Department of AI-DS

Lab Manual

Semester-VII

Subject: Mini Project Lab

List of Experiments

Sr. No.	Experiments Name
1	Implementation of DES algorithm for data encryption
2	Implementation of Asymmetric Encryption Scheme – RSA
3	Implementation of Symmetric Encryption Scheme – RC4
4	Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.
5	Study of packet sniffer tools like wireshark, ethereal, tcpdump etc. Use the tools to do the following 1. Observer performance in promiscuous as well as non-promiscous mode. 2. Show that packets can be traced based on different filters.
6	Download and install nmap. Use it with different options to scan open ports,perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.
7	Detect ARP spoofing using open source tool ARPWATCH.
8	Use the Nessus tool to scan the network for vulnerabilities.
9	Implement a code to simulate buffer overflow attack.
10	Set up IPSEC under LINUX
11	Install IDS (e.g. SNORT) and study the logs.
12	Use of iptables in linux to create firewalls.

Mini Project Lab

Experiment No. : 1

Implementation of DES Algorithm for data Encryption

Experiment No. 1

1. **Aim:** Implementation of DES algorithm for data encryption

2. **Objectives:** To know how DES Algorithm will useful for data encryption
3. **Outcomes:** The learner will be able to:-

    - Understand the encryption and decryption algorithm using DES algorithm

4. **Hardware / Software Required :** Python/C Programming

5. **Theory:**

DES is a symmetric encryption system that uses 64-bit blocks, 8 bits of which are used for parity checks. The key therefore has a "useful" length of 56 bits, which means that only 56 bits are actually used in the algorithm. The algorithm involves carrying out combinations, substitutions and permutations between the text to be encrypted and the key, while making sure the operations can be performed in both directions. The key is ciphered on 64 bits and made of 16 blocks of 4 bits, generally denoted k1 to k16. Given that "only" 56 bits are actually used for encrypting, there can be 256 different keys.
The main parts of the algorithm are as follows:

- Fractioning of the text into 64-bit blocks
- Initial permutation of blocks
- Breakdown of the blocks into two parts: left and right, named L and R
- Permutation and substitution steps repeated 16 times
- Re-joining of the left and right parts then inverse initial permutation

ALGORITHM:
STEP-1: Read the 64-bit plain text.
STEP-2: Split it into two 32-bit blocks and store it in two different arrays. STEP-3: Perform XOR operation between these two arrays.
STEP-4: The output obtained is stored as the second 32-bit sequence and the original second 32-bit sequence forms the first part.
STEP-5: Thus the encrypted 64-bit cipher text is obtained in this way.
Repeat the same process for the remaining plain text characters.

6. Conclusion:

In this experiment you learned how DES algorithm is useful for encryption and decryption in Cryptography.

7. Questions:

1. Explain DES algorithm
2. What is encryption and decryption in DES?
3. How XOR operation used in DES?

Mini Project Lab

Experiment No. : 2

Implementation of Asymmetric Encryption Scheme – RSA

Experiment No. 2

1. **Aim:** Implementation of Asymmetric Encryption Scheme – RSA

2. **Objectives:** To know how RSA Asymmetric Encryption Algorithm will useful for public and private key generation.

3. **Outcomes:** The learner will be able to:-

    - Understand the encryption and decryption algorithm using RSA algorithm

4. **Hardware / Software Required :** Python/C Programming

5. **Theory:**
   The RSA algorithm was invented by Ronald L. Rivest, Adi Shamir, and Leonard Adleman in 1977 and released into the public domain on September 6, 2000.
   Public-key systems–or asymmetric cryptography–use two different keys with a mathematical relationship to each other. Their protection relies on the premise that knowing one key will not help you figure out the other. The RSA algorithm uses the fact that it's easy to multiply two large prime numbers together and get a product. But you can't take that product and reasonably guess the two original numbers, or guess one of the original primes if only the other is known. The public key and private keys are carefully generated using the RSA algorithm; they can be used to encrypt information or sign it.

Key generation

1) Pick two large prime numbers p and q, p != q;
2) Calculate n = p × q;
3) Calculate ø (n) = (p − 1)(q − 1);
4) Pick e, so that gcd(e, ø (n)) = 1, 1 < e < ø (n);
5) Calculate d, so that d · e mod ø (n) = 1, i.e., d is the multiplicative inverse of e in mod ø (n);
6) Get public key as KU = {e, n};
7) Get private key as KR = {d, n}.

Encryption

For plaintext block P < n, its ciphertext C = P^e (mod n).

Decryption

For ciphertext block C, its plaintext is P = C^d (mod n).

6. **Conclusion:**

In this experiment you learned how the security of the RSA cryptosystem is based on two mathematical problems: the problem of factoring large numbers and the

RSA problem. Full decryption of an RSA ciphertext is thought to be infeasible on the assumption that both of these problems are hard, i.e., no efficient algorithm exists for solving them. Providing security against partial decryption may require the addition of a secure padding scheme.

7. **Questions:**
    1. Expand RSA
    2. What is encryption and decryption in RSA?
    3. To encrypt a message P, Compute c=-------?
    4. To compute c compute P=----------?
    5. Define cryptography.

Mini Project Lab

Experiment No. : 3

Implementation of Symmetric Encryption Scheme – RC4

Experiment No. 3

1. **Aim:** Implementation of Symmetric Encryption Scheme – RC4

2. **Objectives:** To know how RC4 Algorithm is useful for Symmetric Encryption.

3. **Outcomes:** The learner will be able to:-

   - Understand the RC4 Symmetric Encryption algorithm

4. **Hardware / Software Required :** Python/C Programming

5. **Theory:**

   RC4 is a stream cipher designed in 1987 by Ron Rivest for RSA Security. It is a variable key size stream cipher with byte-oriented operations. The algorithm is based on the use of a random permutation. Analysis shows that the period of the cipher is overwhelmingly likely to be greater than 10100. Eight to sixteen machine operations are required per output byte, and the cipher can be expected to run very quickly in software. RC4 was kept as a trade secret by RSA Security. In September 1994, the RC4 algorithm was anonymously posted on the Internet on the Cypherpunks anonymous remailers list. The RC4 algorithm is remarkably simply and quite easy to explain. A variable-length key of from 1 to 256 bytes (8 to 2048 bits) is used to initialize a 256-byte state vector S, with elements S[0], S[1], …, S[255]. At all times, S contains a permutation of all 8-bit numbers from 0 through 255. For encryption and decryption, a byte k (see Figure 1) is generated from S by selecting one of the 255 entries in a systematic fashion. As each value of k is generated, the entries in S are once again permuted.

6. **Initialization of S**

   To begin, the entries of S are set equal to the values from 0 through 255 in ascending order; that is; S[0] = 0, S[1] = 1, …, S[255] = 255. A temporary vector, T, is also created. If the length of the key K is 256 bytes, then K is transferred to T. Otherwise, for a key of length keylen bytes, the first keylen elements of T are copied from K and then K is repeated as many times as necessary to fill out T. These preliminary operations can be summarized as follows:

```
/*  Initialization
*/ for i = 0 to
255 do S[i] = i;
T[i] = K[i mod keylen];
```

Next we use T to produce the initial permutation of S. This involves starting with S[0] and

going through to S[255], and, for each S[i], swapping S[i] with another byte in S according to a scheme dictated by T[i]:

/* Initial Permutation of S */

```
j = 0;
for i = 0 to 255 do
j = (j + S[i] + T[i]) mod 256;
Swap (S[i], S[j]);
```

Because the only operation on S is a swap, the only effect is a permutation. S still contains all the numbers from 0 through 255.

Stream Generation

Once the S vector is initialized, the input key is no longer used. Stream generation involves starting with S[0] and going through to S[255], and, for each S[i], swapping S[i] with another byte in S according to a scheme dictated by the current configuration of S. After S[255] is reached, the process continues, starting over again at S[0]:

/* Stream Generation */

```
i, j = 0;
-6-
while (true)
i = (i + 1) mod 256;
j = (j + S[i]) mod 256; Swap (S[i],
S[j]);
t = (S[i] + S[j]) mod 256; k = S[t];
```

To encrypt, XOR the value k with the next byte of plaintext. To decrypt, XOR the value k with the next byte of ciphertext.

7. Conclusion:

In this experiment you learned how RC4 Symmetric Encryption algorithm useful for Cryptography.

8. Questions:

1. Explain RC4 algorithm
2. Write Key generation algorithm for RC4?
3. In which protocols RC4 is used?

Mini Project Lab

Experiment No. : 4

Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.

Experiment No. 4

1. **Aim:** Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registers

2. **Objectives:** To know how to gather information about the networks by using different n/w reconnaissance tools.

3. **Outcomes:** The learner will be able to:-

    - Understand, identify, analyze and design the problem, implement the same using current techniques, skills, and tools and validate the solution including both hardware and software.
    - Use network-based tools for network analysis.

4. **Hardware / Software Required :** WHOIS client

5. **Theory:**

    1. **Whois - whois** searches for an object in a WHOIS database. WHOIS is a query and response protocol that is widely used for querying databases that store the registered users of an Internet resource, such as a domain name or an IP address block, but is also used for a wider range of other information. Most modern versions of **whois** try to guess the right server to ask for the specified object. If no guess can be made, **whois** will connect to **whois.networksolutions.com** for NIC handles or **whois.arin.net** for IPv4 addresses and network names.

    Examples:

    - Obtaining the domain WHOIS record for computersolutions.com
    - WHOIS record by IP querying
    - Querying WHOIS in google search engine

2 **Dig -** Dig is a networking tool that can query DNS servers for information. It can be very helpful for diagnosing problems with domain pointing and is a

good way to verify that your configuration is working. The most basic way to use dig is to specify the domain we wish to query: dig example.com

3. **Traceroute** - Traceroute prints the route that packets take to a network host. Traceroute utility uses the TTL field in the IP header to achieve its operation. For users who are new to TTL field, this field describes how much hops a particular packet will take while traveling on network. So, this effectively outlines the lifetime of the packet on network. This field is usually set to 32 or 64. Each time the packet is held on an intermediate router, it decreases the TTL value by 1. When a router finds the TTL value of 1 in a received packet then that packet is not forwarded but instead discarded. After discarding the packet, router sends an ICMP error message of –Time exceeded‖ back to the source from where packet generated. The ICMP packet that is sent back contains the IP address of the router. So now it can be easily understood that traceroute operates by sending packets with TTL value starting from 1 and then incrementing by one each time. Each time a router receives the packet, it checks the TTL field, if TTL field is 1 then it discards the packet and sends the ICMP error packet containing its IP address and this is what traceroute requires. So traceroute incrementally fetches the IP of all the routers between the source and the destination.

Example: traceroute example.com

traceroute to example.com (64.13.192.208), 64 hops max, 40 byte

packets 1 72.10.62.1 (72.10.62.1) 1.000 ms 0.739 ms 0.702 ms

2 10.101.248.1 (10.101.248.1) 0.683 ms 0.385 ms 0.315 ms

3 10.104.65.161 (10.104.65.161) 0.791 ms 0.703 ms 0.686 ms

4 10.104.65.161 (10.104.65.161) 0.791 ms 0.703 ms 0.686 ms

5 10.0.10.33 (10.0.10.33) 2.652 ms 2.260 ms 5.353 ms

6 acmkokeaig.gs01.gridserver.com (64.13.192.208) 3.384 ms 8.001 ms 2.439 ms

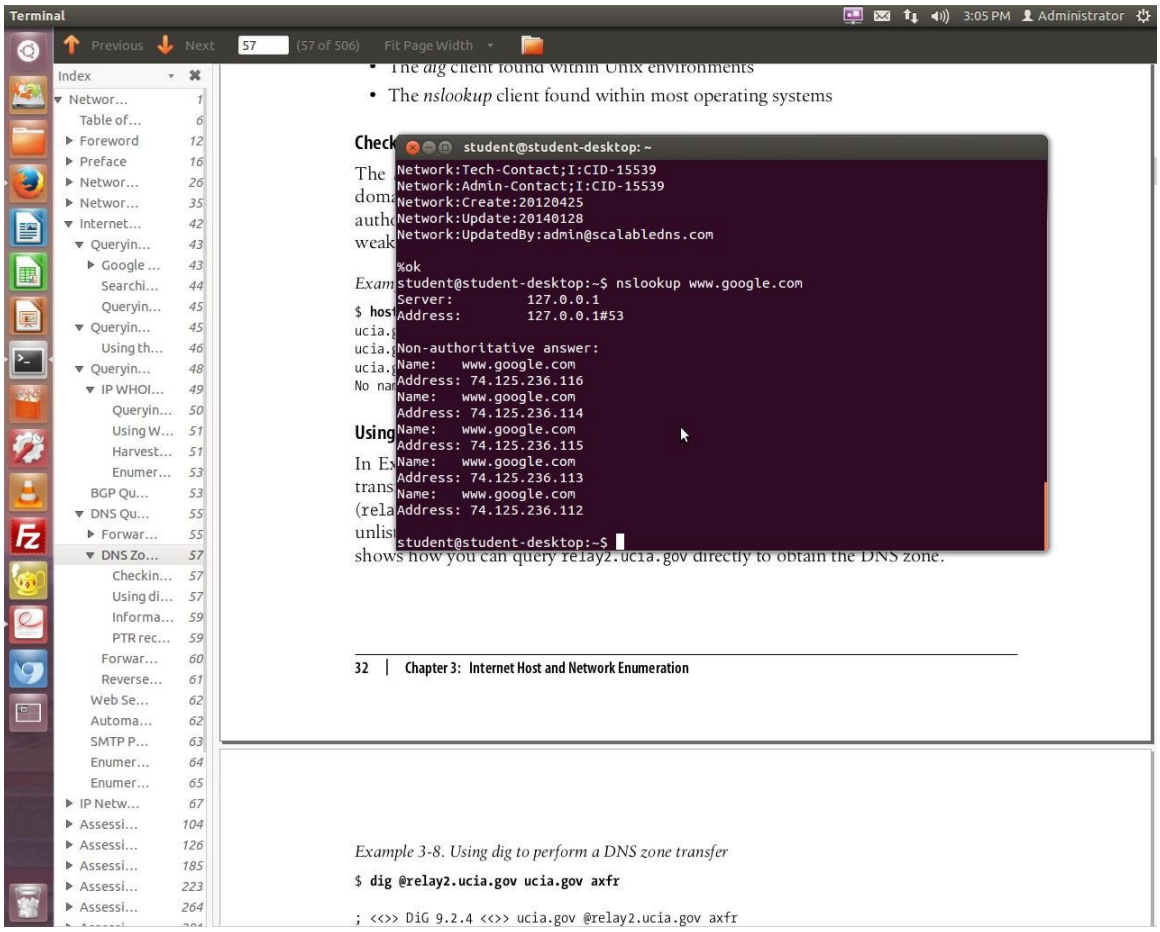
4. **Nslookup** - The nslookup command is used to query internet name servers

interactively for information. nslookup, which stands for "name server lookup", is a useful tool for finding out information about a named domain. By default, nslookup will translate a domain name to an IP address (or vice versa). For instance, to find out what

the IP address of microsoft.com is, you could run the command:

nslookup
microsoft.com Server:
8.8.8.8
Address:
8.8.8.8#53 Non-
authoritative
answer: Name:
microsoft.com
Address: 134.170.185.46
Name:
microsoft.com
Address: 134.170.188.221

Here, 8.8.8.8 is the address of our system's Domain Name Server. This is the server our system is configured to use to translate domain names into IP addresses. "#53" indicates that we are communicating with it on port 53, which is the standard port number domain name servers use to accept queries. Below this, we have our lookup information for microsoft.com. Our name server returned two entries, 134.170.185.46 and 134.170.188.221. This indicates that microsoft.com uses a round robin setup to distribute server load. When you accessmicrsoft.com, you may be directed to either of these servers and your packets will be routed to the correct destination.You can see that we have received a "Non- authoritative answer" to our query. An answer is "authoritative" only if our DNS has the complete zone file information for the domain in question. More often, our DNS will have a cache of information representing the last authoritative answer it received when it made a similar query, this information is passed on to you, but the server qualifies it as "non- authoritative": the information was recently received from an authoritative source, but the DNS server is not itself thatauthority.



Using nslookup to enumerate basic mx records

4. **Conclusion:**

In this experiment you learned how to take the first steps toward ethical hacking. Information gathering, in the form of reconnaissance, foot printing, and social engineering, is necessary to learn as much about the target as possible. By following the information-gathering methodology, ethical hackers can ensure they are not missing any steps and valuable information.Time spent in the information- gathering phase is well worth it to speed up and produce successful hacking exploits.

5. **Viva Questions:**

- How to use traceroute to identify network problem?
- What is "WHOIS" database?
- Which command is used for verifying and troubleshooting problems?
- How to Use Nslookup to Verify DNS Configuration?

6. References:

- http://www.howtogeek.com/134132/how-to-use-traceroute-to-identify -network- problems/
- http://www.networksolutions.com/whois/index.jsp?bookmarked=84d118 2fe7fc4e af63cca54a21b1:9jF4
- https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3 &cad=r ja&uact=8&ved=0ahUKEwig2r6Fnc3NAhUBsI8KHVIWBd4QFggmMAI&u rl=h ttp%3A%2F%2Fwww.tecmint.com%2F10-linux-dig-domain- information-groper- commands-to-query- dns%2F&usg=AFQjCNGQMPoL_ye2s1WW8UMerEFnSX_Xfw&sig2=38vl1g O rm3zmMkLN7RVHBw
- https://technet.microsoft.com/en-us/library/aa997324(v=exchg.65).aspx

Mini Project Lab

Experiment No. : 5

Study of packet sniffer tools like wireshark, ethereal, tcpdump etc

Experiment No. 5

1. **Aim:** Study of packet sniffer tools like wireshark, ethereal, tcpdump etc

2. **Objectives:** To observe the performance in promiscuous & non-promiscuous mode & to find the packets based on different filters.

3. **Outcomes:** The learner will be able to:-

   - Identify different packets moving in/out of network using packet sniffer for network analysis.
   - Understand professional, ethical, legal, security and social issues and responsibilities. Also will be able to analyze the local and global impact of computing on individuals, organizations, and society.
   - Match the industry requirements in the domains of Database management, Programming and Networking with the required management skills.

4. **Hardware / Software Required:** Wireshark, Ethereal and tcpdump.

5. **Theory:**

Wireshark, a network analysis tool formerly known as Ethereal, captures packets in real time and display them in human-readable format. Wireshark includes filters, color-coding and other features that let you dig deep into network traffic and inspect individual packets.

Applications:

- Network administrators use it to troubleshoot network problems
- Network security engineers use it to examine security problems
- Developers use it to debug protocol implementations
- People use it to learn network protocol internals beside these examples can be helpful in many other situations too.

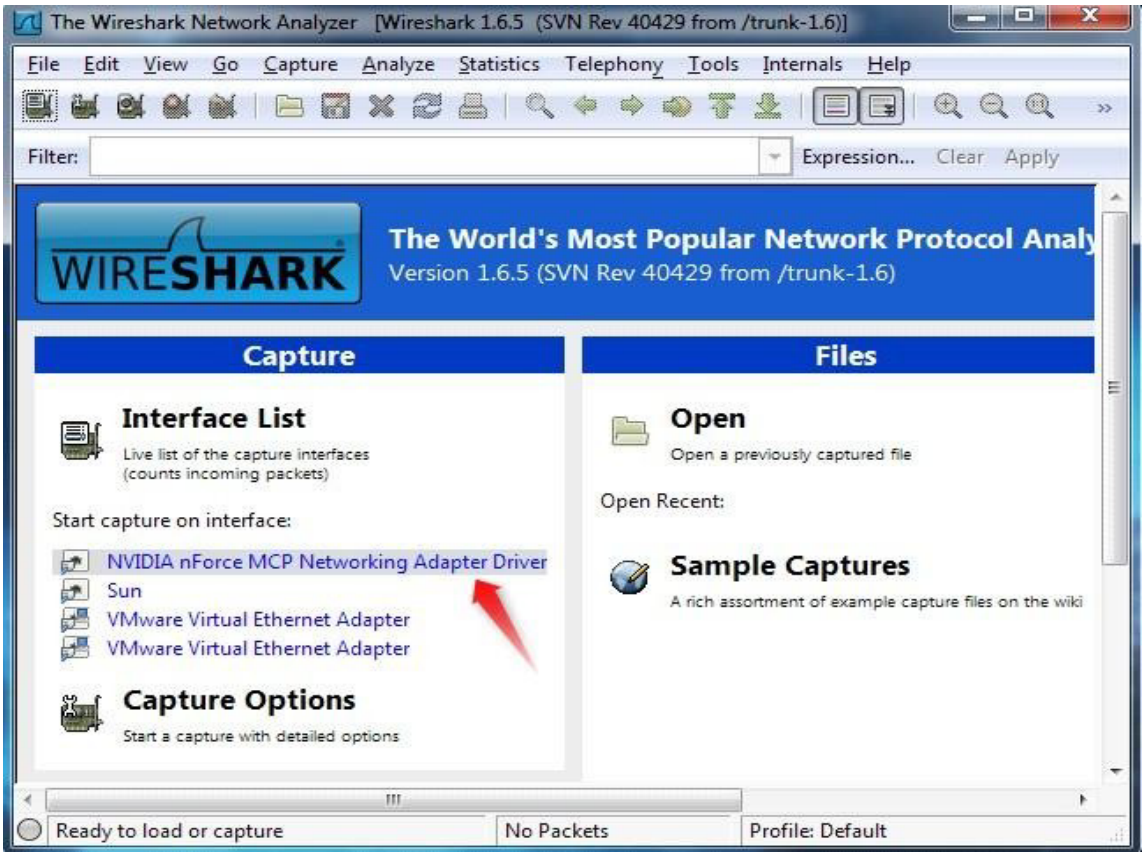
Features:

The following are some of the many features wireshark provides:

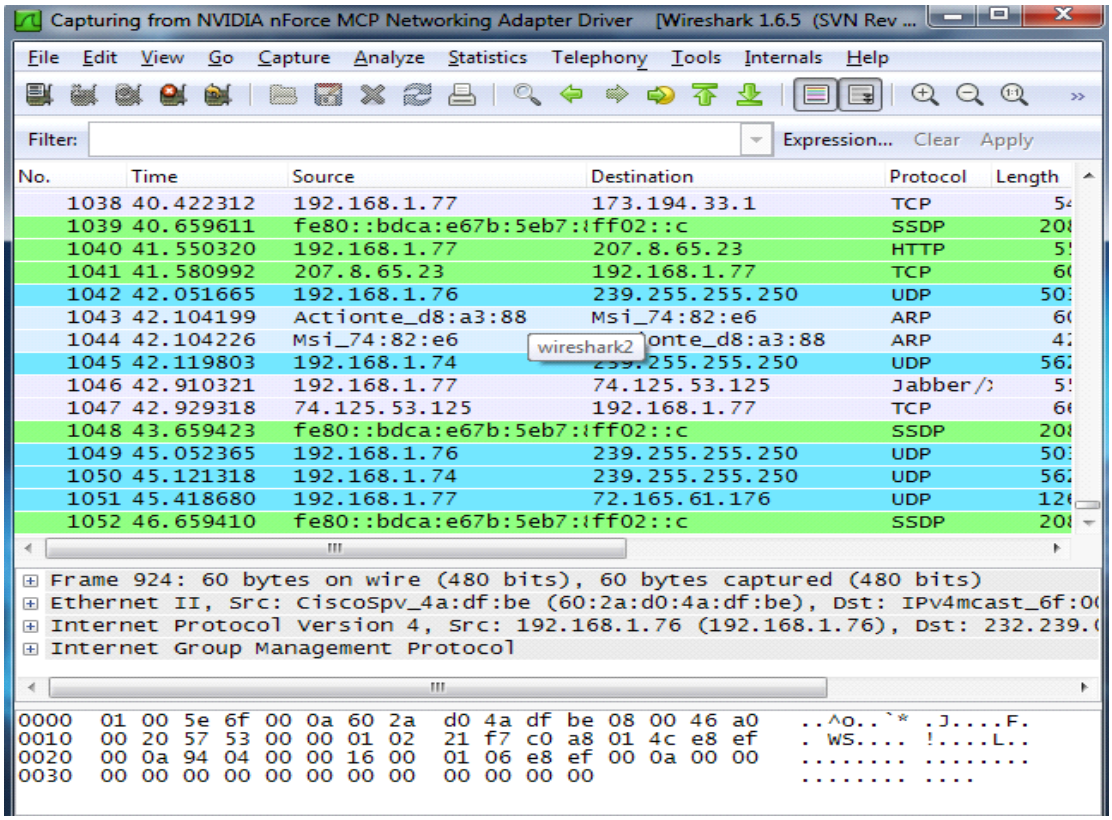
- Available for UNIX and Windows.
- Capture live packet data from a network interface.
- Open files containing packet data captured with tcpdump/WinDump, Wireshark, and a number of other packet capture programs.
- Import packets from text files containing hex dumps of packet data.
- Display packets with very detailed protocol information.
- Export some or all packets in a number of capture file formats.
- Filter packets on many criteria.
- Search for packets on many criteria.
- Colorize packet display based on filters.
- Create various statistics.

Capturing Packets

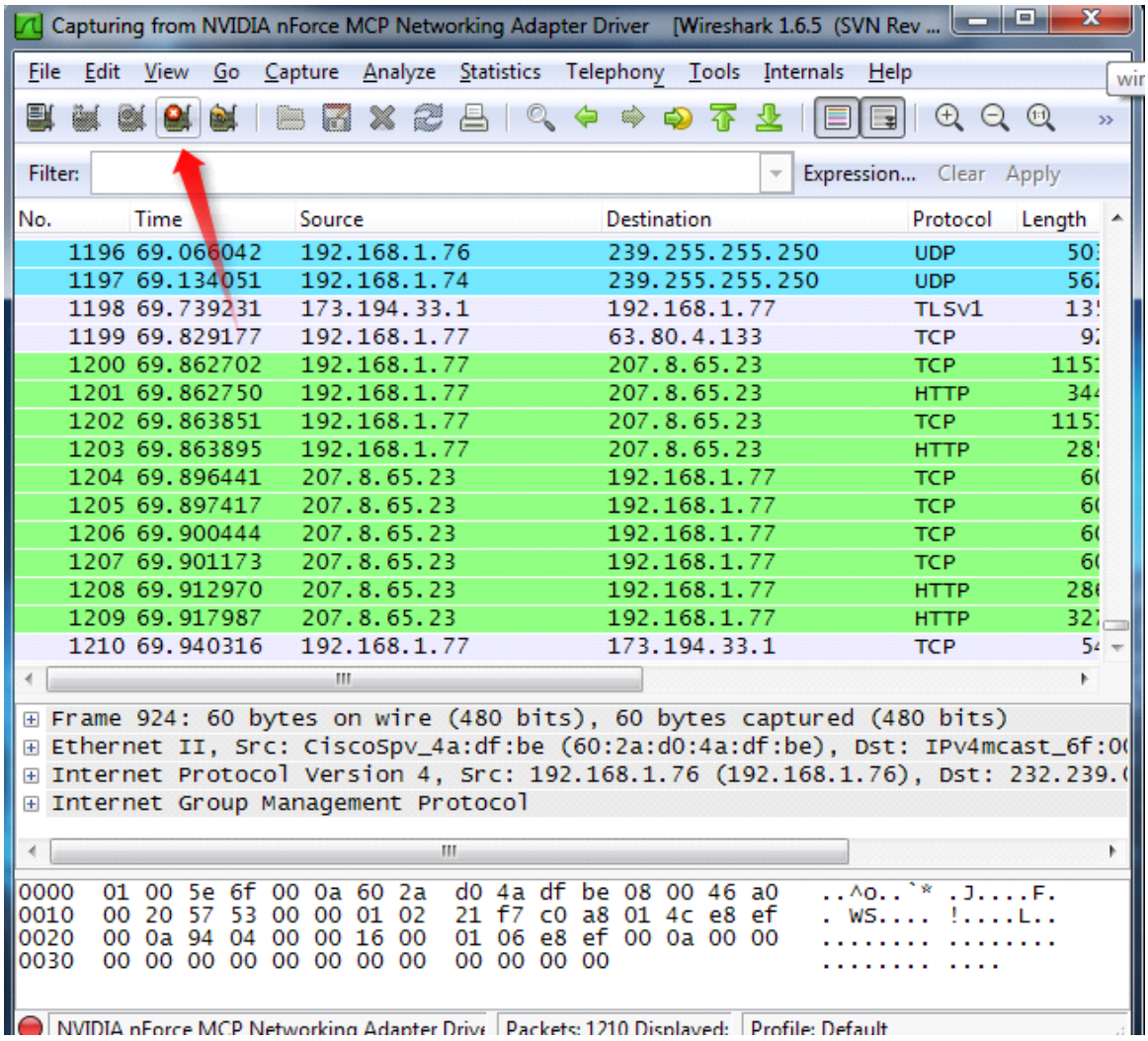
After downloading and installing wireshark, you can launch it and click the name of an interface under Interface List to start capturing packets on that interface. For example, if you want to capture traffic on the wireless network, click your wireless interface. You can configure advanced features by clicking Capture Options.



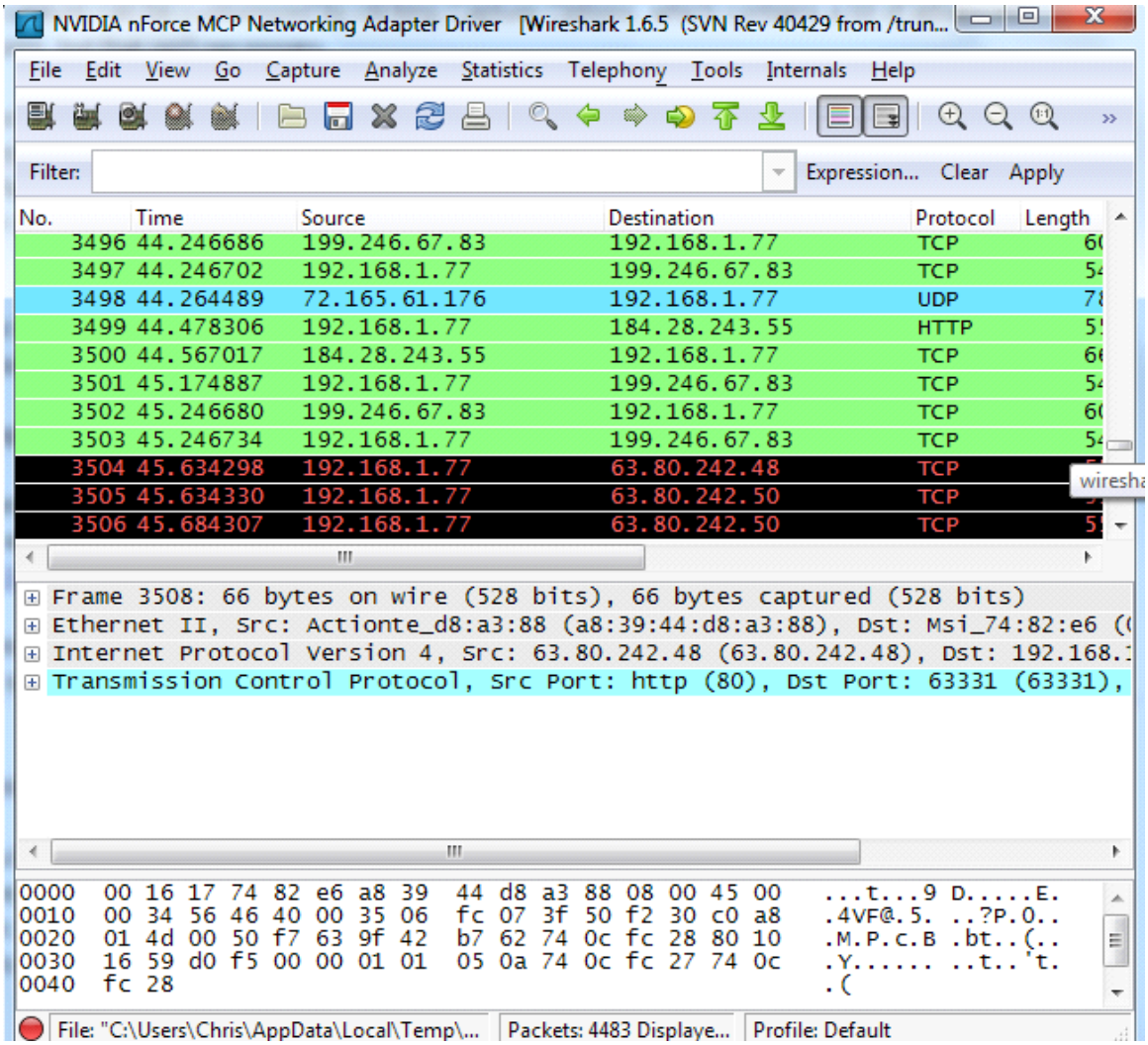
As soon as you click the interface's name, you'll see the packets start to appear in real time. Wireshark captures each packet sent to or from your system. If you're capturing on a wireless interface and have promiscuous mode enabled in your capture options, you'll also see other the other packets on the network.



Click the stop capture button near the top left corner of the window when you want to stop capturing traffic.



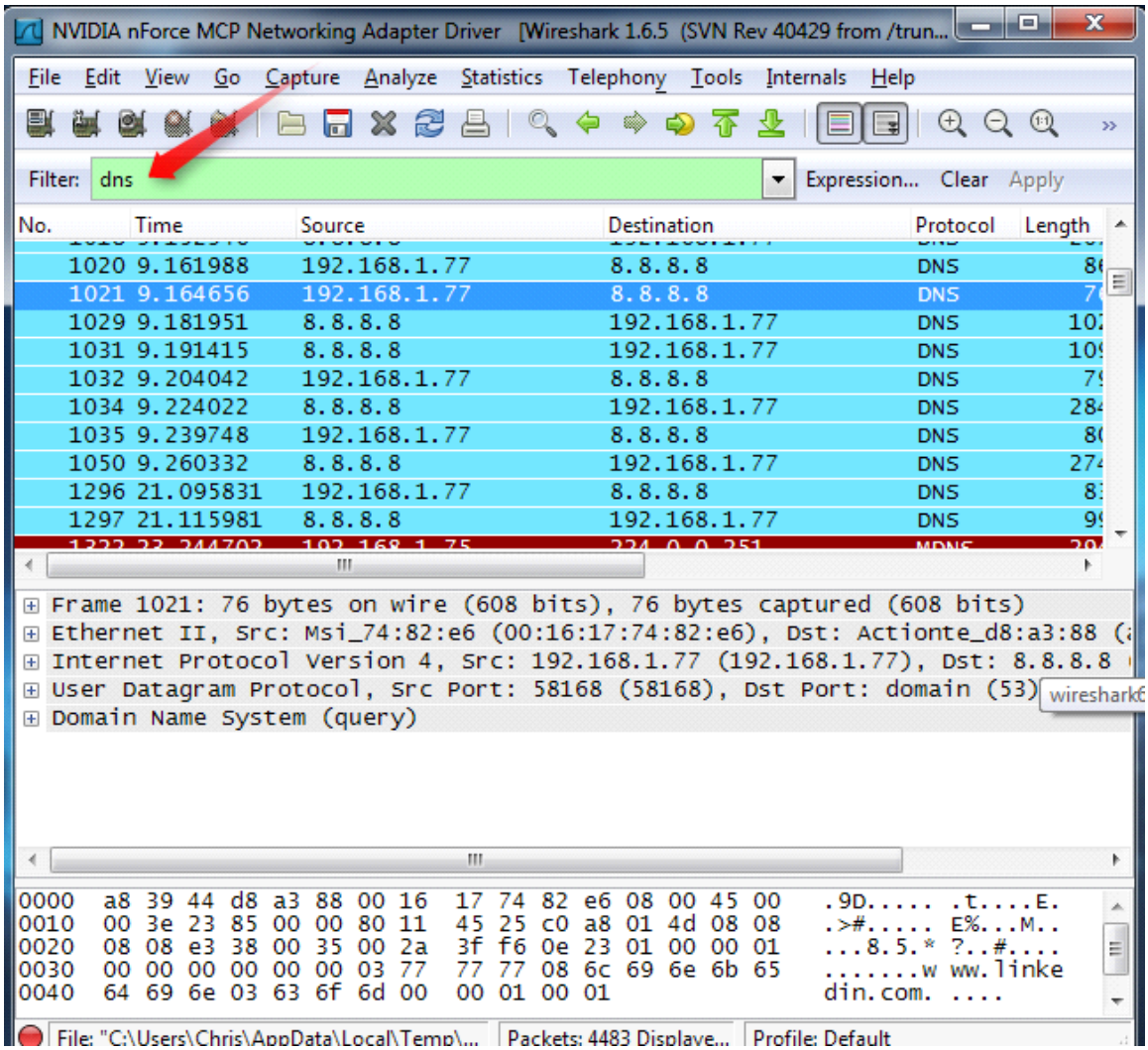
Wireshark uses colors to help you identify the types of traffic at a glance. By default, green is TCP traffic, dark blue is DNS traffic, light blue is UDP traffic, and black identifies TCP packets with problems — for example, they could have been deliveredout-of-order.



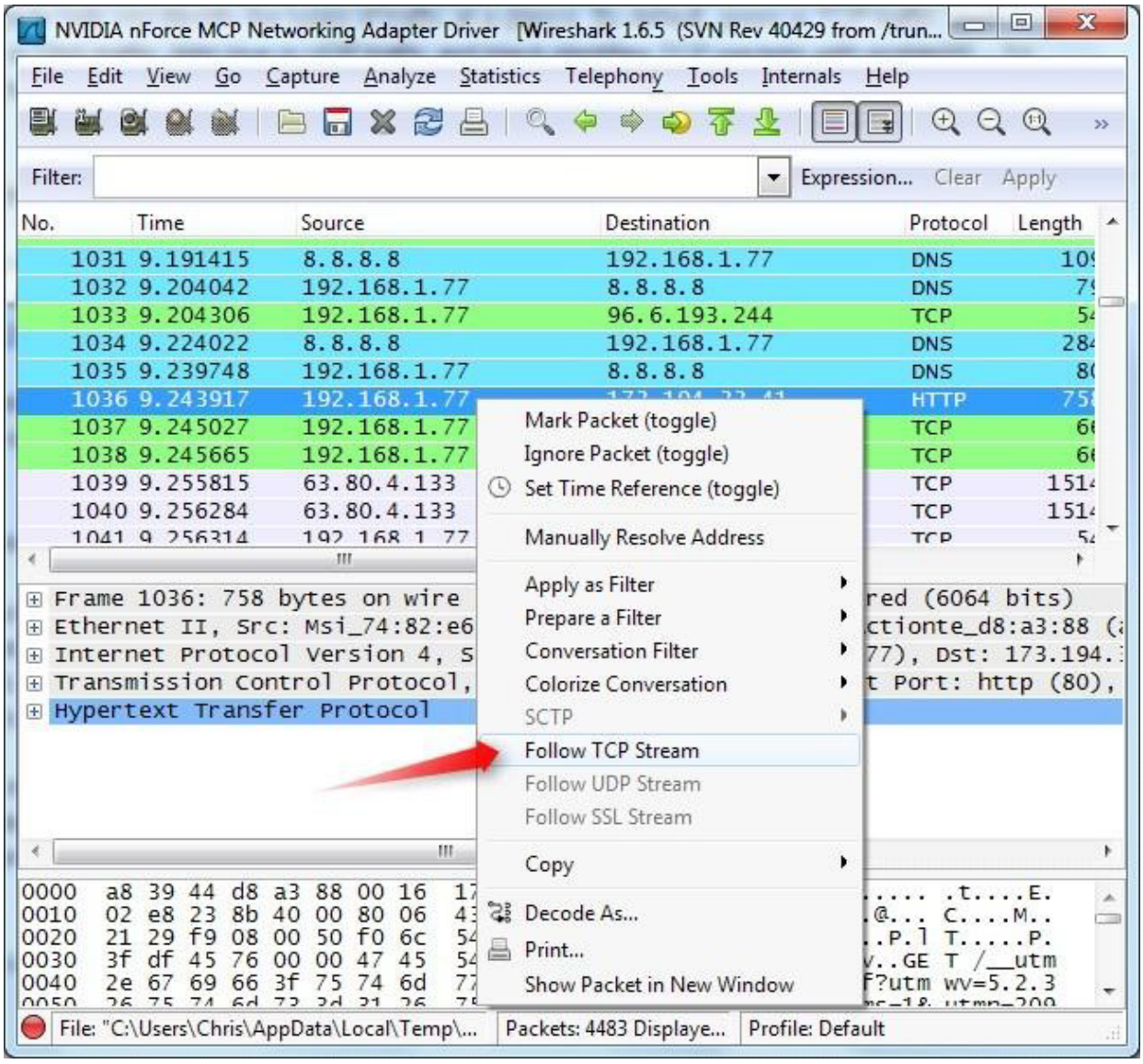
Filtering Packets

If you're trying to inspect something specific, such as the traffic a program sends when phoning home, it helps to close down all other applications using the network so you can narrow down the traffic. Still, you'll likely have a large amount of packets to sift through. That's where Wireshark's filters come in.

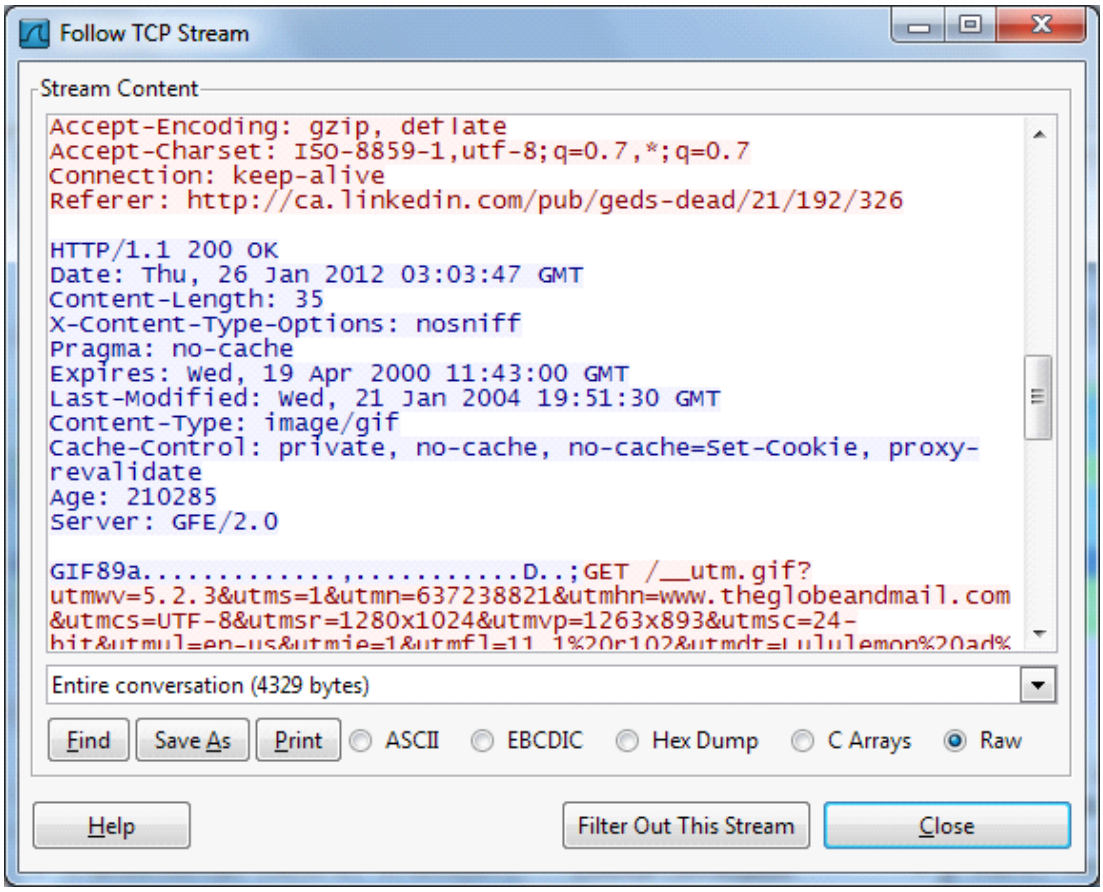
The most basic way to apply a filter is by typing it into the filter box at the top of the window and clicking Apply (or pressing Enter). For example, type —dns‖ and you'll see only DNS packets. When you start typing, Wireshark will help you autocomplete your filter.



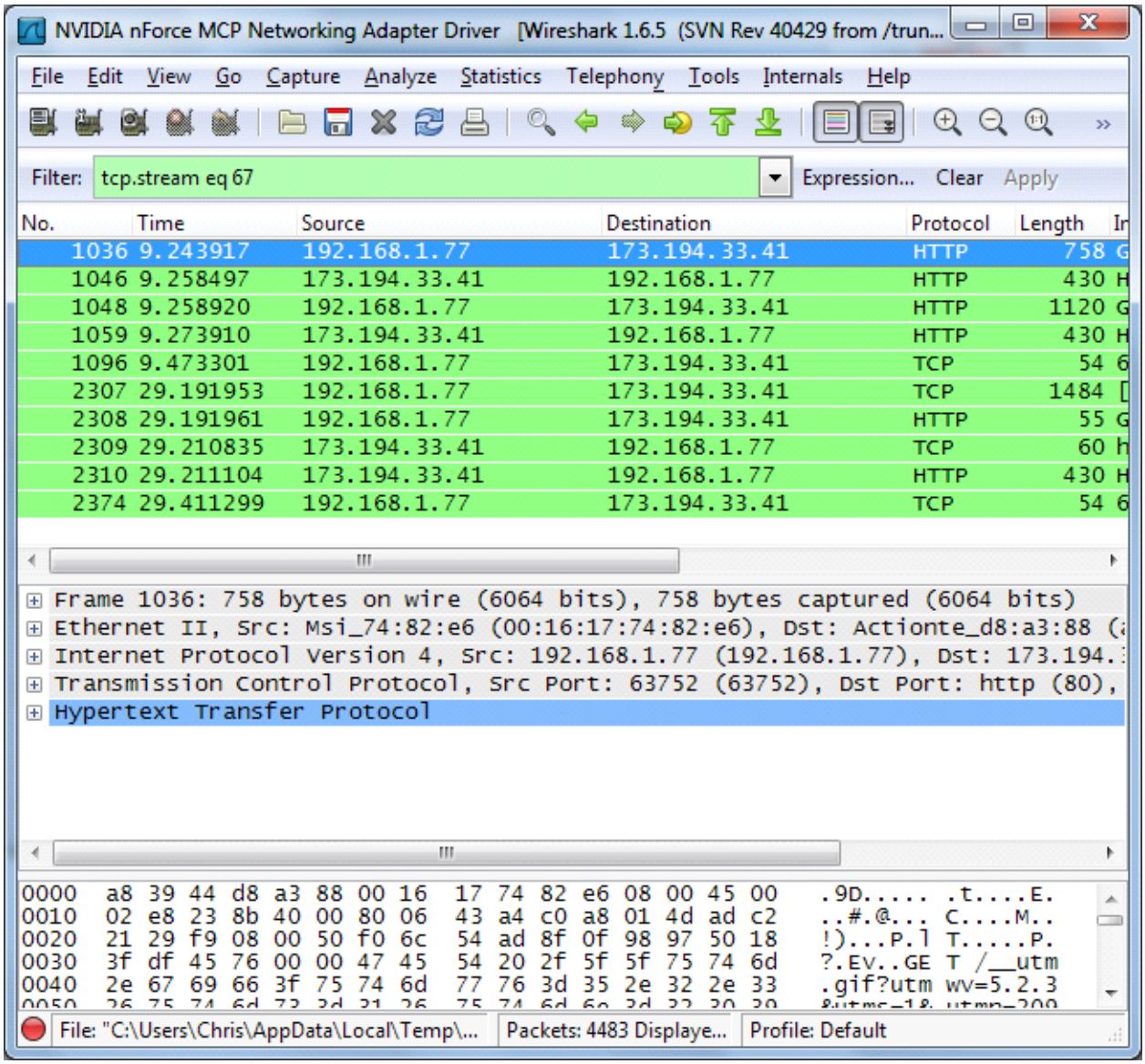
Another interesting thing you can do is right-click a packet and select Follow TCPStream



You'll see the full conversation between the client and the server.

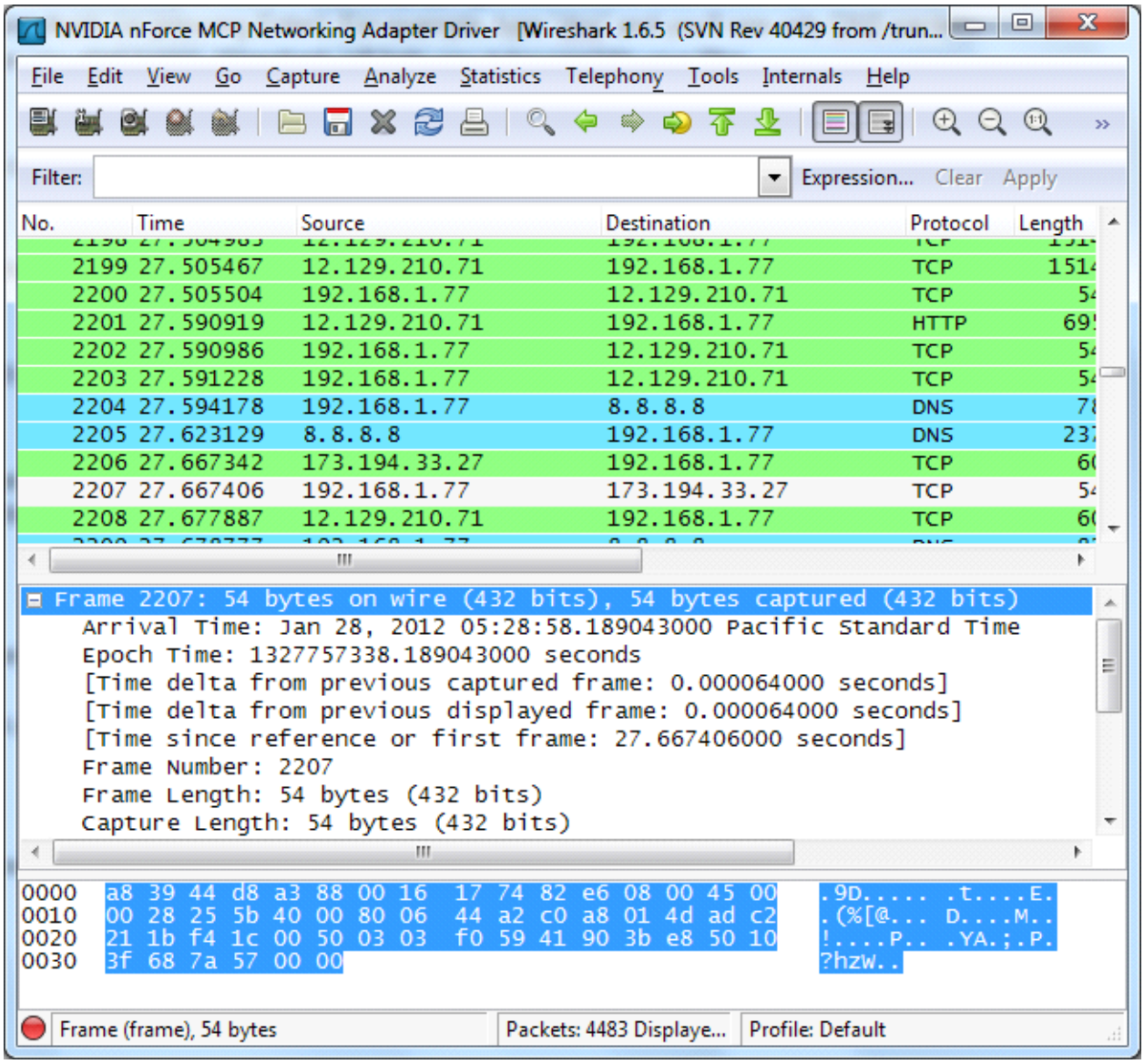


Close the window and you'll find a filter has been applied automatically — Wireshark is showing you the packets that make up the conversation.

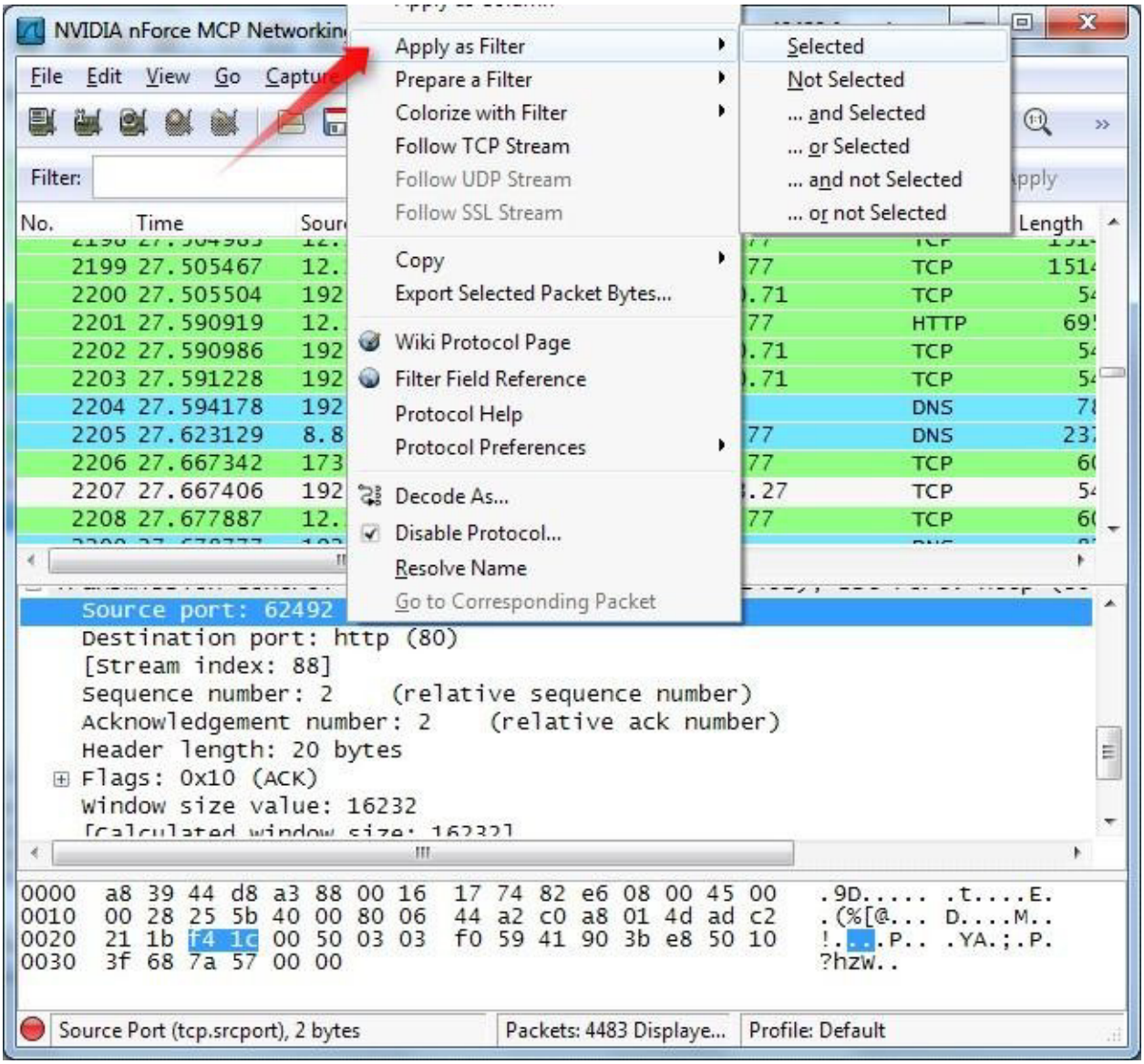


Inspecting Packets

Click a packet to select it and you can dig down to view its details.



You can also create filters from here — just right-click one of the details and use the Apply as Filter submenu to create a filter based on it.



Wireshark is an extremely powerful tool, and this tutorial is just scratching the surface of what you can do with it. Professionals use it to debug network protocol implementations, examine security problems and inspect network protocol internals.

6. **Conclusion:**

   In this experiment we analyze various packet sniffing tools that monitor network traffic transmitted between legitimate users or in the network. The packet sniffer is network monitoring tool. It is opted for network monitoring, traffic analysis, troubleshooting, Packet grapping, message, protocol analysis, penetration testing and many other purposes.

7. **Viva Questions:**

- What is packet sniffer?

- How to sniff passwords with wireshark?
- List packet sniffing tools other than mentioned above?

8. References:

- http://netsecurity.about.com/od/informationresources/a/What-Is-A-Packet- Sniffer.htm
- https://samsclass.info/120/proj/p3-wireshark.htm
- http://sectools.org/tag/sniffers/

Mini Project Lab

Experiment No. : 6

Download and install nmap. Use it with different options to scan open ports, perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.

Experiment No. 6

1. **Aim:** Download and install nmap. Use it with different options to scan open ports,perform OS fingerprinting, do a ping scan, tcp port scan, udp port scan, etc.

2. **Objectives:** objective of this module to learn nmap installation & use this to scan different ports.

3. **Outcomes:** The learner will be able to:-

    - Scan the network using scanning techniques available in NMAP.
    - Use current techniques, skills, and tools necessary for computing practice

4. **Hardware / Software Required :** NMAP Tool
5. **Theory:**

Nmap (Network Mapper) is a security scanner originally written by Gordon Lyon (also known by his pseudonym Fyodor Vaskovich) used to discover hosts and services on a computer network, thus creating a "map" of the network. To accomplish its goal, Nmap sends specially crafted packets to the target host and then analyzes the responses. Unlike many simple port scanners that just send packets at some predefined constant rate, Nmap accounts for the network conditions (latency fluctuations, network congestion, the target interference with the scan) during the run. Also, owing to the large and active user community providing feedback and contributing to its features, Nmap has been able to extend its discovery capabilities beyond simply figuring out whether a host is up or down and which ports are open and closed; it can determine the operating system of the target, names and versions of the listening services, estimated uptime,type of device, and presence of a firewall.

Nmap features include:

Host Discovery – Identifying hosts on a network. For example, listing the hosts which respond to pings or have a particular port open.

Port Scanning – Enumerating the open ports on one or more target hosts.

Version Detection – Interrogating listening network services listening on remote devices to determine the application name and version number.

OS Detection – Remotely determining the operating system and some hardware characteristics of network devices.

Basic commands working in Nmap

For target specifications:

nmap <target's URL or IP with spaces between them>

For OS detection:

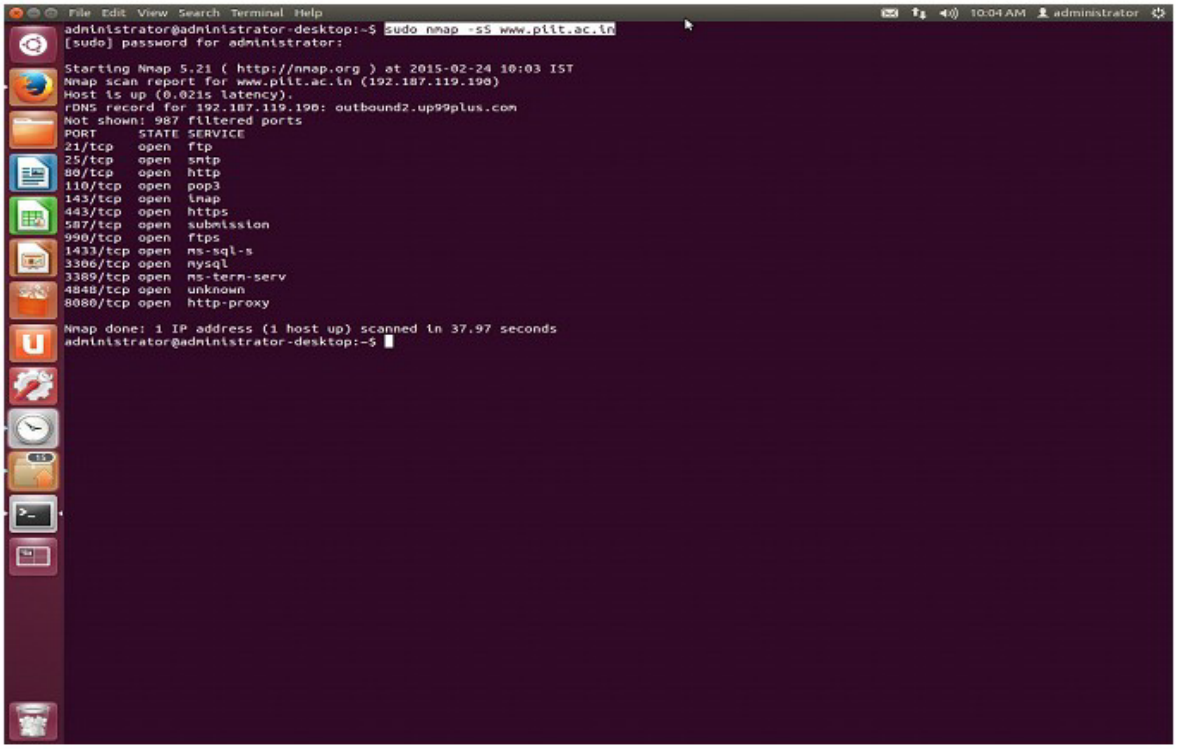
nmap -O <target-host's URL or IP>

For version detection:

nmap -sV <target-host's URL or IP>

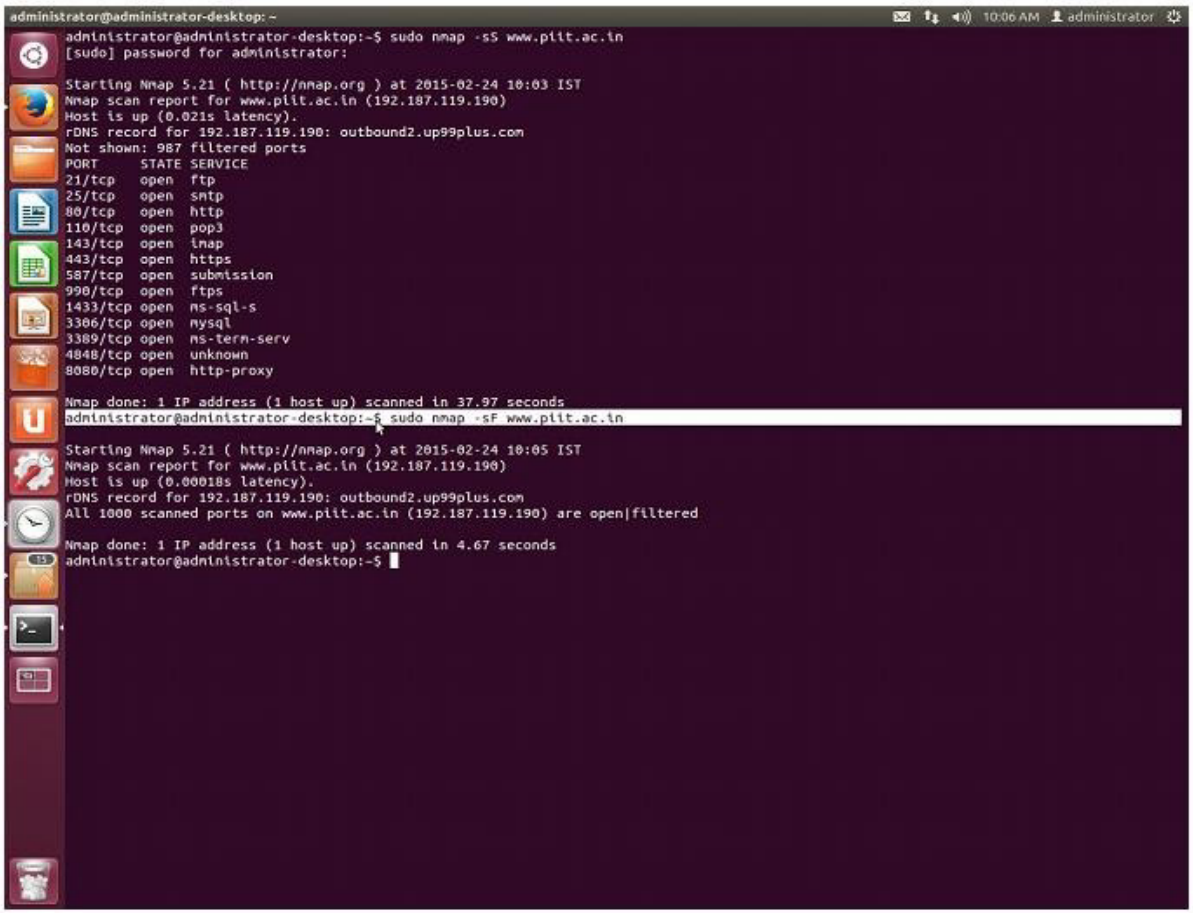
After the installation of nmap:> **sudo apt-get install nmap**

SYN scan is the default and most popular scan option for good reasons. It can be performed quickly, scanning thousands of ports per second on a fast network not hampered by restrictive firewalls. It is also relatively unobtrusive and stealthy since it never completes TCP connections.



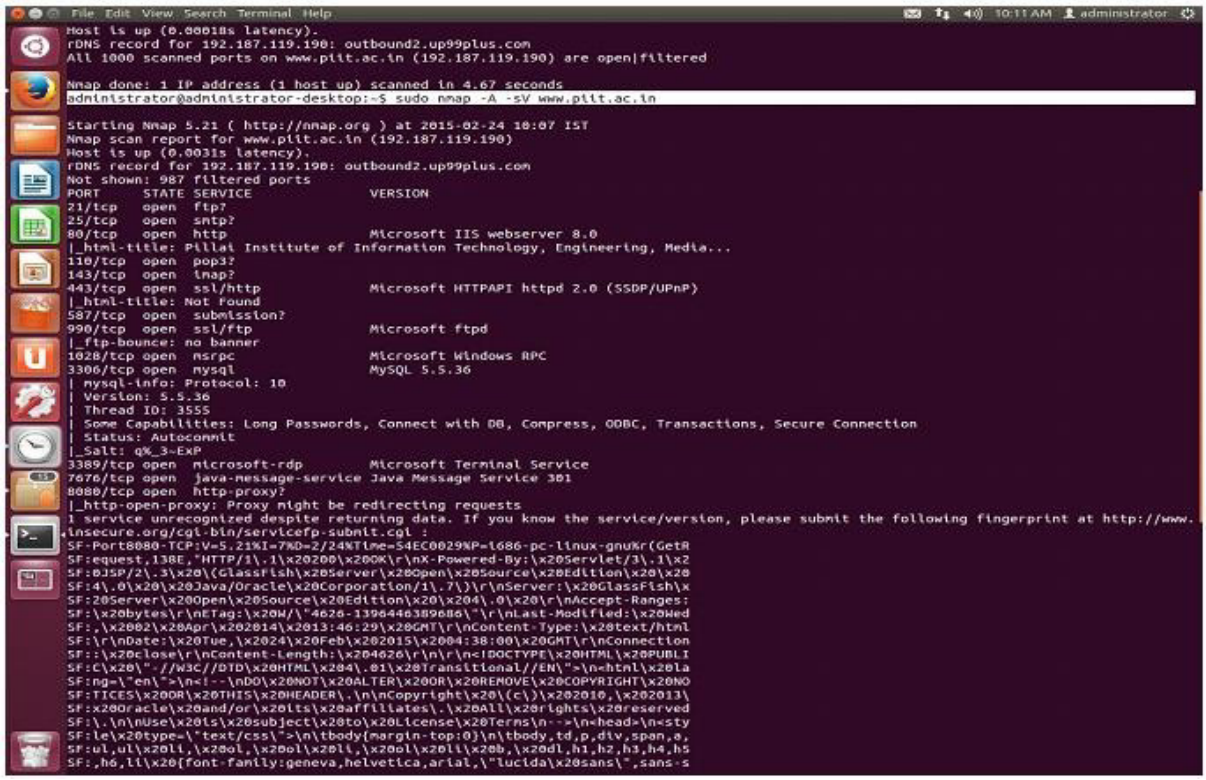
FIN scan (-sF)

Sets just the TCP FIN bit.



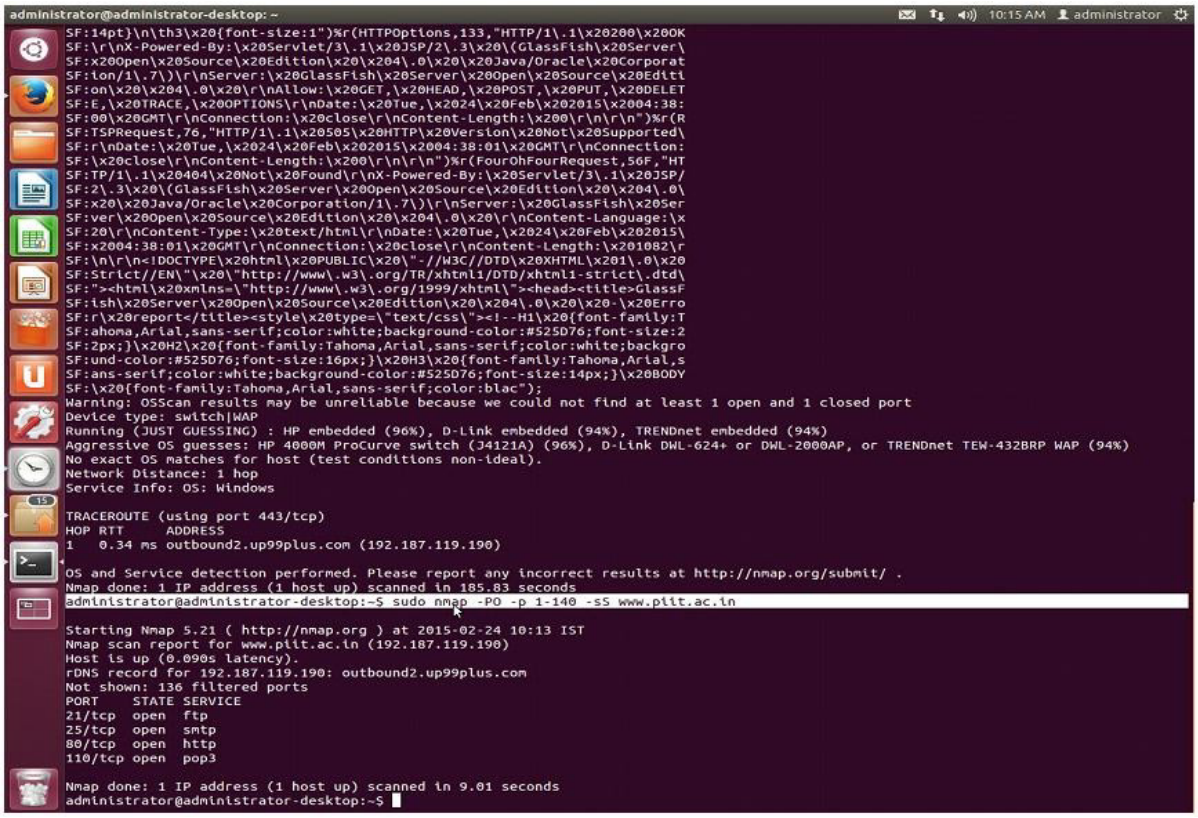
-sV (Version detection) :Enables version detection, as discussed above.

Alternatively, we can use -A, which enables version detection among other things.



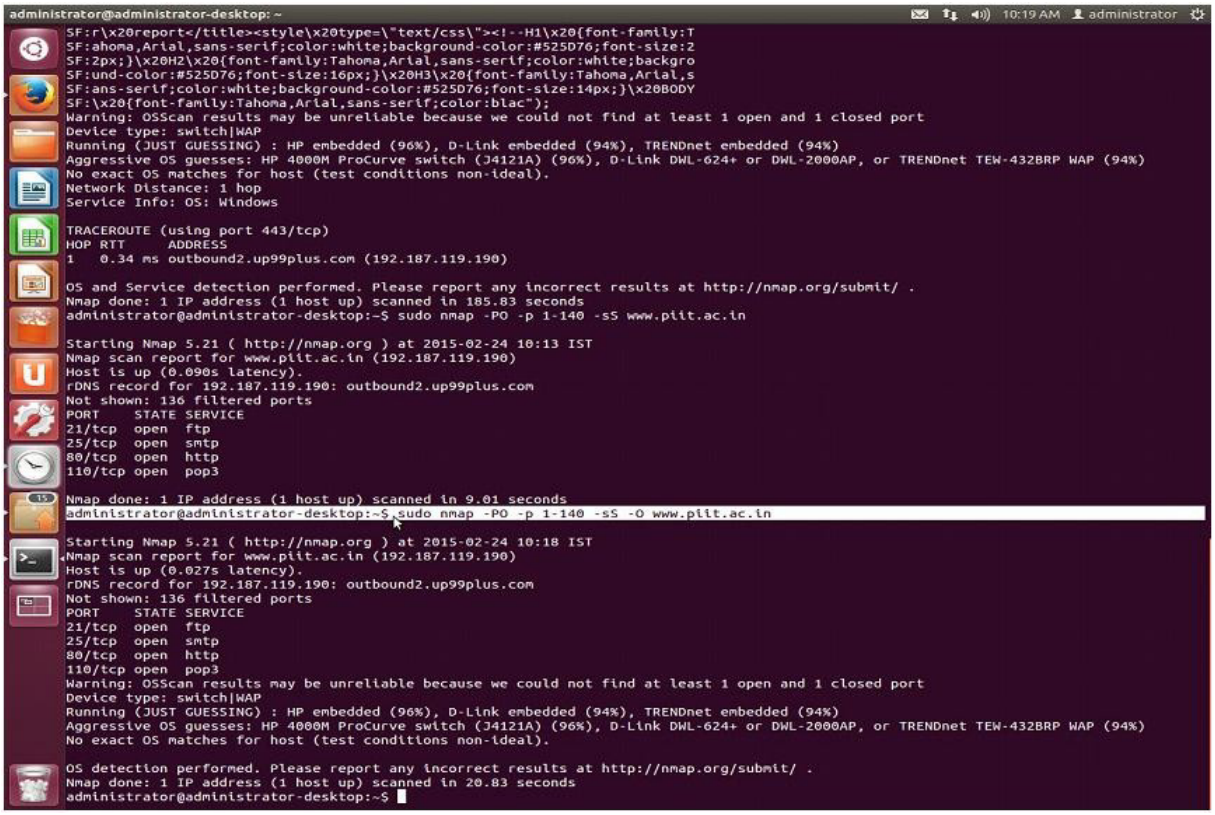
-PO protocol list (IP Protocol Ping) :

The newest host discovery option is the IP protocol ping, which sends IP packets with the specified protocol number set in their IP header. The protocol list takes the same format as do port lists in the previously discussed TCP, UDP and SCTP host discovery options.



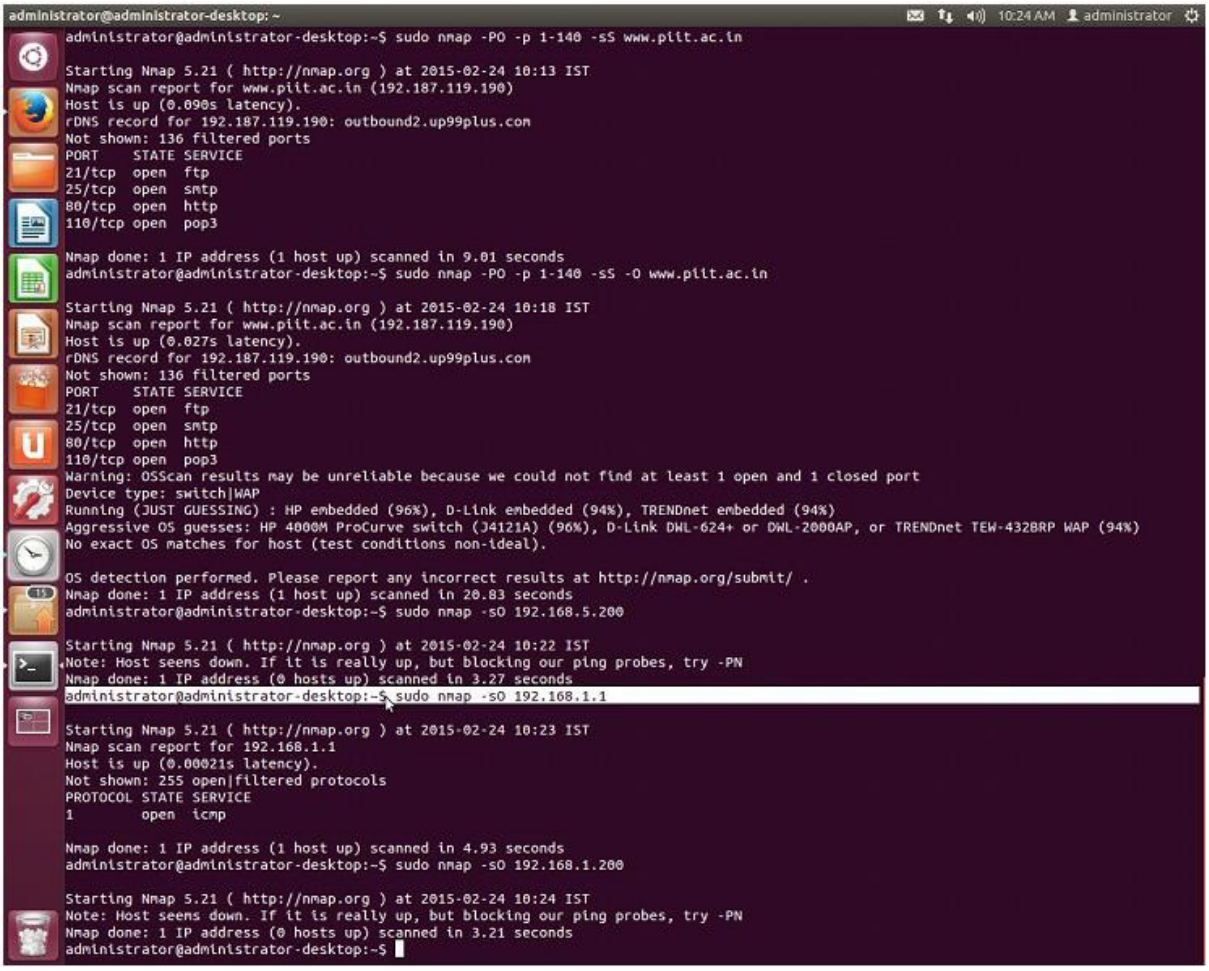
-p port ranges (Only scan specified ports) .

This option specifies which ports you want to scan and overrides the default. Individual port numbers are OK, as are ranges separated by a hyphen (e.g. 1-1023). The beginning and/or end values of a range may be omitted, causing Nmap to use 1 and 65535, respectively.



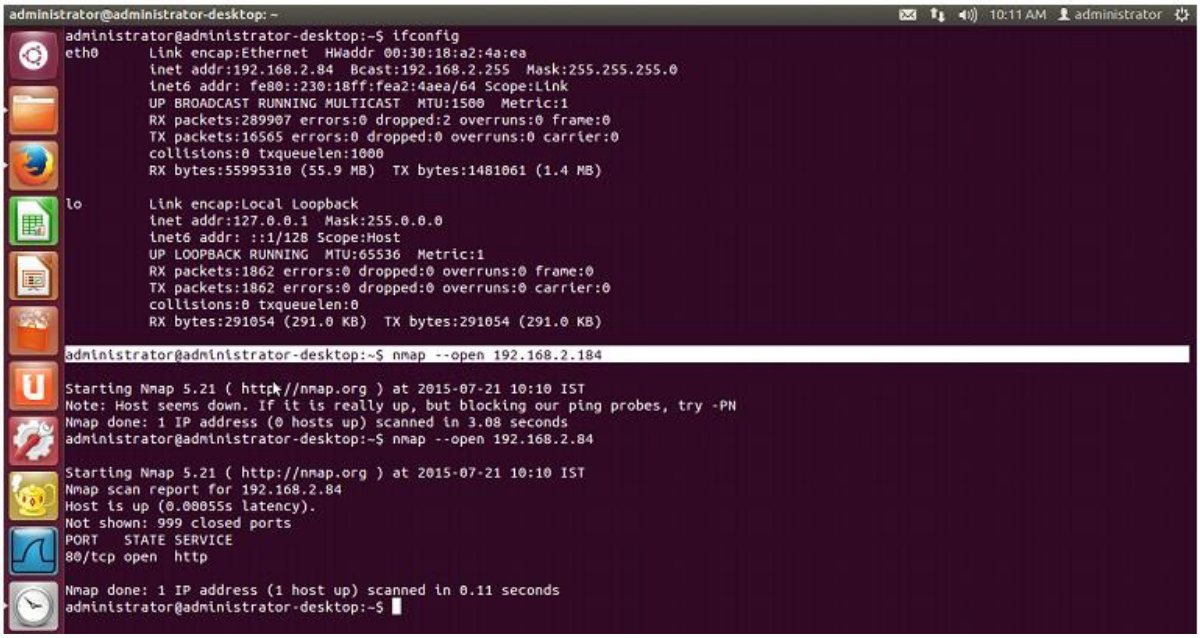
-sO (IP protocol scan) .

IP protocol scan allows you to determine which IP protocols (TCP, ICMP, IGMP, etc.) are supported by target machines. This isn't technically a port scan, since it cycles through IP protocol numbers rather than TCP or UDP port numbers.



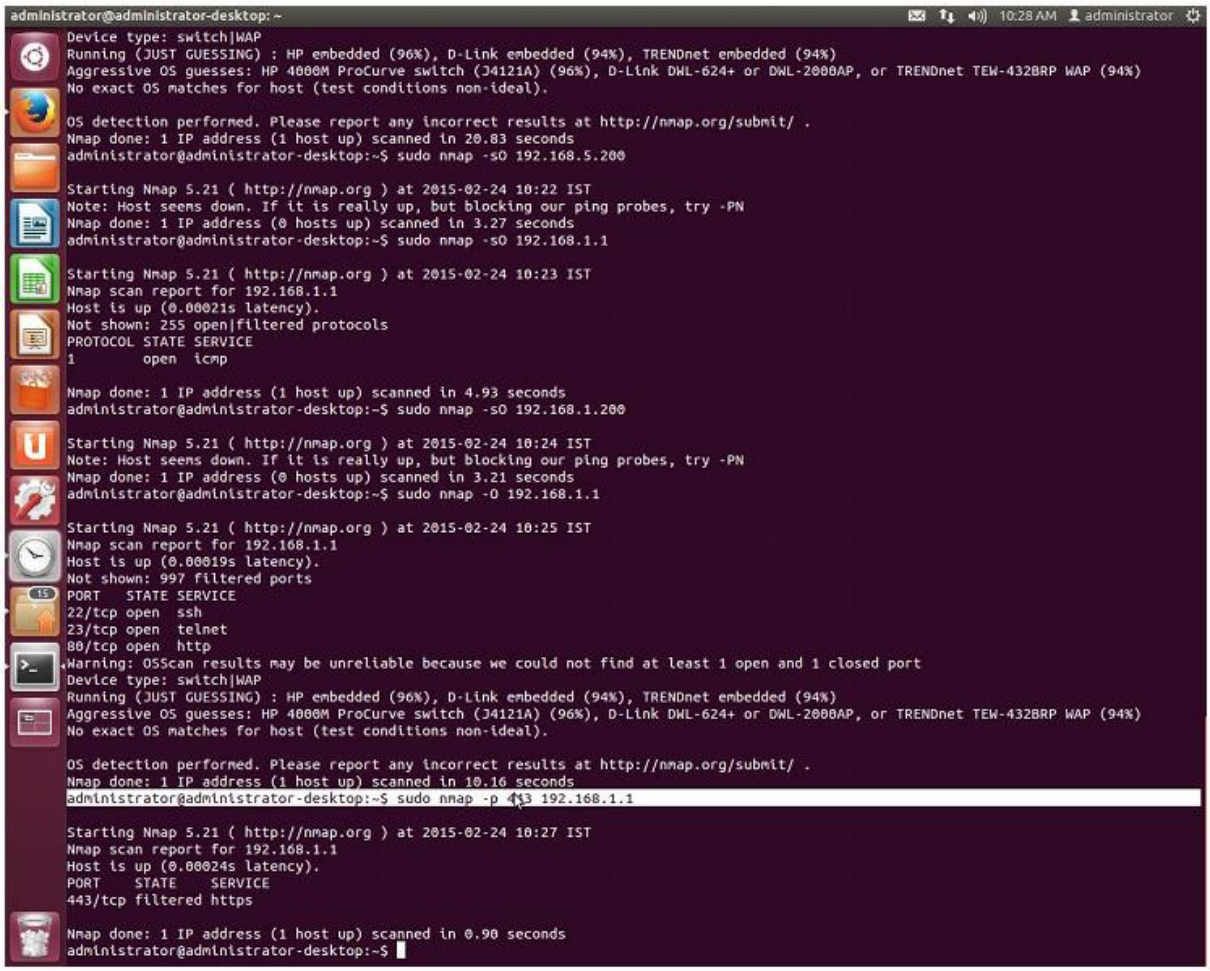
--open (Show only open (or possibly open) ports) .

Sometimes you only care about ports you can actually connect to (open ones), and don't want results cluttered with closed, filtered, and closed|filtered ports.



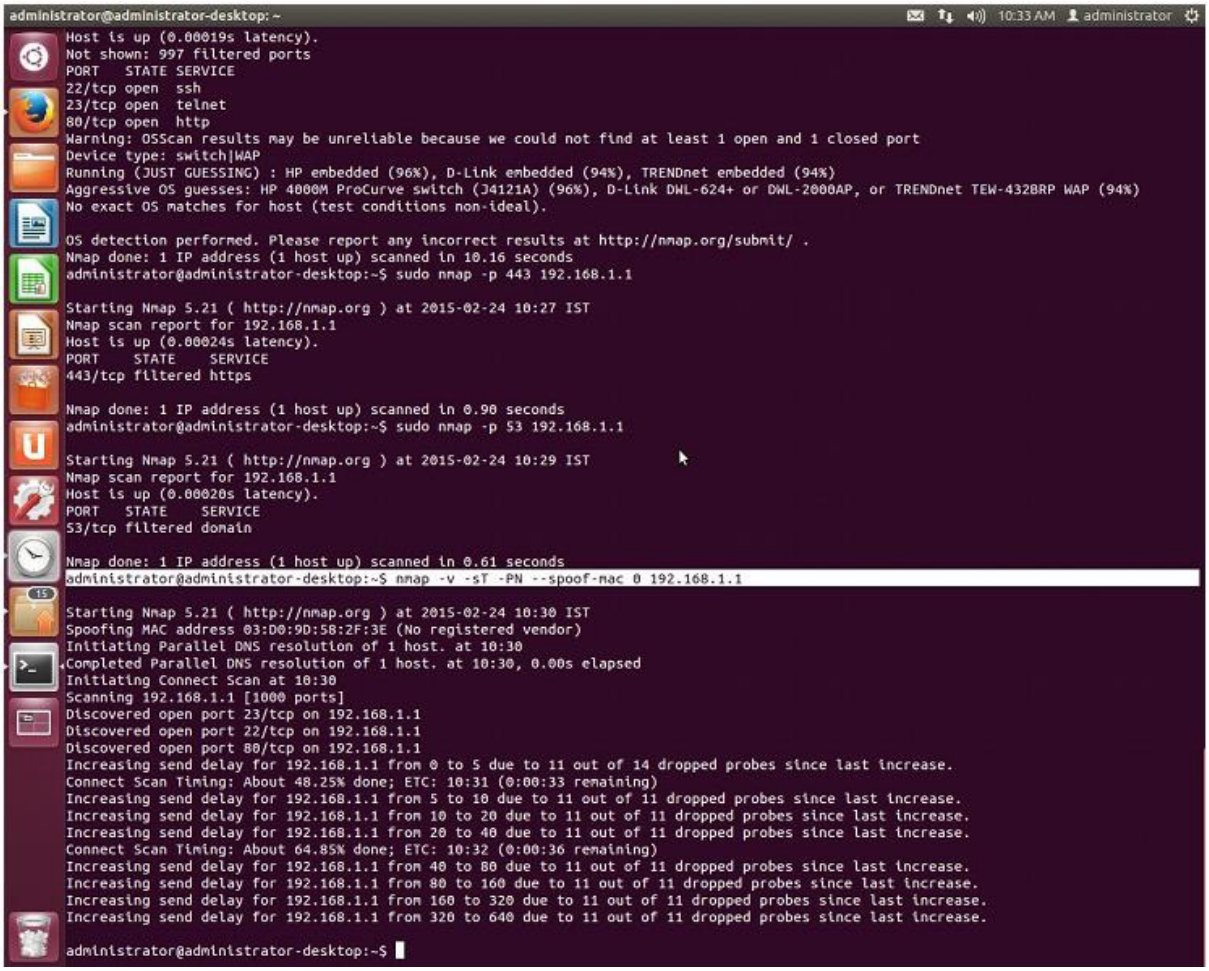
-p port ranges (Only scan specified ports) .

This option specifies which ports you want to scan and overrides the default. Individual port numbers are OK, as are ranges separated by a hyphen (e.g. 1-1023). The beginning and/or end values of a range may be omitted, causing Nmap to use 1 and 65535, respectively.



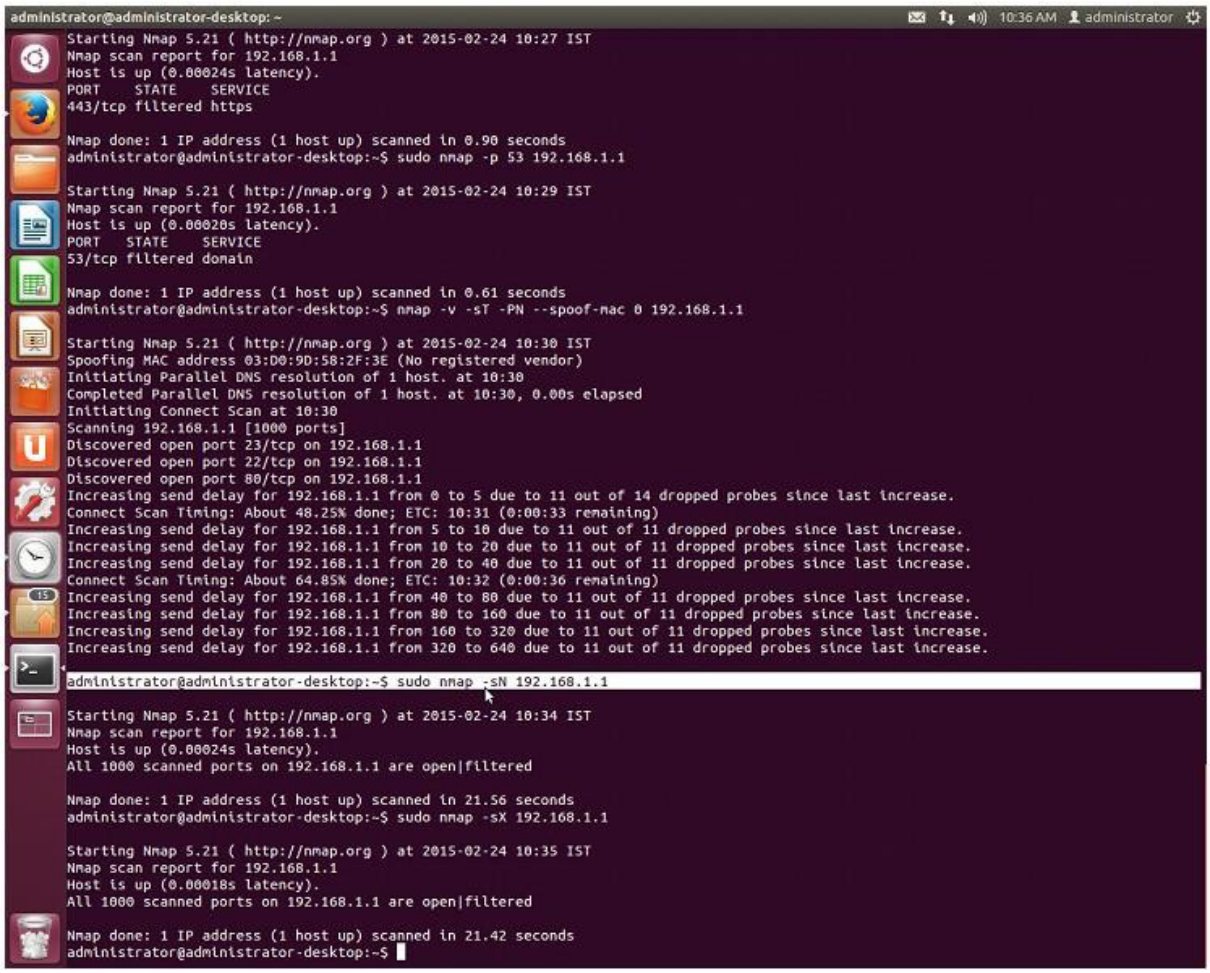
-sT (TCP connect scan) .

TCP connect scan is the default TCP scan type when SYN scan is not an option. This is the case when a user does not have raw packet privileges or is scanning IPv6 networks. Instead of writing raw packets as most other scan types do, Nmap asks the underlying operating system to establish a connection with the target machine and port by issuing the connect system call. Along with spoofing.



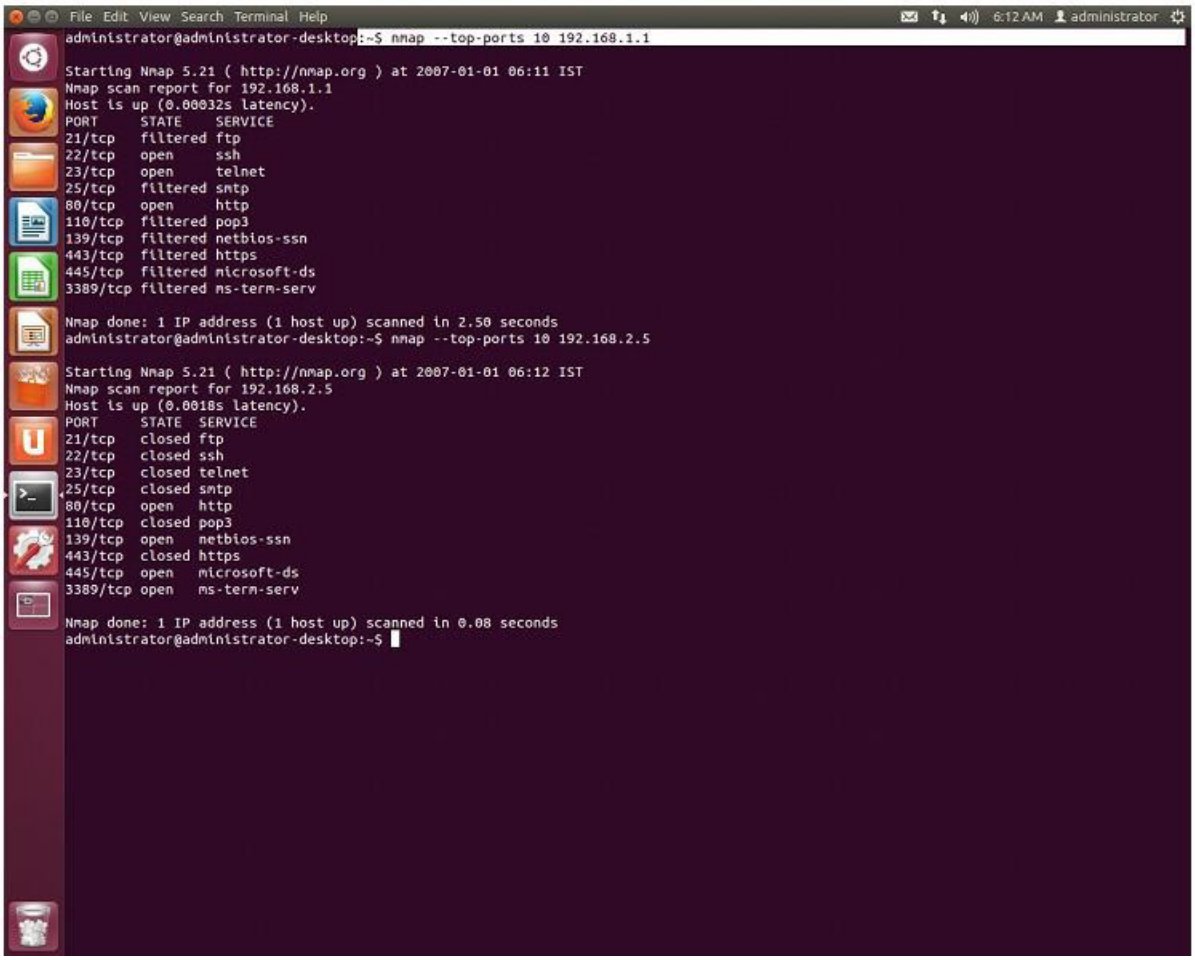
Null scan (-sN):

Does not set any bits (TCP flag header is 0)



--top-ports <integer of 1 or greater>

Scans the N highest-ratio ports found in nmap-services file.

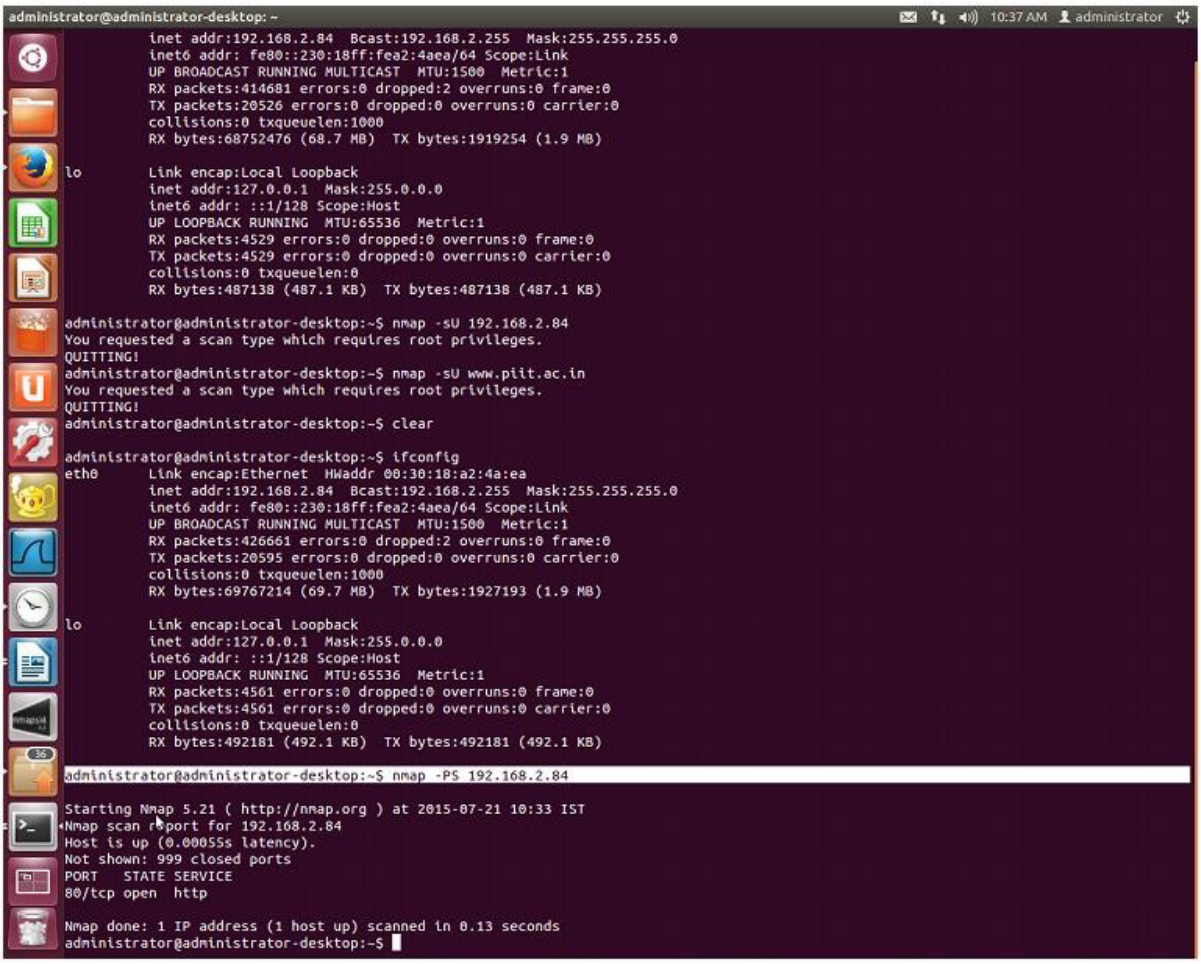


-PS port list (TCP SYN Ping) .

This option sends an empty TCP packet with the SYN flag set. The default destination port is

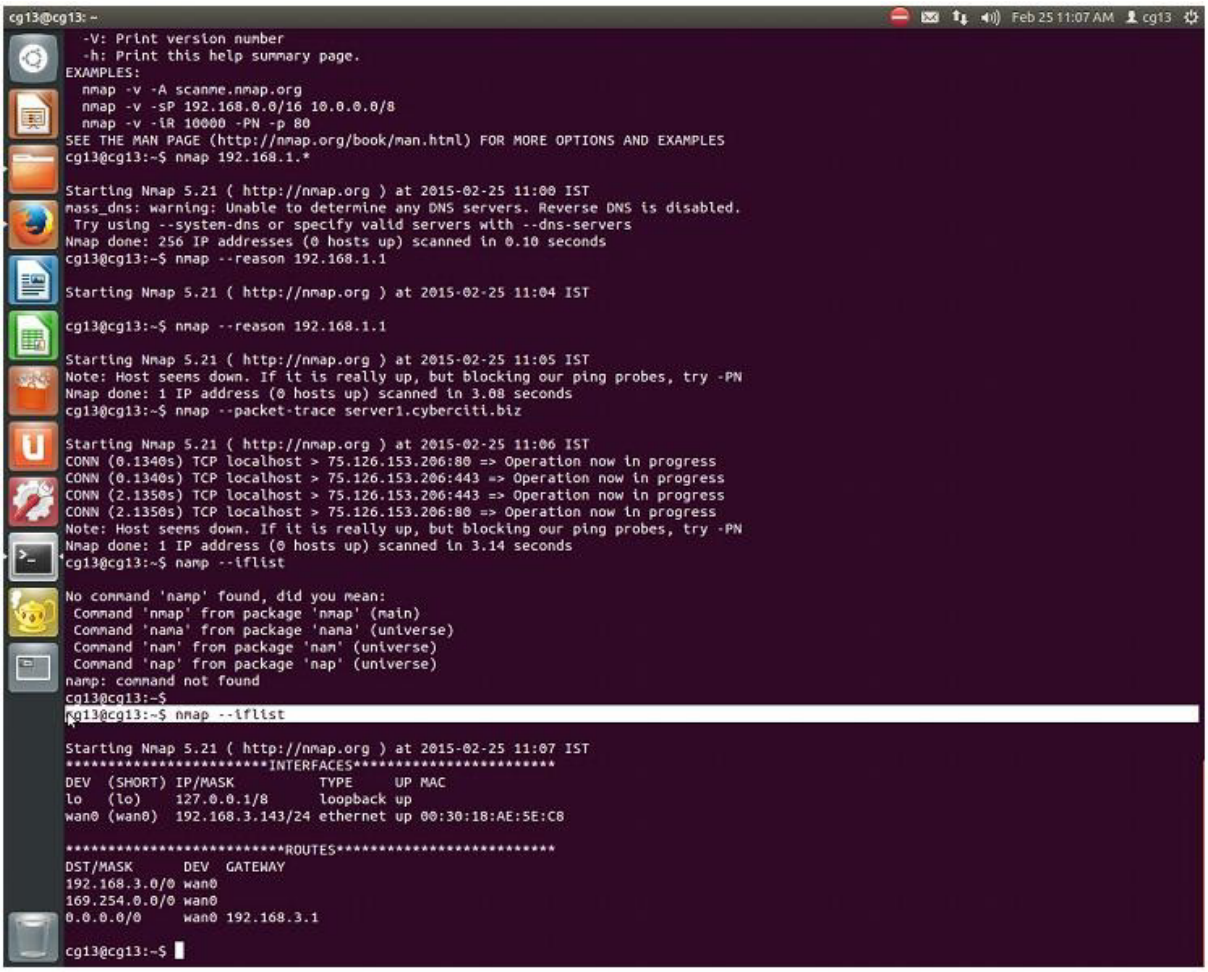
80 (configurable at compile time by changing DEFAULT_TCP_PROBE_PORT_SPEC innmap.h). Alternate ports can be specified as a parameter. The syntax is the same as for the

-p except that port type specifiers like T: are not allowed.



nmap –iflist

host interface and route information with nmap by using —iflist‖ option.



6. **Conclusion:**

   Network scanning provides a wealth of information about the target network, which is valuable regardless of whether you're trying to attack the network or protect it from attack. While performing a basic scan is a simple matter, the network scanners covered in this experiment provide a wide array of options to tweak your scan to achieve the best results. Nmap is used to detect IP spoofing and port scanning.

7. **Viva Questions:**

   - What is Host Discovery?
   - How to use nmap to detect remote OS?
   - How to check whether NMAP already installed or not?
   - what are the phases of NMAP scanning?

8. **References:**

   - https://nmap.org/docs/discovery.pdf

- https://nmap.org/book/install.html#inst-already

- https://books.google.co.in/books?id=hyi5BgAAQBAJ&pg=PA205&lpg=PA205&
  dq=phases+of+nmap&source=bl&ots=BCACFIV8by&sig=QQ6BLonVo1UBblw
  rdogaNJ_1FKI&hl=en&sa=X&ved=0ahUKEwiDjofJoc3NAhUESI8KHa1rBqsQ6 AEITTAJ#v=onepage&q=phases%20of%20nmap&f=false

Mini Project Lab

Experiment No. : 7

Detect ARP spoofing using open source tool ARPWATCH

Experiment No. 7

1. **Aim:** Detect ARP spoofing using open source tool ARPWATCH.

2. **Objectives:** Objective of the module to find ARP spoofing using open source.

3. **Outcomes:** The learner will be able to:-

    - Identify network vulnerability with tool usage.
    - Also recognize the need of such tool to identify ARP spoofing, and an ability to engage in life-long learning to exploit gained skills and knowledge of contemporary issues.

4. **Hardware / Software Required** :ARPWATCH Tool

5. **Theory:**

Arpwatch Commands and Usage

To watch a specific interface, type the following command with _-i_ and device name.

```
# arpwatch -i eth0
```

So, whenever a new MAC is plugged or a particular IP is changing his MAC address on the network, you will notice syslog entries at _/var/log/syslog_ or _/var/log/message_ file.

```
# tail -f /var/log/messages
```

Sample Output

```
Apr 15 12:45:17 tecmint arpwatch: new station 172.16.16.64 d0:67:e5:c:9:67
Apr 15 12:45:19 tecmint arpwatch: new station 172.16.25.86 0:d0:b7:23:72:45
Apr 15 12:45:19 tecmint arpwatch: new station 172.16.25.86 0:d0:b7:23:72:45
Apr 15 12:45:19 tecmint arpwatch: new station 172.16.25.86 0:d0:b7:23:72:45
Apr 15 12:45:19 tecmint arpwatch: new station 172.16.25.86 0:d0:b7:23:72:45
```

The above output displays new workstation. If any changes are made, you will get following output.

```
Apr 15 12:45:17 tecmint arpwatch: changed station 172.16.16.64 0:f0:b8:26:82:56 (d0:67:e5:c:9:67)
Apr 15 12:45:19 tecmint arpwatch: changed station 172.16.25.86 0:f0:b8:26:82:56 (0:d0:b7:23:72:45)
Apr 15 12:45:19 tecmint arpwatch: changed station 172.16.25.86 0:f0:b8:26:82:56 (0:d0:b7:23:72:45)
Apr 15 12:45:19 tecmint arpwatch: changed station 172.16.25.86 0:f0:b8:26:82:56 (0:d0:b7:23:72:45)
Apr 15 12:45:19 tecmint arpwatch: changed station 172.16.25.86 0:f0:b8:26:82:56 (0:d0:b7:23:72:45)
```

You can also check current ARP table, by using following command.

```
# arp -a
```

Sample Output:

```
tecmint.com (172.16.16.94) at 00:14:5e:67:26:1d [ether] on eth0

? (172.16.25.125) at b8:ac:6f:2e:57:b3 [ether] on eth0
```

If you want to send alerts to your custom email id, then open the main configuration file_/etc/sysconfig/arpwatch_ and add the email as shown below.

```
# -u <username> : defines with what user id arpwatch should run

# -e <email>    : the <email> where to send the reports

# -s <from>     : the <from>-address

OPTIONS="-u arpwatch -e tecmint@tecmint.com -s 'root (Arpwatch)'"
```

Here is an example of an email report, when a new MAC is connected on.

hostname: centos

ip address: 172.16.16.25

interface: eth0

ethernet address: 00:24:1d:76:e4:1d

ethernet vendor: GIGA-BYTE TECHNOLOGY CO.,LTD.

timestamp: Monday, April 15, 2012 15:32

6. **Conclusion:**

   Arpwatch is a software or program tool for monitoring Address Resolution Protocol traffic on a computer network. Its main goal is to detect arp poisoning attacks like (*e.g. ARP Poisoning, Ettercap, and Netcut*) also detect intruders in your network by sending an email to an administrator when new Ethernet MAC addresses seen on the network.

7. **Viva Questions:**

   - What is ARP spoofing?
   - What is IP spoofing?

8. **References:**

   - http://www.veracode.com/security/arp-spoofing
   - http://searchsecurity.techtarget.com/definition/IP-spoofing

Mini Project Lab

Experiment No. : 8

Use the Nessus tool to scan the network for vulnerabilities.

Experiment No. 8

1. **Aim:** Use the Nessus tool to scan the network for vulnerabilities.

2. **Objectives:** Objective of the module is scan system and network analysis.

3. **Outcomes:** The learner will be able to:- usage.

    - Identify network vulnerability with tool
    - Use current techniques, skills, and tools to find out different vulnerabilities and the countermeasures for identified vulnerabilities.

4. **Hardware / Software Required :** Nessus Vulnerability Scanner | Tenable Network Security tool

5. **Theory:**

Nessus is a proprietary comprehensive vulnerability scanner which is developed by Tenable Network Security. It is free of charge for personal use in a non-enterprise environment.

Operation

- Nessus allows scans for the following types of vulnerabilities:
- Vulnerabilities that allow a remote hacker to control or access sensitive data on a system.
- Misconfiguration (e.g. open mail relay, missing patches, etc.).

Default passwords, a few common passwords, and blank/absent passwords on some system accounts. Nessus can also call Hydra (an external tool) to launch a dictionary attack.Denials of service against the TCP/IP stack by using malformed packets

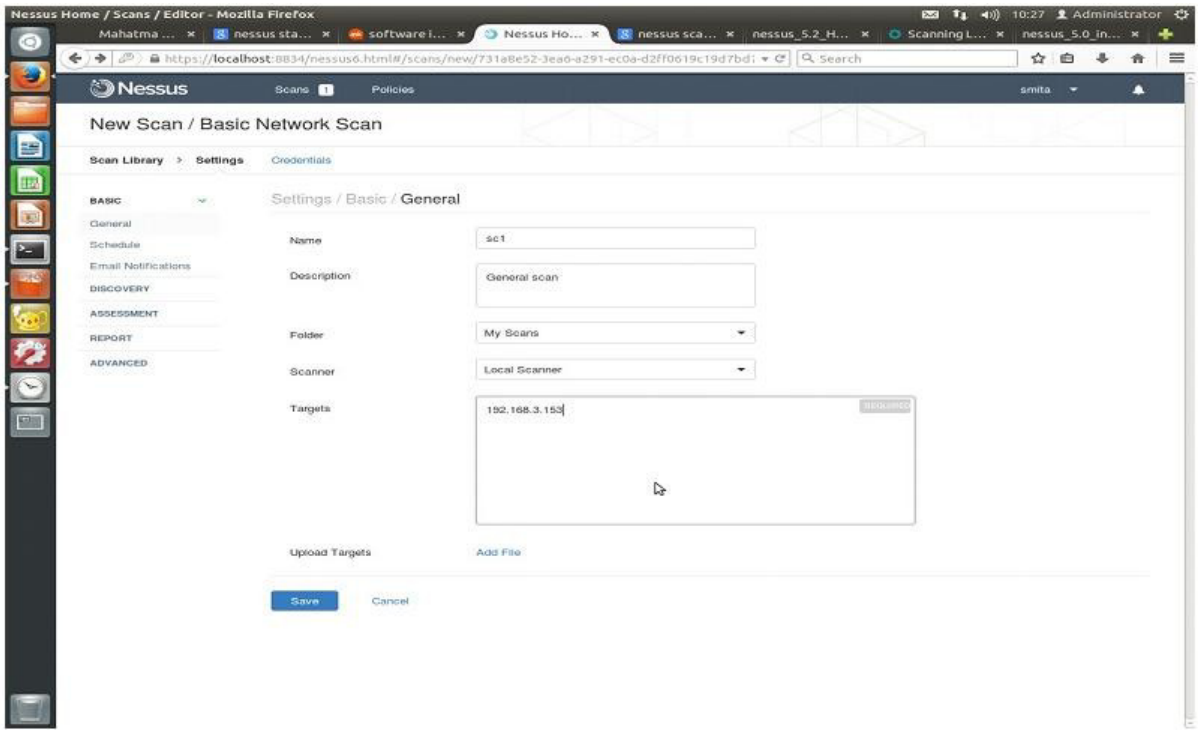
Preparation for PCI DSS audits

On UNIX (including Mac OS X), it consists of nessusd, the Nessus daemon, which

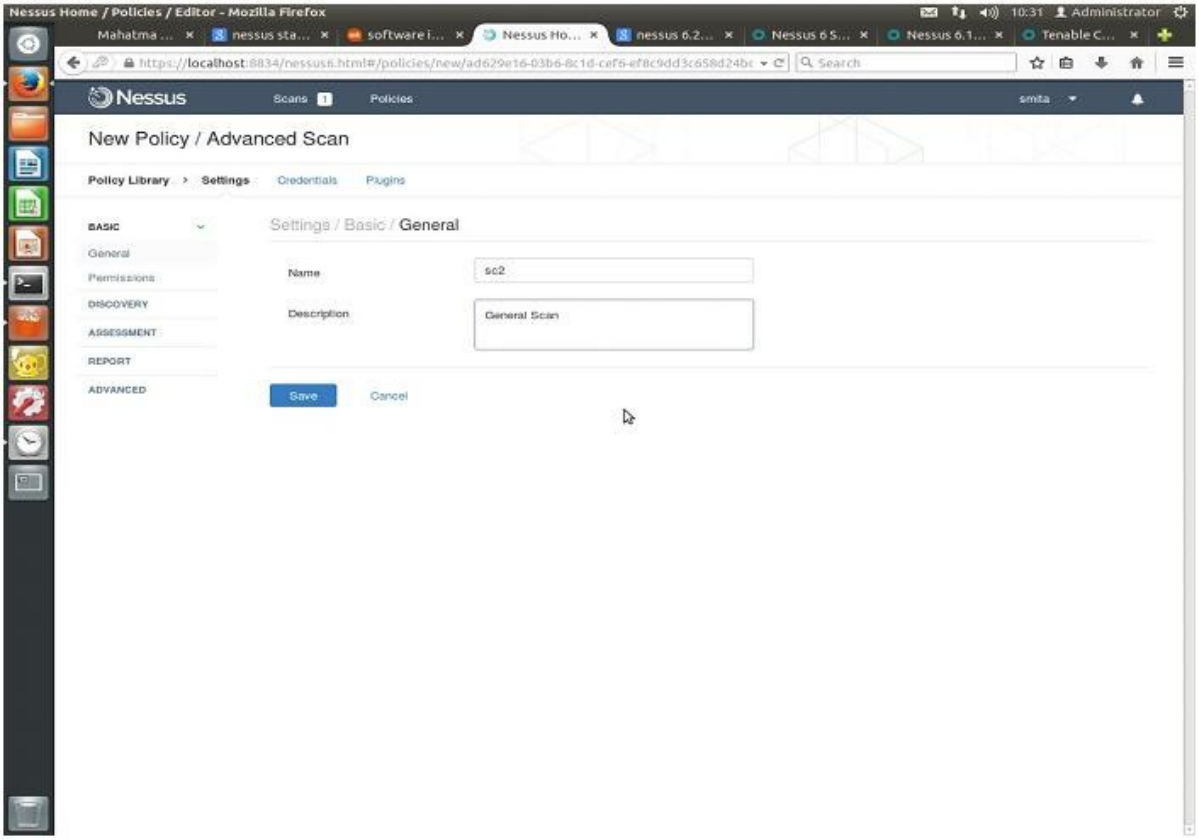
does the scanning, and nessus, the client, which controls scans and presents the vulnerability results to the user. In typical operation, Nessus begins by doing a port scan with one of its four internal

port scanners (or it can optionally use AmapM[4] or Nmap[5]) to determine which ports are open on the target and then tries various exploits on the open ports. The vulnerability tests, available as subscriptions, are written in NASL(Nessus Attack Scripting Language), a scripting language optimized for custom network interaction. Tenable Network Security produces several dozen new vulnerability checks (called plugins) each week, usually on a daily basis. These checks are available for free to the general public; commercial customers are not allowed to use this Home Feed any more. The Professional Feed (which is not free) also give access to support and additional scripts (e.g. audit files, compliance tests, additional vulnerability detection plugins). Optionally, the results of the scan can be reported in various formats, such as plain text, XML, HTML and LaTeX. The results can also be saved in a knowledge base for debugging. On UNIX, scanning can be automated through the use of a command-line client. There exist many different commercial, free and open source tools for both UNIX and Windows to manage individual or distributed Nessus scanners. If the user chooses to do so (by disabling the option 'safe checks'), some of Nessus' vulnerability test may try to cause vulnerable services or operating systems to crash. This lets a user test the resistance of a device before putting it in production. Nessus provides additional functionality beyond testing for known network vulnerabilities. For instance, it can use Windows credentials to examine patch levels on computers running the Windows operating system, and can perform password auditing using dictionary and brute force methods. Nessus 3 and later can also audit systems to make sure they have been configured per a specific policy, such as the NSA's guide for hardening Windows servers.

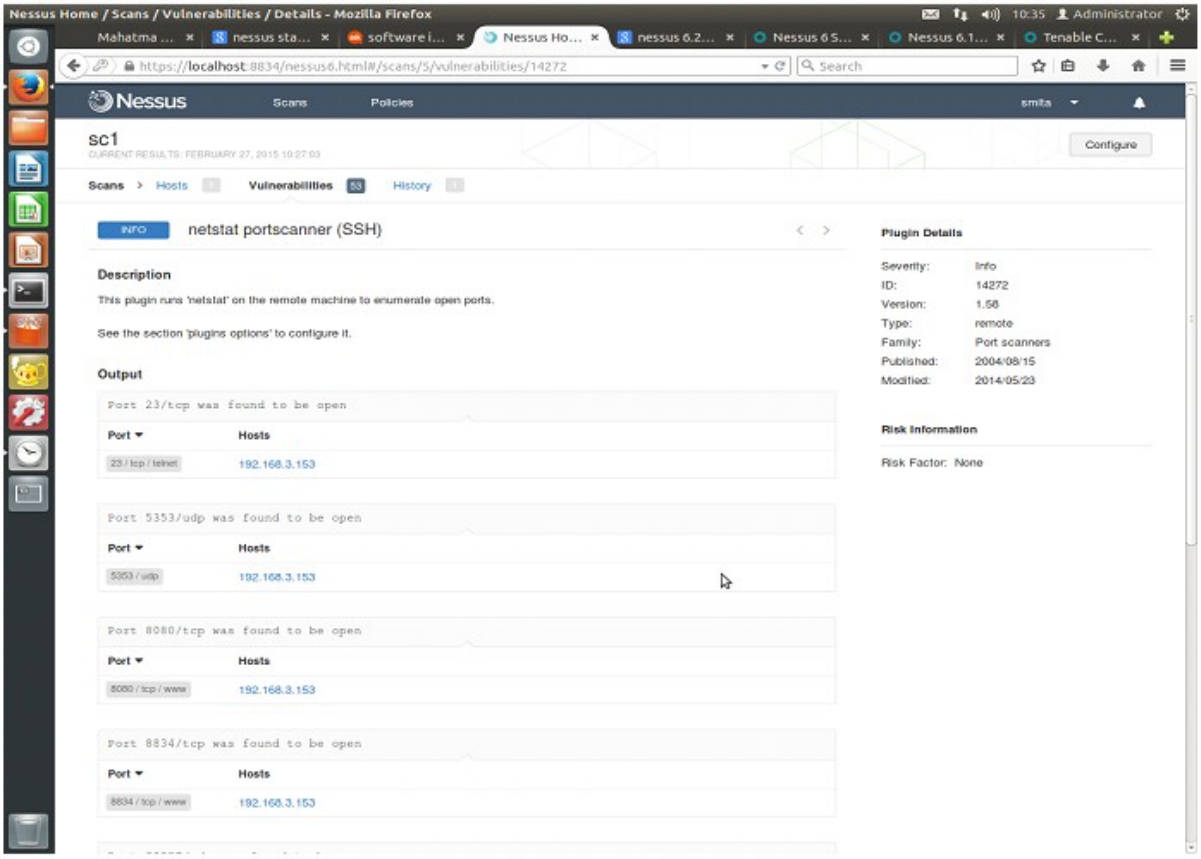
Basic Network scanning:



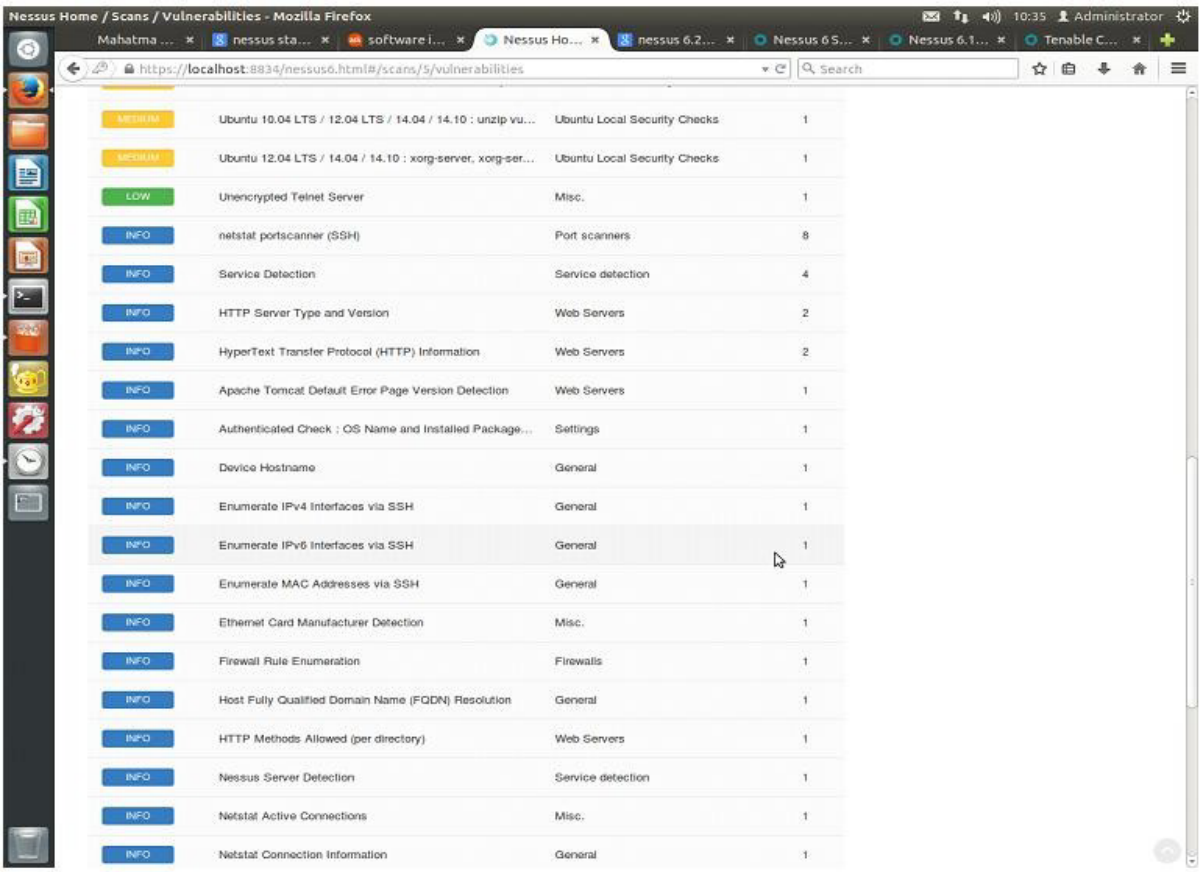
Advanced scanning in general search:



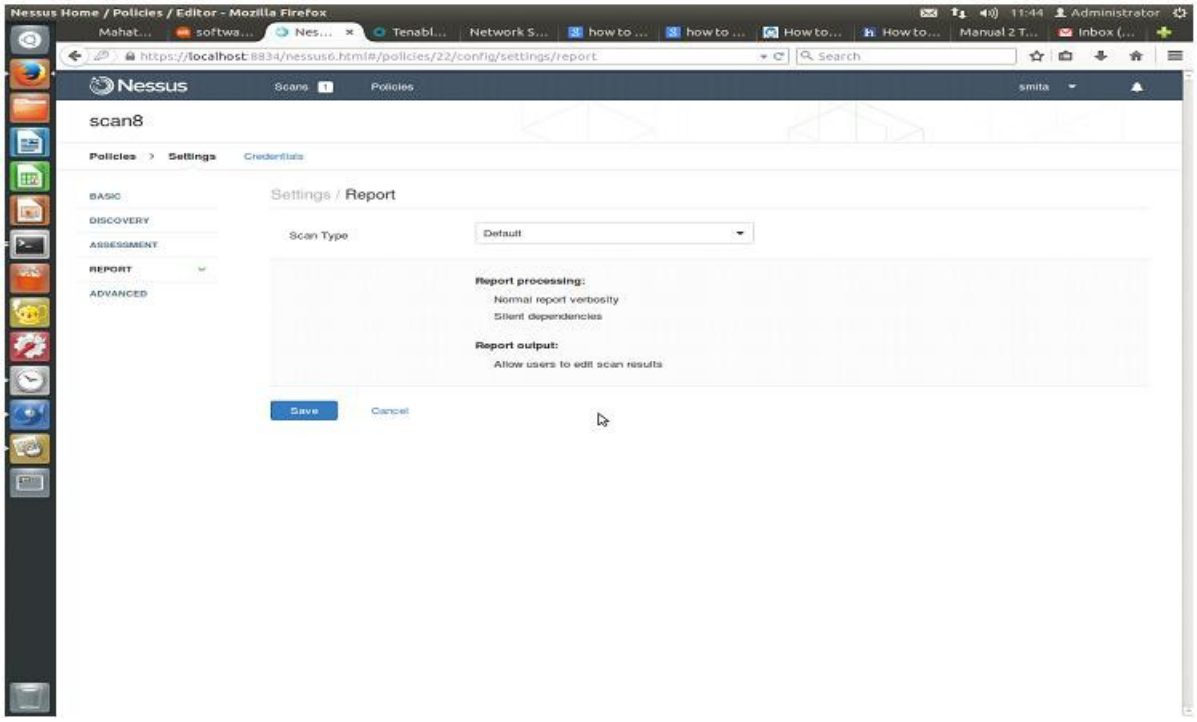
Ntstat port scanning:



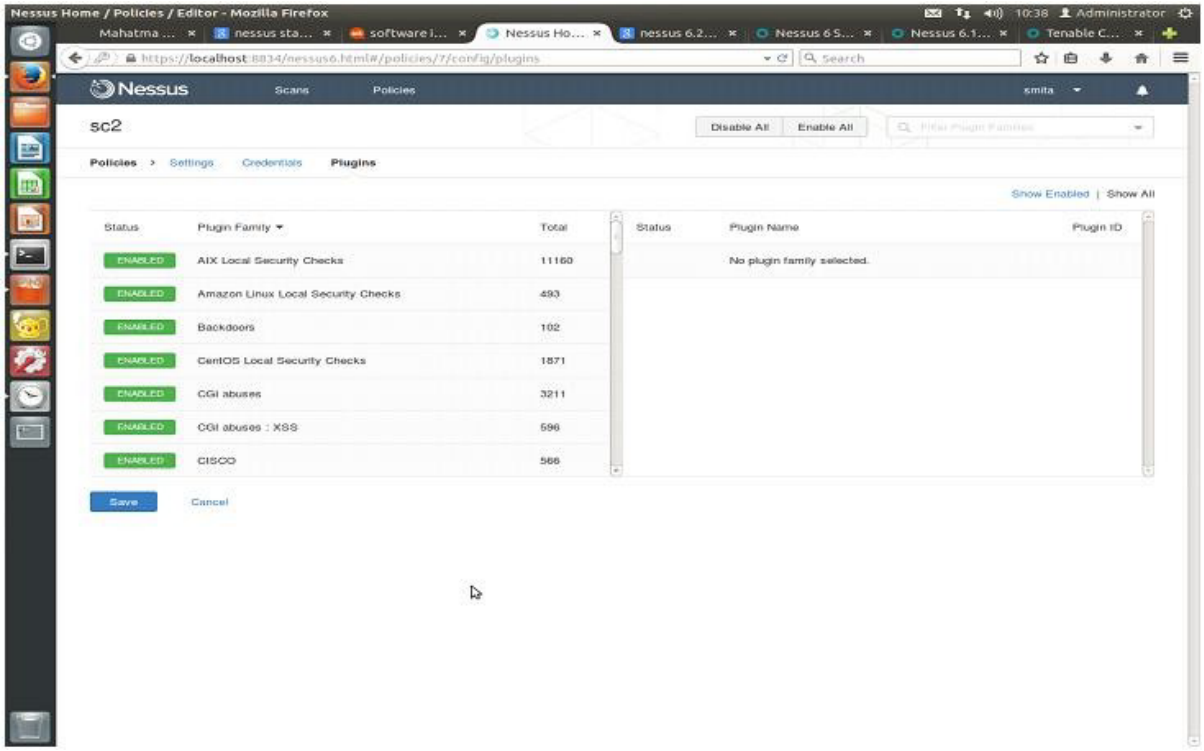
Vulnerability Mapping:



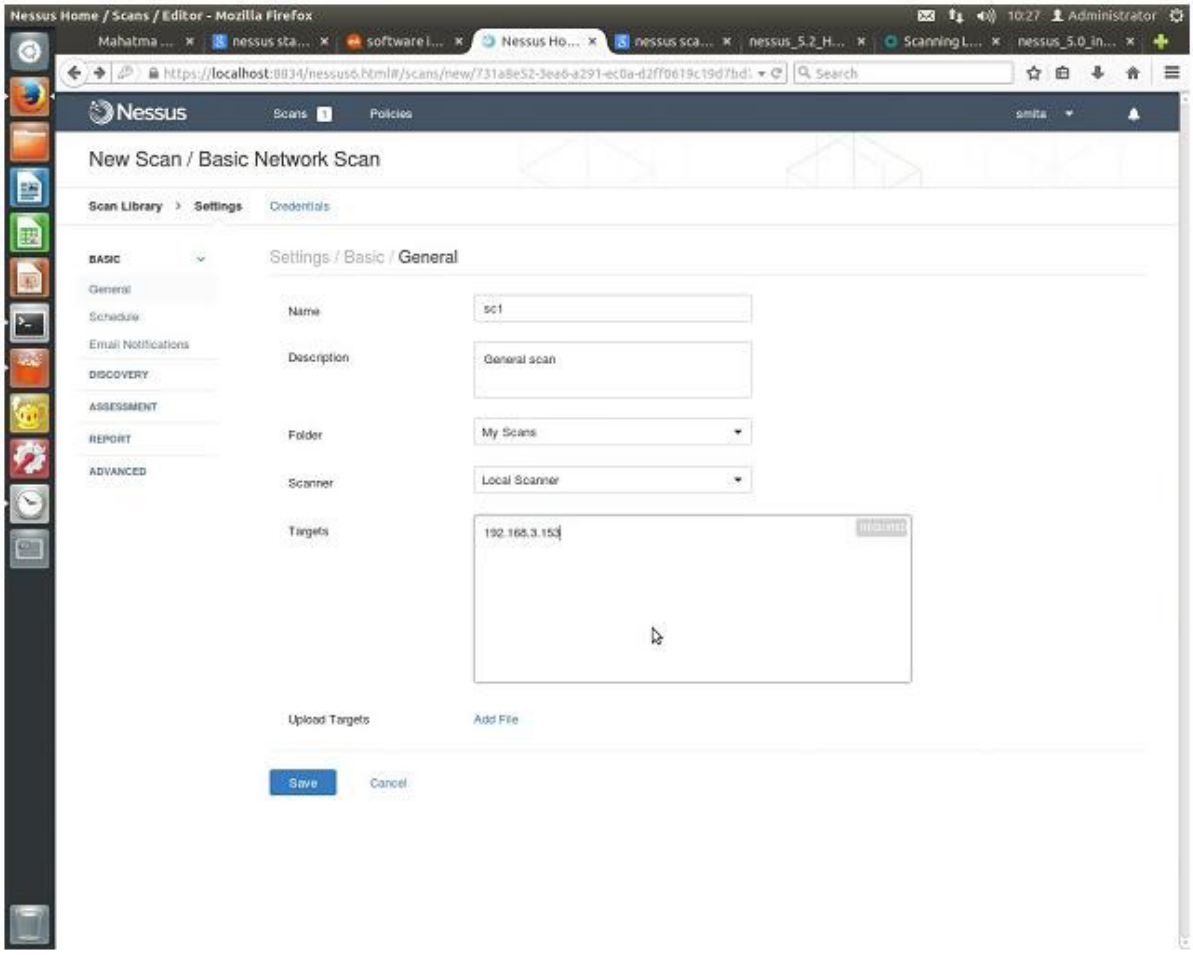
Policies:



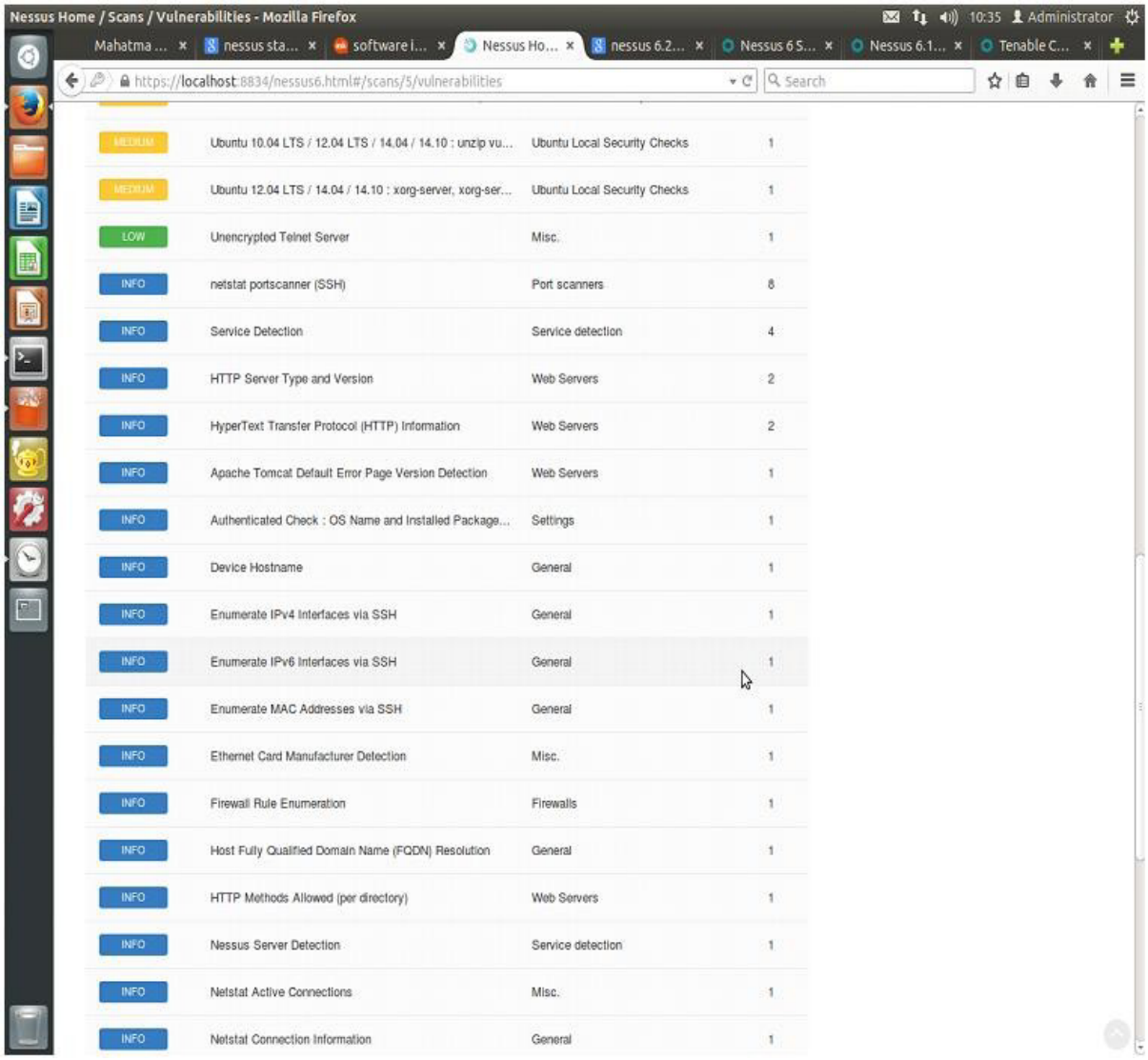
Plugins:



General Scanning:



Port Scanning:



6. Conclusion:

Running a security scanner against your systems is a very important part of the job. It is a system administrator or security officer‘s job to keep their systems secure and the data contained in them safe. Hackers have access to all the same information and tools that the rest of us do. Hackers run the very same tools and it is advantageous to know what the results are that they see if they scan your Nessus provides a lot of functionality in one tool. It utilizes Nmap, easy to update plug-ins,

and nice reporting tools for upper management. It is has repeatedly scored high on comparisons between scanners including commercial scanners that come with a hefty price tag. And of course as budgets tighten, remember Nessus is a free tool. The only cost is the users time in learning it and using it, but that is a cost

associated with all tools. And luckily

Nessus is an easy to learn tool. Using this tool and seeing the vulnerabilities will help you gain knowledge of your systems and help teach you how to protect them.

7. **Viva Questions:**

   - What's the current version of Nessus?
   - What OS platforms does Nessus have builds for?
   - What are the system/hardware requirements for using Nessus?
   - What is the heart of the nessus?
   - When using the Nessus user interface, which of browsers are supported?

8. **References:**

   - http://www.tenable.com/products/nessus/nessus-faq
   - https://docs.tenable.com/nessus/6_7/index.htm#getting_started/hardware.htm
   - http://www.symarntec.com/connect/articles/introduction-nessus
   - https://docs.tenable.com/nessus/6_7/index.htm#getting_started/Browsers.htm%3FTocPath%3DGetting%2520Started%7CSystem%2520Requirements%7C_3

Mini Project Lab

Experiment No. : 9

Implement a code to simulate buffer overflow attack.

Experiment No. 9

1. **Aim:** Implement a code to simulate buffer overflow attack.

2. **Objectives:** Objective of the module Is to check buffer overflow in an NS2 environment

3. **Outcomes:** The learner will be able to:-

    - Identify different type of types of buffer overflow vulnerabilities and attacks, and survey the various defensive measures that mitigate buffer overflow vulnerabilities.
    - Identify the use higher-level programming languages that are strongly type, does not allow direct memory access and are effective countermeasure to avoid buffer overflow attack.
    - Engage in life-long learning to exploit gained skills and knowledge of contemporary issues.

4. **Hardware / Software Required :** Stack Guard compiler.

5. **Theory:**

A buffer overflow, or buffer overrun, is an anomaly where a program, while writing data to a buffer, overruns the buffer's boundary and overwrites adjacent memory locations. This is a special case of the violation of memory safety.

A buffer overflow occurs when a program or process tries to store more data in a buffer (temporary data storage area) than it was intended to hold.

Buffer

overflow:

Code:

#include

<stdio.h>

#include

<string.h>

```
int main(void)
{
        char
        buff[15]; int
        pass = 0;
        printf("\n Enter the password :
        \n"); gets(buff);
        if(strcmp(buff, "thecorrectpaswd"))
        {
        printf ("\n Wrong Password \n");
        }
        else
        {
        printf ("\n Correct Password
        \n"); pass = 1;
        }
        if(pass)
        {
        /* Now Give root or admin rights to user*/
        printf ("\n Root privileges given to the user
        \n");
        }
        return 0;
```

}

Output :

>>administrator@PIIT-05:~/Desktop/me CS pracs$ gcc -Wall -fno-stack-protector bufferoverflow.c -o

>>bufferoverflow

The above command deactivates the default GC Compiler's flag which

detects Stack Smashing

>>administrator@PIIT-05:~/Desktop/me CS pracs$ ./bufferoverflow

>>Enter the password :

thewrong

Wrong Password

>>administrator@PIIT-05:~/Desktop/me CS pracs$ ./bufferoverflow

>>Enter the password :

thecorrectpas

wd Correct

Password

Root privileges given to the user

administrator@PIIT-05:~/Desktop/me CS

pracs$ ./bufferoverflow Enter the password :

thewrongpasswordent

ered Wrong Password

Root privileges given to the user

Here, the entered password length is above the permissible length with wrong contents still the user is given the ROOT PRIVILEDGES. This demonstrates the Buffer Overflow.

6. **Conclusion:**

   Buffer overflow has been the most exploited vulnerability for more than a decade. Buffer overflow vulnerabilities are the most common way to gain control of a remote host. Attacker can insert and execute attack code. Error is made at program creation, is invisible to user. StackGuard is a systematic compiler tool that prevents a broad class of buffer overflow security attacks from succeeding.

7. **Viva Questions:**

   - What can a buffer overflow attack do?
   - How do buffer overflow attacks work?
   - Explain how to protect against buffer overflow.

8. **References:**

   - http://www.windowsecurity.com/articles-tutorials/windows_os_security/Analysis_of_Buffer_Overflow_Attacks.html
   - http://searchsecurity.techtarget.com/news/1048483/Buffer-overflow-attacks-How- do-they-work
   - https://www.owasp.org/index.php/Buffer_overflow_attack

Mini Project Lab

Experiment No. : 10

Set up IPSEC under LINUX

Experiment No. 10

1. **Aim:** Set up IPSEC under LINUX.

2. **Objectives:** Objective of the module for implementing security vulnerabilities

3. **Outcomes:** The learner will be able to:-

    - Recognition of the need for end-to-end security.
    - Install and understand different security mechanisms for network security like firewall,IPSEC.
    - Engage in continuing professional development and higher studies.

4. **Hardware / Software Required :** L2TP/IPsec VPN client setup

5. **Theory:**

Internet Protocol Security (IPsec) is a protocol suite for securing Internet Protocol (IP) communications by authenticating and encrypting each IP packet of a communication session. IPsec includes protocols for establishing mutual authentication between agents at the beginning of the session and negotiation of cryptographic keys to be used during the session. IPsec can be used in protecting data flows between a pair of hosts (host-to-host), between a pair of security gateways (network-to-network), or between a security gateway and a host (network-to-host).

Internet Protocol security (IPsec) uses cryptographic security services to protect communications over Internet Protocol (IP) networks. IPsec supports network-level peer authentication, data origin authentication, data integrity, data confidentiality (encryption), and replay protection.

IPsec is an end-to-end security scheme operating in the Internet Layer of the Internet Protocol Suite, while some other Internet security systems in widespread use, such as Transport Layer Security (TLS) and Secure Shell (SSH), operate in the upper layers at Application layer. Hence, only IPsec protects any application traffic over an IP network. Applications can be automatically secured by IPsec at

the IP layer.

The following commands will add the werner-jaeger PPA into your repo's, and then install the 'l2tp-ipsec-vpn' package:

>>sudo apt-add-repository ppa:werner-jaeger/ppa-werner-vpn

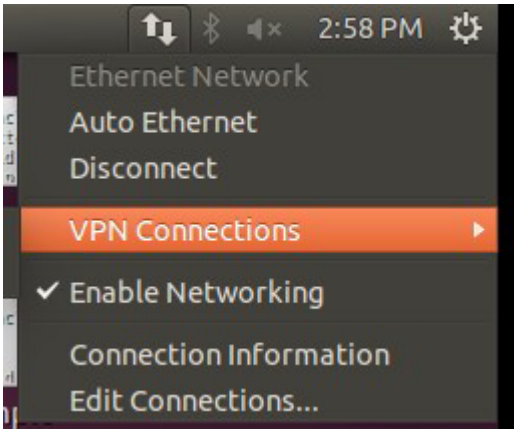
>>sudo apt-get update

>>sudo apt-get install l2tp-ipsec-vpn

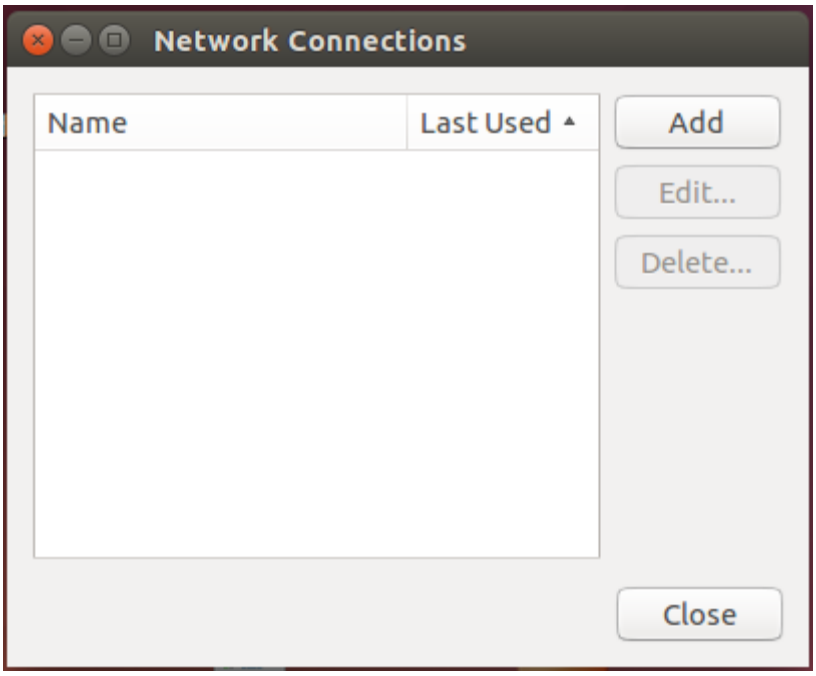
· Now, we will whitelist our system tray which will allow our newly installed package to show up on our system tray:

>>**gsettings set com.canonical.Unity.Panel systray-whitelist "['all']"**

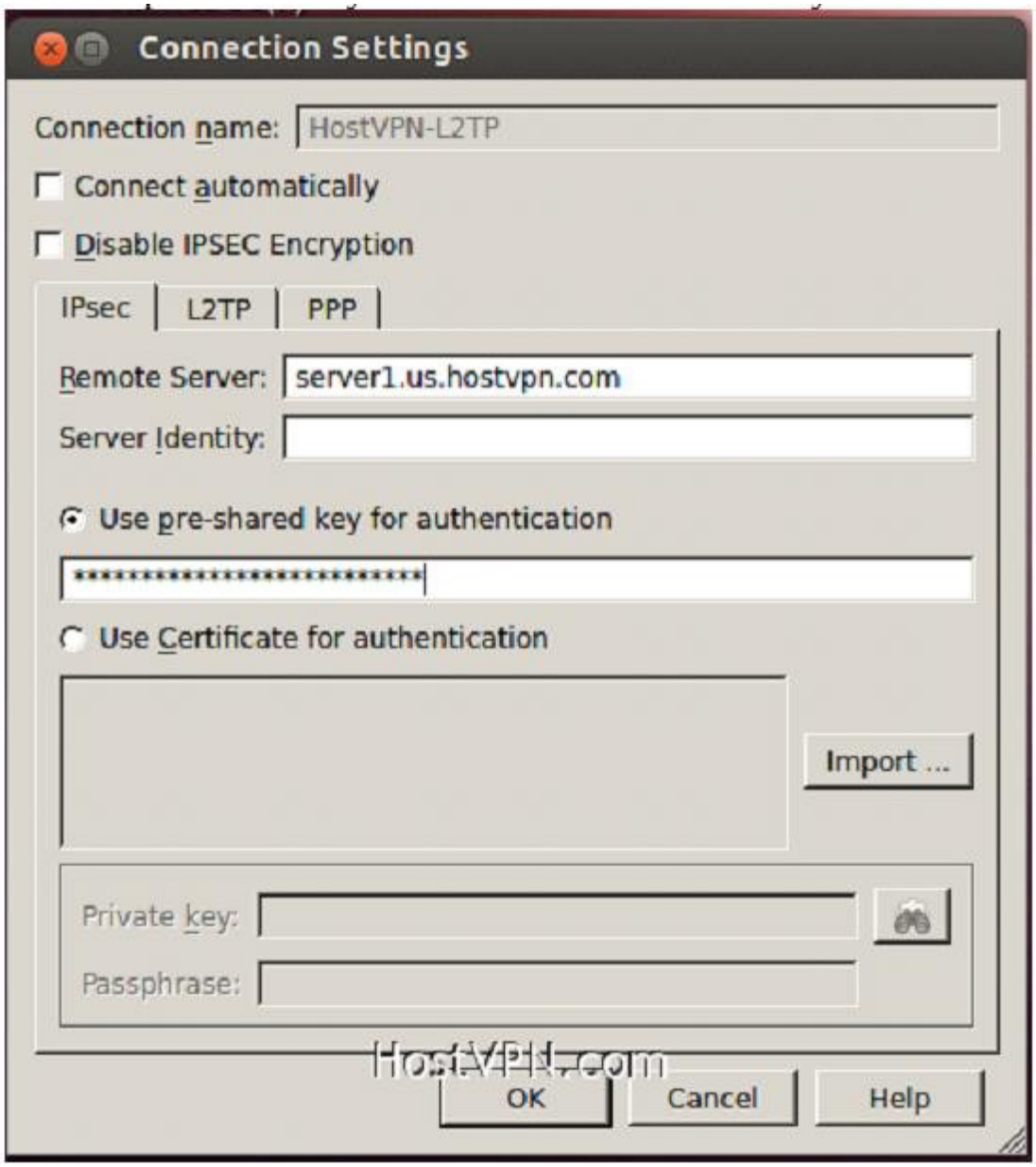
- After whitelisting our system tray, it's imperative that you reboot/restart your machine.
- Once your machine has rebooted, click on the new icon, and click 'Edit Connections ...' from the menu.



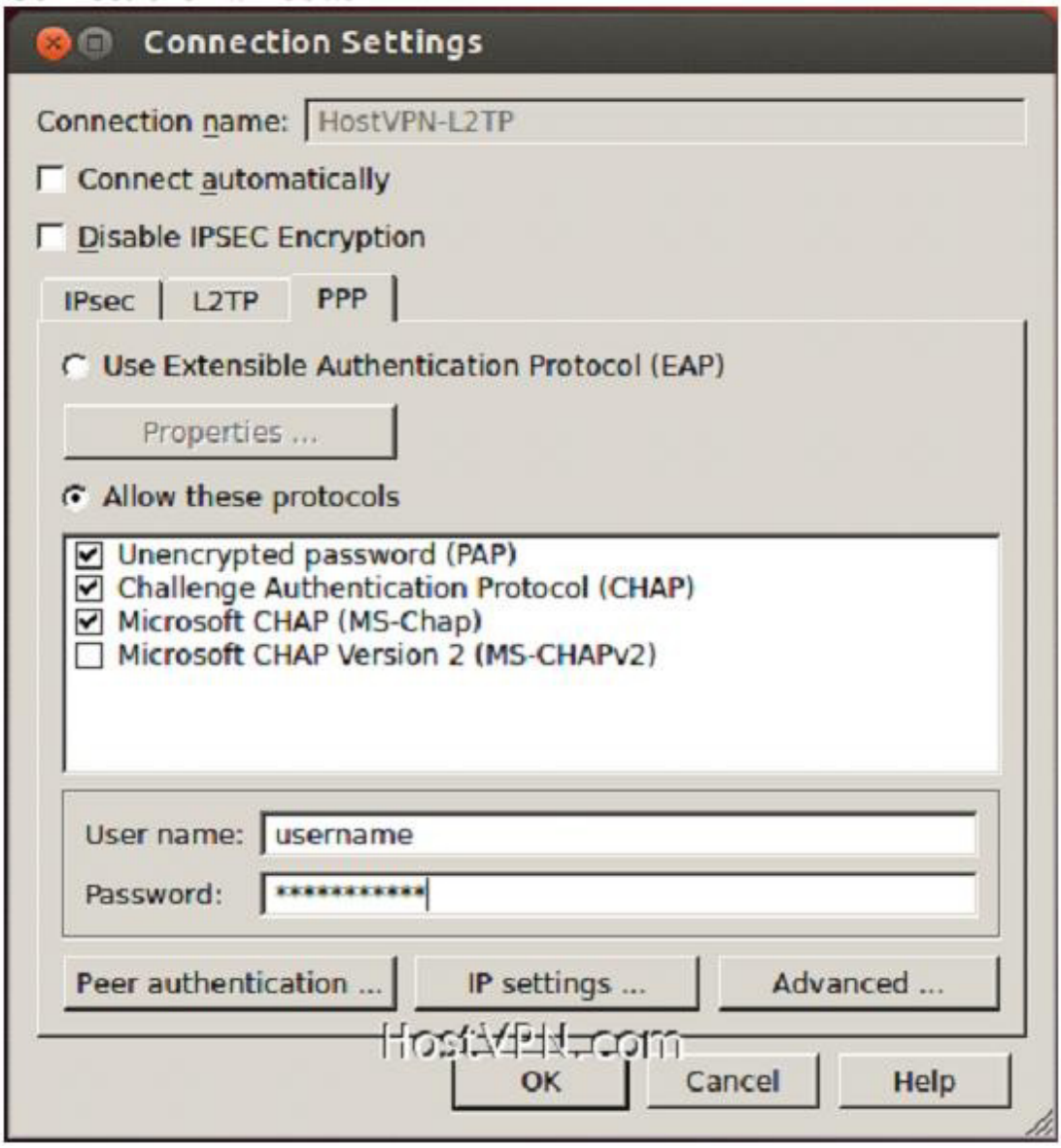
- This will show the "VPN Connections" window. Click the "Add ..." button and set the connection name to anything you'd like, e.g. "HostVPN-L2TP", and click "OK".



- Now select your newly added connection, and click "Edit ...".
- On the IPSec tab, set the remote server to the server name from your HostVPN e-mail. Select the "Use pre-shared key for authentication" and enter your PSK from the HostVPN e-mail.



- On the PPP tab, select "Allow these protocols", and ensure all are selected except "Microsoft CHAP Version 2 (MS-CHAPv2)". Fill in the "User name:" and "Password:" fields with your HostVPN username and password, and then click "OK". Now click "Close" on the "VPN Connections" window.



- Click on the L2TP/IPSec VPN icon in the systray again and click on the connection name that we just created.

6. **Conclusion:**

   IPsec is an end-to-end security scheme operating in the Internet Layer of the Internet Protocol Suite. IPsec protects all application traffic over an IP network. Also IPsec supports network-level peer authentication, data origin authentication, data integrity, data confidentiality (encryption), and replay protection.

7. **Viva Questions:**

   - Identify any other mechanism like IPSEC.
   - Explain different encryption mechanism used in IPSEC

8. **References:**

   - http://www.ciscopress.com/articles/article.asp?p=24833&seqNum=6
   - https://raymii.org/s/tutorials/IPSEC_L2TP_vpn_with_Ubuntu_14.04.html
   - https://riobard.com/2010/04/30/l2tp-over-ipsec-ubuntu/

Mini Project Lab

Experiment No. : 11

Install IDS (e.g. SNORT) and study the logs.

Experiment No. 11

1. **Aim:** Install IDS (e.g. SNORT) and study the logs.

2. **Objectives:** From this experiment, the student will be able to

3. **Outcomes:** The learner will be able to:-

    - Simulate intrusion detection system using snort tool.
    - To use current techniques, skills, and IDS tools necessary for computing practice.
    - Understand professional, ethical, legal, security and social issues and responsibilities.

4. **Hardware / Software Required:** Snort tool.

5. **Theory:**

Snort is an intrusion detection system written by Martin Roesch. Snort is a lightweight network intrusion detection system, capable of performing real-time traffic analysis and packet logging on IP networks. It can perform protocol analysis, content searching/matching and can be used to detect a variety of attacks and probes, such as buffer overflows, stealth port scans, CGI attacks, SMB probes, OS fingerprinting attempts, and much more. Snort uses a flexible rules language to describe traffic that it should collect or pass, as well as a detection engine that utilizes a modular plugin architecture.

Snort can be configured to run in three modes:

- ***Sniffer mode***, which simply reads the packets off of the network and displays them for you in a continuous stream on the console (screen).
- ***Packet Logger mode***, which logs the packets to disk.
- ***Network Intrusion Detection System (NIDS) mode***, the most complex and configurable configuration, which allows Snort to analyze network traffic for matches against a user-defined rule set and performs several actions based upon what it sees.

- *Inline mode*, which obtains packets from iptables instead of from libpcap and then causes iptables to drop or pass packets based on Snort rules that use inline-specific rule types

Sniffer Mode:

If you just want to print out the TCP/IP packet headers to the screen (i.e. sniffer mode), try following, this command will run Snort and just show the IP and TCP/UDP/ICMP headers, nothing else.

./snort –v

If you want to see the application data in transit, try the following, this instructs Snort to display the packet data as well as the headers.

./snort –vd

If you want an even more descriptive display, showing the data link layer headers, do this:

./snort -vde

Packet Logger Mode:

If you want to record the packets to the disk, you need to specify a logging directory and Snort will automatically know to go into packet logger mode:

./snort -dev -l ./log

Of course, this assumes you have a directory named log in the current directory. If you don't, Snort will exit with an error message. When Snort runs in this mode, it collects every packet it sees and places it in a directory hierarchy based upon the IP address of one of the hosts in the datagram.

If you just specify a plain -l switch, you may notice that Snort sometimes uses the address of the remote computer as the directory in which it places packets and sometimes it uses the local host address. In order to log relative to the home network, you need to tell Snort which network is the home network:

./snort -dev -l ./log -h 192.168.1.0/24

This rule tells Snort that you want to print out the data link and TCP/IP headers as well as application data into the directory ./log, and you want to log the packets relative to the 192.168.1.0 class C network. All incoming packets will be recorded into subdirectories of the log directory, with the directory names being based on the address of the remote (non- 192.168.1) host.

Note: Note that if both the source and destination hosts are on the home network, they are logged to a directory with a name based on the higher of the two port numbers or, in the case of a tie, the source address.

Once the packets have been logged to the binary file, you can read the packets back out of the file with any sniffer that supports the tcpdump binary format (such as tcpdump or Ethereal). Snort can also read the packets back by using the -r switch, which puts it into playback mode. Packets from any tcpdump formatted file can be processed through Snort in any of its run modes. For example, if you wanted to run a binary log file through Snort in sniffer mode to dump the packets to the screen, you can try something like this:

./snort -dv -r packet.log

You can manipulate the data in the file in a number of ways through Snort's packet logging and intrusion detection modes, as well as with the BPF interface that's available from the command line. For example, if you only wanted to see the ICMP packets from the log file, simply specify a BPF filter at the command line and Snort will only see the ICMP packets in the file:

./snort -dvr packet.log icmp

Network Intrusion Detection System (NIDS) mode:

To enable Network Intrusion Detection System (NIDS) mode so that you don't record every single packet sent down the wire, try this:

./snort -dev -l ./log -h 192.168.1.0/24 -c snort.conf

where snort.conf is the name of your rules file. This will apply the rules configured in the snort.conf file to each packet to decide if an action based upon the rule type in the file should be taken. If you don't specify an output directory for the program, it will default to
/var/log/snort.

One thing to note about the last command line is that if Snort is going to be used in a long term way as an IDS, the -v switch should be left off the command line for the sake of speed. The screen is a slow place to write data to, and packets can be dropped while writing to the display.

It's also not necessary to record the data link headers for most applications, so you can usually omit the -e switch, too.

./snort -d -h 192.168.1.0/24 -l ./log -c snort.conf

This will configure Snort to run in its most basic NIDS form, logging packets that trigger rules specified in the snort.conf in plain ASCII to disk using a hierarchical directory structure (just like packet logger mode).

Inline Mode:

Snort 2.3.0 RC1 integrated the intrusion prevention system (IPS) capability of Snort Inline into the official Snort project. Snort Inline obtains packets from iptables instead of libpcap and then uses new rule types to help iptables pass or drop packets based on Snort rules.

There are three rule types you can use when running Snort with Snort Inline:

- **drop** - The drop rule type will tell iptables to drop the packet and log it via usual Snort means.
- **reject** - The reject rule type will tell iptables to drop the packet, log it via usual Snort means, and send a TCP reset if the protocol is TCP or an icmp port unreachable if the protocol is UDP.

- **sdrop** - The sdrop rule type will tell iptables to drop the packet. Nothing is logged.

When using a reject rule, there are two options you can use to send TCP resets:

- You can use a RAW socket (the default behavior for Snort Inline), in which case you must have an interface that has an IP address assigned to it. If there is not an interface with an IP address assigned with access to the source of the packet, the packet will be logged and the reset packet will never make it onto the network.

- You can also now perform resets via a physical device when using iptables. We take the indev name from ip_queue and use this as the interface on which to send resets. We no longer need an IP loaded on the bridge, and can remain pretty stealthy as the config layer2_resets in snort_inline.conf takes a source MAC address which we substitue for the MAC of the bridge.

For example:

config layer2resets

tells Snort Inline to use layer2 resets and uses the MAC address of the bridge as the source MAC in the packet, and:

config layer2resets: 00:06:76:DD:5F:E3

will tell Snort Inline to use layer2 resets and uses the source MAC of 00:06:76:DD:5F:E3 in the reset packet.

- The command-line option **-disable-inline-initialization** can be used to not initialize IPTables when in inline mode. To be used with command-line option -T to test for a valid configuration without requiring opening inline devices and adversely affecting traffic flow.

6. **Conclusion:**

   SNORT is an open source network intrusion prevention and detection system utilizing a rule-driven language, which combines the benefits of signature, protocol and anomaly based inspection methods.

7. **Viva Questions:**

   - Can we use Snort to protect a network from denial-of-service attacks?
   - Can Snort decode encrypted traffic?
   - Can Snort detect layer 2 attacks?
   - Can Snort log flows or sessions?
   - Can Snort rebuild content from traffic?

8. **References:**

   - http://www.thegeekstuff.com/2010/08/snort-tutorial/
   - https://www.howtoforge.com/intrusion_detection_base_snort
   - https://www.snort.org/

Mini Project Lab

Experiment No. : 12

Use of iptables in linux to create firewalls.

Experiment No. 12

1. **Aim:** Use of iptables in linux to create firewalls

2. **Objectives:** To study how to create and destroy firewall security parameters.

3. **Outcomes:** The learner will be able to:-

    - Recognize the need for having a security on host side by controlling incoming / outgoing traffic using the acquired skills and knowledge.
    - Design rules for the INPUT/OUTPUT/FORWARD chain.

4. **Hardware / Software Required :**

5. **Theory:**

IPtables are the tables provided by the Linux kernel firewall (implemented as different Netfilter modules) and the chains and rules it stores. Different kernel modules and programs are currently used for different protocols; iptables applies to IPv4, ip6tables to IPv6, arptables to ARP, and ebtables to Ethernet frames.

iptables requires elevated privileges to operate and must be executed by user root, otherwise it fails to function. On most Linux systems, iptables is installed as /usr/sbin/iptables and documented in its man pages which can be opened using man iptables when installed. It may also be found in /sbin/iptables, but since iptables is more like a service rather than an "essential binary", the preferred location remains /usr/sbin.

1. To drop all traffic:

sudo iptables -P INPUT DROP

sudo iptables -P OUTPUT DROP

sudo iptables -P FORWARD

DROP # sudo iptables -L -v –n

2. Only Block Incoming Traffic

To drop all incoming / forwarded packets, but allow

outgoing traffic, # sudo iptables -P INPUT DROP

sudo iptables -P FORWARD

DROP # sudo iptables -P OUTPUT

ACCEPT

sudo iptables -A INPUT -m state --state NEW,ESTABLISHED -j

ACCEPT # sudo iptables -L -v –n

3. Block Outgoing

IPaddress host -t a

hostname

sudo iptables -A OUTPUT -d outgoing ipaddress -j DROP

4. Block or Allow ICMP ping request

sudo iptables -A INPUT -p icmp --icmp-type echo-request -j DROP/ACCEPT

6. **Conclusion:**
   There are many other firewall utilities and some that may be easier, but iptables is a good learning tool, if only because it exposes some of the underlying netfilter structure and because it is present in so many systems.
7. **Viva Questions:**
   - List and implementation of extra commands.
   - Find another GUI tools to create firewalls.
8. **References:**
   - https://www.digitalocean.com/community/tutorials/how-to-set-up-a -firewall- using-iptables-on-ubuntu-14-04
   - http://www.howtogeek.com/177621/the-beginners-guide-to-iptables- the-linux- firewall/