
.NET Conf
2022
Debugging a .NET program after crash
(Post-mortem debugging)
Mirco Vanini

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About me

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Consultant focused on industrial and embedded solutions using .NET and other native SDKs with over 30 years of experience, XeDotNet community co-founder, speaker and Microsoft MVP since 2012

Microsoft MVP Most Valuable Professional

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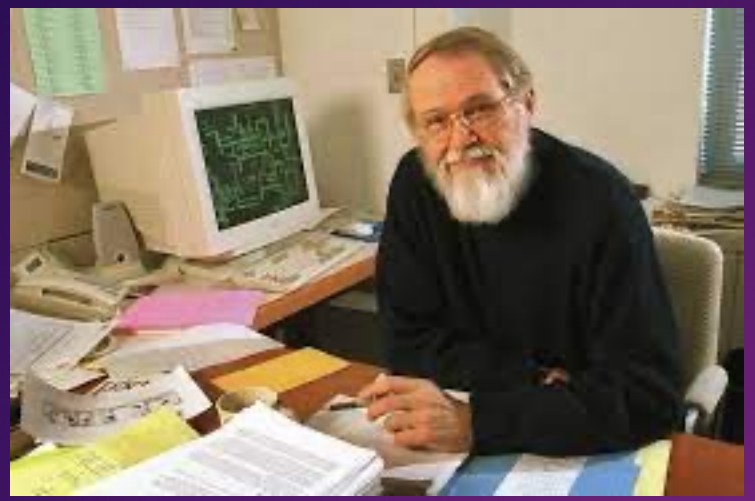
Software Bugs are Expensive

Debugging is twice as hard as writing the code in the first place. Therefore, if you write the code as cleverly as possible, you are, by definition, not smart enough to debug it.

Brian Kernighan



Importance of debugging

- Perfect code is an illusion
- Legacy Code
- Deeper Understanding
- Helps you learn & write better code in the future

Production Debugging

Requirements

- Obtain actionable information about crashes and errors
- Obtain accurate performance information

Limitations

- Can’t install Visual Studio
- Can’t suspend production servers
- Can’t run intrusive tools

Dump File

- A user dump is a snapshot of a running process
- A kernel dump is a snapshot of the entire system
- Dump files are useful for post-mortem diagnostics and for production debugging
- Anytime you can't attach and start live debugging, a dump might help

Limitations of Dump Files

- **A dump file is a static snapshot**
  - You can’t debug a dump, just analyze it
  - Sometimes a repro is required (or more than one repro)
- Sometimes several dumps must be compared

Taxonomy of Dumps

- Crash dumps are dumps generated when an application crashes
- Hang dumps are dumps generated on-demand at a specific moment
- These are just names, the contents of the dump files are the same!

Generating a Hang Dump

Task Manager

right-click and choose “Create Dump File”
Creates a dump in **%LOCALAPPDATA%\Temp**

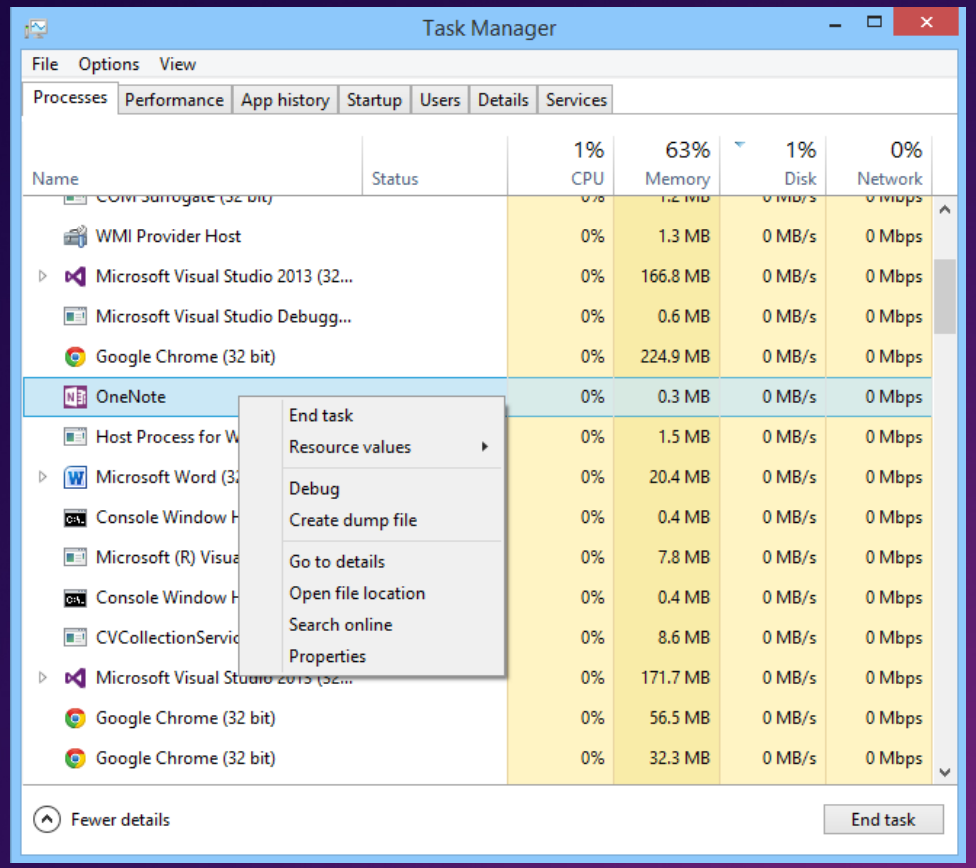
SysInternals - Procdump

Sysinternals utility for creating dumps,

Light-weight, no-install utility for generating dumps

DebugDiag

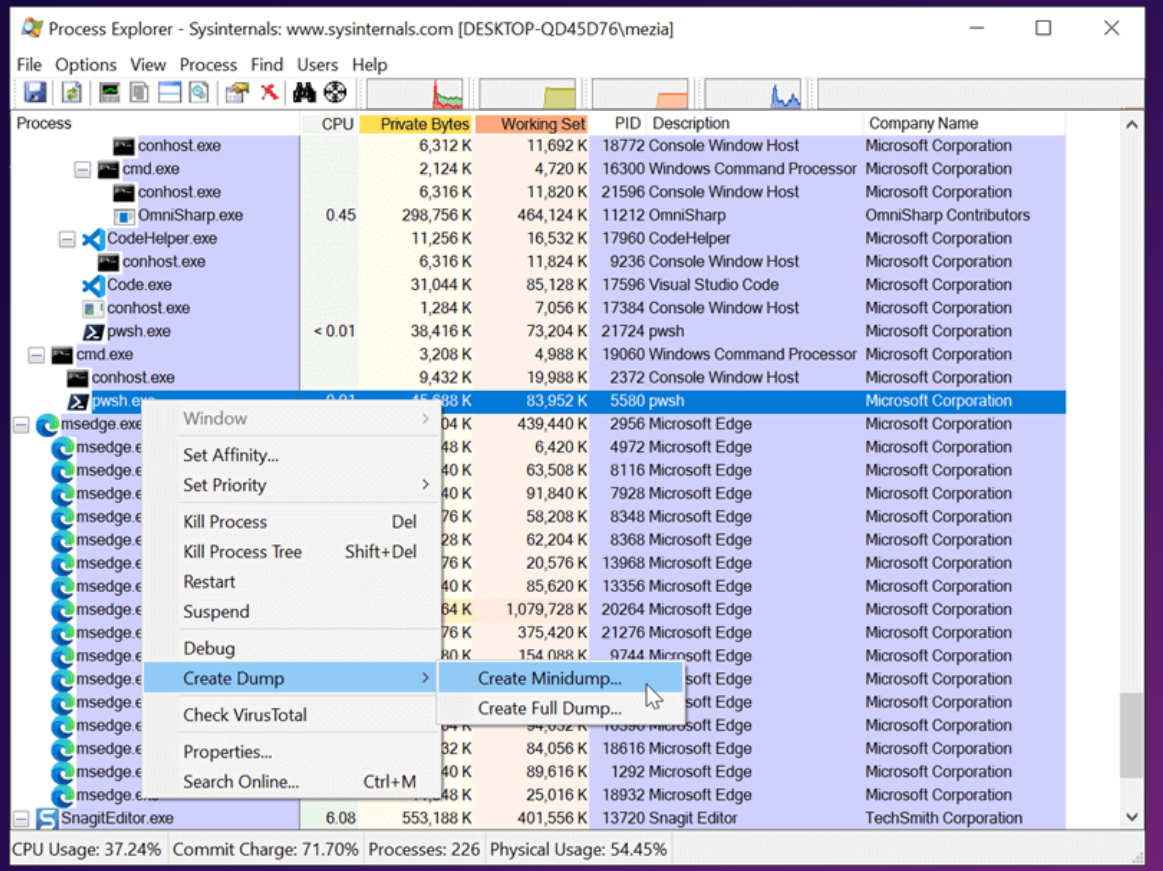
Microsoft tool for monitoring and dump generation



Generating a Hang Dump

SysInternals - Process Explorer

Right–click on the process and
select the "Create Dump" menu item



Generating a Hang Dump

.NET Core diagnostic global tools

dotnet-dump

The dotnet-dump tool is a way to collect and analyze Windows and Linux core dumps without a native debugger.

dotnet-gcdump

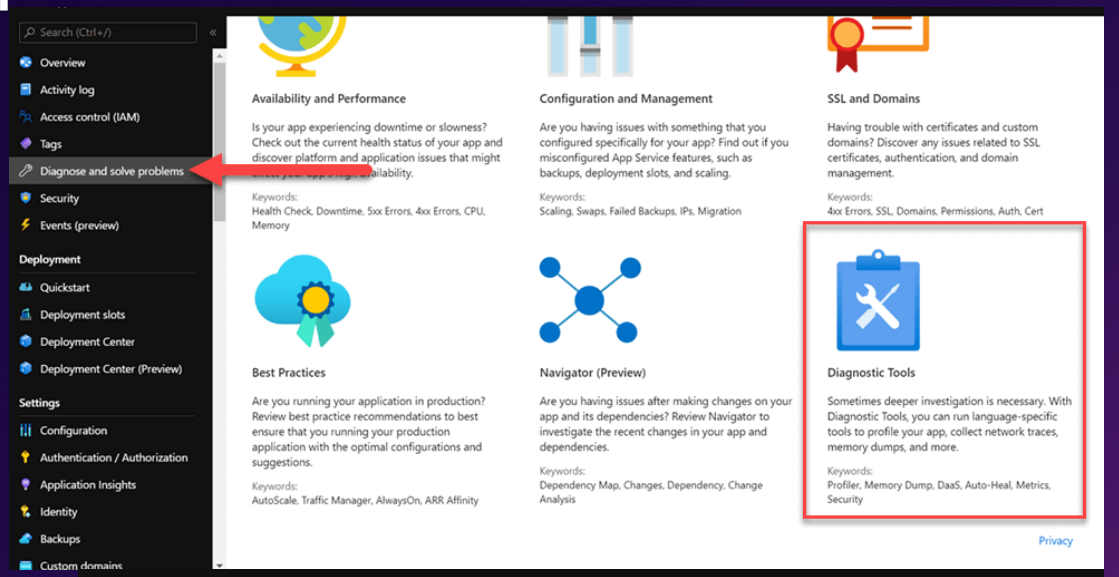
The dotnet-gcdump tool is a way to collect GC (Garbage Collector) dumps of live .NET processes.

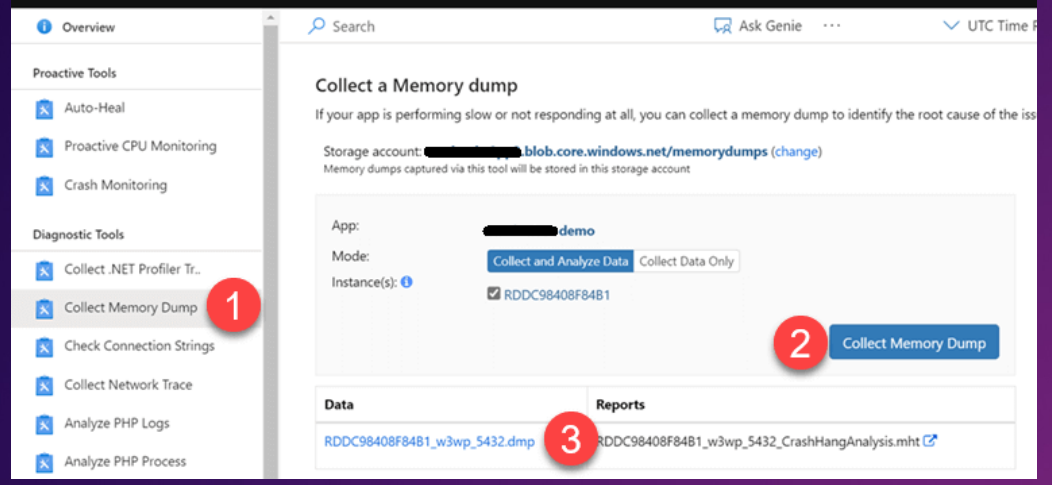
Generating a Hang Dump

Azure App Services

Select your App Service
Go to "Diagnose and solve problems”
Select Diagnose Tools

Select "Collect Memory Dump”
Click on the "Collect Memory Dump" button
After a few minutes, the dump
is available in the configured storage account





[Collect and Automate Diagnostic Actions with Azure App Services]

Analyzing Dumps File

Native debugger (WinDBG)

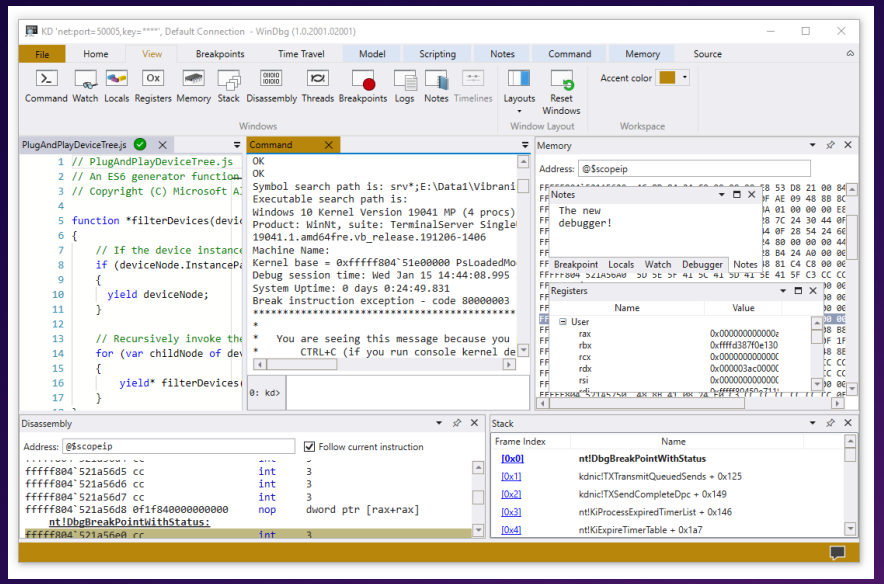
[Analyze crash dump files by using WinDbg]

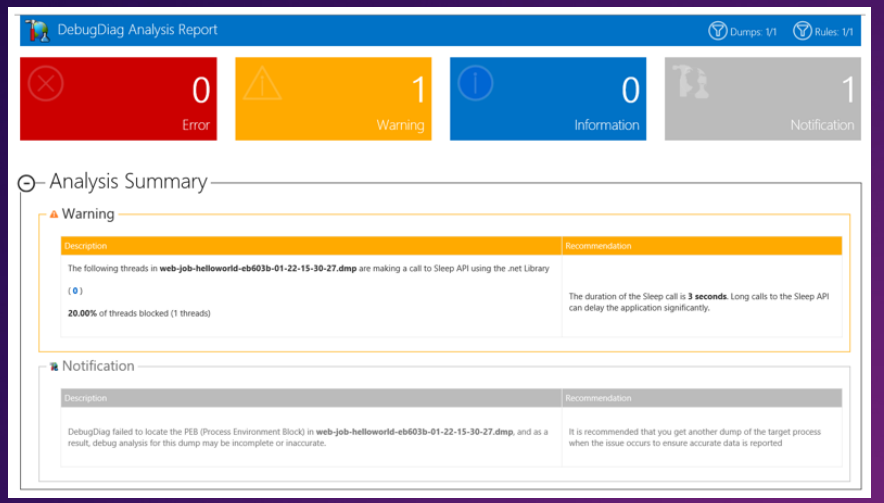
DebugDiag

[How to Use Debug Diagnostics to Analyze a Memory Dump]

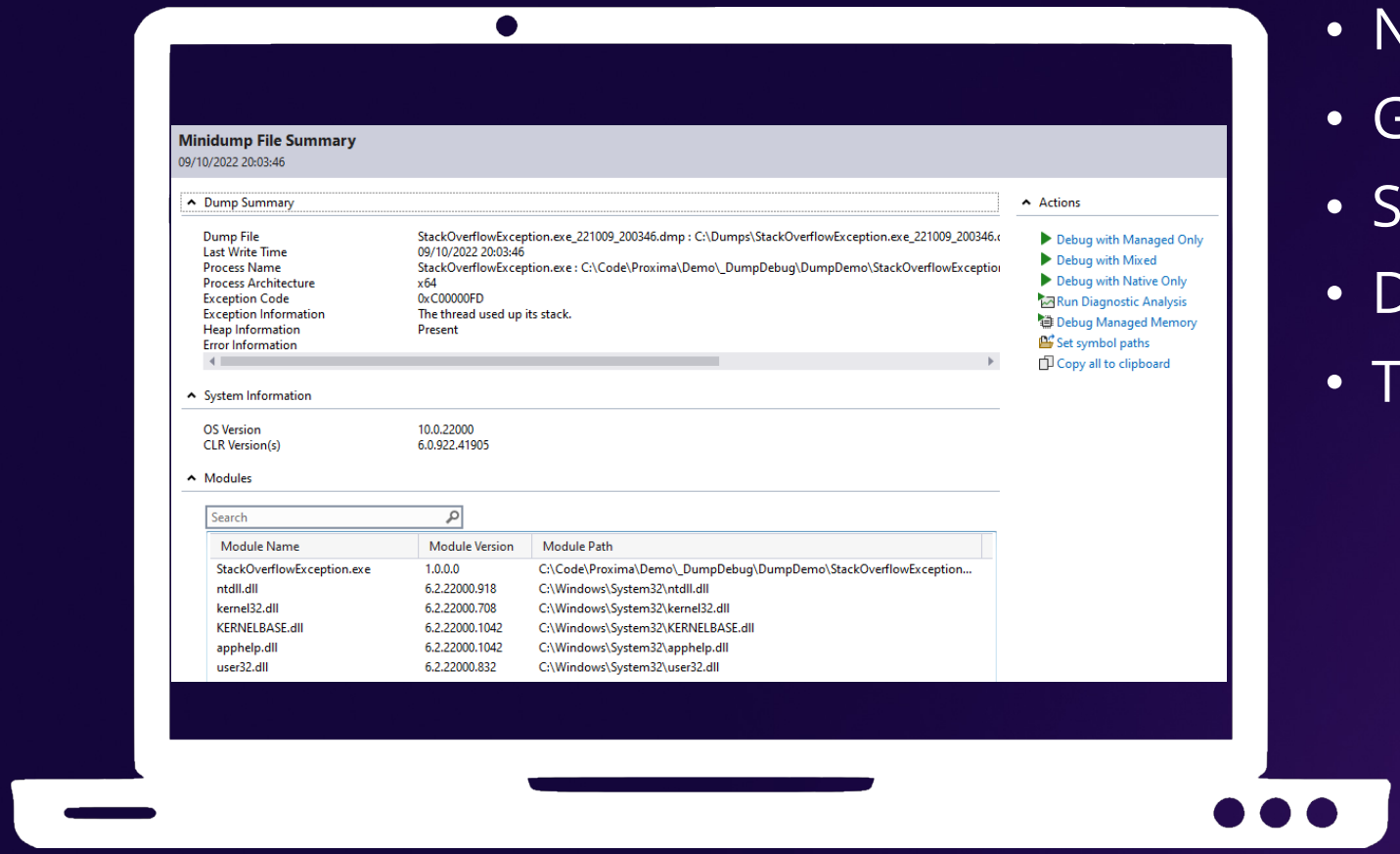
Visual Studio

[Dump files in the Visual Studio debugger]





Demo



- Null reference exceptions
- GC Heap pressure, OOM Exceptions
- Stack overflow
- Dead Lock
- Threadpool OutOfThreads

Common Bugs

CRASHES

- Check the event viewer
- Capture dump on crash
- Look at the faulting stack

PERFORMMANCE ISSUES

- Capture one or more dumps
- Look at all stacks
- if you can repro in test, consider profiling

- **Low CPU**
  Waiting for an external resource
  Deadlock
- **High CPU**
  Tight loop, High CPU in GC

MEMORY LEAKS

- Capture multiple dumps
- Compare to see what objects are leaking
- Find out why they are still around

Thanks !

Q&A

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