

Open in app ↗

Sign up Sign in

Medium Search

Write 

Lateral Movement — SCM and DLL Hijacking Primer

 Dwight Hohnstein · [Follow](#)



Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Detailed Description

The Service Control Manager (SCM) governs all aspects of running services installed on a Windows Computer. Historically, the Service Control Manager has been abused by attackers to escalate their privilege locally on a machine or to create new services on target machines for persistence or lateral movement.

Instead of creating new services, attackers can move laterally using the SCM

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

https://github.com/djhohnstein/wlbsctrl_poc

https://github.com/djhohnstein/TSMSISrv_poc

. . .

Methodology

To find services that contained DLL hijacks, I first deployed the most common versions of Windows that are still under support: Windows 7.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

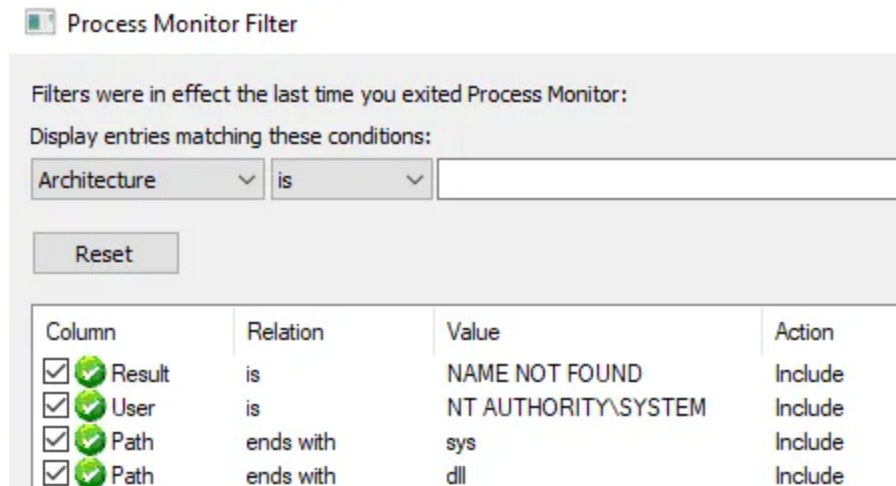
- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month



The Process Monitor filter used.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

During this process of stopping services, clearing Process Monitor logs, and restarting the services, I documented each service that attempted to search for a DLL that wasn't present on disk. Using this new data set of potentially vulnerable services across the Windows product line, two met the criteria I set when starting this endeavor: IKEEXT and SessionEnv.

. . .

IKEEXT Analysis and Exploitation

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

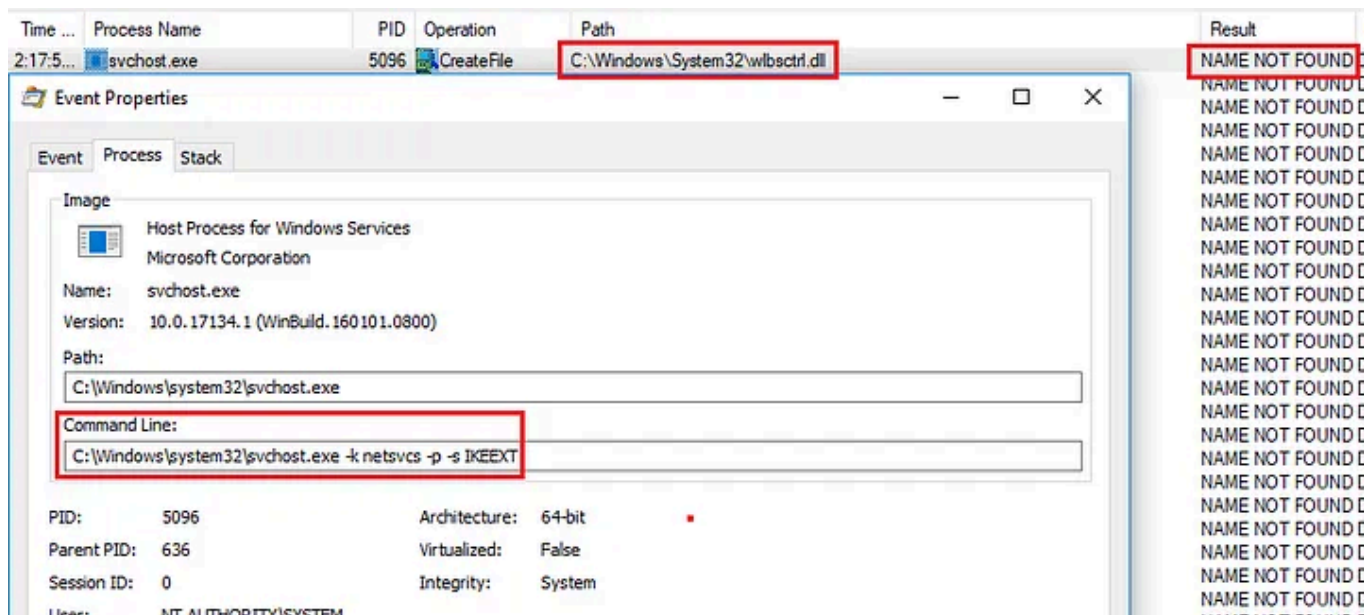
- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month



Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

When clicking the search result from above I'm navigated to the data segment that defines the string. Right clicking this address and select References > Show References to Address, I'm pointed to a singular function at 0x180005ea0. Jumping to this function we see that after variable declarations, the first function call is to LoadLibraryExW with a path-relative reference to wlbsctrl.dll. From our Process Monitor logs above, we know that this function is called at some point during service startup. As such, no more analysis is needed to build a working proof of concept.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

(C:\Windows\System32\ by default). Then, use the service control manager binary (sc.exe) to restart the service.

Example command set to leverage the DLL hijack in IKEEXT.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

. . .

SessionEnv Analysis and Exploitation

Applying the same methodology from IKEEXT to the SessionEnv service, we are greeted with two DLLs being queried by svchost.exe: TSMSISrv.dll and TSVIPSrv.dll.

Time ...	Process Name	PID	Operation	Path	Result	Detail
3:07:5...	svchost.exe	6708	CreateFile	C:\Windows\System32\TSMSISrv.dll	NAME NOT FOUND	Desired Acc

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Once again, these files aren't searched for recursively using the DLL search order specification; rather, they must be called directly by name somewhere within the calling library, SessEnv.dll. Using the string reference method as above we are dropped into a singular function that references both TSMSISrv.dll and TSVIPSrv.dll by name.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

point, we know nothing about this function other than it takes four arguments, one of which is a DLL.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Thus, to leverage this service to execute code, we need to place a DLL in %SYSTEMROOT%\System32\ with a name of TSMSISrv.dll or TSVIPSrv.dll that performs our actions on PROCESS_ATTACH. Then use the Service Control Manager to stop and start the service to have the service load your crafted DLL.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Operational Caveat

One caveat of this technique is that at times, other processes besides the process started by the service may occasionally load your planted DLL. If this happens you **will not** be able to delete your file. You can attempt to call a remote free on the library, but this will crash the remote process. You could attempt to swap the contents out in memory and replace all functions with a call to FreeLibrary, but this will also crash the process. The only way to remove the file is to move it to another location such as the APPDATA folder and restart the machine. After restart, no process should have a handle on

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

The SCM RPC methods invoked when stopping a service.

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month

wanted to create a .NET DLL and use the Unmanaged Exports nuget library. The discovery of these additional services and function calls is left as an exercise for the reader.

. . .

Additional Resources

- https://docs.microsoft.com/en-us/openspecs/windows_protocols/ms-scmr/705b624a-13de-43cc-b8a2-99573da3635f

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month



Written by Dwight Hohnstein

173 Followers · Writer for Posts By SpecterOps Team Members

IBM X-Force Red Team Operator

Follow

Medium

Sign up to discover human stories that deepen your understanding of the world.

Free

- ✓ Distraction-free reading. No ads.
- ✓ Organize your knowledge with lists and highlights.
- ✓ Tell your story. Find your audience.

Sign up for free

✦ Membership

- ✓ Read member-only stories
- ✓ Support writers you read most
- ✓ Earn money for your writing
- ✓ Listen to audio narrations
- ✓ Read offline with the Medium app

Try for 5 \$/month