Windows Internals 101

[AFK.conf]

PS > ls env:

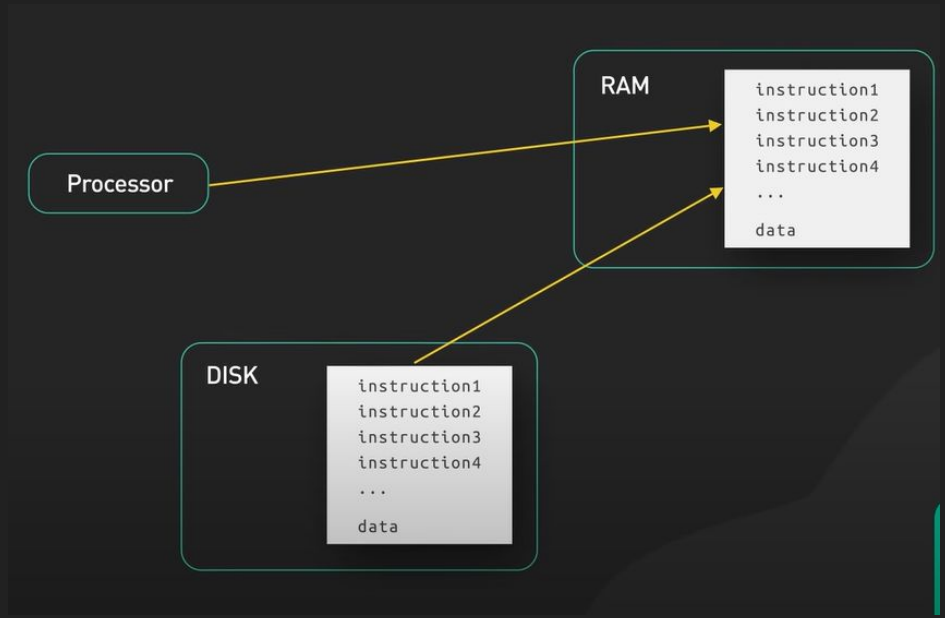
- Offensive Security Accenture
- Twitter / GitHub @g0ttfrid
- Linkedin in/yurimaia

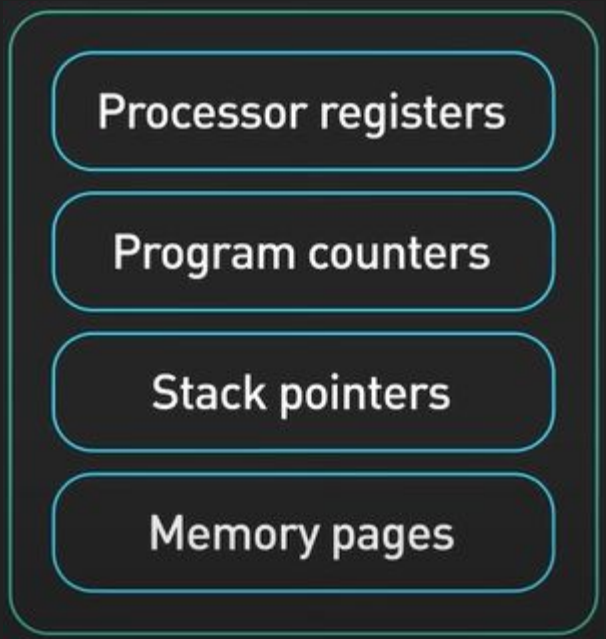
PS > Agenda

- Process, Threads and Handles
- Windows API (Win32 API)
- User Mode vs Kernel Mode
- Syscalls

PS > Process, Threads and Handles

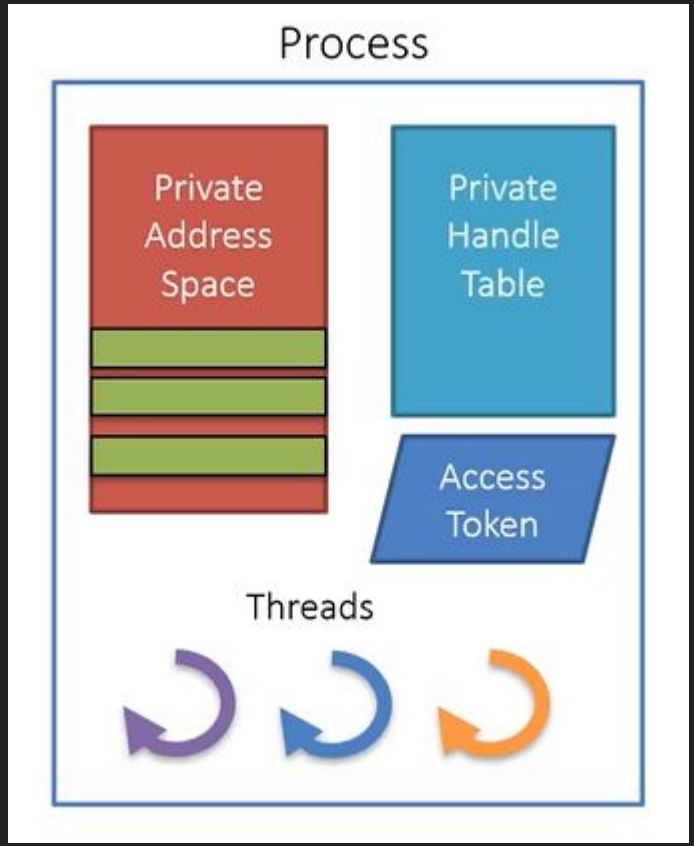
- Program > Process
- Resources





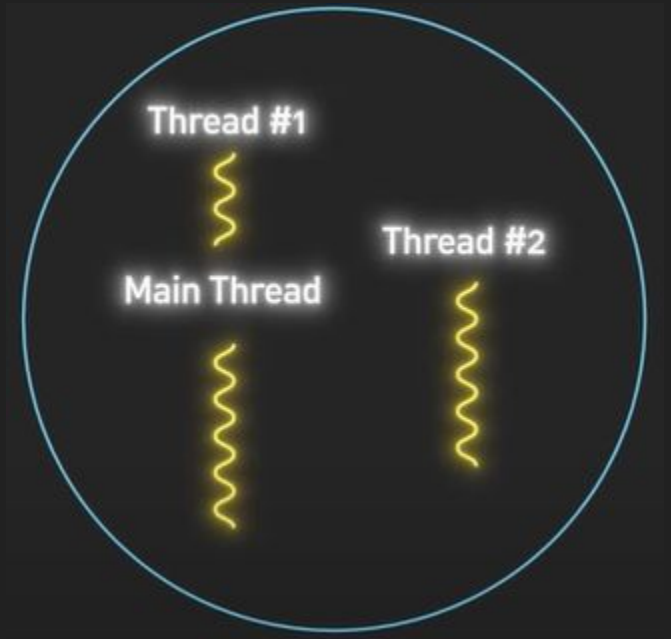
PS > Process, Threads and Handles

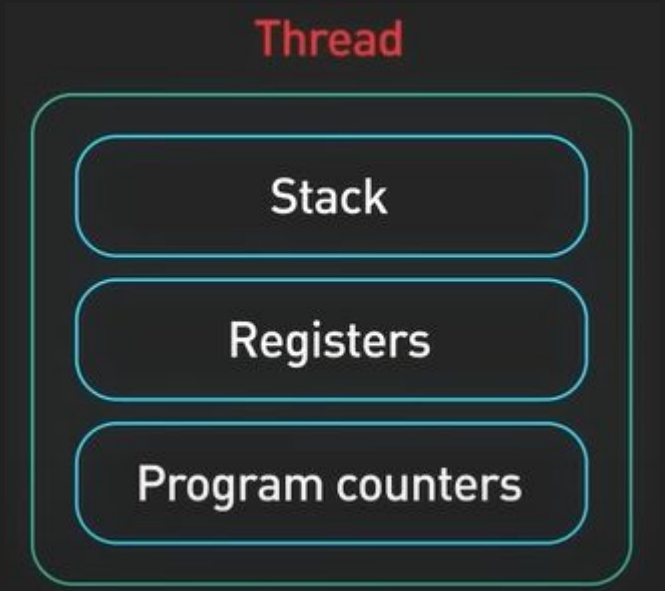
- Address Space



PS > Process, Threads and Handles

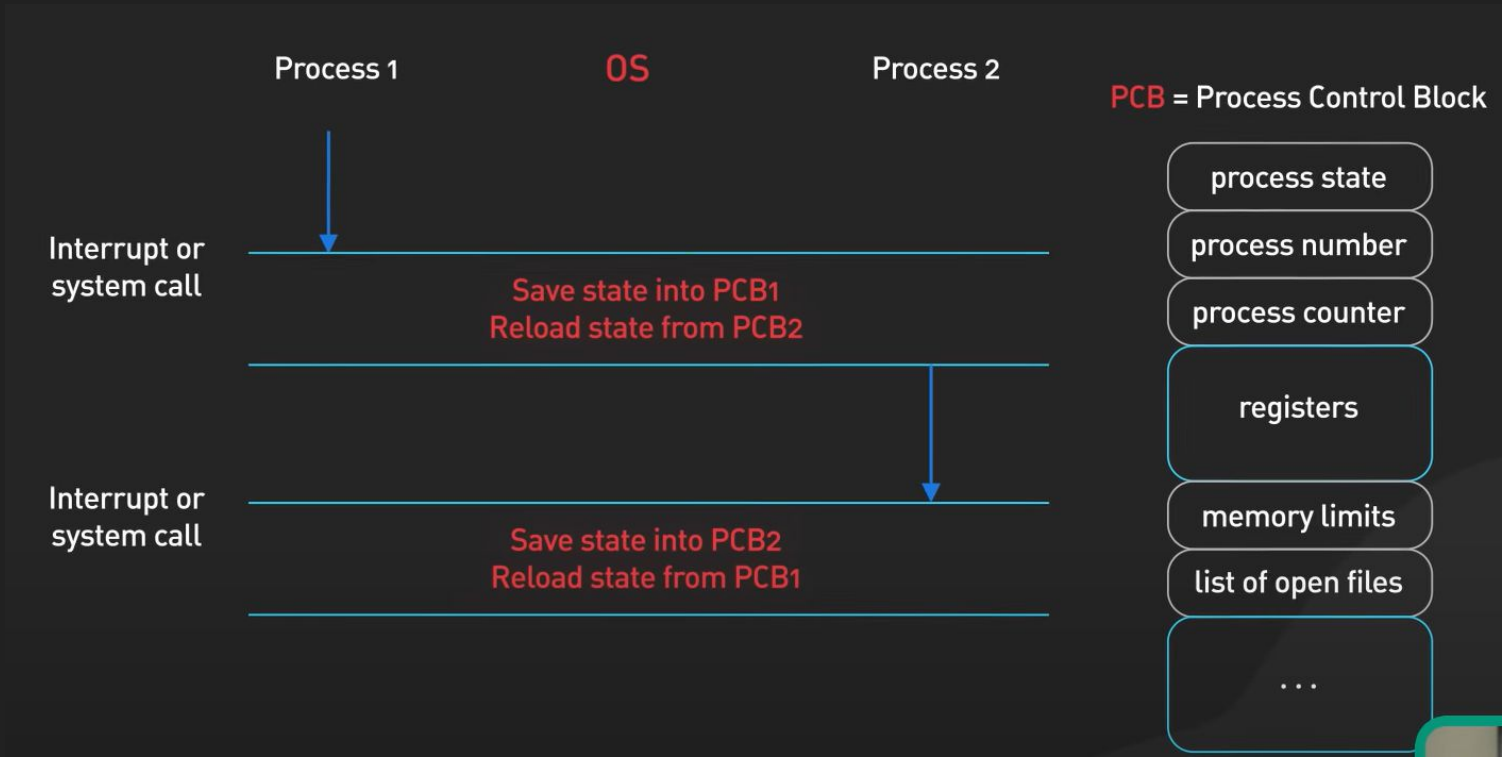
- Threads





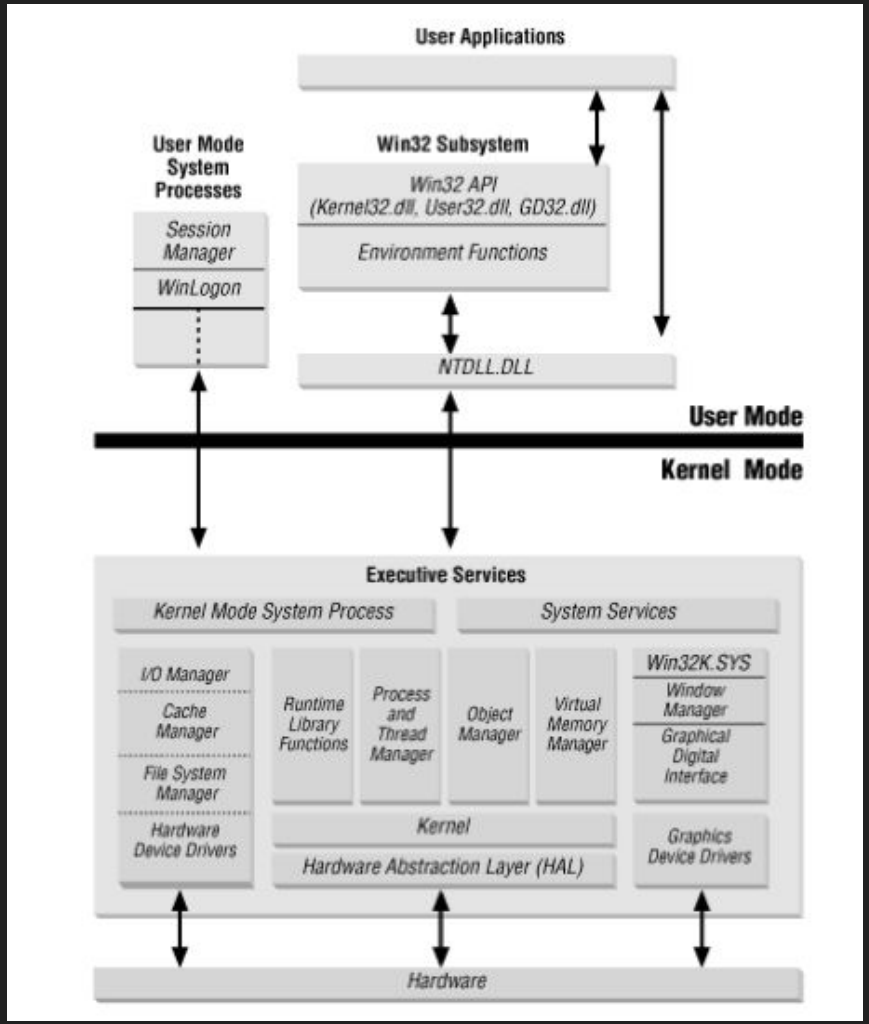
PS > Process, Threads and Handles

- Context Switch



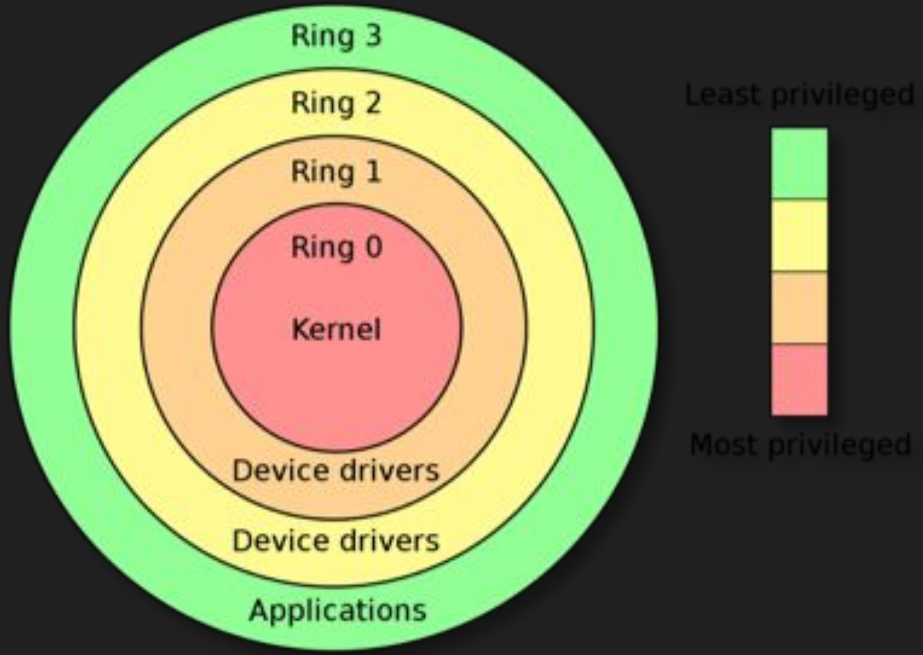
PS > Windows API (Win32 API)

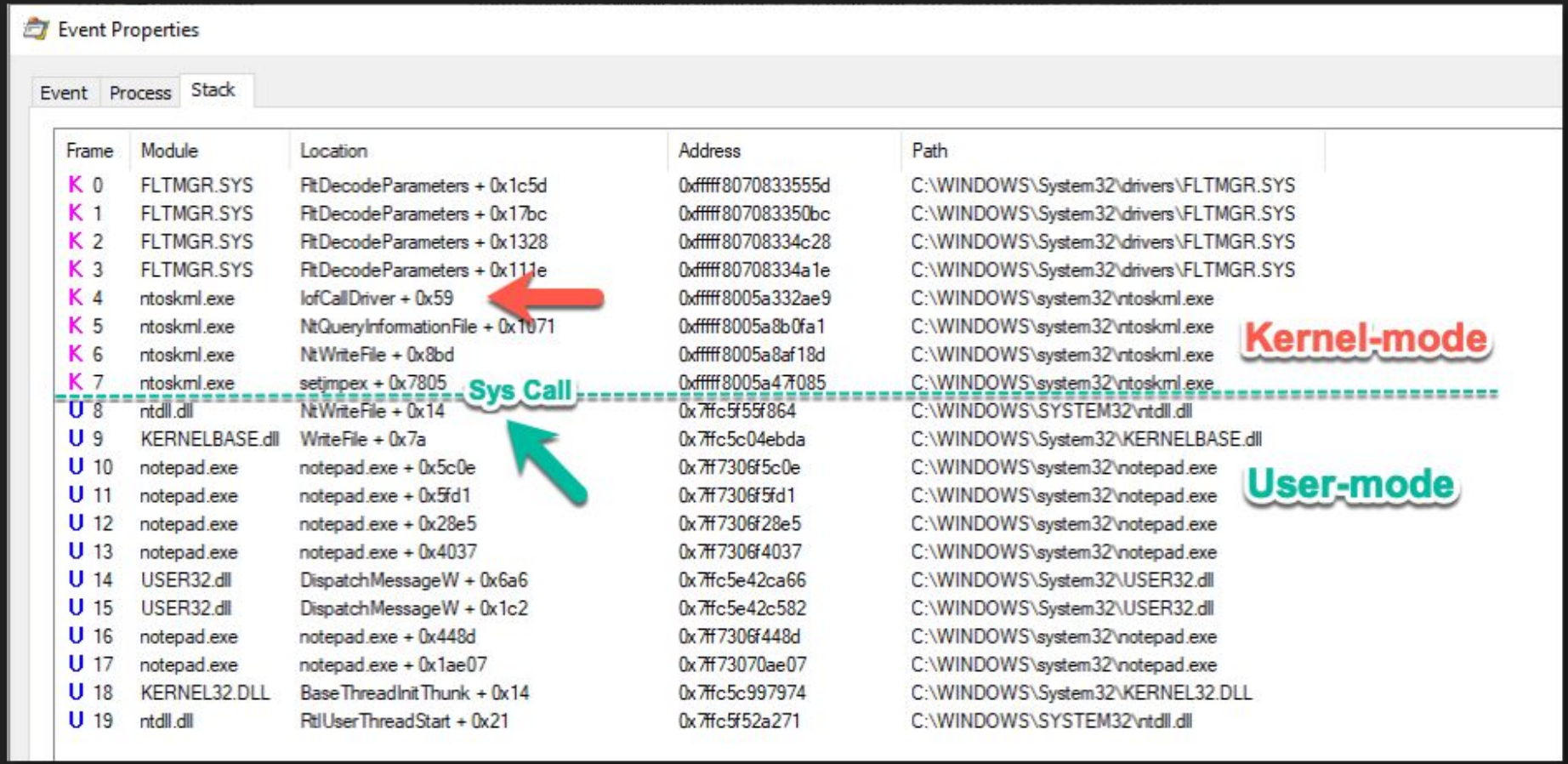
- Host enumeration
- Starting processes
- Process injection
- Token manipulation
- And more…


User Applications
User Mode System Processes
Session Manager
WinLogon
Win32 Subsystem
Win32 API (Kernel32.dll, User32.dll, GD32.dll)
Environment Functions
NTDLL.DLL
User Mode
Kernel Mode
Executive Services
Kernel Mode System Process
System Services
I/O Manager
Cache Manager
File System Manager
Hardware Device Drivers
Runtime Library Functions
Process and Thread Manager
Object Manager
Virtual Memory Manager
Win32K.SYS
Window Manager
Graphical Digital Interface
Kernel
Hardware Abstraction Layer (HAL)
Graphics Device Drivers
Hardware

PS > User Mode vs Kernel Mode

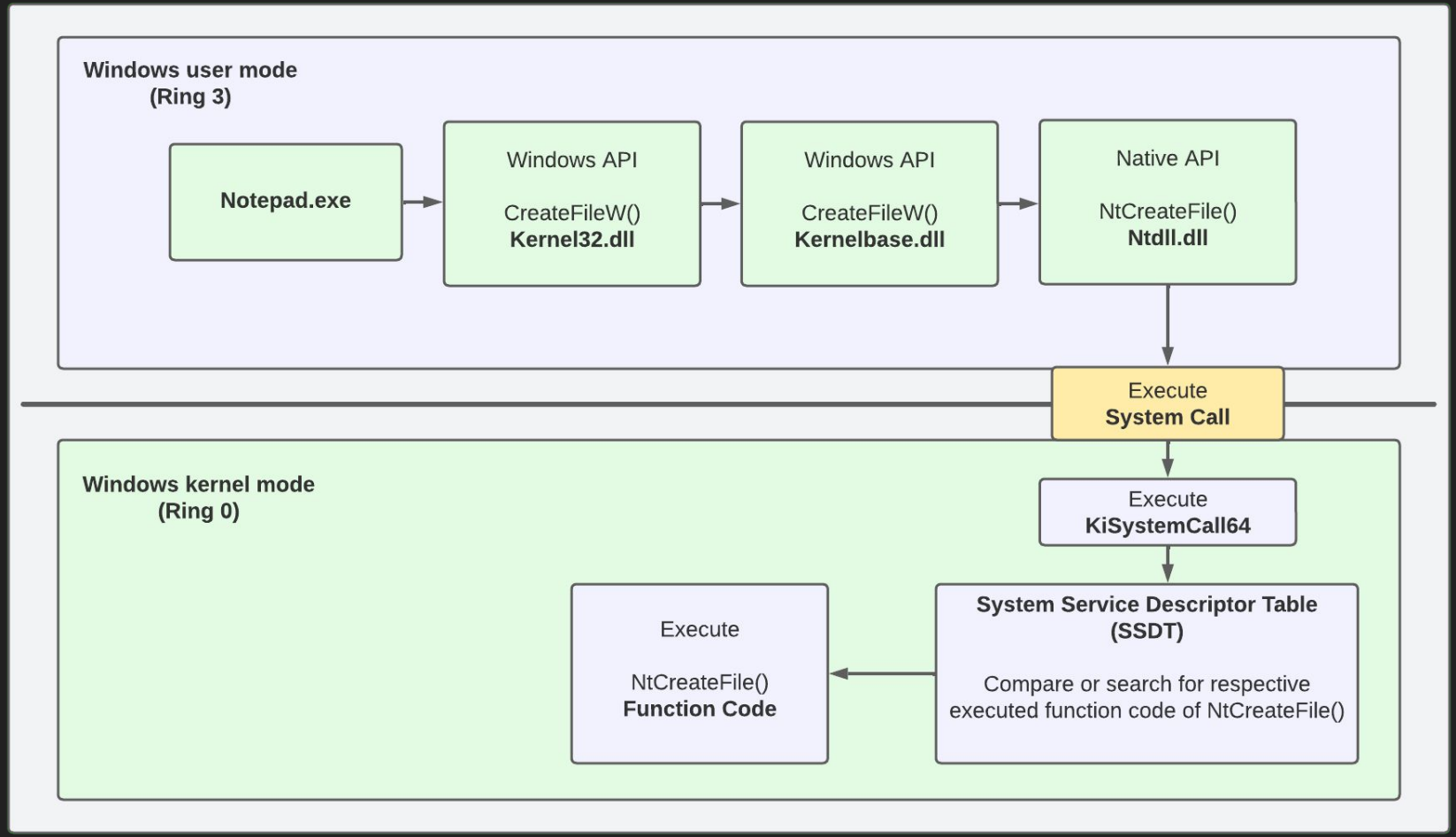
- User apps
- S.O. Services




Event Properties
Event
Process
Stack
Frame
Module
Location
Address
Path
K 0 FLTMGR.SYS FltDecodeParameters + 0x1c5d 0xfffff8070833555d C:\WINDOWS\System32\drivers\FLTMGR.SYS
K 1 FLTMGR.SYS FltDecodeParameters + 0x17bc 0xfffff807083350bc C:\WINDOWS\System32\drivers\FLTMGR.SYS
K 2 FLTMGR.SYS FltDecodeParameters + 0x1328 0xfffff80708334c28 C:\WINDOWS\System32\drivers\FLTMGR.SYS
K 3 FLTMGR.SYS FltDecodeParameters + 0x111e 0xfffff80708334a1e C:\WINDOWS\System32\drivers\FLTMGR.SYS
K 4 ntoskrnl.exe IofCallDriver + 0x59 0xfffff8005a332ae9 C:\WINDOWS\system32\ntoskrnl.exe
K 5 ntoskrnl.exe NtQueryInformationFile + 0x1071 0xfffff8005a8b0fa1 C:\WINDOWS\system32\ntoskrnl.exe
K 6 ntoskrnl.exe NtWriteFile + 0x8bd 0xfffff8005a8af18d C:\WINDOWS\system32\ntoskrnl.exe
K 7 ntoskrnl.exe setjmpex + 0x7805 0xfffff8005a47f085 C:\WINDOWS\system32\ntoskrnl.exe
U 8 ntdll.dll NtWriteFile + 0x14 0x7ffc5f55f864 C:\WINDOWS\SYSTEM32\ntdll.dll
U 9 KERNELBASE.dll WriteFile + 0x7a 0x7ffc5c04ebda C:\WINDOWS\System32\KERNELBASE.dll
U 10 notepad.exe notepad.exe + 0x5c0e 0x7ff7306f5c0e C:\WINDOWS\system32\notepad.exe
U 11 notepad.exe notepad.exe + 0x5fd1 0x7ff7306f5fd1 C:\WINDOWS\system32\notepad.exe
U 12 notepad.exe notepad.exe + 0x28e5 0x7ff7306f28e5 C:\WINDOWS\system32\notepad.exe
U 13 notepad.exe notepad.exe + 0x4037 0x7ff7306f4037 C:\WINDOWS\system32\notepad.exe
U 14 USER32.dll DispatchMessageW + 0x6a6 0x7ffc5e42ca66 C:\WINDOWS\System32\USER32.dll
U 15 USER32.dll DispatchMessageW + 0x1c2 0x7ffc5e42c582 C:\WINDOWS\System32\USER32.dll
U 16 notepad.exe notepad.exe + 0x448d 0x7ff7306f448d C:\WINDOWS\system32\notepad.exe
U 17 notepad.exe notepad.exe + 0x1ae07 0x7ff73070ae07 C:\WINDOWS\system32\notepad.exe
U 18 KERNEL32.DLL BaseThreadInitThunk + 0x14 0x7ffc5c997974 C:\WINDOWS\System32\KERNEL32.DLL
U 19 ntdll.dll RtlUserThreadStart + 0x21 0x7ffc5f52a271 C:\WINDOWS\SYSTEM32\ntdll.dll
Sys Call
Kernel-mode
User-mode

PS > Syscalls

- Access to hardware such as scanners and printers
- Network connections for sending and receiving data packets
- Reading and writing files
- and more…



The figure shows the transition from Windows user mode to kernel mode in the context of saving a file within notepad.exe.

Hands-on

PS > refs

https://training.zeropointsecurity.co.uk/courses/red-team-ops-ii
https://learn.microsoft.com/pt-br/windows/win32/procthread/about-processes-and-threads
https://synzack.github.io/Blinding-EDR-On-Windows/
https://www.outflank.nl/blog/2019/06/19/red-team-tactics-combining-direct-system-calls-and-srdi-to-bypass-av-edr/
https://redops.at/en/blog/direct-syscalls-a-journey-from-high-to-low