Chapter 06
Finding Vulnerabilities

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Outline

- From Nmap Version Scan to Potential Vulnerability
- Nessus
- The Nmap Scripting Engine
- Running a Single NSE Script
- Metasploit Scanner Modules
- Metasploit Exploit Check Functions
- Web Application Scanning
- Manual Analysis

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From Nmap Version Scan to Potential Vulnerability

- Intelligence Gathering about our target and the attack surface → Now we can develop scenarios to reach our pentest goals

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Tenable Security's Nessus

- One of the most widely used commercial vulnerability scanners
- Nessus database includes vulnerabilities across platforms and protocols, and its scanner performs a series of checks to detect known issues
- # service nessusd start
- https://localhost:8834 (the Nessus web interface on TCP port)

- Get your Activation Code at:
  - http://www.tenable.com/products/nessus-home/

Nessus® vulnerability scanner

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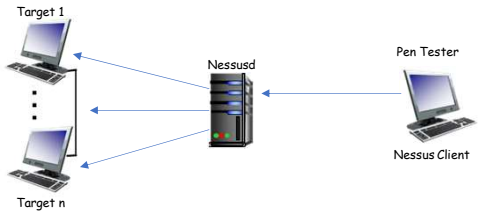
Nessus Architecture

- Nessus is a client server architecture
- Client: browser based. Used to configure and manage things
- Server: nessusd. It is used to perform the scan
- Client and nessud often run on the same machine
- Can run on Windows, Linux and macOS



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Nessus Plugins

- Plugins are small programs that tell the scanning engine what to measure for each individual security issue on a target
- More than 181,537 plugins
- Nessus auto update plugins every 24 hours
- Update Nessus plugins at the start of the project
  - # sudo /opt/nessus/sbin/nessuscli update --plugins-only
- Record which plugins you used for scan
- Make a note of the particular plugin configuration (scan policy) you use for the test **so that your results will be repeatable**.
- By default, Nessus does not run dangerous plugins

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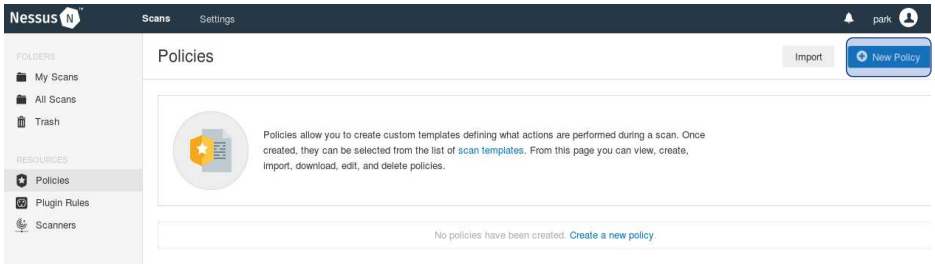
Nessus – Policies

- Nessus policies are like configuration files that tell Nessus which vulnerability checks, port scanners, and so on to run in the vulnerability scan



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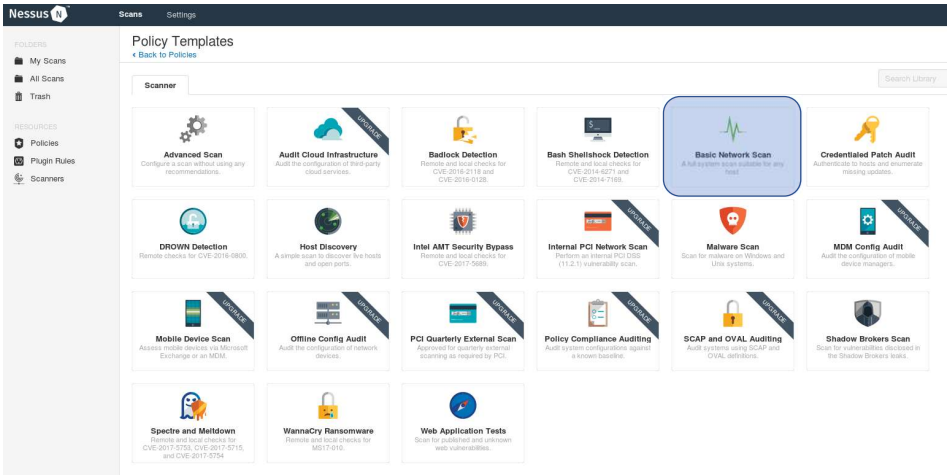
Nessus - Policies



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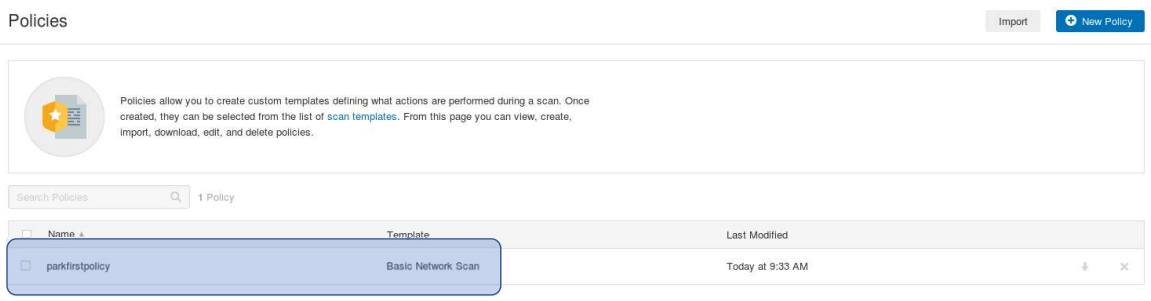
Nessus – Policies



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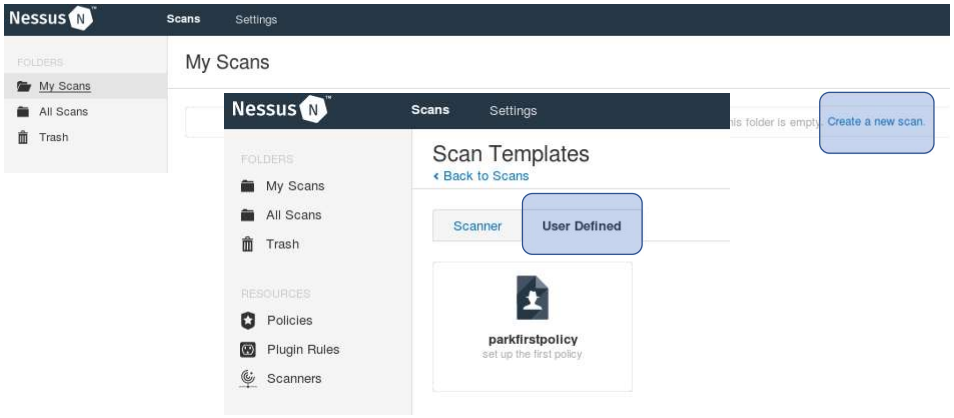
Scanning with Nessus

- Let's run Nessus against our target machines



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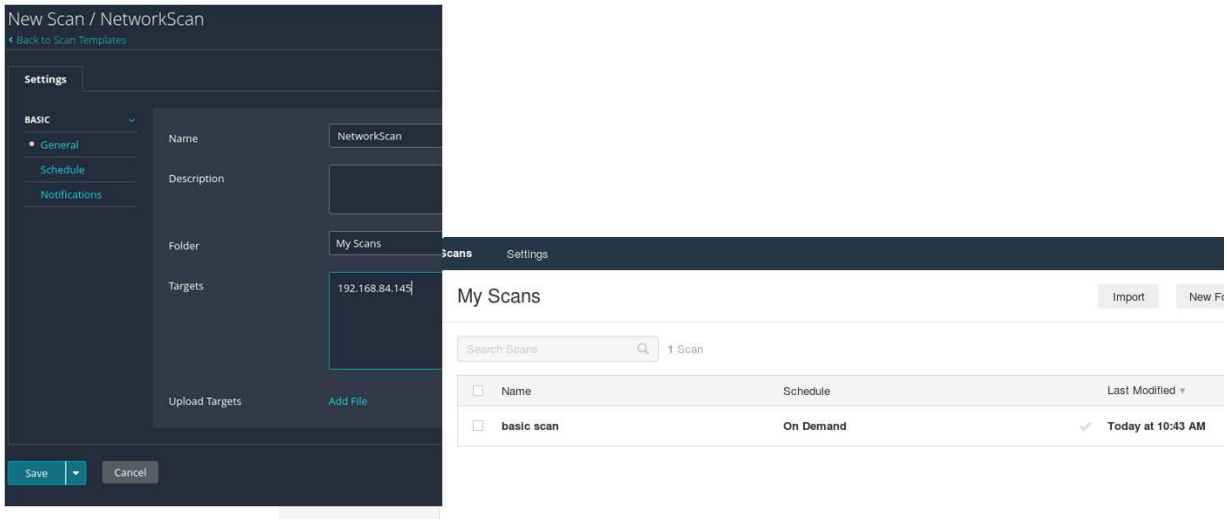
Scanning with Nessus



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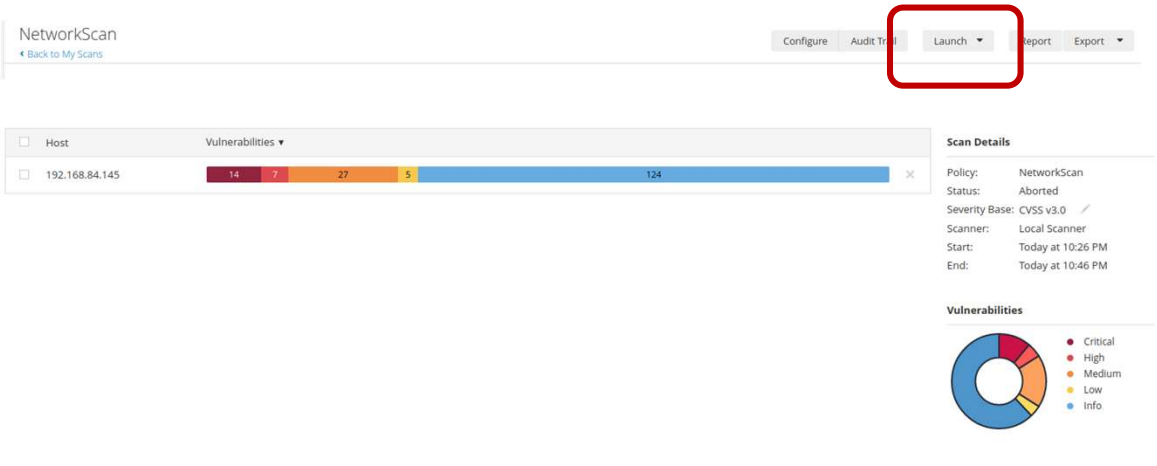
Scanning with Nessus



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Scanning with Nessus

Nessus | Scans | Settings | park

FOLDERS
- My Scans
- All Scans
- Trash

RESOURCES
- Policies
- Plugin Rules
- Scanners

SMBv1. SMBv1 lacks security features that were included in later SMB versions. SMBv1 can be disabled by following the vendor instructions provided in Microsoft KB2696547. Additionally, US-CERT recommends that users block SMB directly by blocking TCP port 445 on all network boundary devices. For SMB over the NetBIOS API, block TCP ports 137 / 139 and UDP ports 137 / 138 on all network boundary devices.

See Also

https://technet.microsoft.com/library/security/MS17-010
http://www.nessus.org/u?321523eb
http://www.nessus.org/u?7bec1941
http://www.nessus.org/u?d9f569cf
https://blogs.technet.microsoft.com/filecab/2016/09/16/stop-using-smb1/
https://support.microsoft.com/en-us/kb/2696547
http://www.nessus.org/u?8dcab5e4
http://www.nessus.org/u?36fd3072
http://www.nessus.org/u?4c7e0cf3
https://github.com/stamparm/EternalRocks/
http://www.nessus.org/u?59db5b5b

Exploit Available: true
Exploit Ease: Exploits are available
Patch Pub Date: March 14, 2017
Vulnerability Pub Date: March 14, 2017
In the news: true

Exploitable With

Metasploit (MS17-010 EternalBlue SMB Remote Windows Kernel Pool Corruption)
Core Impact

Reference Information

EDB-ID: 41891, 41987
MSFT: MS17-010
BID: 96703, 96704, 96705, 96706, 96707, 96709

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Nessus Rankings

- Nessus ranks vulnerabilities based on the **Common Vulnerability Scoring System (CVSS) version 3**, from the National Institute of Standards and Technology (NIST)
- Ranking is calculated based on the impact to the system if the issue is exploited
- **The actual risk of a vulnerability depends on the environment**

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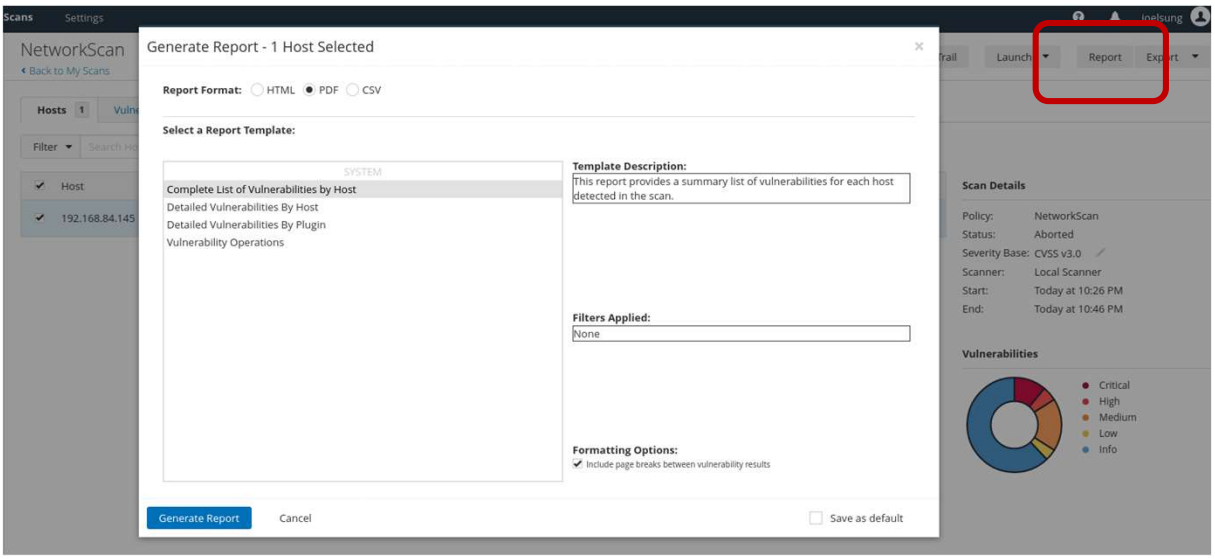
Exporting Nessus Results



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Other Commercial Vulnerability Scanning Tools

- Nexpose by Rapid 7 https://www.rapid7.com/products/nexpose/
- Saint, http://www.saintcorporation.com/
- Retina, https://www.beyondtrust.com/resources/brochures/retina-network-security-scanner
- Acunetix, specialized in Web vulnerability scanning, https://www.acunetix.com/
- Qualys, a scanning service, https://www.qualys.com/

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Methods for Discovering Vulnerabilities

- Check software version number
  - Red Hat Enterprise Linux (RHEL) often keeps old version number when a patch is released
- Check protocol version number
- Look at its behavior
- Check its configuration
  - Authenticated vulnerability scan
- Run exploit against it
  - Help reduce false positive but it doesn't help us manage false negative
- Not all vulnerabilities lead to exploit

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Researching Vulnerabilities

- Security Focus
  - http://www.securityfocus.com/
- Packet Storm
  - http://www.packetstormsecurity.org/
- Exploit Database
  - http://www.exploit-db.org
- Common Vulnerabilities and Exposures
  - http://www.cve.mitre.org
- Open Sourced Vulnerability Database (OSVDB)
  - http://osvdb.com
- US-CERT
  - www.us-cert.gov/cas/techalerts
- HackerStorm
  - www.hackerstorm.co.uk

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Nmap Scripting Engine (NSE)

- From Caterpillar to Butterfly …
  - **NSE** provides entirely new skill set and dimension to **Nmap**
  - Vulnerability scanning, advanced network discovery, detection of backdoor, and even exploitation become possible in Nmap
  - https://nmap.org/nsedoc/scripts/
  - NSE and its scripts are prebuilt into Nmap
  - **root@kali:~#** nmap --script banner 10.0.2.5

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NSE examples: banner

- Banner script
  - https://nmap.org/nsedoc/scripts/banner.html
  - A simple banner grabber which connects to an open TCP port and prints out anything sent by the listening service **within five seconds**

```
root@kali:~# nmap -sV --script=banner 10.0.2.5
Starting Nmap 7.70 ( https://nmap.org ) at 2019-02-27 15:27 EST
Nmap scan report for 10.0.2.5
Host is up (0.00014s latency).
Not shown: 977 closed ports
PORT     STATE SERVICE     VERSION
21/tcp   open  ftp         vsftpd 2.3.4
|_banner: 220 (vsFTPd 2.3.4)
22/tcp   open  ssh         OpenSSH 4.7p1 Debian 8ubuntu1 (protocol 2.0)
|_banner: SSH-2.0-OpenSSH_4.7p1 Debian-8ubuntu1
23/tcp   open  telnet      Linux telnetd
|_banner: \xFF\xFD\x18\xFF\xFD \xFF\xFD#\xFF\xFD'
25/tcp   open  smtp        Postfix smtpd
|_banner: 220 metasploitable.localdomain ESMTP Postfix (Ubuntu)
```

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Nmap at Defcon 2010

- Defcon 18 - Mastering the Nmap Scripting Engine
  - https://www.youtube.com/watch?v=M-Uq7YSfZ4I
  - (00:00~04:00) + (9:55~10:30) + (11:40~16:00) + (28:00~36:00)

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The Nmap Scripting Engine

- Let you run publicly available scripts and write your own
- Extremely useful for scanning for and measuring a relative small number of specific items across a large number of target systems
- Categories of the available scripts
  - # gedit /usr/share/nmap/scripts/script.db
- Search for script in a specific category
  - # grep safe /usr/share/nmap/scripts/script.db
- Count the number of scripts in a specific category
  - # cat /usr/share/nmap/scripts/script.db | grep discovery | wc -l

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The Nmap Scripting Engine

Open | script.db /usr/share/nmap/scripts | Save

```
Entry { filename = "acarsd-info.nse", categories = { "discovery", "safe", } }
Entry { filename = "address-info.nse", categories = { "default", "safe", } }
Entry { filename = "afp-brute.nse", categories = { "brute", "intrusive", } }
Entry { filename = "afp-ls.nse", categories = { "discovery", "safe", } }
Entry { filename = "afp-path-vuln.nse", categories = { "exploit", "intrusive", "vuln", } }
Entry { filename = "afp-serverinfo.nse", categories = { "default", "discovery", "safe", } }
Entry { filename = "afp-showmount.nse", categories = { "discovery", "safe", } }
Entry { filename = "ajp-auth.nse", categories = { "auth", "default", "safe", } }
Entry { filename = "ajp-brute.nse", categories = { "brute", "intrusive", } }
Entry { filename = "ajp-headers.nse", categories = { "discovery", "safe", } }
Entry { filename = "ajp-methods.nse", categories = { "default", "safe", } }
Entry { filename = "ajp-request.nse", categories = { "discovery", "safe", } }
Entry { filename = "allseeingeye-info.nse", categories = { "discovery", "safe", "version", } }
Entry { filename = "amqp-info.nse", categories = { "default", "discovery", "safe", "version", } }
Entry { filename = "asn-query.nse", categories = { "discovery", "external", "safe", } }
Entry { filename = "auth-owners.nse", categories = { "default", "safe", } }
Entry { filename = "auth-spoof.nse", categories = { "malware", "safe", } }
Entry { filename = "backorifice-brute.nse", categories = { "brute", "intrusive", } }
Entry { filename = "backorifice-info.nse", categories = { "default", "discovery", "safe", } }
Entry { filename = "bacnet-info.nse", categories = { "discovery", "version", } }
Entry { filename = "banner.nse", categories = { "discovery", "safe", } }
Entry { filename = "bitcoin-getaddr.nse", categories = { "discovery", "safe", } }
Entry { filename = "bitcoin-info.nse", categories = { "discovery", "safe", } }
Entry { filename = "bitcoinrpc-info.nse", categories = { "default", "discovery", "safe", } }
Entry { filename = "bittorrent-discovery.nse", categories = { "discovery", "safe", } }
Entry { filename = "bjnp-discover.nse", categories = { "discovery", "safe", } }
Entry { filename = "broadcast-ataoe-discover.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-avahi-dos.nse", categories = { "broadcast", "dos", "intrusive",
"vuln", } }
Entry { filename = "broadcast-bjnp-discover.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-db2-discover.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-dhcp-discover.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-dhcp6-discover.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-dns-service-discovery.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-dropbox-listener.nse", categories = { "broadcast", "safe", } }
Entry { filename = "broadcast-eigrp-discovery.nse", categories = { "broadcast", "discovery",
"safe", } }
Entry { filename = "broadcast-igmp-discovery.nse", categories = { "broadcast", "discovery"
```

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The Nmap Scripting Engine

- Categories of the available scripts
  - ❖ Information gathering
  - ❖ Active vulnerability assessment
  - ❖ Searches for signs of previous compromises, and so on
- Currently defined categories are auth, broadcast, brute, default. discovery, dos, exploit, external, fuzzer, intrusive, malware, safe, version, and vuln. Category names are not case sensitive
- To get more information about a particular script or category of scripts
  - ❖ # nmap --script-help default
- Run all the scripts in the *default* category, ***-sC***
  - ❖ # nmap -sC <target IP address(es)>

Categories
auth
broadcast
brute
default
discovery
dos
exploit
external
fuzzer
intrusive
malware
safe
version
vuln

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Running NSE Scripts

- To run NSE
  - ❖nmap --script=[all, category, dir, script] [target] –p [ports]
  - ❖Add --script-args=[arguments] to pass arguments to a script
  - ❖Do not run all scripts since NSE contains Dos scripts which may harm target systems

Categories
auth
broadcast
brute
default
discovery
dos
exploit
external
fuzzer
intrusive
malware
safe
version
vuln

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Running a Single NSE Script

- The NSE script **nfs-ls**.nse
  - ❖Connects to NFS and audit shares
  - ❖**Mounts the remote shares, audits their permissions, and lists the files included in the share**
  - ❖# nmap --script=nfs-ls <target IP address>
- More information about a script?
  - ❖# nmap --script-help nfs-ls
- --script-trace: detailed output from each script

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Metasploit Scanner Modules

- msf > use scanner/ftp/anonymous
- msf auxiliary(anonymous) > set RHOSTS <target IP address(es)>
- msf auxiliary(anonymous) > exploit

- Anonymous FTP login credentials
  - User: anonymous
  - Password: guest

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Metasploit Exploit Check Functions

- "**check**" functions
  - Connects to a target to see if it is vulnerable, rather than attempting to exploit a vulnerability

- msf > use windows/smb/ms08_067_netapi
  msf exploit(ms08_067_netapi) > set RHOST <target IP address>
  msf exploit(ms08_067_netapi) > check

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