TRAS LAS SOMBRAS: EVADIENDO COMO EL ADVERSARIO

CARLOS GARRIDO

WHOAMI

HELLO S-1-1-0

- Red Team Operations Leader en Pentraze Cybersecurity.
- Instructor de Ciberseguridad (Red Team) en USACH.
- Security Research:
  - CVE-2023-2705 (Gravity Forms gAppointments – WordPress)
  - CVE-2023-2707 (Gravity Forms gAppointments – WordPress)
  - DPAPI For Impact (https://malapi.io/winapi/CryptProtectData)
  - Process Hypnosis
  - Interactive Cross-Session Token Impersonation Terminal
  - Extracting Active Directory Credentials from an unsealed and unaunthenticated HashiCorp Vault.

- Evasión de defensas
- Windows 101
- Arquitectura de un EDR
- Subverting the Windows Kernel
- ROP local para control de flujo sin corrupción de memoria
- Process hypnosis: Debugger assisted control flow hijack

AGENDA

Evasión de defensas

Sobrevolando la Pirámide del Dolor

Windows 101

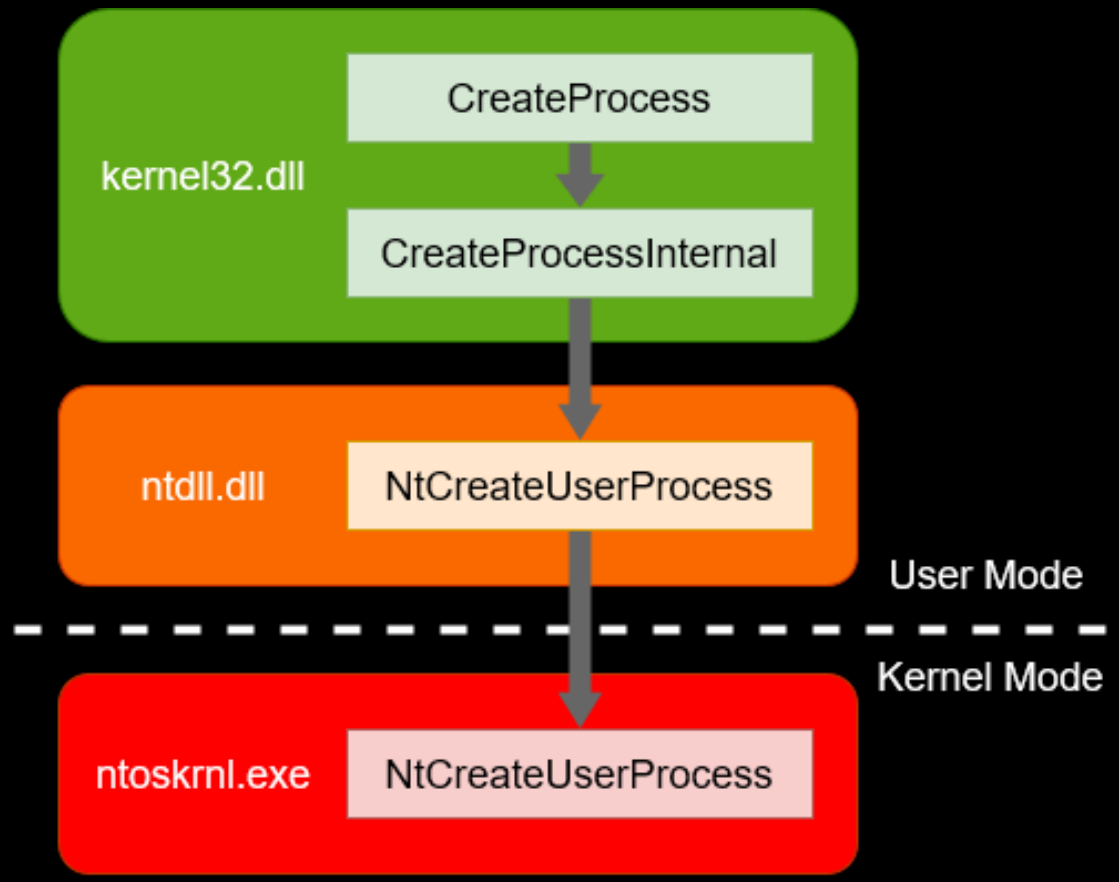
Win32 API

- API de Windows, también conocida como interfaz de programación de aplicaciones de Windows, facilita la comunicación entre los programas creados por el usuario y el sistema operativo Windows.

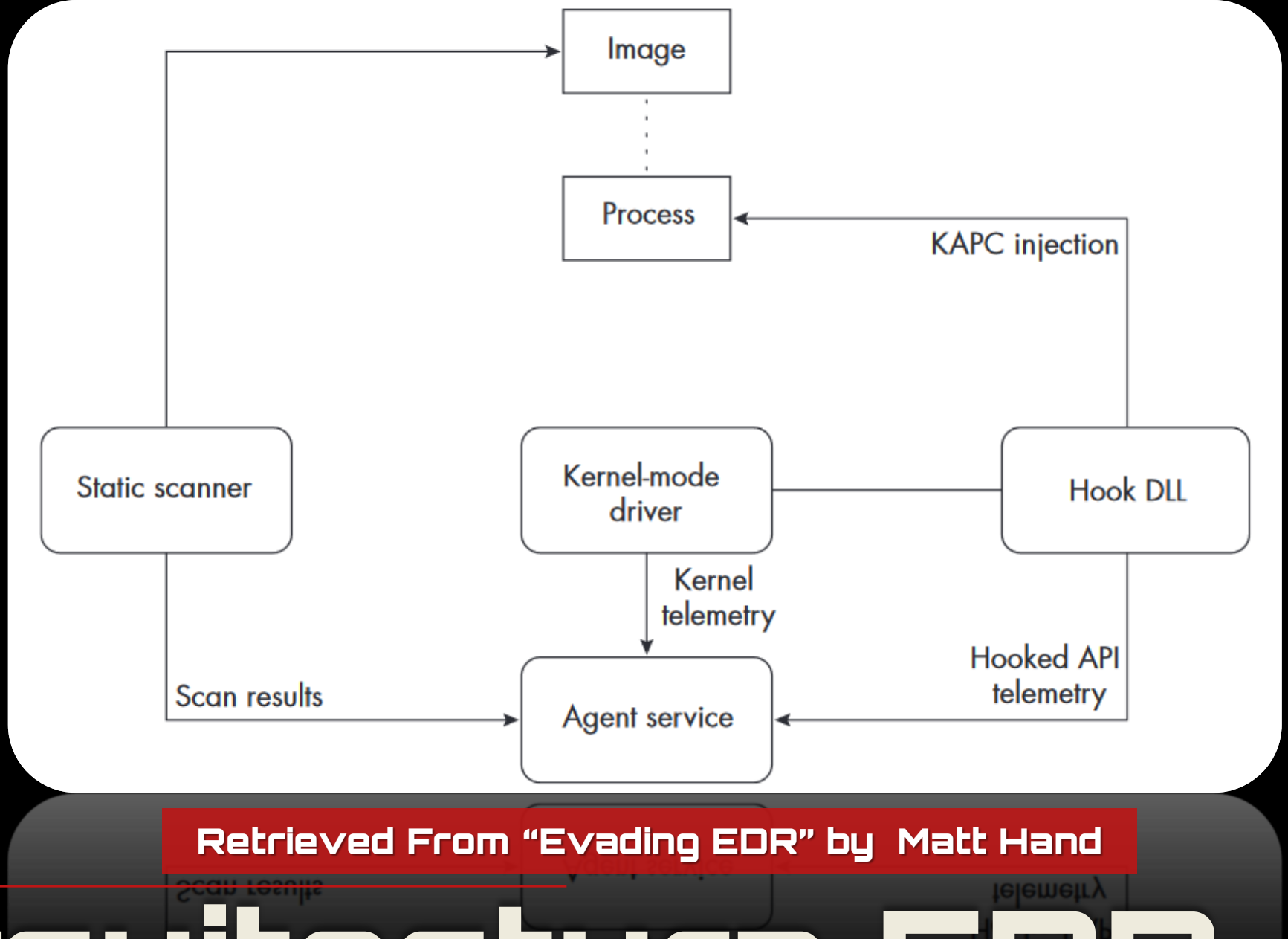
```C++
HANDLE CreateFileA(
  [in]           LPCSTR                lpFileName,
  [in]           DWORD                 dwDesiredAccess,
  [in]           DWORD                 dwShareMode,
  [in, optional] LPSECURITY_ATTRIBUTES lpSecurityAttributes,
  [in]           DWORD                 dwCreationDisposition,
  [in]           DWORD                 dwFlagsAndAttributes,
  [in, optional] HANDLE                hTemplateFile
);
```

```C++
BOOL MoveFileA(
  [in] LPCSTR lpExistingFileName,
  [in] LPCSTR lpNewFileName
);
```

Funciones NT



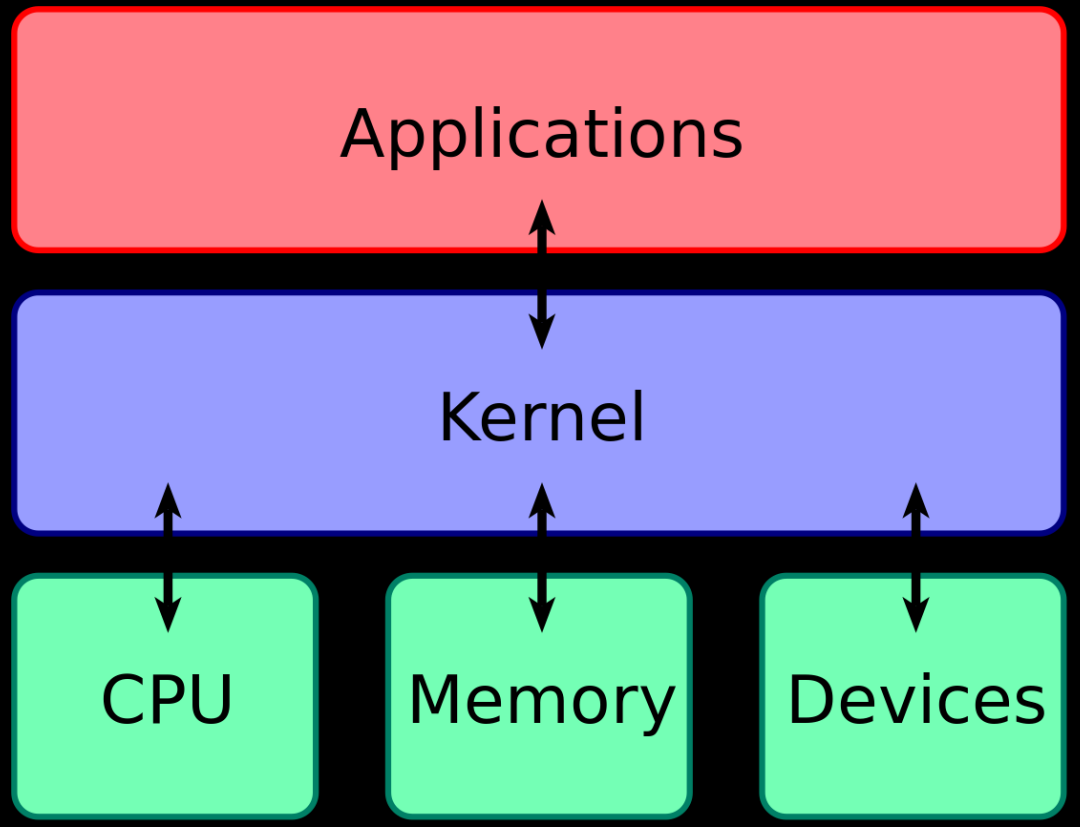
EDR



Retrieved From “Evading EDR” by Matt Hand

Arquitectura EDR

Subverting The Windows Kernel



Windows Kernel

Protected Process Light (PPL)

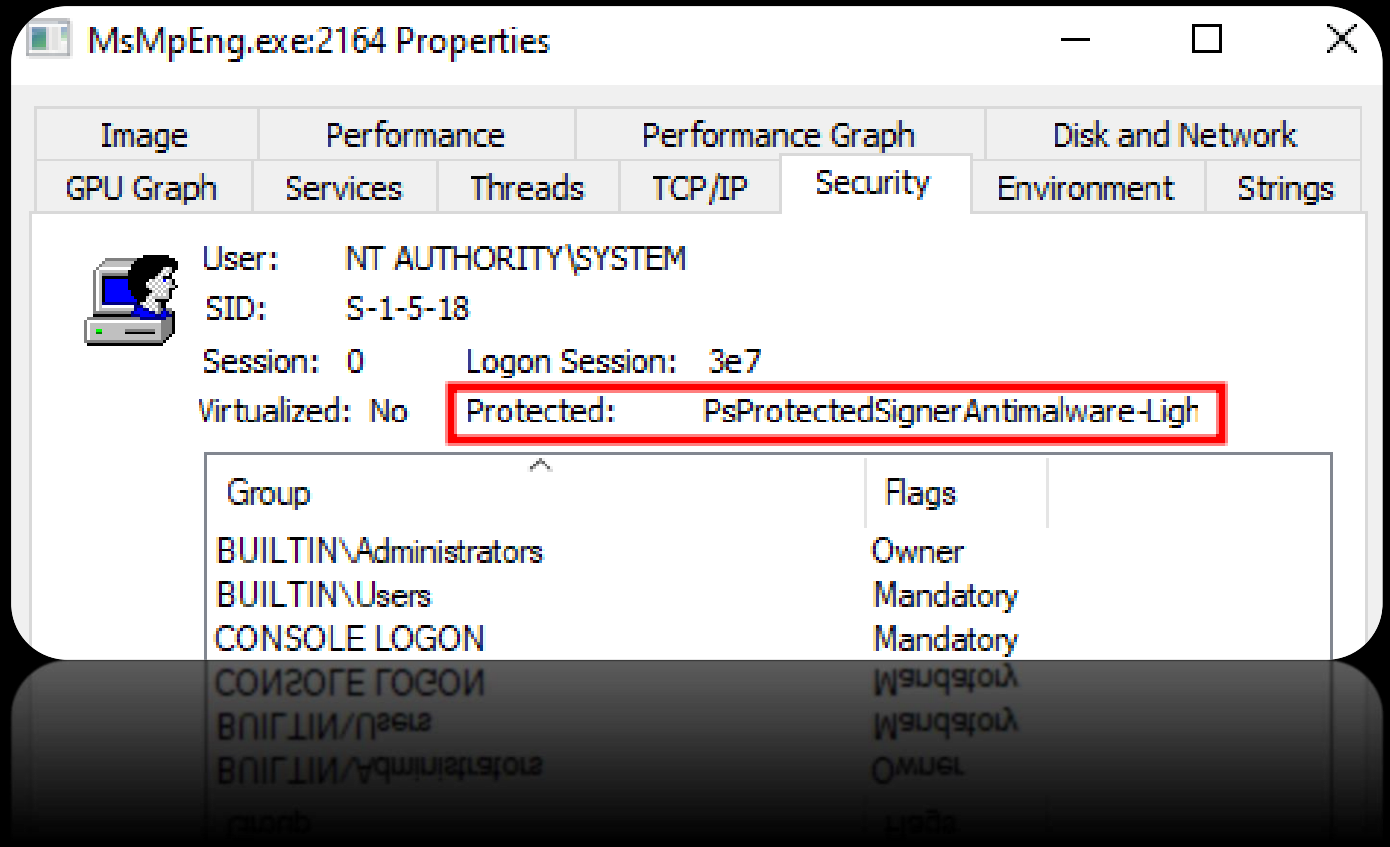
- PPL (Protected Process Light) es un mecanismo de seguridad.
- Permite la ejecución de programas con firmas especiales.
- Estos programas se ejecutan de manera protegida contra manipulaciones y terminaciones.
- Incluso los usuarios administrativos no pueden manipular o terminar estos programas.
- Su propósito es prevenir ataques de malware.
- También protege procesos críticos del sistema.

Protected Process Light (PPL) - LSASS

```
mimikatz # privilege::debug
Privilege '20' OK

mimikatz # sekurlsa::ekeys
ERROR kuhl_m_sekurlsa_acquireLSA ; Handle on memory (0x00000005)
```

Process	CPU	Private Bytes	Working Set	PID	Description	Protection	Integrity
lsass.exe	< 0.01	7,136 K	8,664 K	688		PsProtectedSignerLsa-Light	System

PPL Internals

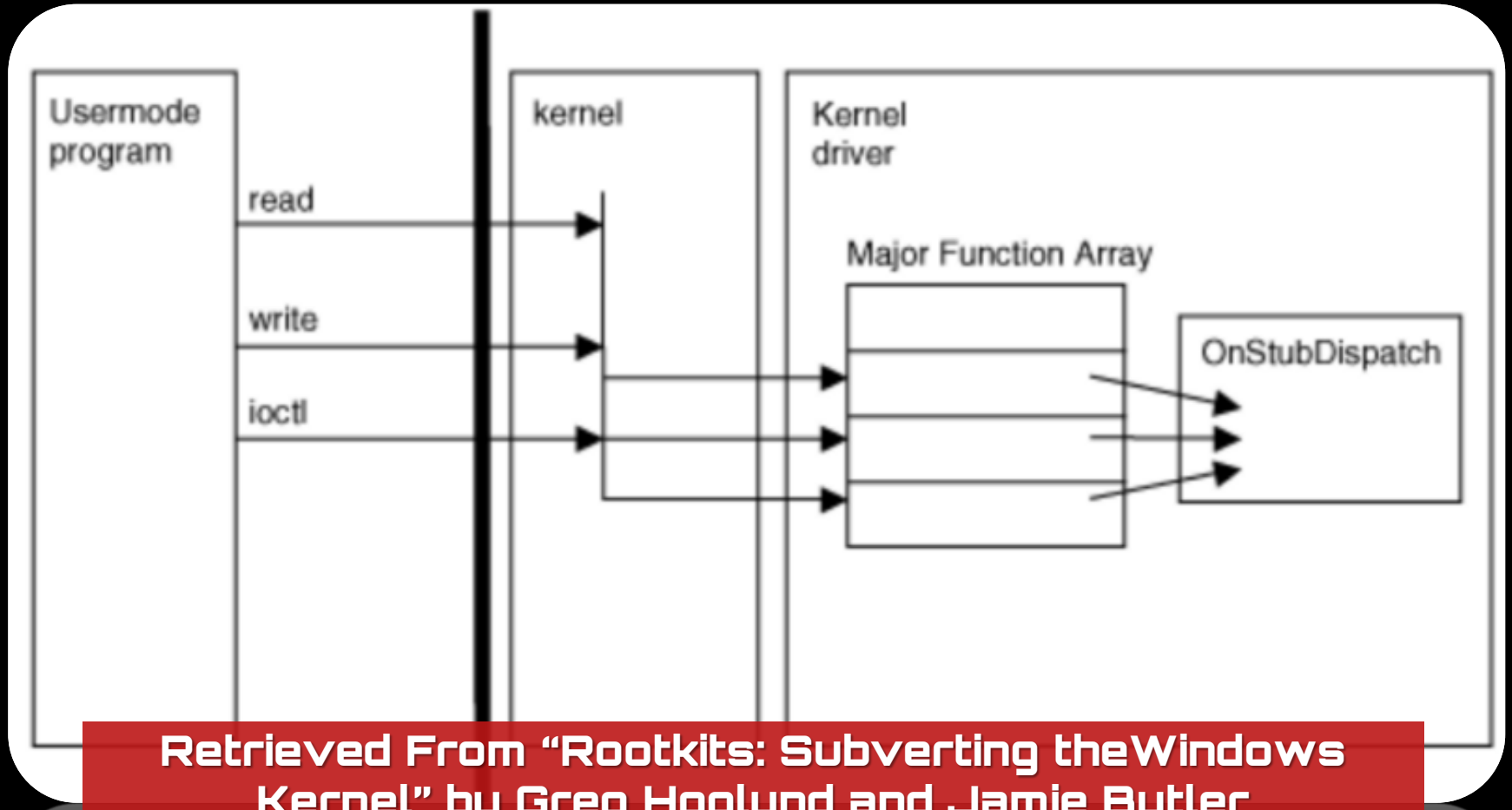


PPL Internals

```
0: kd> !process 0 0 Msmpeng.exe
PROCESS ffffad041e2850c0
    SessionId: 0  Cid: 0874    Peb: 3259603000  ParentCid: 0290
    DirBase: 533d3000  ObjectTable: ffff970c7c9c6180  HandleCount: 818.
    Image: MsMpEng.exe
```

```
0: kd> dt nt!_PS_PROTECTION (0xffffad041e2850c0 + 0x87a)
   +0x000 Level              : 0x31 '1'
   +0x000 Type               : 0y001
   +0x000 Audit              : 0y0
   +0x000 Signer             : 0y0011
```

```
0: kd> dt nt!_PS_PROTECTED_SIGNER
   PsProtectedSignerNone = 0n0
   PsProtectedSignerAuthenticode = 0n1
   PsProtectedSignerCodeGen = 0n2
   PsProtectedSignerAntimalware = 0n3
   PsProtectedSignerLsa = 0n4
   PsProtectedSignerWindows = 0n5
   PsProtectedSignerWinTcb = 0n6
   PsProtectedSignerWinSystem = 0n7
   PsProtectedSignerApp = 0n8
   PsProtectedSignerMax = 0n9
```

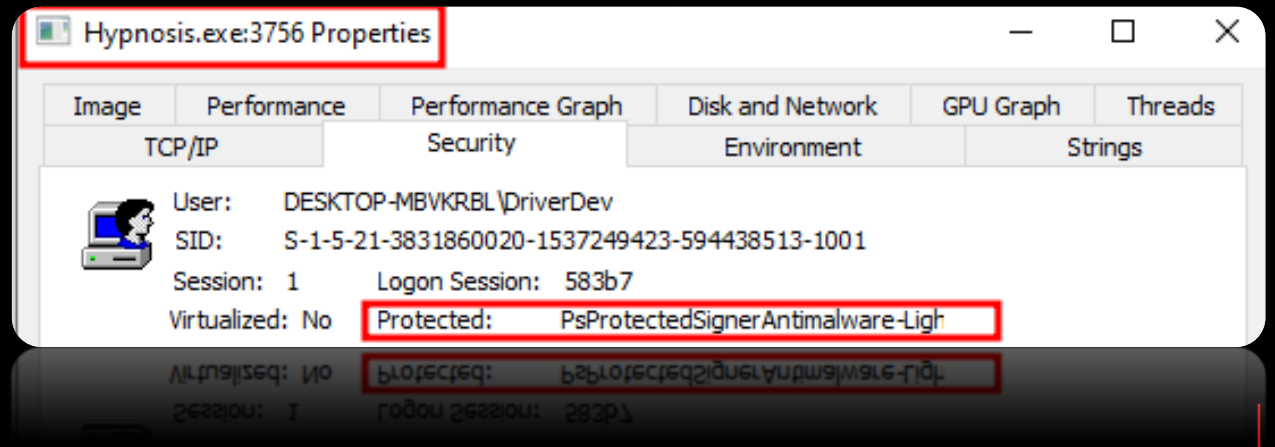


Retrieved From “Rootkits: Subverting theWindows Kernel” by Greg Hoglund and Jamie Butler

Kernel - Drivers

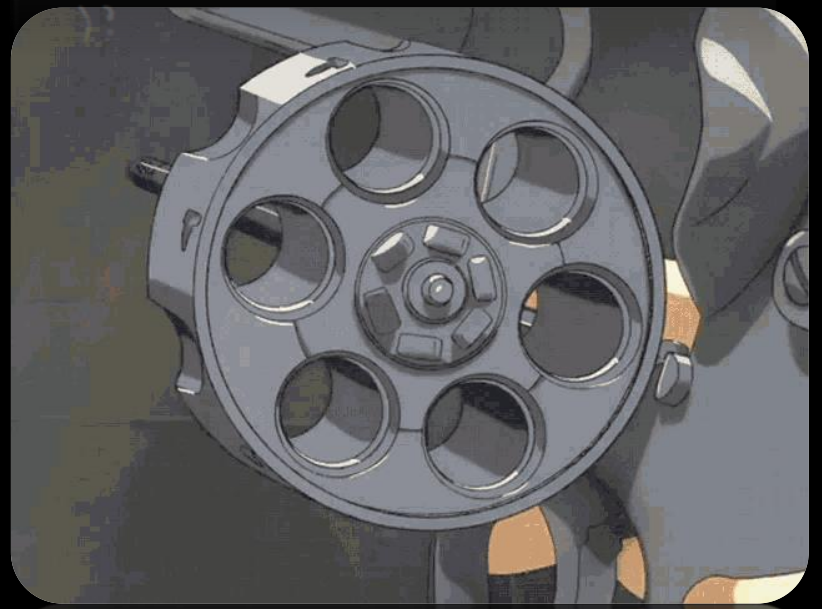
```
SERVICE_NAME: DriverDev
        TYPE               : 1  KERNEL_DRIVER
        STATE              : 4  RUNNING
                                (STOPPABLE, NOT_PAUSABLE,
IGNORES_SHUTDOWN)
        WIN32_EXIT_CODE    : 0  (0x0)
        SERVICE_EXIT_CODE  : 0  (0x0)
        CHECKPOINT         : 0x0
        WAIT_HINT          : 0x0
        PID                : 0
        FLAGS              :
```

```
C:\DriverDev>.\Client_Driver.exe 3756 2
[+] Opening handle to driver
[+] Calling IOCTL_PROTECT_PROCESS...
```

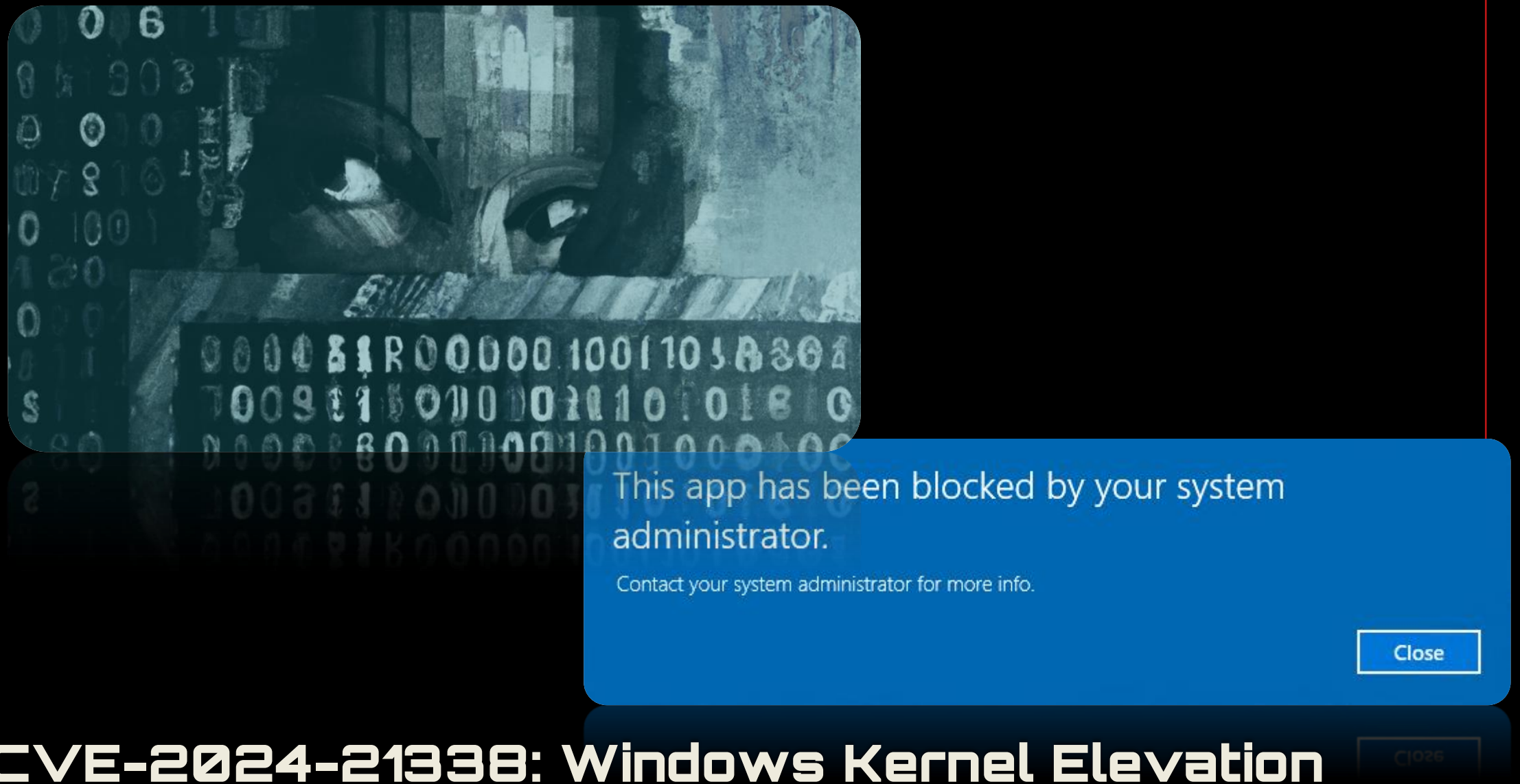


Bring your own Anti-Malware


```cpp
void KeBugCheck(
  [in] ULONG BugCheckCode
);
```



Kernel Patch Guard (KPP) & Driver Signature Enforcement

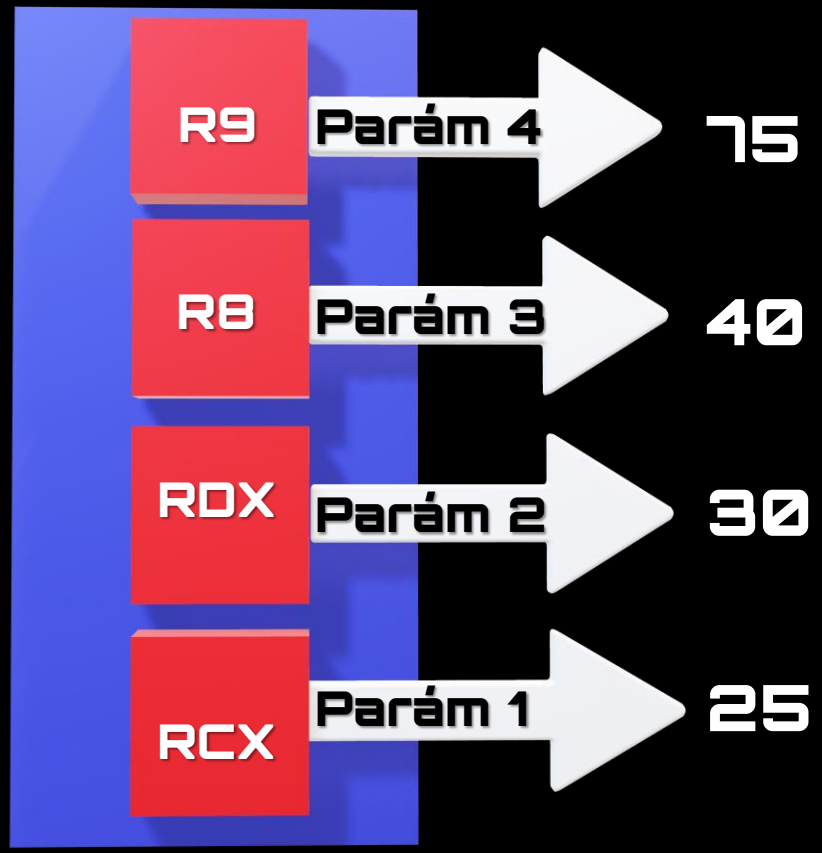


CVE-2024-21338: Windows Kernel Elevation of Privilege

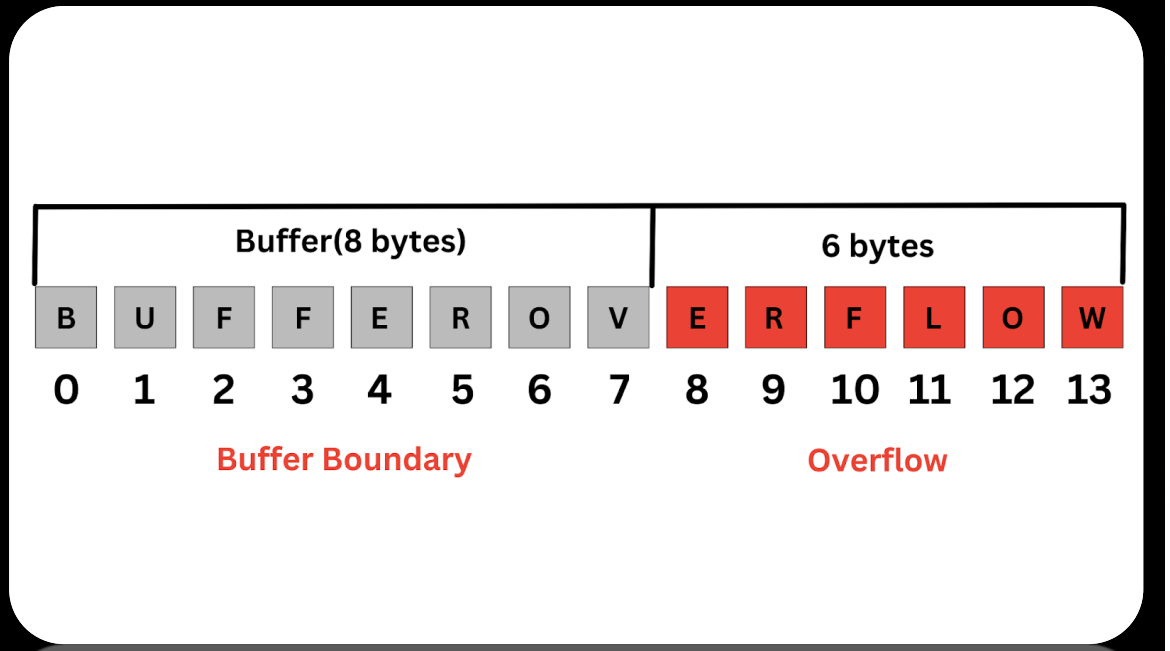
ROP Local para control de flujo sin corrupción de memoria

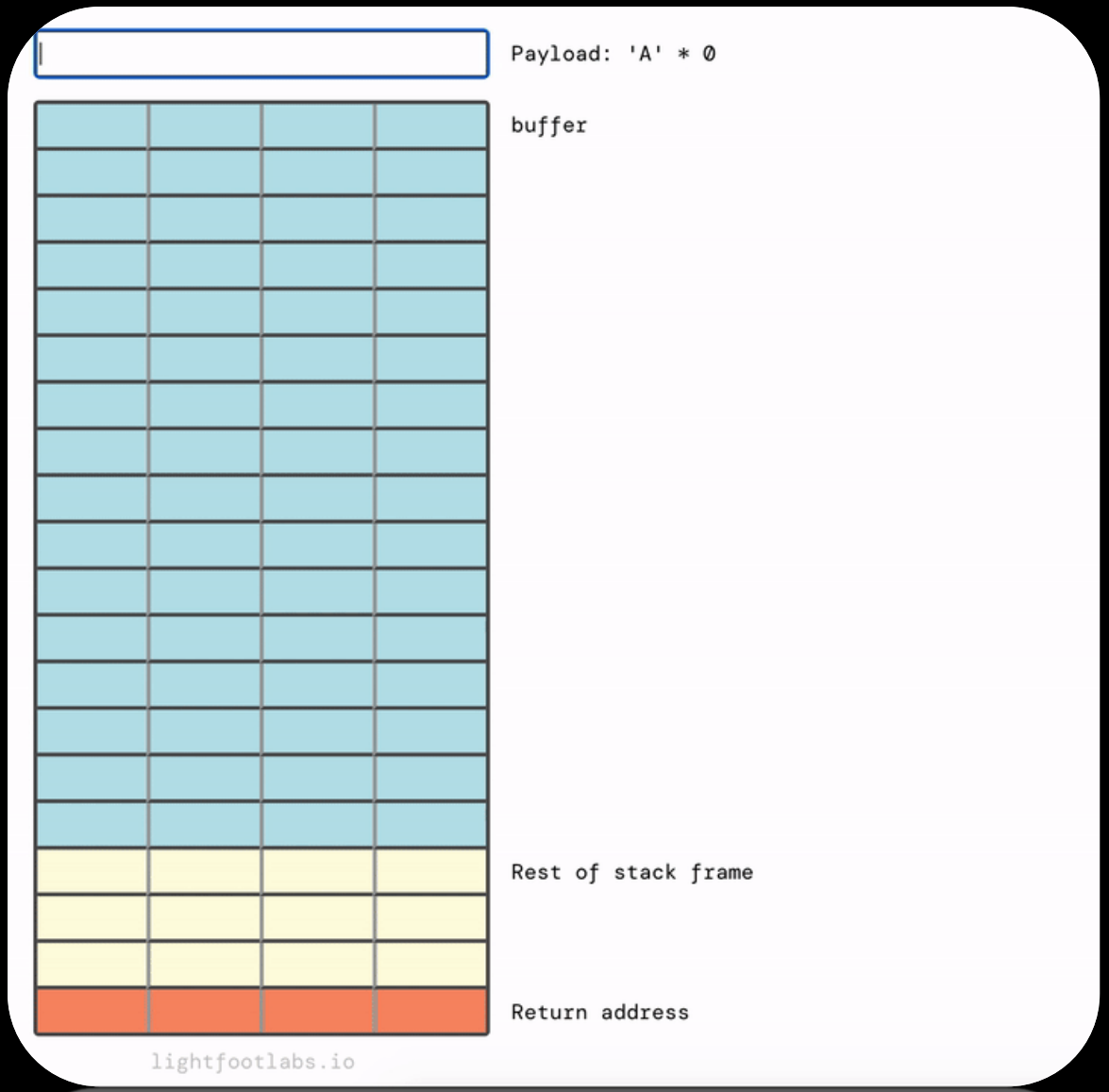
X64 FastCall Calling Convention

```
1    int suma (int p1, int p2, int p3, int p4){
2        int results = p1 + p2 + p3 + p4;
3        return results;
4    }
5
6    suma(25, 30, 40, 75);
```



Corrupción de memoria 101





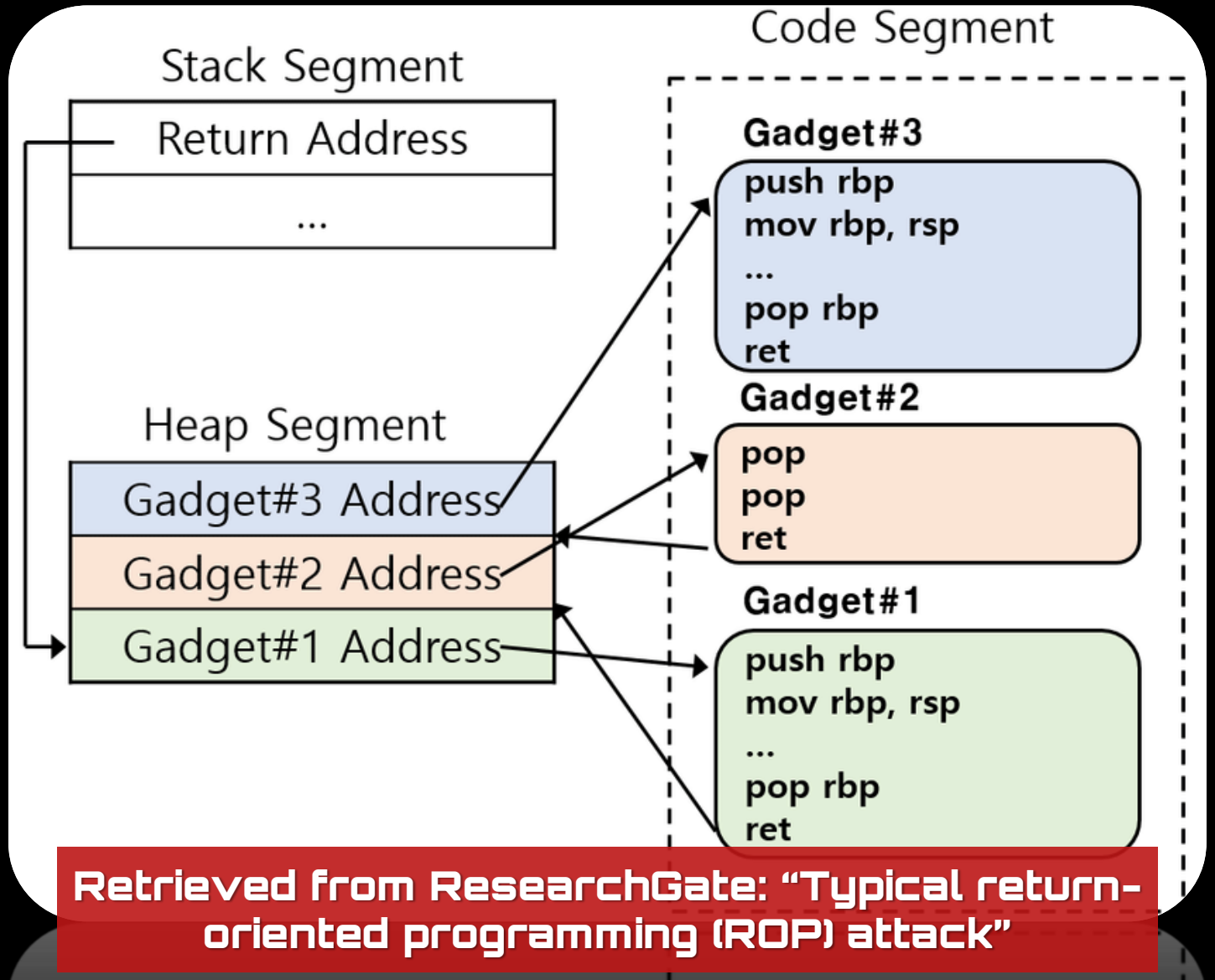
ROP Local para control de flujo sin corrupción de memoria

Data Execution Prevention (DEP)


```
773b1430 cc              int     3
0:006> !vprot eip
BaseAddress:        773b1000
AllocationBase:     77320000
AllocationProtect:  00000080  PAGE_EXECUTE_WRITECOPY
RegionSize:         00087000
State:              00001000  MEM_COMMIT
Protect:            00000020  PAGE_EXECUTE_READ
Type:               01000000  MEM_IMAGE
```

```
0:006> !vprot @esp
BaseAddress:        0661f000
AllocationBase:     065e0000
AllocationProtect:  00000004  PAGE_READWRITE
RegionSize:         00001000
State:              00001000  MEM_COMMIT
Protect:            00000004  PAGE_READWRITE
Type:               00020000  MEM_PRIVATE
```

ROP Local para control de flujo sin corrupción de memoria

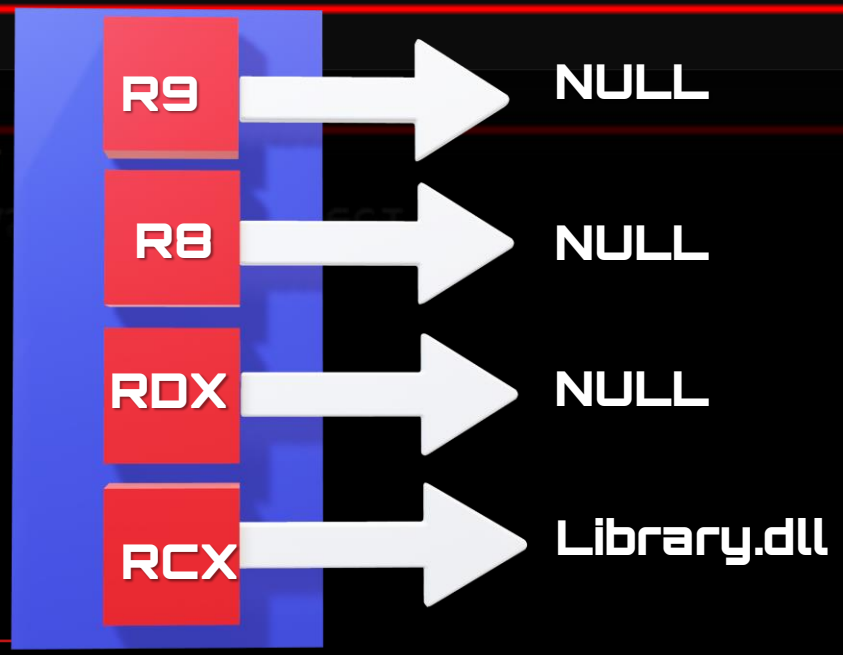


Retrieved from ResearchGate: "Typical return-oriented programming (ROP) attack"

Return Oriented Programming

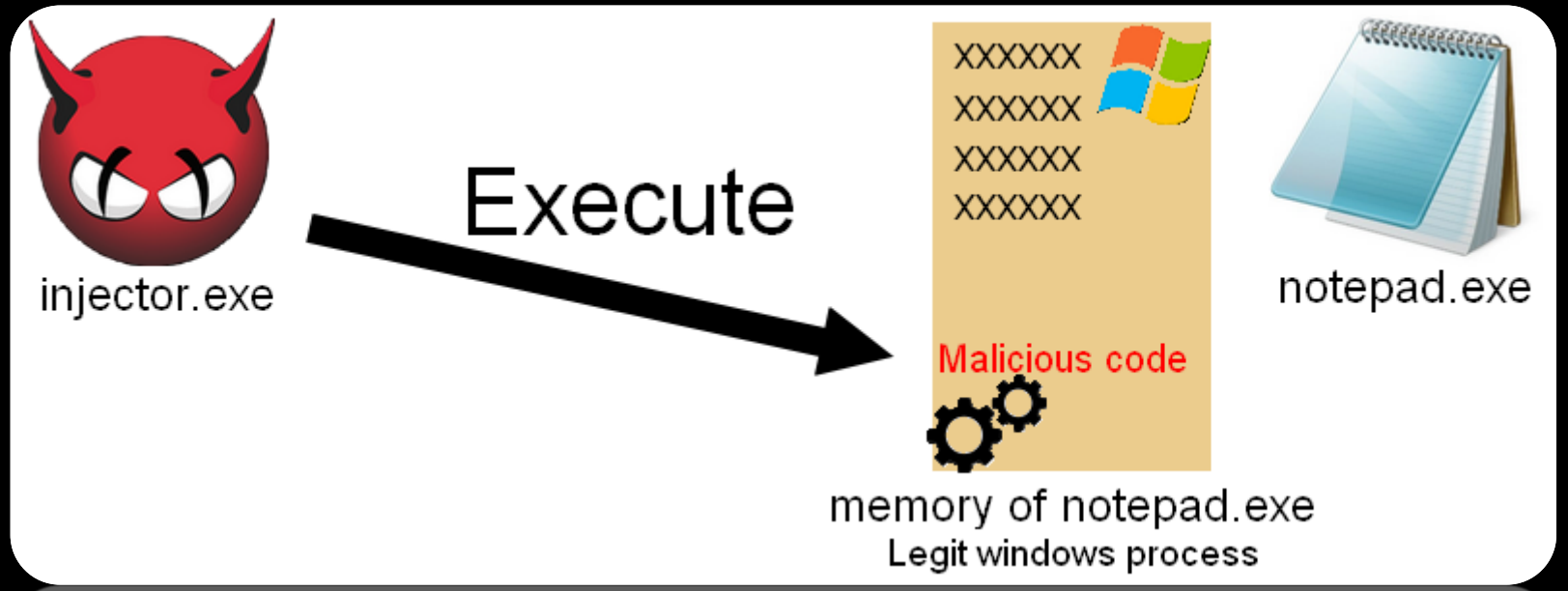
```
[+] Base Address of the process : 0x00007FF710B80000
[+] KernelBase.dll,  POS: 3 ADDRESS: 00007FF827E50000
[+] LoadLibraryW Address:  0x7ff827ed2480
[+] .data Section RVA: 0x7000
[+] .data Section Virtual Size: 0x730
[+] Target Data Cave: 0x00007FF710B87730
[+] Aligning Stack to 16 bytes boundary: 0x00007FF710B87750
[+] Gadget #1: POP RCX ; NOP ; MOV EAX, 0x0000007F ; RET --> KERNELBASE.dll + 0xa095e
[+] Gadget #2: POP RBX ; RET  --> KERNELBASE.dll + 0xbec1
[*] Gadget #3: CALL RBX --> KERNELBASE.dll + 0x7ab7
The command completed successfully.
```

```
C++

HMODULE LoadLibraryW(
  [in] LPCWSTR lpLibFileName
);
```

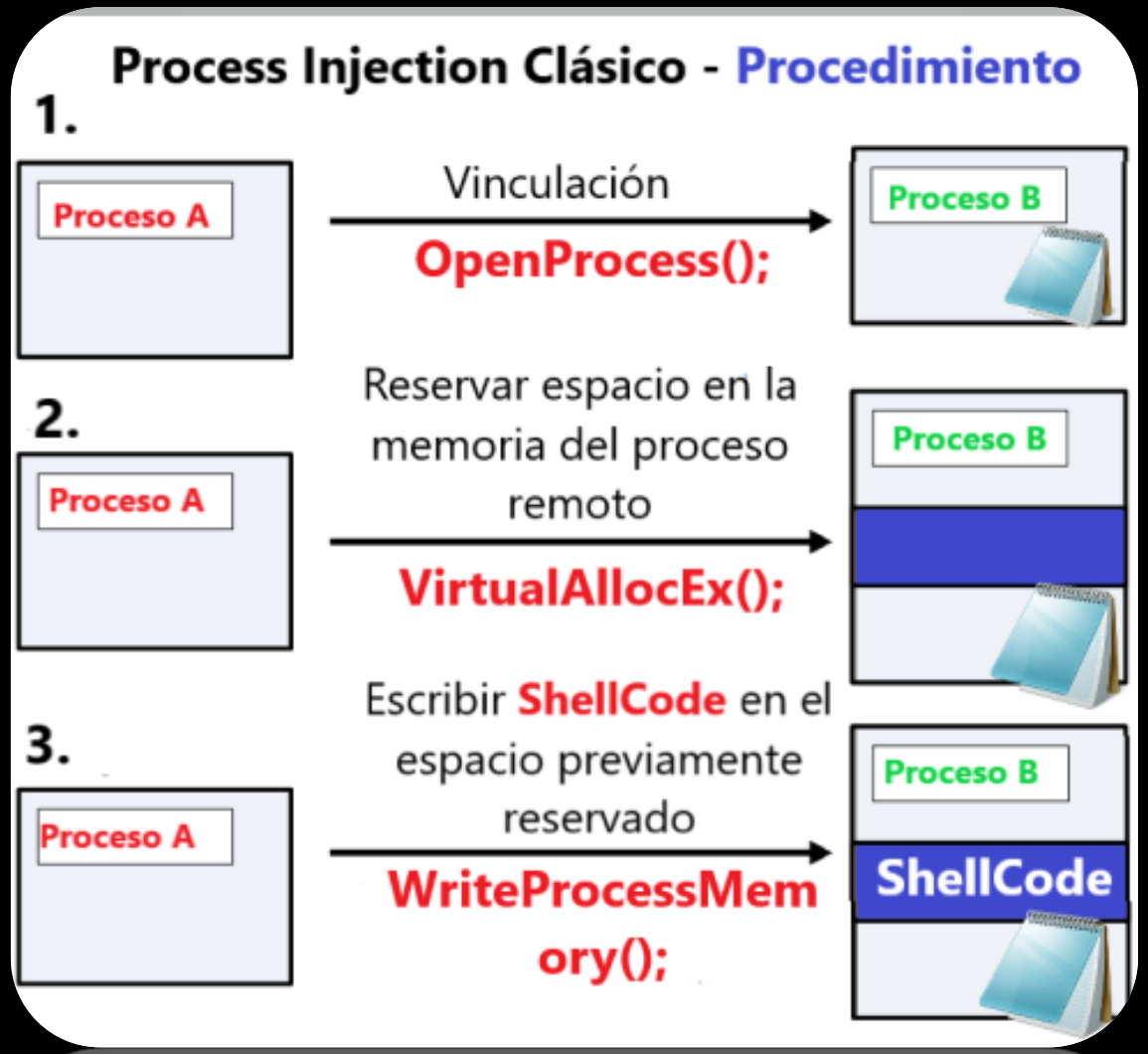


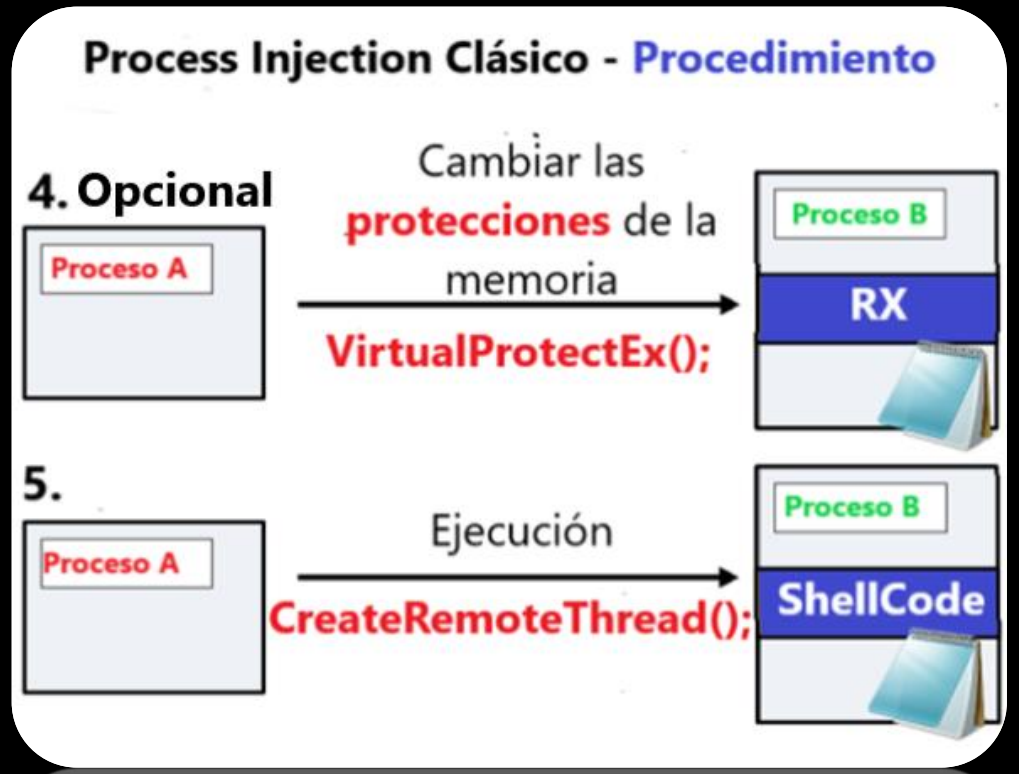
Return Oriented Programming

Process Hypnosis

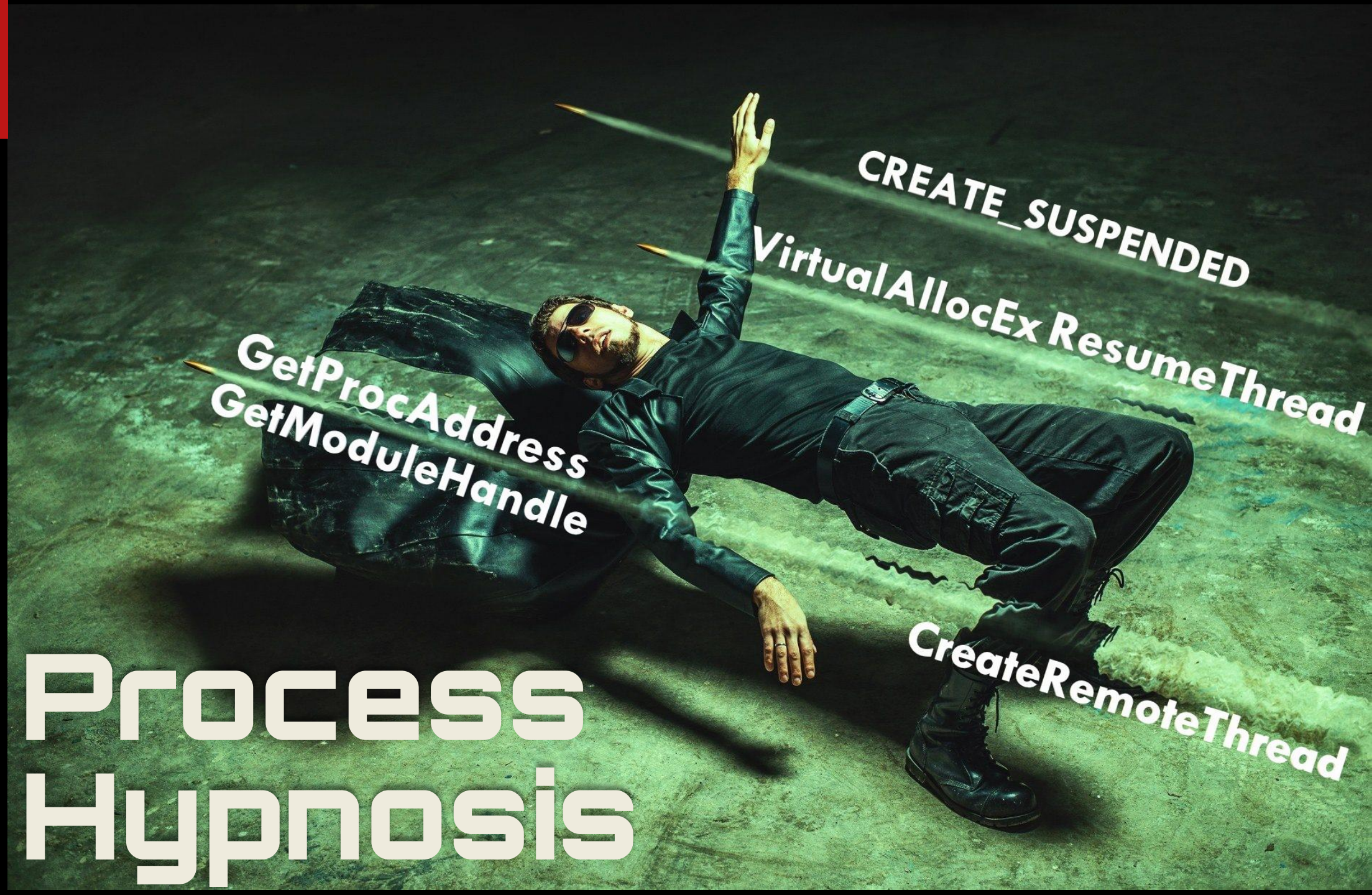


Process Injection (Clásico)





Process Injection (Clásico)



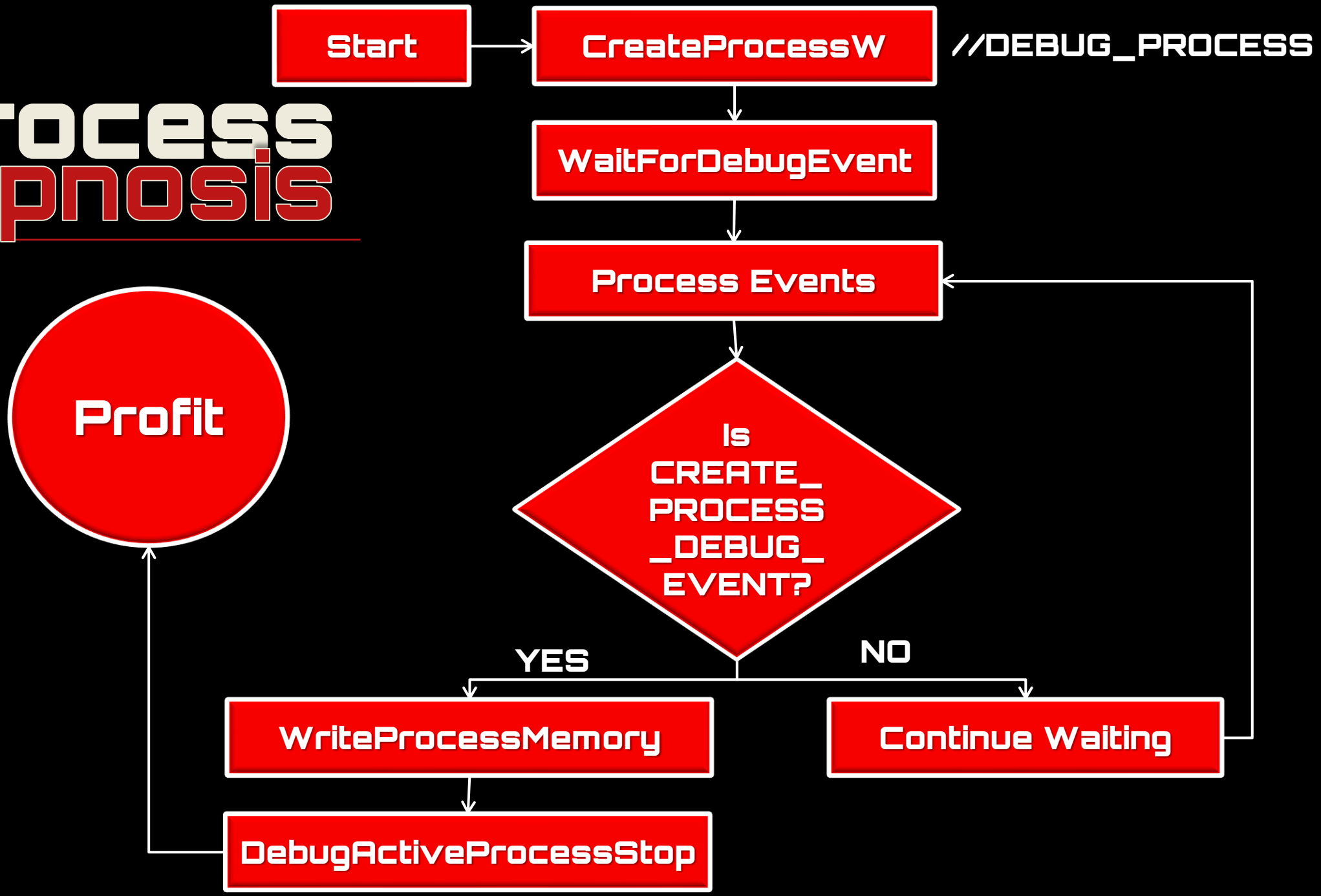
Process Hypnosis

Freeze

```
0: kd> bl
     0 e Disable Clear  fffff807`6e6b2184     0001 (0001) nt!PsFreezeProcess "!process -1 0; g"
     1 e Disable Clear  fffff807`6e71a744     0001 (0001) nt!PsThawProcess "!process -1 0"

0: kd> g
PROCESS ffff878b73339080
    SessionId: 1  Cid: 1558    Peb: 86d32fc000  ParentCid: 0fac
    DirBase: 4c5a8000  ObjectTable: ffffaf0e72a8e9c0  HandleCount:   0.
    Image: MRT.exe

PROCESS ffff878b73339080
    SessionId: 1  Cid: 1558    Peb: 86d32fc000  ParentCid: 0fac
FreezeCount 1
    DirBase: 4c5a8000  ObjectTable: ffffaf0e72a8e9c0  HandleCount:   0.
    Image: MRT.exe

nt!PsThawProcess:
fffff807`6e71a744 88542410        mov     byte ptr [rsp+10h],dl
```

Freeze

Process Hypnosis



```
[+] Process created successfully - PID: 20512
[+] New Process Created - PID: 20512
[+] New Thread Created - TID: 16868
[+] Process lpStartAddress: 0x00007FF69F835BC0
[+] Process Main Thread: 0x0000000000000144

[+] DLL Remote Address: 0x000000DAB9780268
[+] DLL Name: ntdll.dll
[+] DLL Base Address: 0x00007FFD269F0000
[+] DLL hFile: 0x0000000000000134

[+] CreateRemoteThread Address: 0x00007FFD2684B190

[+] DLL Remote Address: 0x0000026022E27C50
[+] DLL Name: C:\WINDOWS\System32\KERNEL32.DLL
[+] DLL Base Address: 0x00007FFD26810000
[+] DLL hFile: 0x0000000000000160
```

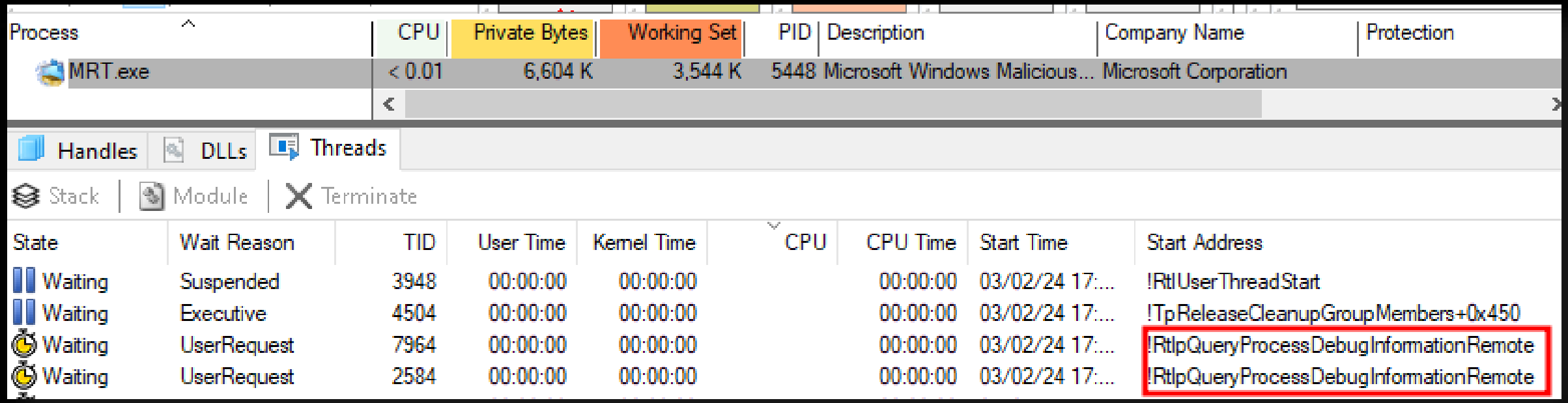
```
[+] New Thread Created: 0x00007FFEE89A2B30
[+] New Thread Handle: 0x0000000000000114
[+] New Thread ThreadLocalBase: 0x000000AA85F8C000
```

Process Hypnosis

```
[+] Process [DEBUG] created successfully - PID: 7436
[+] New Process Created - PID: 7436
[+] New Thread Created - TID: 6836
[+] Process lpStartAddress: 0x00007FF7244D5BC0
[+] Process Main Thread: 0x00000000000000DC

[+] Shellcode was successfully written [327 bytes]

[+] Successfully detached from the DEBUG process. Continuing the process' flow execution...
```

Process Hypnosis

¿Qué evadimos?



RtlQueryProcessDebugInformationRemote –

Función no documentada

Detección

THANK YOU