

Disassemble Memory File

Memory.DMP used in post-mortem debugging can be processed without “Debugging Tools for Windows”, particularly to obtain a call tree for a given function.

`UfSymbol.ps1` disassembles once a memory file and stores the output in local directory. A 2nd run uses the `.disassembly` file to parse the functions' body. The root body contains the symbol requested by the user. A dependency graph is built either upstream, representing all the callers of the function, or downstream representing the callees. Care must be taken when specifying `-Depth`: * generic functions have many callers

\$StopDisassembly is a table of symbols where parsing stops. For example, **KeYieldProcessorEx** calls other functions that are minute.

Sample Output builds the call tree for `nt!KiSystemStartup`.

```
PS > (Measure-Command {
    $Image = 'D:\DataLake\2025-04-28\MEMORY.DMP'
    & '.\UfSymbol.ps1' -Symbol nt!KiSystemStartup -Image $Image -Depth 4 -Down | Out-Default
}).TotalSeconds
```

File "D:\DataLake\2025-01-28\MEMORY.DMP" of 1194.36 Mb has been processed in 4570 seconds.

D:\Processing\53c6f2af-38db-4219-9f41-f794c7897f5a\53c6f2af-38db-4219-9f41-f794c7897f5a.disassembly

D:\Processing\53c6f2af-38db-4219-9f41-f794c7897f5a\53c6f2af-38db-4219-9f41-f794c7897f5a.meta

D:\Processing\53c6f2af-38db-4219-9f41-f794c7897f5a\53c6f2af-38db-4219-9f41-f794c7897f5a.retpoline

The 1st line gives a heads-up about the disassembly duration:

- a smaller file was processed in 1.26 hours on the same system.

The disassembly is done in parallel using all cores but 1. Once completed, the `.meta` file contains the properties:

- OS and Computer where the BSOD occurred
- Image path and Hash. The hash identifies image duplicates, resulting in a disassembly bypass.
- System where disassembly took place, number of CPUs allotted, CPU model, duration and Image size.
- The default modules used to disassemble the Image:
 - for a `.dmp` file *nt*, *pci*, *acpi* and *hal* functions are disassembled
 - *base name* for all others

The `.retpoline` file is an indirection table for bodies compiled with `/guard:cf`. Wherever `call nt!guard_dispatch_icall` is found, the function pointer is resolved in the memory file and displayed.

Back to KiSystemStartup call tree:

- 1302 callees are identified for **-Depth 4**
- Complete disassembly and identification took **5215** seconds on an “Intel(R) Core(TM) i3-7100U CPU @ 2.40GHz” with 3 cpus.
- **nt!atol, nt!KeQueryPerformanceCounter** can be part of **\$StopDisassembly**.

```

uf nt!KdInitSystem
├── uf nt!KeQueryPerformanceCounter
│   ├── uf nt!HalpTimerGetInternalData
│   └── uf nt!HalpTimerScaleCounter
│       ├── uf nt!ExAllocatePool2
│       ├── uf nt!_security_check_cookie
│       └── uf nt!MmGetPagedPoolCommitPointer
└── uf nt!KdRegisterDebuggerDataBlock
...
uf nt!PpmUpdatePerformanceFeedback
uf nt!guard_dispatch_icall (nt!_security_cookie
    nt!HalpOriginalPerformanceCounter
    nt!HalPrivateDispatchTable+0x1b0=nt!HalpProcessorPrepareForIdle
    nt!HalPrivateDispatchTable+0x1c0=nt!HalpProcessorResumeFromIdle
    nt!HalpTimerReferencePage
    nt!HalPrivateDispatchTable+0x418=nt!HalpLbrResumeRecording
    nt!HalPrivateDispatchTable+0x2f8=nt!HalpTimerClockStop
    nt!PopCsConsumption+0x140)
5215.506918

```

Notes

- PowerShell *Core* is required. *Desktop 5.1* is slow.
- **.retpoline** built is not parallelized.
- SVG rendering is not implemented.
- *UfSymbol* is meant for USB migration; the tool can run without internet.
- Removing CR character from the large disassembly can result in *OutOfMemory* exception.

```
PS > $prefix = "https://raw.githubusercontent.com/armaber/scripts/refs/heads/disasm/";  
    "functions.ps1", "UfSymbol.ps1" | foreach {  
        Invoke-WebRequest $prefix/DisassembleImage/$PSItem -OutFile $PSItem;  
    }
```