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Network Security (CS 6823)

Lab -2

Due: 09/24/2015

NMAP Scan

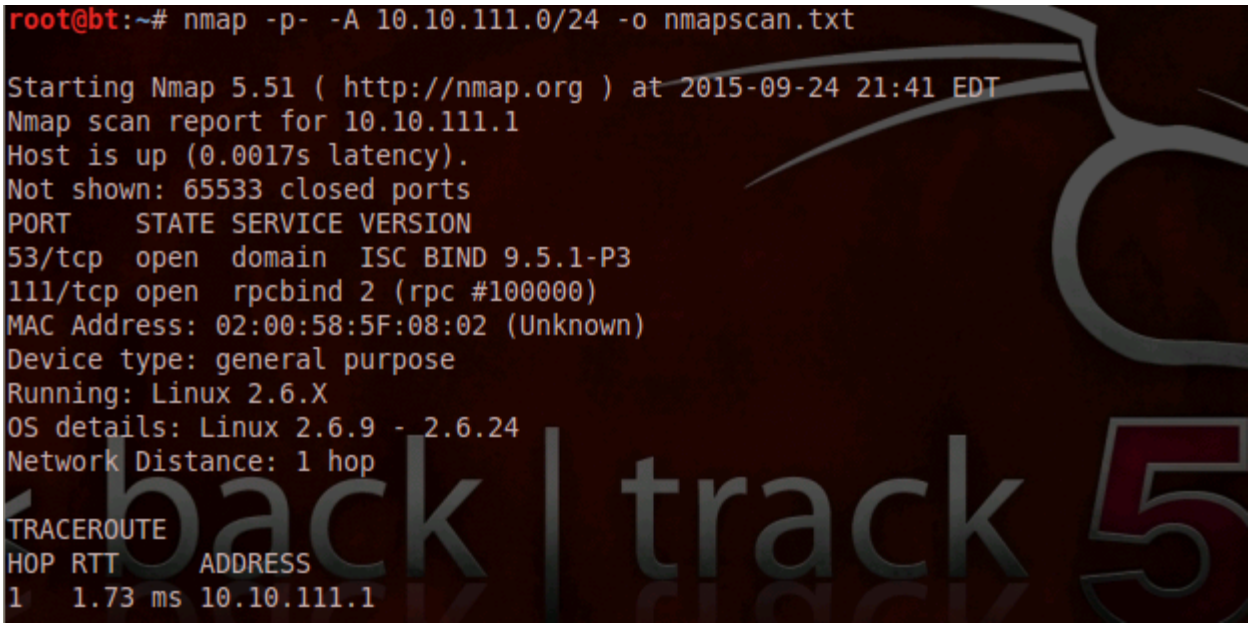
Nmap command to find the required details
Command: nmap –sV –O 10.10.111.0/24 –o nmapscan.txt

Options:
-p- is to scan all the ports from 1-65535. (It does take some time but scans all the port.
-A turns on Advanced and Aggressive feature such as Operating System and service detection.
-o is to write the contents into a file. (File can be downloaded using sftp protocol).

Using nmap scan we can see all the open ports and the corresponding operating systems they are running. When nmap command is used, probes are sent and responses to this probe are used to classify the ports into three categories: either open, closed or filtered.

There are six machines running.

IP Address: 10.10.111.1
Open Ports: 53/tcp, 111/tcp
OS: Linux 2.6.X



IP Address: 10.10.111.2
Open Ports: 53/tcp, 111/tcp
OS: Linux 2.6.X

```
Nmap scan report for 10.10.111.2
Host is up (0.0017s latency).
Not shown: 65533 closed ports
PORT    STATE SERVICE VERSION
53/tcp  open  domain  ISC BIND 9.5.1-P3
111/tcp open  rpcbind 2 (rpc #100000)
MAC Address: 02:00:58:D0:00:01 (Unknown)
Device type: general purpose
Running: Linux 2.6.X
OS details: Linux 2.6.9 - 2.6.24
Network Distance: 1 hop

TRACEROUTE
HOP RTT     ADDRESS
1   1.74 ms 10.10.111.2
```

IP Address: 10.10.111.106
Open Ports: 22/tcp
OS: Linux 2.6.X

```
Nmap scan report for 10.10.111.106
Host is up (0.0019s latency).
Not shown: 65533 closed ports
PORT    STATE SERVICE VERSION
22/tcp  open  ssh     OpenSSH 5.1p1 Debian 5 (protocol 2.0)
| ssh-hostkey: 1024 af:0d:05:e1:87:a5:53:c8:5c:aa:ff:50:7c:3d:16:c6 (DSA)
|_2048 c3:7d:70:74:f8:0d:d4:16:47:39:0b:41:10:0a:2f:46 (RSA)
111/tcp open  rpcbind 2 (rpc #100000)
MAC Address: 02:00:58:97:0C:01 (Unknown)
No exact OS matches for host (If you know what OS is running on it, see http://n
map.org/submit/ ).
TCP/IP fingerprint:
OS:SCAN(V=5.51%D=9/24%OT=22%CT=1%CU=38135%PV=Y%DS=1%DC=D%G=Y%M=020058%TM=56
OS:04A728%P=i686-pc-linux-gnu)SEQ(SP=CA%GCD=1%ISR=CB%TI=Z%CI=Z%II=I%TS=9)SE
OS:Q(SP=CA%GCD=2%ISR=CB%TI=Z%CI=Z%II=I%TS=9)OPS(O1=M5B4ST11NW6%O2=M5B4ST11N
OS:W6%O3=M5B4NNT11NW6%O4=M5B4ST11NW6%O5=M5B4ST11NW6%O6=M5B4ST11)WIN(W1=16A0
OS:%W2=16A0%W3=16A0%W4=16A0%W5=16A0%W6=16A0)ECN(R=Y%DF=Y%T=40%W=16D0%O=M5B4
OS:NNSNW6%CC=N%Q=)T1(R=Y%DF=Y%T=40%S=O%A=S+%F=AS%RD=0%Q=)T2(R=N)T3(R=Y%DF=Y
OS:%T=40%W=16A0%S=O%A=S+%F=AS%O=M5B4ST11NW6%RD=0%Q=)T4(R=Y%DF=Y%T=40%W=0%S=
OS:A%A=Z%F=R%O=%RD=0%Q=)T5(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=AR%O=%RD=0%Q=)T6(R=
OS:Y%DF=Y%T=40%W=0%S=A%A=Z%F=R%O=%RD=0%Q=)T7(R=Y%DF=Y%T=40%W=0%S=Z%A=S+%F=A
OS:R%O=%RD=0%Q=)U1(R=Y%DF=N%T=40%IPL=164%UN=0%RIPL=G%RID=G%RIPCK=G%RUCK=G%R
OS:UD=G)IE(R=Y%DFI=N%T=40%CD=S)

Network Distance: 1 hop
Service Info: OS: Linux

TRACEROUTE
HOP RTT     ADDRESS
1   1.90 ms 10.10.111.106
```

IP Address: 10.10.111.107
Open Ports: 111/tcp, 54615/tcp
OS: Linux 2.6.X

```
Nmap scan report for 10.10.111.107
Host is up (0.0046s latency).
Not shown: 65533 closed ports
PORT      STATE SERVICE VERSION
111/tcp   open  rpcbind 2 (rpc #100000)
54615/tcp open  status  1 (rpc #100024)
Device type: general purpose
Running: Linux 2.6.X
OS details: Linux 2.6.19 - 2.6.36
Network Distance: 0 hops
```

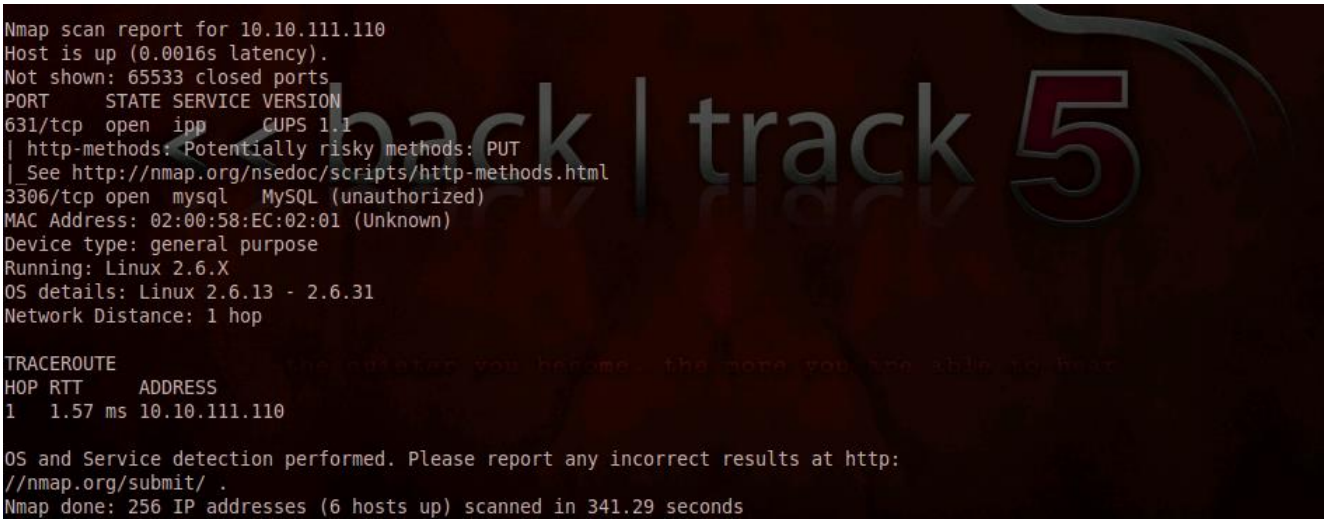
IP Address: 10.10.111.109
Open Ports: 135/tcp, 139/tcp, 445/tcp, 1025/tcp, 5000/tcp
OS: Microsoft Windows 2000|XP

```
Nmap scan report for 10.10.111.109
Host is up (0.0028s latency).
Not shown: 65530 closed ports
PORT     STATE SERVICE      VERSION
135/tcp  open  msrpc        Microsoft Windows RPC
139/tcp  open  netbios-ssn
445/tcp  open  microsoft-ds Microsoft Windows XP microsoft-ds
1025/tcp open  msrpc        Microsoft Windows RPC
5000/tcp open  upnp         Microsoft Windows UPnP
MAC Address: 02:00:58:7B:0A:01 (Unknown)
Device type: general purpose
Running: Microsoft Windows 2000|XP
OS details: Microsoft Windows 2000 SP0/SP1/SP2 or Windows XP SP0/SP1
Network Distance: 1 hop
Service Info: OS: Windows

Host script results:
|_nbstat: NetBIOS name: VICTIM1, NetBIOS user: POLY, NetBIOS MAC: 02:00:58:7b:0a
:01 (unknown)
|_smbv2-enabled: Server doesn't support SMBv2 protocol
| smb-os-discovery:
|   OS: Windows XP (Windows 2000 LAN Manager)
|   Name: WORKGROUP\VICTIM1
|_  System time: 2015-09-25 04:47:40 UTC-7

TRACEROUTE
HOP RTT     ADDRESS
1   2.80 ms 10.10.111.109
```

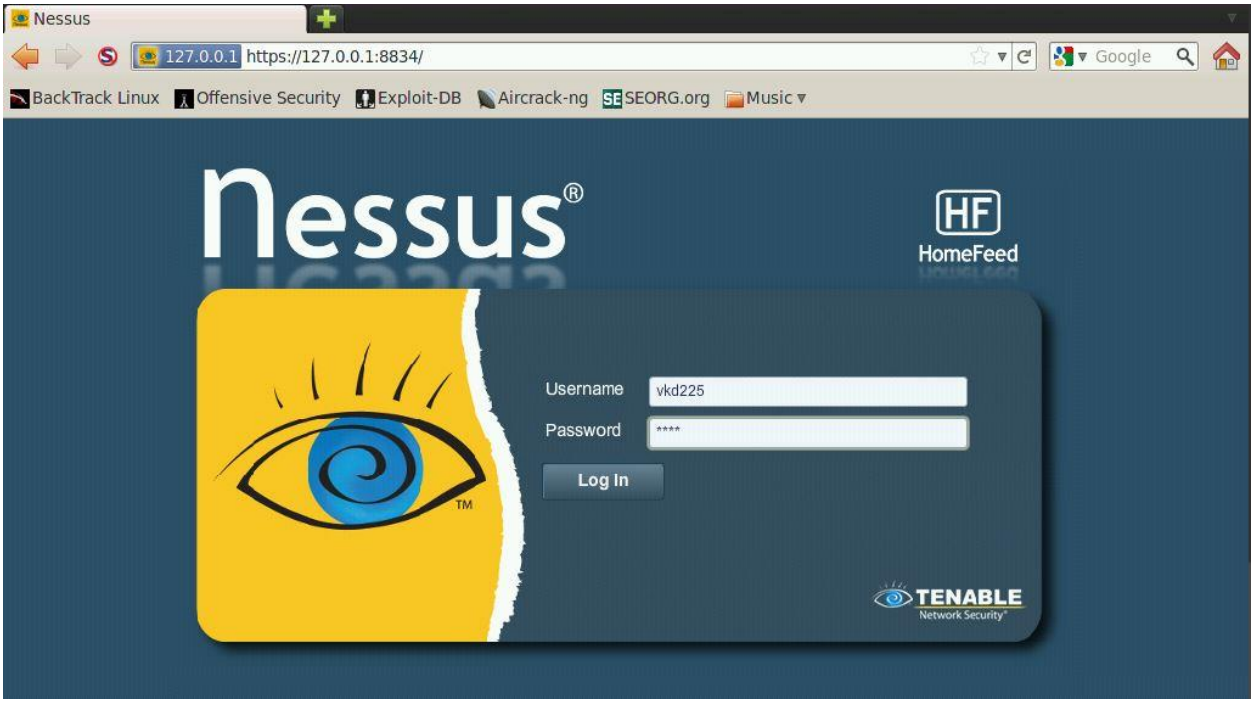
IP Address: 10.10.111.110
Open Ports: 631/tcp, 3306/tcp
OS: Linux 2.6.x



Nessus Vulnerability Scan

Starting Nessus:

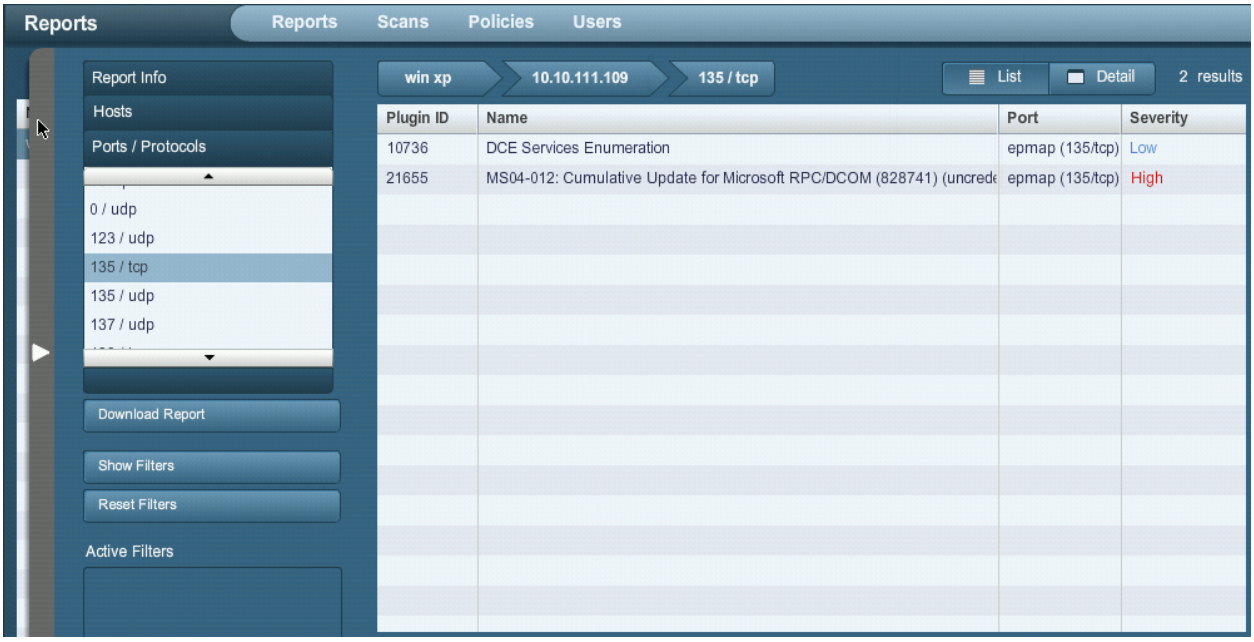
Nessus opening in Firefox:



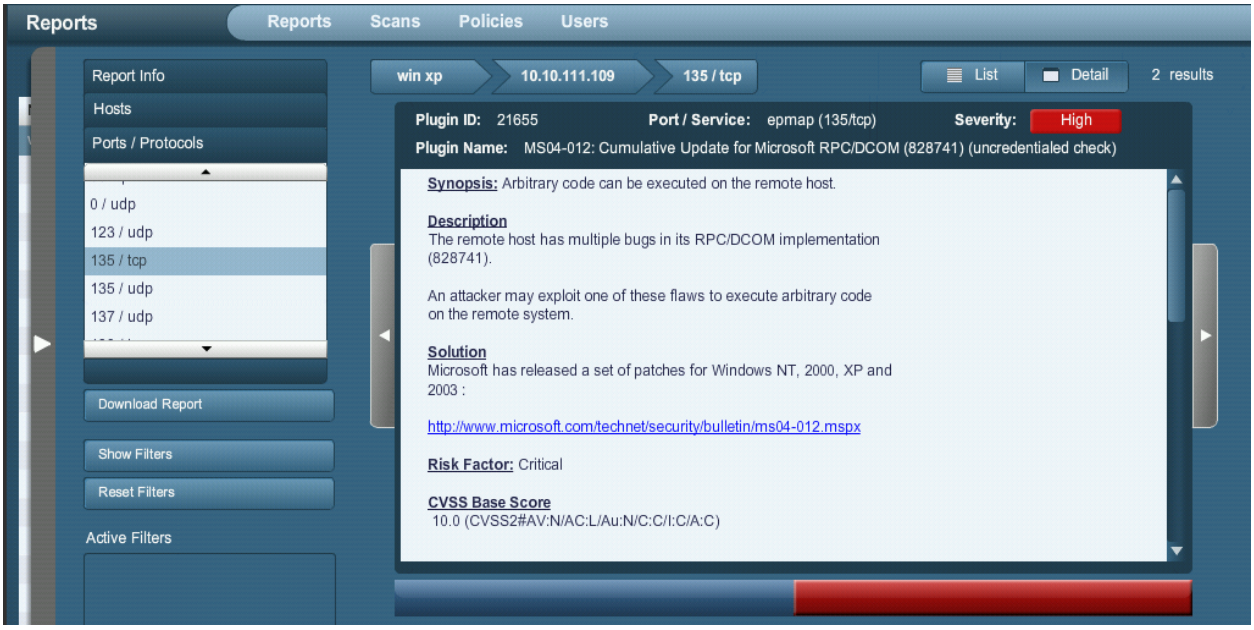
Nessus scan for XP Machine (IP address: 10.10.111.109)

The picture shows the vulnerabilities present in the win XP machine (10.10.111.109) associated with each port. The vulnerabilities are present as severity of ‘High’, ‘Medium’, ‘Low’ and ‘Open Ports’.

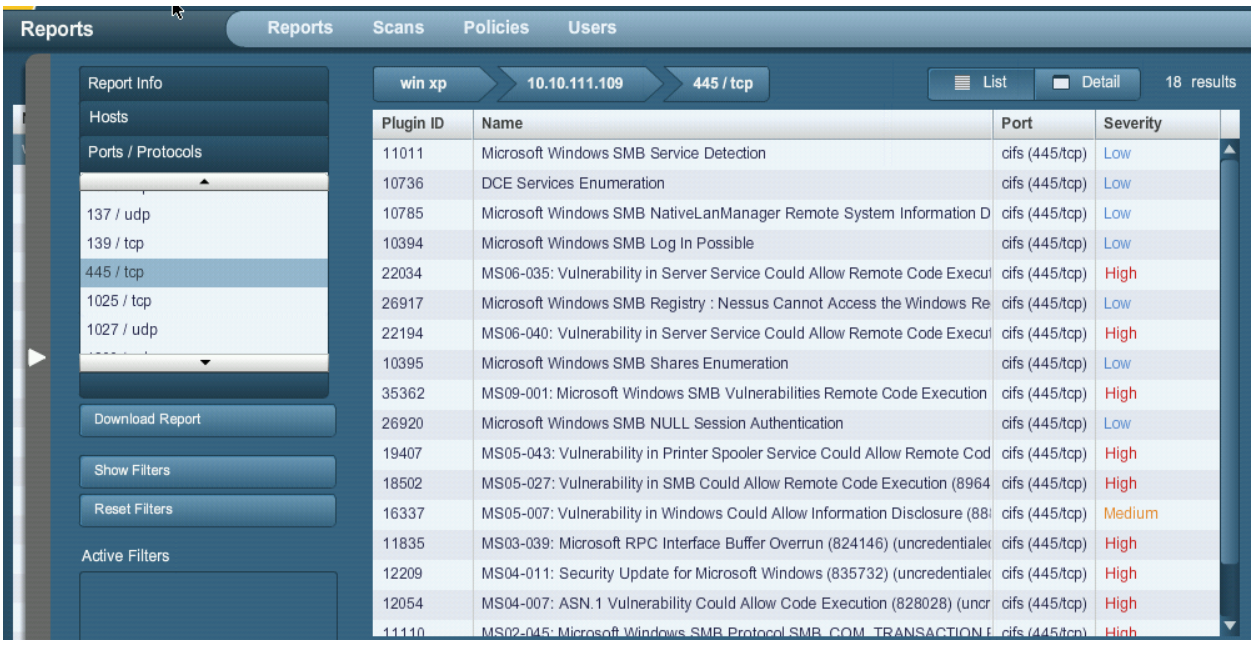
The picture shows the vulnerabilities associated with port 135 and it has 1 ‘Low’ type severity and 1’High’ type severity and 1 open port present.



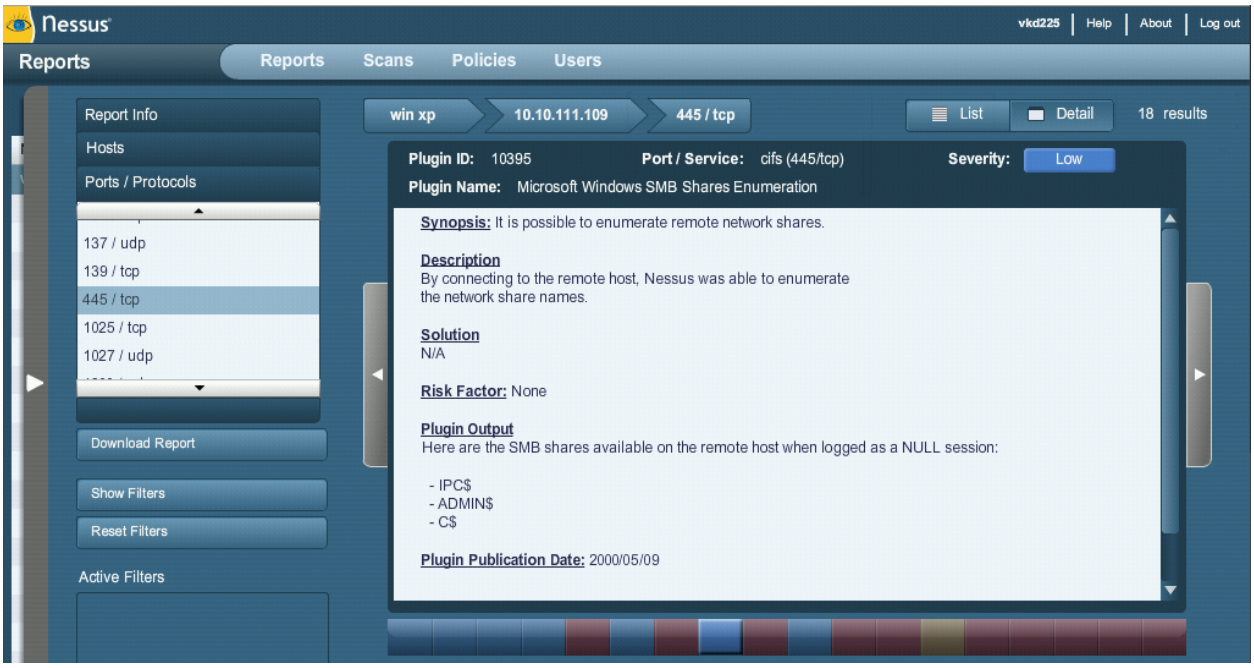
Further looking into the vulnerability, we can see the synopsis, Description and Solution present for the vulnerability. For an example, we are looking at the high type vulnerability.

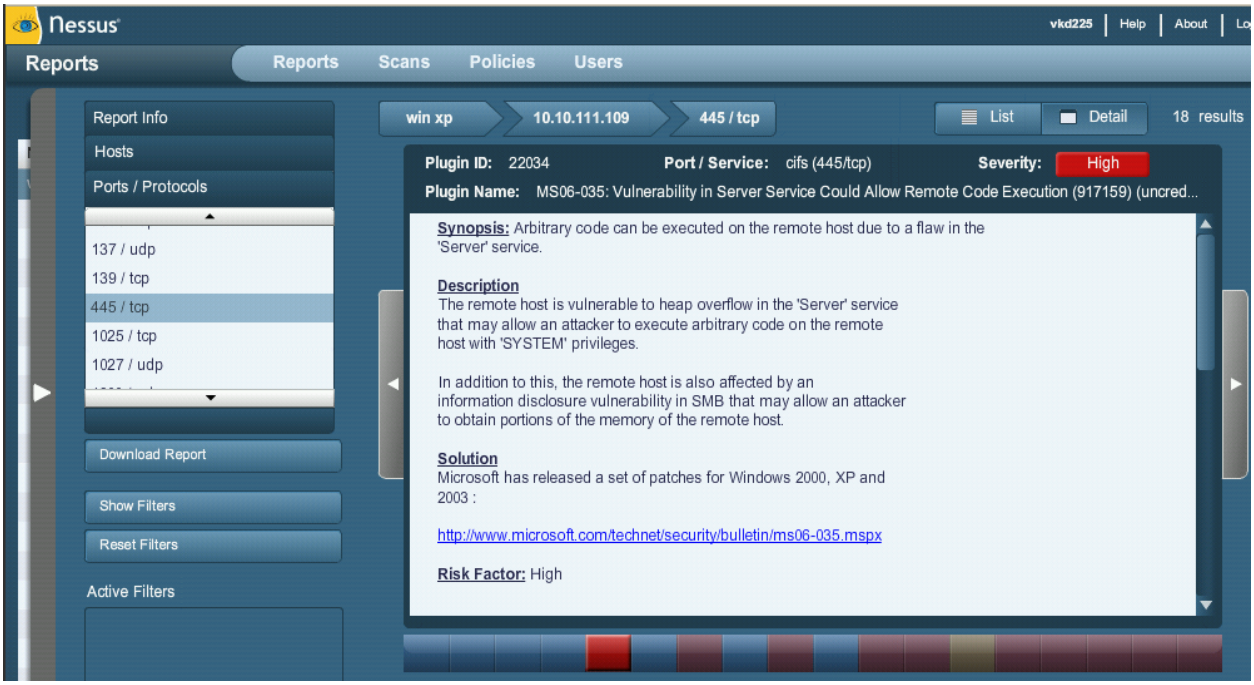


For another example, we can see the vulnerabilities associated with port 445 and it has 10 ‘High’ type, 1 ’Medium’ type and 7 ’Low’ type severity and 1 open port present.



Further looking into the vulnerability, we can see the synopsis, Description and Solution present for the vulnerability. For an example, we are looking at the high type and a low type vulnerability associated with port 445.





Python/Scapy programming

1

a: - Built a TCP packet with no payload and encapsulated the packet in IP packet and called it as a 'layer2'.

layer2= IP()/TCP()

- Encapsulated the IP packet (layer2) into an Ethernet packet and called it as 'layer1'.

layer1= Ether()/layer2

layer1.show()

Showing layer1 shows a TCP packet encapsulated in an IP packet (layer2), which is further encapsulated in an Ethernet packet and shows destination and source addresses (MAC and IP addresses).

b: - Built a UDP packet with no payload and encapsulated the packet in IP packet and called it as a 'layer2'.

layer2= IP()/UDP()

- Encapsulated the IP packet (layer2) into an Ethernet packet and called it as 'layer1'.

layer1= Ether()/layer2

layer1.show()

Showing layer1 shows a UDP packet encapsulated in an IP packet (layer2), which is further encapsulated in an Ethernet packet and shows destination and source addresses (MAC and IP addresses).

```
>>> layer2 = IP()/UDP()
>>> layer1 = Ether()/layer2
>>> layer1.show()
###[ Ethernet ]###
  dst       = ff:ff:ff:ff:ff:ff
  src       = 00:00:00:00:00:00
  type      = 0x800
###[ IP ]###
     version   = 4
     ihl       = None
     tos       = 0x0
     len       = None
     id        = 1
     flags     =
     frag      = 0
     ttl       = 64
     proto     = udp
     chksum    = None
     src       = 127.0.0.1
     dst       = 127.0.0.1
     \options   \
###[ UDP ]###
        sport     = domain
        dport     = domain
        len       = None
        chksum    = None
>>>
```

2: Set of packets for IP address 10.20.111.109/30 and subnet and port number 80 and 53 are generated and sent.

Pck = IP(dst = "10.20.111.109/24")
pckport = TCP (dport = [80,53])
[k for k in pck/port]

```
>>> pck = IP(dst = "10.10.111.109/30")
>>> pckport = TCP (dport = [53,80])
>>> [k for k in pck/pckport]
[<IP  frag=0 proto=tcp dst=10.10.111.108 |<TCP  dport=domain |>>, <IP  frag=0 proto=tcp dst=10.10.111.108 |<TCP  dport=www |>
>, <IP  frag=0 proto=tcp dst=10.10.111.109 |<TCP  dport=domain |>>, <IP  frag=0 proto=tcp dst=10.10.111.109 |<TCP  dport=www
|>>, <IP  frag=0 proto=tcp dst=10.10.111.110 |<TCP  dport=domain |>>, <IP  frag=0 proto=tcp dst=10.10.111.110 |<TCP  dport=ww
w |>>, <IP  frag=0 proto=tcp dst=10.10.111.111 |<TCP  dport=domain |>>, <IP  frag=0 proto=tcp dst=10.10.111.111 |<TCP  dport=
www |>>]
>>>
```

pckport.show()

```
>>> pckport.show()
###[ TCP ]###
  sport     = ftp_data
  dport     = ['domain', 'www']
  seq       = 0
  ack       = 0
  dataofs   = None
  reserved  = 0
  flags     = S
  window    = 8192
  chksum    = None
  urgptr    = 0
  options   = {}
>>>
```

The destination port for 53 is 'domain' (Domain Name System) and 80 is www (HTTP).

3:
An ICMP packet is generated and is called PACKET with a destination address 10.10.111.109 (Windows XP machine) and is encapsulated in IP layer packet.
PACKET = IP (dst=”10.10.111.109”)/ICMP()

The PACKET was sent and received using sr1(PACKET) function which is for sending packets and receiving answers. It receives only one packet that answered the sent packet.

SENREC = sr1(PACKET)

```
>>> PACKET = IP (dst="10.10.111.109")/ICMP()
>>> SENREC = sr1(PACKET)
Begin emission:
.Finished to send 1 packets.
*
Received 2 packets, got 1 answers, remaining 0 packets
>>>
```

Pck = sr(IP(dst = “10.10.11.109”)/ICMP())
ans, unans = sr(IP(dst = “10.10.11.109”)/ICMP())
ans.summary() shows the source IP and destination IP address for ICMP request and reply.

```
>>> pck = sr(IP(dst= "10.10.111.109")/ICMP())
Begin emission:
Finished to send 1 packets.
*
Received 1 packets, got 1 answers, remaining 0 packets
>>> ans,unans = sr(IP(dst= "10.10.111.109")/ICMP())
Begin emission:
Finished to send 1 packets.
*
Received 1 packets, got 1 answers, remaining 0 packets
>>> ans.summary()
IP / ICMP 10.10.111.107 > 10.10.111.109 echo-request 0 ==> IP / ICMP 10.10.111.109 > 10.10.111.107 echo-reply 0 / Padding
>>>
```

4. Traceroute without built in command for traceroute

ans, unans = sr(IP (dst = “10.10.111.2”, ttl =(4,25), id = RandShort())/TCP(flags=0x2))

```
>>> ans,unans = sr(IP(dst= "10.10.111.2", ttl = (4,25),id = RandShort())/TCP(flags=0x2))
Begin emission:
.******.***************Finished to send 22 packets.
*
Received 24 packets, got 22 answers, remaining 0 packets
```

for snd, rcv in ans:

print snd.ttl, rcv.src, isinstace(rcv.payload, TCP)

```
>>> for snd,rcv in ans:
...     print snd.ttl, rcv.src, isinstance(rcv.payload, TCP)
...
4 10.10.111.2 True
5 10.10.111.2 True
6 10.10.111.2 True
7 10.10.111.2 True
8 10.10.111.2 True
9 10.10.111.2 True
10 10.10.111.2 True
11 10.10.111.2 True
12 10.10.111.2 True
13 10.10.111.2 True
14 10.10.111.2 True
15 10.10.111.2 True
16 10.10.111.2 True
17 10.10.111.2 True
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19 10.10.111.2 True
20 10.10.111.2 True
21 10.10.111.2 True
22 10.10.111.2 True
23 10.10.111.2 True
24 10.10.111.2 True
25 10.10.111.2 True
>>>
```