UNIVERSITY OF SCIENCE AND TECHNOLOGY OF HANOI

Information and Communication Technology Department

Final Report Part 1.1

Malware Analyst

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Ha Noi, 12 December 2024

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Basic Static Analysis

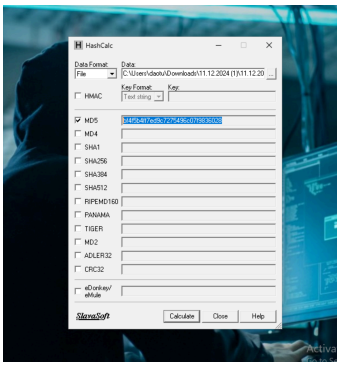
Purpose

The idea here is to glean any information from the file itself. This information is useful because it gives us an idea of what to expect when we run the executable, and may give us enough information to tweak our tools to get more out of the following basic dynamic analysis.

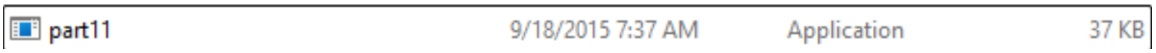
File information

File:part11.exe

MD5: bf4f5b4ff7ed9c7275496c07f9836028. Using HashClac to find MD5



Size File: 37KB.

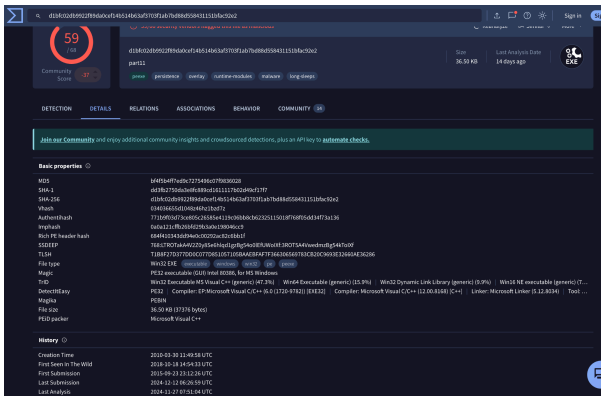


VirusTotal

Detection ratio: 59/68

Packers Identified: Not packed

Creation Time: 2010-03-30 11:49:58 UTC



Interesting Sections:

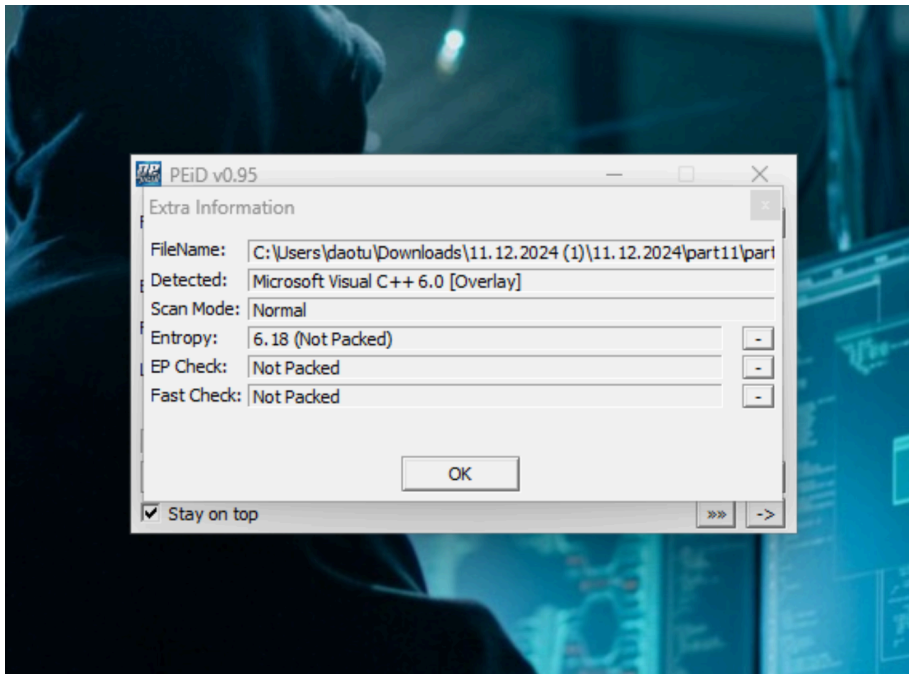
Sections

Name	Virtual Address	Virtual Size	Raw Size	Entropy	MD5	Chi2
.text	4096	29114	29184	6.6	fec4f9ce4bdabdd0a69037ce73cc7bdd	169673.19
.rdata	36864	3446	3584	5.22	a1496b151ceb8edaa8b2ede718108456	85707.62
.data	40960	8988	3072	2.2	efbbde8ca7f252ba3dbcf87d5c04fe50	469798

Figure 1: Section information from VirusTotal

PEiD

PEiD shows the file is not packed.

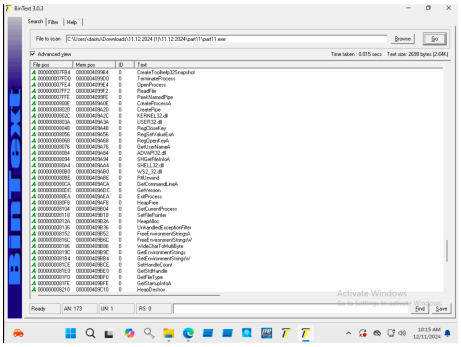


Dependency Walker

KERNEL32.DLL
ADVAPI32.DLL
SHELL32.DLL
WS2_32.DLL

A 00000000802C	000000409A2C	0	KERNEL32.dll
A 00000000803A	000000409A3A	0	USER32.dll
A 000000008048	000000409A48	0	RegCloseKey
A 000000008056	000000409A56	0	RegSetValueExA
A 000000008068	000000409A68	0	RegOpenKeyA
A 000000008076	000000409A76	0	GetUserNameA
A 000000008084	000000409A84	0	ADVAPI32.dll
A 000000008094	000000409A94	0	SHGetFileInfoA
A 0000000080A4	000000409AA4	0	SHELL32.dll
A 0000000080B0	000000409AB0	0	WS2_32.dll

Bintext



Some function-like names that aren’t in the imports list.

+)KERNEL32.DLL

- CloseHandle
- CopyFileA
- CreateFileA
- CreateFileMappingA
- CreatePipe
- CreateProcessA
- CreateToolhelp32Snapshot
- DeleteFileA
- ExitProcess
- FileTimeToSystemTime

+)ADVAPI32.DLL

- GetUserNameA
- RegCloseKey
- RegOpenKeyA
- RegSetValueExA

+)SHELL32.DLL

- SHGetFileInfoA

+)WS2_32.DLL

- closesocket
- connect
- gethostbyname
- gethostname
- htons
- inet_addr
- inet_ntoa
- recv
- send
- Socket

Conclusion

The Total virus report has enough basic information for static analysis because the information is not packed.

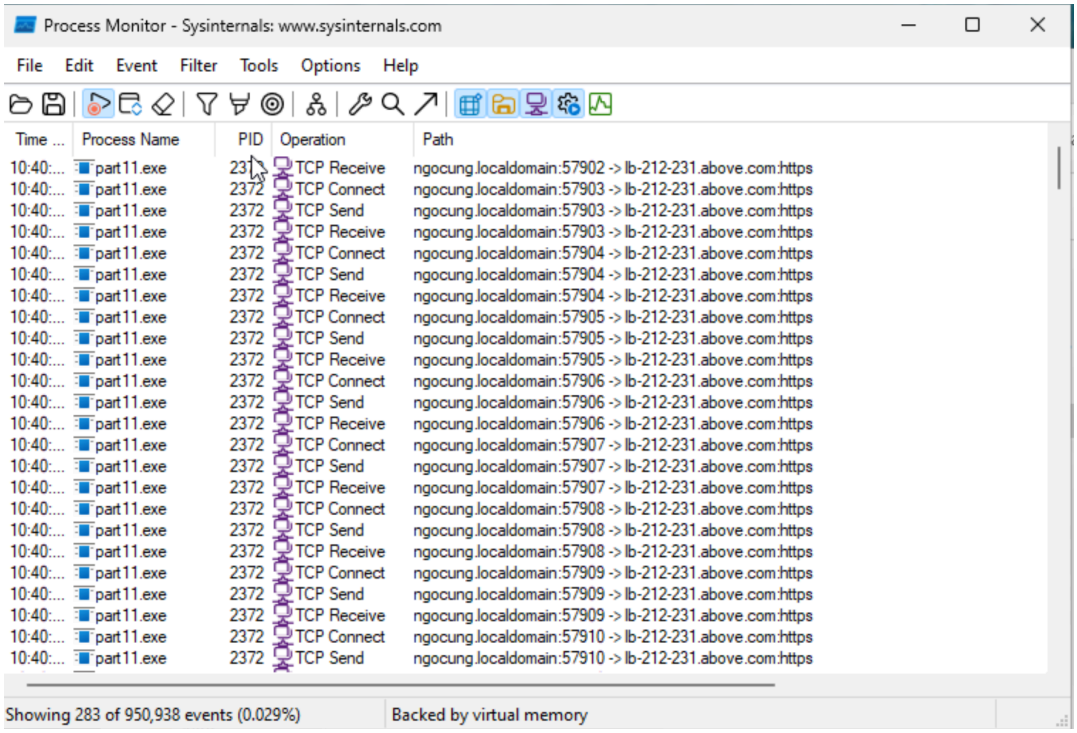
Basic Dynamic Analysis

Purpose

By running the program and analyzing its effects on the system we can get a first-hand look of the malware in action. This gives us some context when we disassemble the executable during advanced static analysis. It also allows us to develop host or network based signatures to identify the presence of this malware on a system in the future.

ProcessMonitor

Access crypto libs a lot, probably for the unpacking procedure.

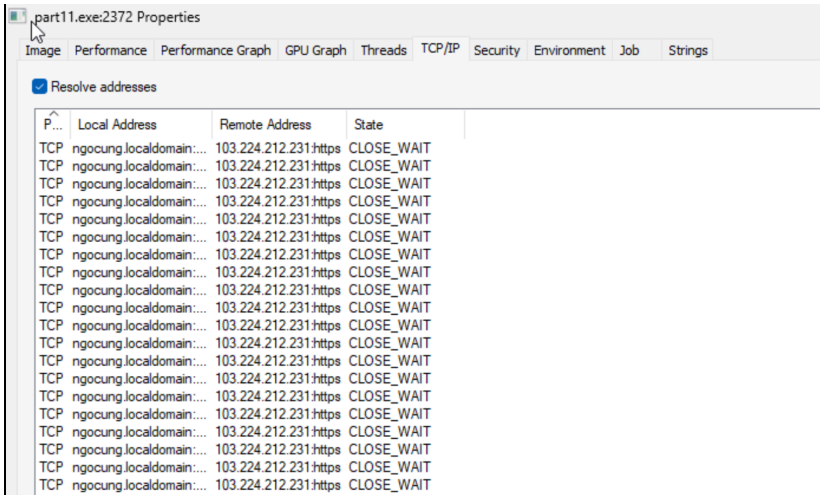


The file contains **4 types of operations (`Operation`)**. Here's the list of operation types and their general purposes:

1. TCP Receive
   - Description: Represents the activity of receiving data over a TCP network connection.
   - Purpose: Used to gather data sent from a server or another device through a TCP link.
2. TCP Connect
   - Description: Represents the establishment of a new TCP connection between two devices (e.g., client and server).
   - Purpose: Allows a process to connect to a server or another service over the network.
3. TCP Send
   - Description: Represents sending data over a TCP connection to the network.
   - Purpose: Facilitates data transmission from the current process to a server or another device.
7. TCP Reconnect
   - Description: Represents re-establishing a TCP connection, usually after a previous connection was interrupted.
   - Purpose: Maintains communication with a server or another device following a lost connection.

ProcessExplorer

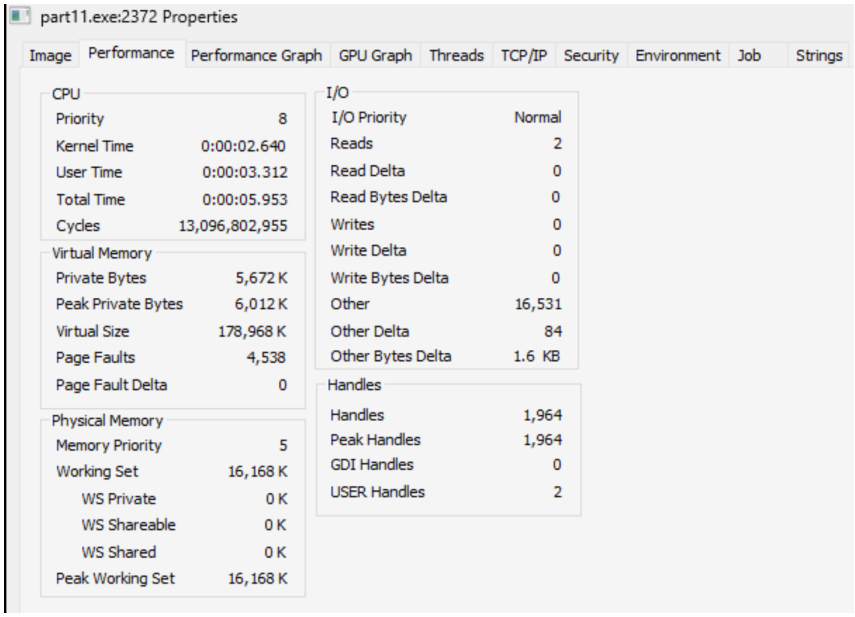
1. TCP/IP maintains multiple `CLOSE_WAIT` TCP connections to `103.224.212.231` on port 443, suggesting improper connection handling. This may indicate inefficient coding or potential malicious activity; further investigation is needed.



2. Performance for the process, detailing resource usage. Key points include:

- CPU: Low usage with a total time of 5.9 seconds and priority 8.
- Memory: Moderate use of virtual memory (178,968 K virtual size) with 16,168 K in the working set.
- I/O: 16,531 "Other" I/O operations suggest unusual activity.
- Handles: 1,964 handles, which is relatively high.

This behavior could indicate potentially abnormal or resource-intensive activity. Further analysis or sandbox testing is recommended.



Conclusion

The file contains seven operations: TCP Receive, TCP Connect, TCP Send, Thread Create, Thread Exit, ReadFile, and TCP Reconnect. Most involve network communication (*Receive, Send, Connect, Reconnect*), while others manage threading

(*Create, Exit*) or file access (*ReadFile*). Network operations dominate, indicating a system focused on data transmission and connectivity.

Advanced Static Analysis

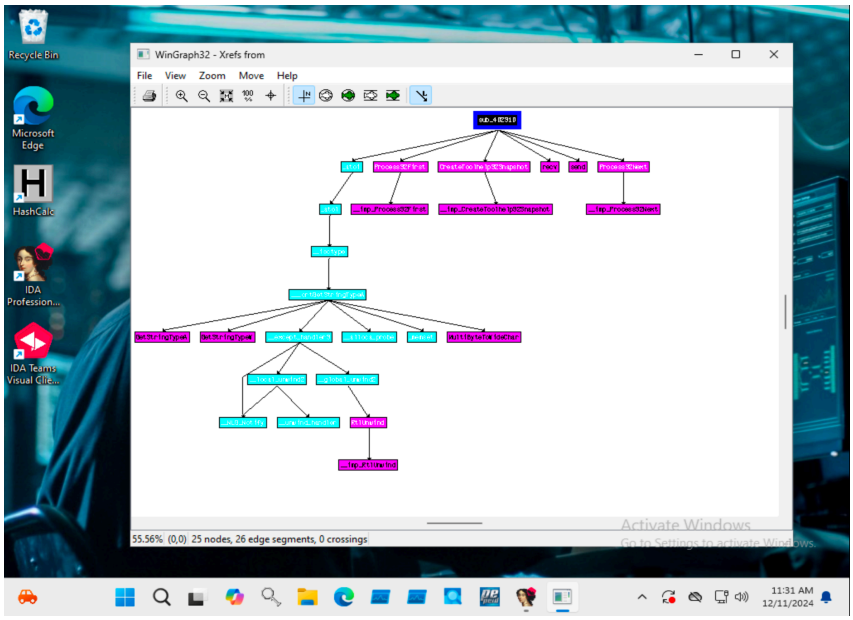
Purpose

The purpose is to analyze malware functions, control flow analysis, and generate function and variable names.

IDA

+) Lists processes: 0x0402310 Probably a function to provide a list of the system's active processes. It may make use of APIs like as Process32First, Process32Next, and CreateToolhelp32Snapshot.

Graph:



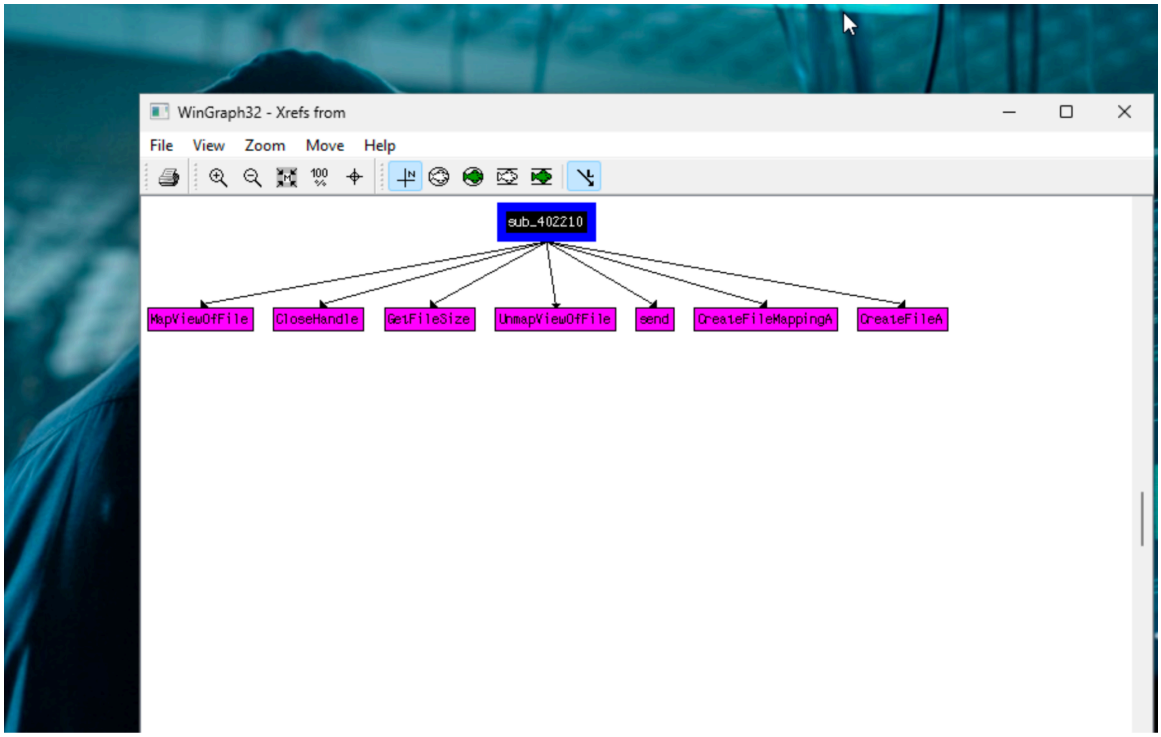

```
; int __cdecl sub_402310(SOCKET s)
sub_402310 proc near

String= byte ptr -236h
hSnapshot= dword ptr -234h
buf= byte ptr -230h
var_130= dword ptr -130h
var_12C= dword ptr -12Ch
pe= PROCESSENTRY32 ptr -128h
s= dword ptr  4

sub     esp, 238h
push    ebx
push    0               ; th32ProcessID
push    2               ; dwFlags
mov     [esp+244h+pe.dwSize], 128h
call    CreateToolhelp32Snapshot
lea     ecx, [esp+23Ch+pe]
mov     [esp+23Ch+hSnapshot], eax
push    ecx             ; lppe
push    eax             ; hSnapshot
mov     [esp+244h+var_12C], 1
call    Process32First
mov     ebx, [esp+23Ch+s]
test    eax, eax
jz      loc_4023F8
```

CreateToolhelp32Snapshot: Captures a snapshot of all processes.

Process32First: Retrieves the first process in the snapshot.

Process32Next: Iterates through the remaining processes.

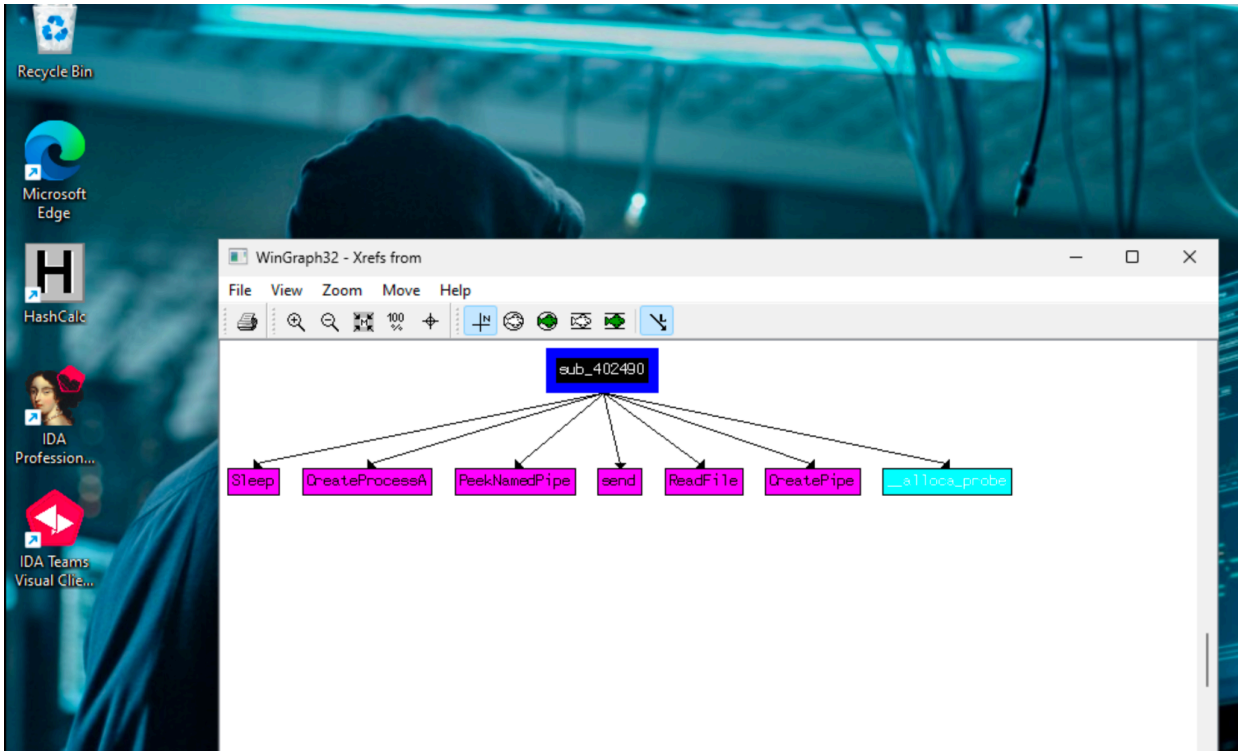
+)Upload File (0x00402210): A file is XOR-encrypted using the key 0x55 and uploaded to a distant server via a socket using the sub_402210 function (already examined).




```
; int __cdecl sub_402210(SOCKET s, LPCSTR lpFileName)
sub_402210 proc near

buf= byte ptr -204h
len= dword ptr -4
s= dword ptr  4
lpFileName= dword ptr  8

mov     ecx, [esp+lpFileName]
sub     esp, 204h
xor     eax, eax
push    ebx
push    esi
push    edi
```

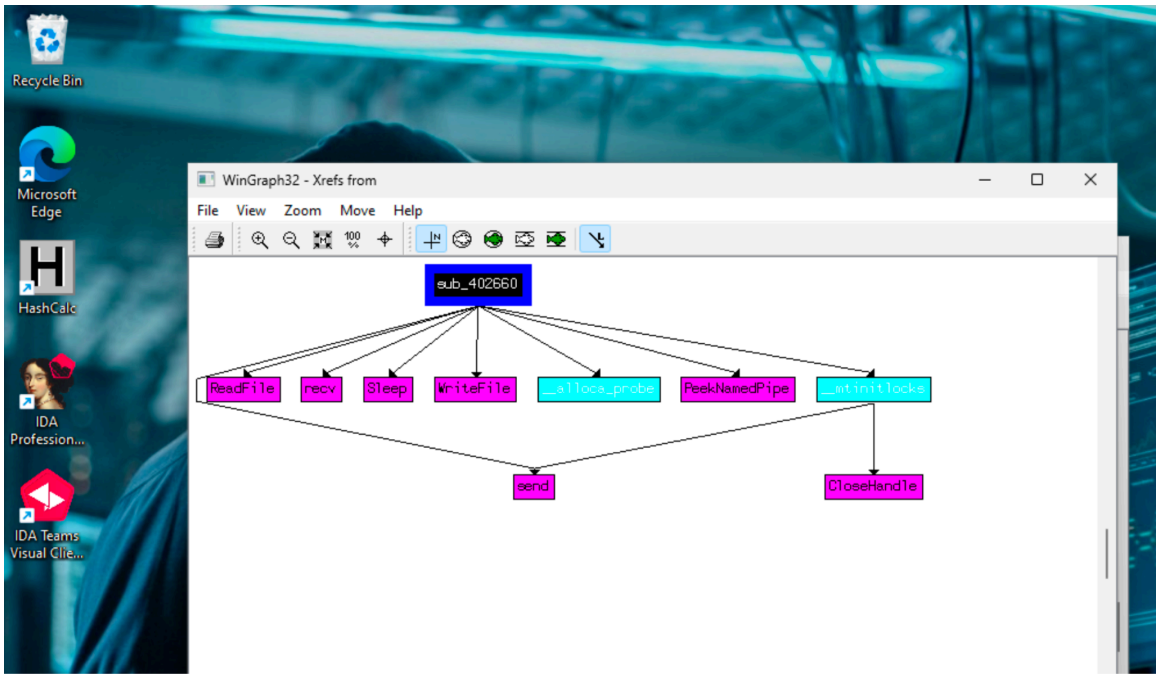
+)Remote Shell (0x0402490 and 0x0402660): By enabling a remote shell, an attacker might take control of the compromised system and run commands on it. They may transmit and receive commands via a socket or communicate with cmd.exe.

0x0402490:




```
; int __cdecl sub_402490(SOCKET s)
sub_402490 proc near

PipeAttributes= _SECURITY_ATTRIBUTES ptr -106Ch
CommandLine= byte ptr -1060h
var_105C= dword ptr -105Ch
StartupInfo= _STARTUPINFOA ptr -1058h
ProcessInformation= _PROCESS_INFORMATION ptr -1014h
Buffer= byte ptr -1004h
var_4= dword ptr -4
s= dword ptr  4

mov     eax, 106Ch
call    __alloca_probe
push    ebx
push    ebp
push    esi
mov     esi, ds:CreatePipe
xor     ebx, ebx
push    edi
lea     eax, [esp+107Ch+PipeAttributes]
push    ebx             ; nSize
push    eax             ; lpPipeAttributes
mov     ebp, 1
push    offset hWritePipe ; hWritePipe
push    offset hNamedPipe ; hReadPipe
mov     [esp+108Ch+PipeAttributes.nLength], 0Ch
mov     [esp+108Ch+PipeAttributes.lpSecurityDescriptor], ebx
mov     [esp+108Ch+PipeAttributes.bInheritHandle], ebp
call    esi ; CreatePipe
lea     ecx, [esp+107Ch+PipeAttributes]
push    ebx             ; nSize
push    ecx             ; lpPipeAttributes
push    offset hFile    ; hWritePipe
push    offset dword_40AA8C ; hReadPipe
```

0x0402660:




```
; int __cdecl sub_402660(SOCKET s, LPCVOID lpBuffer)
sub_402660 proc near

var_100C= dword ptr -100Ch
buf= byte ptr -1006h
Buffer= byte ptr -1004h
var_4= dword ptr -4
s= dword ptr  4
lpBuffer= dword ptr  8

mov     eax, 100Ch
call    __alloca_probe
push    ebx
xor     ebx, ebx
push    esi
mov     esi, [esp+1014h+lpBuffer]
push    edi
mov     [esp+1018h+var_100C], ebx
xor     eax, eax
```

CreateProcessA: Creates a new process
WriteFile: Sends commands or responses through a pipe.
PeekNamedPipe: Reads data from a pipe to check if there's input/output.

Conclusion

Analysis functions, such as listing active processes, enabling remote shell access for control, and uploading encrypted files to a remote server.