands related to .NET Core will not be available:

```

0:000> .unload C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\sos\sos.dll
Unloading sos extension DLL

```

```
0:000> .chain
```

Extension DLL search Path:

[...]

```

ELFBinComposition: image 10.0.22000.194, API 0.0.0,
  [path: C:\Program Files (x86)\Windows
Kits\10\Debuggers\x64\winext\ELFBinComposition.dll]
dbghelp: image 10.0.22000.194, API 10.0.6,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\dbghelp.dll]
ext: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\ext.dll]
exts: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\WINXP\exts.dll]
uext: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\winext\uext.dll]
ntsdexts: image 10.0.22000.194, API 1.0.0,
  [path: C:\Program Files (x86)\Windows Kits\10\Debuggers\x64\WINXP\ntsdexts.dll]

```

```
0:000> !pe
```

No export pe found

10. Let's see what **!analyze -v** command says:

```
0:000> !analyze -v
```

```

*****
*                                     *
*                               Exception Analysis                               *
*                                     *
*****

*** WARNING: Unable to verify checksum for ApplicationA.exe
MethodDesc: 00007ffe0a2bc848
Method Name: ApplicationA.MainWindow.Button_Click(System.Object, System.Windows.RoutedEventArgs)
Class:      00007ffe0a2a8f38
MethodTable: 00007ffe0a2bc928
mdToken:   0000000060000005
Module:    00007ffe09db2780
IsJitted:  yes
Current CodeAddr: 00007ffe0a6a95d0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID:      0
  IL Addr:      0000024a3a8420a4
  CodeAddr:     00007ffe0a6a95d0 (MinOptJitted)
  NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2bc848
Method Name: ApplicationA.MainWindow.Button_Click(System.Object, System.Windows.RoutedEventArgs)
Class:      00007ffe0a2a8f38
MethodTable: 00007ffe0a2bc928
mdToken:   0000000060000005
Module:    00007ffe09db2780
IsJitted:  yes

```

```

Current CodeAddr: 00007ffe0a6a95d0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000024a3a8420a4
    CodeAddr: 00007ffe0a6a95d0 (MinOptJitted)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a5fe7e8
Method Name: System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
Class: 00007ffe0a6048a0
MethodTable: 00007ffe0a5ff1f0
mdToken: 000000006000C36
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a547ee0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623d1434
    CodeAddr: 00007ffe0a547ee0 (OptimizedTier1)
    NativeCodeVersion: 000024A60753FD0
    CodeAddr: 0000000627568e0 (ReadyToRun)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2b2fc0
Method Name: System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject, System.Windows.RoutedEventArgs)
Class: 00007ffe0a2a8580
MethodTable: 00007ffe0a2b46a0
mdToken: 00000000600085C
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a547640
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623c9df8
    CodeAddr: 00007ffe0a547640 (OptimizedTier1)
    NativeCodeVersion: 000024A607534D0
    CodeAddr: 000000062741040 (ReadyToRun)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2f17c8
Method Name: System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)
Class: 00007ffe0a2d93b0
MethodTable: 00007ffe0a2f1af8
mdToken: 000000006000B67
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a5448c0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623ced64
    CodeAddr: 00007ffe0a5448c0 (OptimizedTier1)
    NativeCodeVersion: 000024A60752DD0
    CodeAddr: 000000062750970 (ReadyToRun)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a5fe7e8
Method Name: System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
Class: 00007ffe0a6048a0
MethodTable: 00007ffe0a5ff1f0
mdToken: 000000006000C36
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a547ee0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623d1434
    CodeAddr: 00007ffe0a547ee0 (OptimizedTier1)
    NativeCodeVersion: 000024A60753FD0
    CodeAddr: 0000000627568e0 (ReadyToRun)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2f17c8
Method Name: System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)
Class: 00007ffe0a2d93b0
MethodTable: 00007ffe0a2f1af8
mdToken: 000000006000B67
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a5448c0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623ced64
    CodeAddr: 00007ffe0a5448c0 (OptimizedTier1)
    NativeCodeVersion: 000024A60752DD0
    CodeAddr: 000000062750970 (ReadyToRun)
    NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a5fe7e8
Method Name: System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
Class: 00007ffe0a6048a0
MethodTable: 00007ffe0a5ff1f0
mdToken: 000000006000C36
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a547ee0
Version History:
  ILCodeVersion: 0000000000000000
  ReJIT ID: 0
  IL Addr: 0000000623d1434
    CodeAddr: 00007ffe0a547ee0 (OptimizedTier1)
    NativeCodeVersion: 000024A60753FD0

```

```

CodeAddr: 0000000627568e0 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2b2fc0
Method Name: System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject, System.Windows.RoutedEventArgs)
Class: 00007ffe0a2a8580
MethodTable: 00007ffe0a2b46a0
mdToken: 00000000600085C
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a547640
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 0000000623c9df8
CodeAddr: 00007ffe0a547640 (OptimizedTier1)
NativeCodeVersion: 000024A067534D0
CodeAddr: 000000062741040 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a2b0cc0
Method Name: System.Windows.UIElement.RaiseTrustedEvent(System.Windows.RoutedEventArgs)
Class: 00007ffe0a2a8580
MethodTable: 00007ffe0a2b46a0
mdToken: 0000000060006AA
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a5501e0
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 0000000623c0e84
CodeAddr: 00007ffe0a5501e0 (OptimizedTier1)
NativeCodeVersion: 000024A5CE4B6B0
CodeAddr: 0000000627312a0 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a3d62a8
Method Name: System.Windows.Input.InputManager.ProcessStagingArea()
Class: 00007ffe0a32f600
MethodTable: 00007ffe0a3d7570
mdToken: 000000006000C24
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a558aa0
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 0000000623d0ccc
CodeAddr: 00007ffe0a558aa0 (OptimizedTier1)
NativeCodeVersion: 000024A5CE4C630
CodeAddr: 0000000627556f0 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a4c6e60
Method Name: System.Windows.Input.InputProviderSite.ReportInput(System.Windows.Input.InputReport)
Class: 00007ffe0a47d98
MethodTable: 00007ffe0a4c6e90
mdToken: 000000006003157
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a55eb50
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 0000000624609fc
CodeAddr: 00007ffe0a55eb50 (OptimizedTier1)
NativeCodeVersion: 000024A5CE4E130
CodeAddr: 0000000628c3900 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a4c59f0
Method Name: System.Windows.Interop.HwndMouseInputProvider.ReportInput(IntPtr, System.Windows.Input.InputMode, Int32, System.Windows.Input.RawMouseActions, Int32, Int32, Int32)
Class: 00007ffe0a47d660
MethodTable: 00007ffe0a4c5c68
mdToken: 00000000600391A
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a564030
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 00000006247d5ac
CodeAddr: 00007ffe0a564030 (OptimizedTier1)
NativeCodeVersion: 000024A5CE4F3F0
CodeAddr: 000000062909df0 (ReadyToRun)
NativeCodeVersion: 0000000000000000
MethodDesc: 00007ffe0a4c5960
Method Name: System.Windows.Interop.HwndMouseInputProvider.FilterMessage(IntPtr, MS.Internal.Interop.WindowMessage, IntPtr, IntPtr, Boolean ByRef)
Class: 00007ffe0a47d660
MethodTable: 00007ffe0a4c5c68
mdToken: 000000006003914
Module: 00007ffe09f50738
IsJitted: yes
Current CodeAddr: 00007ffe0a550bc0
Version History:
ILCodeVersion: 0000000000000000
ReJIT ID: 0
IL Addr: 00000006247cd14
CodeAddr: 00007ffe0a550bc0 (OptimizedTier1)
NativeCodeVersion: 000024A5CE4ADB0
CodeAddr: 000000062908e30 (ReadyToRun)
NativeCodeVersion: 0000000000000000

```

KEY\_VALUES\_STRING: 1



Key : AV.Dereference  
Value: NullPtr  
Key : AV.Fault  
Value: Write  
Key : Analysis.CPU.mSec  
Value: 4265  
Key : Analysis.DebugAnalysisManager  
Value: Create  
Key : Analysis.Elapsed.mSec  
Value: 9027  
Key : Analysis.Init.CPU.mSec  
Value: 7905  
Key : Analysis.Init.Elapsed.mSec  
Value: 144418  
Key : Analysis.Memory.CommitPeak.Mb  
Value: 194  
Key : CLR.Engine  
Value: CORECLR  
Key : CLR.Version  
Value: 5.0.20.51904  
Key : Timeline.OS.Boot.DeltaSec  
Value: 762  
Key : Timeline.Process.Start.DeltaSec  
Value: 103  
Key : WER.OS.Branch  
Value: vb\_release  
Key : WER.OS.Timestamp  
Value: 2019-12-06T14:06:00Z  
Key : WER.OS.Version  
Value: 10.0.19041.1  
Key : WER.Process.Version  
Value: 1.0.0.0

NTGLOBALFLAG: 400

PROCESS\_BAM\_CURRENT\_THROTTLED: 0

PROCESS\_BAM\_PREVIOUS\_THROTTLED: 0

APPLICATION\_VERIFIER\_FLAGS: 0

CONTEXT: (.ecxr)

rax=00007ffe0a6a9618 rbx=0000024a3aa44020 rcx=0000000100000001  
rdx=0000000000000001 rsi=0000024a3abff3e8 rdi=0000024a3abfb5c8  
rip=00007ffe9768d759 rsp=00000dc0fd7caf0 rbp=00000dc0fd7d160  
r8=0000024a00000007 r9=0000024a5ce8bc80 r10=0000000000000000  
r11=0000000000000000 r12=0000024a3abfad90 r13=0000024a3aa44020  
r14=0000000000000000 r15=0000024a3abfb5e0  
iopl=0 nv up ei pl nz na pe nc  
cs=0033 ss=002b ds=002b es=002b fs=0053 gs=002b efl=00000202

KERNELBASE!RaiseException+0x69:  
00007ffe9768d759 0f1f440000 nop dword ptr [rax+rax]  
Resetting default scope

EXCEPTION\_RECORD: (.exr -1)

ExceptionAddress: 00007ffe0a6a9609  
ExceptionCode: c0000005 (Access violation)  
ExceptionFlags: 00000000

NumberParameters: 2

Parameter[0]: 0000000000000001

Parameter[1]: 0000000000000000

Attempt to write to address 0000000000000000

PROCESS\_NAME: ApplicationA.exe

WRITE\_ADDRESS: 0000000000000000

ERROR\_CODE: (NTSTATUS) 0xc0000005 - The instruction at 0x%p referenced memory at 0x%p. The memory could not be %s.

EXCEPTION\_CODE\_STR: c0000005

EXCEPTION\_PARAMETER1: 0000000000000001

EXCEPTION\_PARAMETER2: 0000000000000000

STACK\_TEXT:

000000dc`0fd7caf0 00007ffe`6986b259 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : KERNELBASE!RaiseException+0x69  
000000dc`0fd7cbd0 00007ffe`6986b28b : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : coreClr!NakedThrowHelper2+0x9  
000000dc`0fd7cc00 00007ffe`6986b295 : 00007ffe`0a6a9609 0000024a`3abff3e8 0000024a`3aa44020 00000000`00000000 : coreClr!NakedThrowHelper\_RspAligned+0x1e  
000000dc`0fd7d128 00007ffe`0a6a9609 : 0000024a`3abff3e8 0000024a`3aa44020 00000000`00000000 0000024a`3abfad90 : coreClr!NakedThrowHelper\_FixRsp+0x5  
000000dc`0fd7d130 00007ffe`0a548023 : 0000024a`3aa1d210 0000024a`3aa44020 0000024a`3abff3e8 00000000`00000000 : 0x00007ffe`0a6a9609  
000000dc`0fd7d170 00007ffe`0a547734 : 0000024a`3abf06c8 00000000`00000000 00000000`00000000 00000000`00000000 : 0x00007ffe`0a548023  
000000dc`0fd7d230 00000000`627311e5 : 0000024a`3aa44020 0000024a`3abff3e8 000000dc`0fd7d340 0000024a`3abfad90 : 0x00007ffe`0a547734  
000000dc`0fd7d290 00007ffe`62b50fe7 : 0000024a`3abff3e8 0000024a`3aa44820 0000024a`3aa44020 000000dc`0fd7d1f0 : PresentationCore+0x4011e5

```

000000dc`0fd7d2d0 00007ffe`62a35840 : 0000024a`3aa44020 0000024a`3a754f20 0000024a`3ab42858 000000dc`0fd7d1f0 : PresentationFramework+0xbbb0fe7
000000dc`0fd7d310 00007ffe`62b51a60 : 0000024a`3aa44020 0000000c`0fd7e0b8 00000000`00000010 000000dc`0fd7d220 : PresentationFramework+0xa95840
000000dc`0fd7d350 00000000`62732b22 : 0000024a`3aa44020 0000024a`3abfad90 00007ffe`0a3dc6f8 00000000`00000001 : PresentationFramework+0xbb1a60
000000dc`0fd7d390 00000000`62757c42 : 0000024a`3aa44020 0000024a`3abfad90 0000024a`3abfad90 00000000`00000001 : PresentationCore+0x402e22
000000dc`0fd7d3d0 00007ffe`0a5448f3 : 00000000`00000000 00000000`00000000 0000024a`3aa44020 00000000`00000001 : PresentationCore+0x427c42
000000dc`0fd7d410 00007ffe`0a548023 : 0000024a`3abfad90 00000000`00000000 0000024a`3aa44020 0000024a`3abf06b0 : 0x00007ffe`0a5448f3
000000dc`0fd7d450 00000000`62740e19 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : 0x00007ffe`0a548023
000000dc`0fd7d510 00000000`62732b6a : 0000024a`3aa44020 0000024a`3abfad90 00007ffe`0a3dc6f8 00000000`00000000 : PresentationCore+0x410e19
000000dc`0fd7d580 00000000`62757c42 : 0000024a`3aa44020 0000024a`3abfad90 0000024a`3abfad90 00000000`00000000 : PresentationCore+0x402b6a
000000dc`0fd7d5c0 00007ffe`0a5448f3 : 0000024a`3aa2d448 00000000`00000001 0000024a`3aa44020 00000000`00000000 : PresentationCore+0x427c42
000000dc`0fd7d600 00007ffe`0a548023 : 0000024a`3abfad90 00007ffe`0a54345f 00000000`00000000 0000024a`3aa1d210 : 0x00007ffe`0a5448f3
000000dc`0fd7d640 00007ffe`0a547734 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : 0x00007ffe`0a548023
000000dc`0fd7d700 00007ffe`0a550211 : 0000024a`3aa44020 0000024a`3abfad90 0000024a`3ab58280 0000024a`3aa1e708 : 0x00007ffe`0a547734
000000dc`0fd7d760 00007ffe`0a558efd : 00000000`00000000 0000024a`3abfad90 0000024a`3ab58280 0000024a`3aa1e708 : 0x00007ffe`0a550211
000000dc`0fd7d7a0 00007ffe`0a55eb11 : 00007ffe`0a0a7d38 00000000`00000000 0000024a`3a754f20 0000024a`3aa1e708 : 0x00007ffe`0a558efd
000000dc`0fd7d860 00007ffe`0a564474 : 00000000`00000001 00000000`00000000 00000000`00000000 00000000`00000000 : 0x00007ffe`0a55eb11
000000dc`0fd7d8b0 00007ffe`0a550eff : 0000024a`3aafb698 00000000`000b048a 00000000`00000000 00000000`000a3325 : 0x00007ffe`0a564474
000000dc`0fd7d9e0 00007ffe`0a550692 : 0000024a`3aafb698 00000000`000b048a 00000000`00000202 00000000`00000000 : 0x00007ffe`0a550eff
000000dc`0fd7da70 00007ffe`0a54967d : 00000000`00000000 00007ffe`944f71b5 0000024a`5cd5c30 00000000`00000007 : 0x00007ffe`0a550692
000000dc`0fd7dae0 00007ffe`0a549596 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : 0x00007ffe`0a54967d
000000dc`0fd7db70 00007ffe`0a548ac7 : 00000000`00000000 00007ffe`944f6e9d 00000000`00000000 00000000`0000000a : 0x00007ffe`0a549596
000000dc`0fd7dbc0 00007ffe`0a5488f5 : 0000024a`3a9a92d8 00007ffe`0a548815 00000000`00000006 00000000`00000000 : 0x00007ffe`0a548ac7
000000dc`0fd7dc20 00007ffe`0a54920c : 0000024a`3a9a91f0 0000024a`3a9a92d8 00000000`00000202 00007ffe`0a541749 : 0x00007ffe`0a5488f5
000000dc`0fd7dc70 00007ffe`0a548f07 : 00000000`00000000 0000000c`00000001 ffffffff`ffffd8f0 0000024a`00000001 : 0x00007ffe`0a54920c
000000dc`0fd7dd00 00007ffe`09d2d772 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000001 : 0x00007ffe`0a548f07
000000dc`0fd7de00 00007ffe`995ae858 : 00000000`00000000 00007ffe`99631070 00000000`00000001 00000000`00000000 : 0x00007ffe`09d2d772
000000dc`0fd7de80 00007ffe`995ae299 : 0000000c`0fd7e140 00007ffe`09bd3484 00000000`000b048a 00000000`00000202 : user32!UserCallWinProcCheckWow+0x2f8
000000dc`0fd7e010 00007ffe`0a18011b : 00007ffe`09bd3484 00000000`0fd7e438 0000000c`0fd7e190 00000000`00000001 : user32!DispatchMessageWorker+0x249
000000dc`0fd7e090 00007ffe`69557ec3 : 0000024a`3a9a92d8 0000000c`0fd7e190 00000000`00000000 00000000`00000000 : 0x00007ffe`0a18011b
000000dc`0fd7e150 00007ffe`695553a1 : 0000024a`3a9a92d8 00000000`000b048a 0000024a`3a9a9188 00000000`00000001 : WindowsBase+0x197ec3
000000dc`0fd7e1e0 00007ffe`6955534e : 0000024a`3a9c3d78 0000024a`3a9a92d8 0000024a`3a9a9188 00000000`00000001 : WindowsBase+0x1953a1
000000dc`0fd7e210 00007ffe`6276966c : 0000024a`3a97db58 00000000`00000000 00000000`00000010 000000dc`0fd7da60 : WindowsBase+0x19534e
000000dc`0fd7e240 00007ffe`62767ccd : 0000024a`3a97db58 00000000`00000000 00000000`00000010 000000dc`0fd7da60 : PresentationFramework+0x7c966c
000000dc`0fd7e270 00007ffe`62764c5c : 0000024a`3a97db58 00000000`00000000 0000024a`5af6f950 00000000`00000005 : PresentationFramework+0x7c7ccd
000000dc`0fd7e2c0 00007ffe`09d1618e : 0000024a`3a97db58 0000024a`3a9c3440 0000024a`5af6f950 00000000`00000005 : PresentationFramework+0x7c4c5c
000000dc`0fd7e2f0 00007ffe`6986a2f3 : 00007ffe`697a2de7 00000000`00000001 0000000c`0fd7ea58 000000dc`0fd7e5c0 : 0x00007ffe`09d1618e
000000dc`0fd7e340 00007ffe`697a2fcc : 0000000c`0fd7e3f0 00007ffe`6974dcd9 00007ffe`09e8e938 000000dc`0fd7e430 : coreclr!CallDescrWorkerInternal+0x83
000000dc`0fd7e380 00007ffe`697c22b3 : 0000000c`0fd7e618 00000000`00000001 00000a47`02715a94 000000dc`0fd7e618 :
coreclr!MethodDescCallSite::CallTargetWorker+0x268
000000dc`0fd7e4c0 00007ffe`697c207e : 00000000`00000000 00000000`00000000 00000000`00000001 000000dc`0fd7ea58 : coreclr!RunMainInternal+0x11f
000000dc`0fd7e5f0 00007ffe`697c1be1 : 0000024a`3a754f20 0000000c`00000001 0000024a`3a754f20 00000000`00000000 : coreclr!RunMain+0xd2
000000dc`0fd7e6a0 00007ffe`697c1908 : 00000000`00000000 00000000`00000010 00000000`00000010 00007ffe`09db39c0 : coreclr!Assembly::ExecuteMainMethod+0x1cd
000000dc`0fd7ea30 00007ffe`69789ad2 : 0000024a`3a705410 00000000`00000001 00000000`00000001 00007ffe`7d4f2569 : coreclr!CorHost::ExecuteAssembly+0x1c8
000000dc`0fd7eba0 00007ffe`7d502c72 : 0000024a`38e3e560 00000000`00000000 0000024a`3a7869f0 00000000`00000000 : coreclr!CoreHost::execute_assembly+0xe2
000000dc`0fd7ec40 00007ffe`7d502ed7 : 0000024a`38df3198 00000000`00000000 00007ffe`7d5663c0 0000024a`38df3198 : hostpolicy!run_app_for_context+0x3be
000000dc`0fd7edd0 00007ffe`7d503b6b : 00000000`00000000 00000000`00000000 0000000c`0fd7ef10 00000000`00000000 : hostpolicy!run_app+0x37
000000dc`0fd7ee10 00007ffe`7d5839ea : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000158 : hostpolicy!corehost_main+0xfb
000000dc`0fd7ef00 00007ffe`7d587358 : 0000024a`38e0bc40 00000000`00000000 00000000`00000000 00000000`00000000 : hostfxr!execute_app+0x206
000000dc`0fd7f0c0 00007ffe`7d585b5f : 0000000c`0fd7f330 00000000`00000001 00000000`00000001 000000dc`0fd7f350 :
hostfxr!fx_muxer_t::handle_exec_host_command+0x214
000000dc`0fd7f1b0 00007ffe`7d582029 : 0000000c`0fd7f350 0000024a`38df5400 00000000`00000001 00007ffe`97abe97b : hostfxr!fx_muxer_t::execute+0x39b
000000dc`0fd7f2f0 00007ffe`3aed0b00 : 00000000`00000008 0000024a`38df5400 00000000`00000008 00007ffe`7d582900 : hostfxr!hostfxr_main_startupinfo+0x89
000000dc`0fd7f3f0 00007ffe`3aed4e18 : 00007ffe`3aeeb780 00000000`00000007 00000000`00000000 00000000`0000005e : ApplicationA_exe!exe_start+0x620
000000dc`0fd7f5d0 00007ffe`3aedfef8 : 00000000`00000000 00000000`00000000 0000024a`38df3190 00000000`00000000 : ApplicationA_exe!wmain+0x124
000000dc`0fd7f740 00007ffe`99477034 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 :
ApplicationA_exe!__scrt_common_main_seh+0x10c
000000dc`0fd7f780 00007ffe`99c7d0d1 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : kernel32!BaseThreadInitThunk+0x14
000000dc`0fd7f7b0 00000000`00000000 : 00000000`00000000 00000000`00000000 00000000`00000000 00000000`00000000 : ntdll!RtlUserThreadStart+0x21

```

```

SYMBOL_NAME: kernelbase!RaiseException+69
MODULE_NAME: KERNELBASE
IMAGE_NAME: KERNELBASE.dll
STACK_COMMAND: ~0s ; .ecxr ; kb
FAILURE_BUCKET_ID: NULL_POINTER_WRITE_c0000005_KERNELBASE.dll!RaiseException
OS_VERSION: 10.0.19041.1
UILDLAB_STR: vb_release
OSPLATFORM_TYPE: x64
OSNAME: Windows 10
IMAGE_VERSION: 10.0.19041.662
FAILURE_ID_HASH: {acf2e24f-4126-16aa-dd5a-81d7676395ba}
Followup: MachineOwner
-----

```

**Note:** We see the unmanaged NULL pointer exception diagnostics (in red) and the top .NET Managed Stack Trace method description (in blue). The STACK\_TEXT output shows only unmanaged stack trace.

## 11. Finally, we get managed stack trace of the current thread:

```
0:000> !CLRStack
OS Thread Id: 0x106c (0)
Child SP          IP Call Site
000000DC0FD7CC30 00007ffe99cccb04 [FaultingExceptionFrame: 000000dc0fd7cc30]
000000DC0FD7D130 00007ffe0a6a9609 ApplicationA.MainWindow.Button_Click(System.Object, System.Windows.RoutedEventArgs)
000000DC0FD7D170 00007ffe0a548023 System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
000000DC0FD7D230 00007ffe0a547734 System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject, System.Windows.RoutedEventArgs)
000000DC0FD7D290 00000000627311e5 System.Windows.UIElement.RaiseEvent(System.Windows.RoutedEventArgs)
000000DC0FD7D2D0 00007ffe62b58fe7 System.Windows.Controls.Primitives.ButtonBase.OnClick()
000000DC0FD7D310 00007ffe62a35840 System.Windows.Controls.Button.OnClick()
000000DC0FD7D350 00007ffe62b51a60 System.Windows.Controls.Primitives.ButtonBase.OnMouseLeftButtonUp(System.Windows.Input.MouseButtonEventArgs)
000000DC0FD7D390 0000000062732e22 System.Windows.UIElement.OnMouseLeftButtonUpThunk(System.Object, System.Windows.Input.MouseButtonEventArgs)
000000DC0FD7D3D0 0000000062757c42 System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)
000000DC0FD7D410 00007ffe0a5448f3 System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)
000000DC0FD7D450 00007ffe0a548023 System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
000000DC0FD7D510 0000000062740e19 System.Windows.UIElement.ReRaiseEventAs(System.Windows.DependencyObject, System.Windows.RoutedEventArgs, System.Windows.RoutedEventArgs)
000000DC0FD7D580 0000000062732b6a System.Windows.UIElement.OnMouseUpThunk(System.Object, System.Windows.Input.MouseButtonEventArgs)
000000DC0FD7D5C0 0000000062757c42 System.Windows.Input.MouseButtonEventArgs.InvokeEventHandler(System.Delegate, System.Object)
000000DC0FD7D600 00007ffe0a5448f3 System.Windows.RoutedEventArgs.InvokeHandler(System.Delegate, System.Object)
000000DC0FD7D640 00007ffe0a548023 System.Windows.EventRoute.InvokeHandlersImpl(System.Object, System.Windows.RoutedEventArgs, Boolean)
000000DC0FD7D700 00007ffe0a547734 System.Windows.UIElement.RaiseEventImpl(System.Windows.DependencyObject, System.Windows.RoutedEventArgs)
000000DC0FD7D760 00007ffe0a550211 System.Windows.UIElement.RaiseTrustedEvent(System.Windows.RoutedEventArgs)
000000DC0FD7D7A0 00007ffe0a558efd System.Windows.Input.InputManager.ProcessStagingArea()
000000DC0FD7D860 00007ffe0a55ebb1 System.Windows.Input.InputProviderSite.ReportInput(System.Windows.Input.InputReport)
000000DC0FD7D8B0 00007ffe0a564474 System.Windows.Interop.HwndMouseInputProvider.ReportInput(IntPtr, System.Windows.Input.InputMode, Int32, System.Windows.Input.RawMouseActions, Int32, Int32, Int32)
000000DC0FD7D9E0 00007ffe0a559eff System.Windows.Interop.HwndMouseInputProvider.FilterMessage(IntPtr, MS.Internal.Interop.WindowMessage, IntPtr, IntPtr, Boolean ByRef)
000000DC0FD7DA70 00007ffe0a550692 System.Windows.Interop.HwndSource.InputFilterMessage(IntPtr, Int32, IntPtr, IntPtr, Boolean ByRef)
000000DC0FD7DAE0 00007ffe0a54967d MS.Win32.HwndWrapper.WndProc(IntPtr, Int32, IntPtr, IntPtr, Boolean ByRef)
000000DC0FD7DB70 00007ffe0a549596 MS.Win32.HwndSubclass.DispatcherCallbackOperation(System.Object)
000000DC0FD7DBE0 00007ffe0a548ac7 System.Windows.Threading.ExceptionWrapper.InternalRealCall(System.Delegate, System.Object, Int32)
000000DC0FD7DC20 00007ffe0a5488f5 System.Windows.Threading.ExceptionWrapper.TryCatchWhen(System.Object, System.Delegate, System.Object, Int32, System.Delegate)
000000DC0FD7DC70 00007ffe0a54920c System.Windows.Threading.Dispatcher.LegacyInvokeImpl(System.Windows.Threading.DispatcherPriority, System.TimeSpan, System.Delegate, System.Object, Int32)
000000DC0FD7DD00 00007ffe0a548f07 MS.Win32.HwndSubclass.SubclassWndProc(IntPtr, Int32, IntPtr, IntPtr)
000000DC0FD7DE00 00007ffe09d2d772 ILStubClass.IL_STUB_ReversePInvoke(Int64, Int32, IntPtr, IntPtr)
000000DC0FD7E0B8 00007ffe995ae858 [InlinedCallFrame: 000000dc0fd7e0b8] MS.Win32.UnsafeNativeMethods.DispatchMessage(System.Windows.Interop.MSG ByRef)
000000DC0FD7E0E8 00007ffe0a18011b [InlinedCallFrame: 000000dc0fd7e0e8] MS.Win32.UnsafeNativeMethods.DispatchMessage(System.Windows.Interop.MSG ByRef)
000000DC0FD7E090 00007ffe0a18011b ILStubClass.IL_STUB_PInvoke(System.Windows.Interop.MSG ByRef)
000000DC0FD7E150 00007ffe69557ec3 System.Windows.Threading.Dispatcher.PushFrameImpl(System.Windows.Threading.DispatcherFrame)
000000DC0FD7E1E0 00007ffe695553a1 System.Windows.Threading.Dispatcher.PushFrame(System.Windows.Threading.DispatcherFrame)
000000DC0FD7E210 00007ffe6955534e System.Windows.Threading.Dispatcher.Run()
000000DC0FD7E240 00007ffe6276966c System.Windows.Application.RunDispatcher(System.Object)
000000DC0FD7E270 00007ffe62767ccd System.Windows.Application.RunInternal(System.Windows.Window)
000000DC0FD7E2C0 00007ffe62764c5c System.Windows.Application.Run()
000000DC0FD7E2F0 00007ffe09d1618e ApplicationA.App.Main()
```

## 12. We close logging before exiting WinDbg Preview:

```
0:000> .logclose
Closing open log file C:\ANETCMDA-Dumps\Windows\x64\ApplicationA.log
```

**Note:** To avoid possible confusion and glitches, we recommend exiting WinDbg Preview or WinDbg after each exercise.