Design Engineering of Computer Systems Professor. Mythili Vutukuru Computer Science and Engineering Indian Institute of Technology, Bombay Lecture 36 (Week 5, Tutorial 1) Network Debugging Tools

Hi, everyone. In this video, we will learn about various network debugging tools.

(Refer Slide Time: 00:21)

Activities 🗈 Terminal -		Thu 12:10	😡 - 😰 🔥 후 🐽 🔒 -
		saurav@ubuntu-18: ~	000
'🤍 File Edit View Search Te	rminal Help		
👝 saurav@ubuntu-	18:~\$ nslookup www.google.co	μ	
Server:	127.0.0.53		
Address:	127.0.0.53#53		
· · · · · · · · · · · · · · · · · · ·			
Non-authoritat	Lve answer:		
wame: www.go	Dgle.com		
Address: 142.2	50.193.68		
	5800.4002.812.2004		
0	5000.4002.0182004		
	18:~\$ nslookup		
<pre>&gt; www.google.c</pre>			
Server:	127.0.0.53		
🗙 Address:	127.0.0.53#53		
🖤 Non-authoritat	ive answer:		
Name: www.go	ogle.com		
Address: 142.2	50.193.68		
Name: www.go	ogle.com		
Address: 2404:	5800:4002:81a::2004		
> set type=MX			
>			
GX			
<u>\</u>			
NPTEL			
Artivities Fi Terminal -		Thu 1212	Ω ⊙ 1. ≎ 14 R
Activities 🗖 Terminal -		Thu 12:12 saurav@ebuntu-18: =	0 - 9 🤹 9 40 B - 000
Activities □Terminal -	rminal Help	Thu 12/12 saurav@ubuntu-18; +	0- 0 % 946. 000
Activities 🗆 Terminal -	vrninal Help	Thu 12:12 saurav@ebuntu-11k -	-9 v ⊽ v 8 000
Activities □Terminal+	sminal Help ive answer:	Thu 1212 saurav@ubunte-18.+	0-6 % 9408- 000
Activities □Terminal+ bio File Edit View Search Tr I Non-authoritat Ame: www.go	rminal Hep ive answer: ogle.com	Thu 1212 sauravQlebonta-18 -	0-9 % ÷48- 000
Activities Terminal File Edit View Search T Non-authoritat Name: www.go	wminal Help ive answer: gle.com 50,193.68	Thu 12:12 səurəvQəbəntə=7R -	0- 9 4 748- 000
Activities Terminal File Edit View Search T Non-authoritat Name: wWW.go Address: 142.2 Name: WWW.go	rminal Help ive answer: ogle.com ogle.com	Thu 12:12 saurav@ebunte-11k =	0-9 % ∓418- 000
Activities DTerminal* File Edit View Search T Non-authoritat Name: www.go Address: 142.2 Phane: www.go Address: 2444	rminal Hdp ive answer: gle.com 50.193.68 gle.com 5800:4002:81a::2004	Thu 1212 searav@debanta-1& -	0-9 % 748. eee
Activities ⊡ Terminal - Tile Edit View Search Ti Non-authoritat Name: www.go Address: 1249.2 Address: 2404: Search Tile Search Tile Search Address: 2404: Search Tile Search Tile Search Address: 2404: Search Tile Search Tile Search Search Tile Search	rminal Heb ive answer: 30.193.68 301e.com 3800:4002:81a::2004 	Thu 12:12 saurav@ubuntu-1&-	0 • 6 4 7 4 6 • •••
Activities □Terminal - Activities □Terminal - File Edit View Search IF Ton-authoritat Mane: www.go Address: 142.2 2 Address: 142.2 2 Address: 442.2 2 Address: 442.2 3 Address: 442.2 4 Address: 4 Address: 4 Addres	wminal Help ive answer: 30.193.68 30.193.68 5800:4002:81a::2004	Thu 12:12 səurəvQidountu=1R =	0- 9 🤹 748-
Activities Diferminal*	rminal Hdp Sgle.com 50.193.68 30e.com 5000:4002:81a::2004 127.0.0.53 127.0.0.53	Thu 1212 searav@debanba-1& -	0-9 % 748. eee
Activities ⊡ Terminal - Telle Edit View Search T Non-authoritat Name: www.go Address: 142.2 Address: 2404: > set type=MX > set type=W Server: Address:	xminal Heb ive answer: gle.com 50.193.68 ogle.com 800:4002:61a::2004 127.0.0.53 127.0.0.53	Thu 12:12 saurav@ubontu=1&-	0 - 6 4 746. ***
Activities Terminal File Edit View Search T Non-authoritat Name: www.go Address: 142.2 ? Address: 2404: > set type=MX > set type=MX > spail.con ? Address: E Non-authoritat	vminal Help ive answer: 50.193.68 rgle.com 5800:4002:81a::2004 127.0.0.53 127.0.0.53 127.0.0.53 127.0.0.53	Thu 12:12 səvravğildəntə-18-	0 • 9 4 7 4 6 • •••
Activities Diferminal*	rminal Hdp bgle.com 50.193.68 30.90:4002:81a::2004 127.0.0.53	Thu 1212 searav@debanb=3k- gmail-smtp-in.l.google.com.	0-9 % 748. eee
Activities Diferminal* Activities Diferminal* The Edit View Search The Non-authoritat Name: www.go Address: 142.2 Name: www.go Address: 2404: Server: Address: 2404: Server: Address: Non-authoritat Maria Loom gmail.com	rminal Heb ive answer: 30.193.68 30:193.68 3000:4002:81a::2004 127.0.0.53 127.0.0.55	Thu 1212 saurav@debonts-18- gnail-smtp-in.l.google.com. gnail-smtp-in.l.google.com	0 - 6 4 7 4 6 - eee
Activities Terminal Activities Terminal Terminal Constraint Nane: www.go Address: 142.2 Address: 142.2 Address: 2404: Server: Server: Address: Nane: www.go Address: 2404: Server: Server: Non-authoritat gnail.com gmail.com	<pre>wminal Help ive answer: g0le.com 50.193.68 g0le.com 5800:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.g mail exchanger = 40 alt4.g mail exchanger = 10 alt1.g</pre>	Thu 1212 saurav@ubunto-18 - gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com.	0 - 9 4 746. ***
Activities Diferminal Activities Piferminal File Edit View Search Ti Nan-authoritat Nane: www.go Address: 142.2 Address: 2404: Server: www.go Server: Address: Non-authoritat Mariai.com gnail.com Mariai.com	rminal Hdp bgle.com 50.193.68 30.93.68 300:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 40 alt4.c mail exchanger = 10 alt1.2 mail exchanger = 30 alt3.c	Thu 1212 saurwiddento-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com.	0-9 % 748. eee
Activities Diferminal* Activities Diferminal* The Edit View Search The Non-authoritat Name: www.go Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: Non-authoritat Mon-authoritat	<pre>rminal Hebp ive answer: gle.com 50.193.68 ogle.com 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 20 alt2.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gnal-s </pre>	Thu 1212 saurav@debonts-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com.	0 - 9 4 7 4 8 - eee
Activities □Terminal- File Edit View Search T Non-authoritat Name: www.go Address: 142.2 Address: 142.2 Address: 2404: > set type=VX > set type=VX > set type=VX > mail.com gmail.com gmail.com gmail.com	<pre>wmbal Heb ive answer: gle.com 50.193.68 ogle.com 127.0.0.53 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 30 alt3.c mail exchanger = 30 alt3.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s </pre>	Thu 1212 sauray@dubunts-18- gmail-sntp-in.l.google.com. gmail-sntp-in.l.google.com. gmail-sntp-in.l.google.com. gmail-sntp-in.l.google.com.	0 • 6 • • • • • 6 •
Activities Diferminal* Activities Piferminal* File Bilt View Search Ti Name: www.go Address: 142.2 Address: 2404: Server: www.go Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Server: Address: Server: Server: Server: Server: Address: Server: Server: Address: Server: Server: Server: Server: Server: Server: Server: Address: Server: Ser	rminal Hdp bgle.com 50.193.68 30.93.68 300:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 20 alt2.c mail exchanger = 30 alt3.c mail exchanger = 30 alt3.c mail exchanger = 30 alt3.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from:	Thu 1212 saurav@debatb=1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 % ¥48. eee
Activities Diferminal- Activities Diferminal- Tell Edit View Search II Non-authoritat Name: www.go Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: Non-authoritat Mon-authoritat Mon-authoritat Mon-authoritat Mon-authoritat Mon-authoritat Server: Address: A	<pre>rmmail Hebp ive answer: gle.com 50.193.68 ogle.com 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 20 alt2.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gnal-5 answers can be found from:</pre>	The 1212 searweddwants-10 gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 4 7 4 8 - eeo
Activities Terminal- Terminal- Terminal Terminal- Address: 142.2 Address: 142.2 Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Non-authoritat Address: Address	<pre>mminal Help ive answer: ogle.com 80.193.68 ogle.com \$800:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt1.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from: DM ive a o c c</pre>	Thu 1212 saurav@dubunto:1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com.	0 • 6 • • • • • 6 •
Activities Diferminal* The Edit View Search The Non-authoritat Name: www.go Address: 142.2 Address: 2404: Server: www.go Address: 2404: Server: Non-authoritat Non-authoritat Non-authoritat Non-authoritative Server: Non-authoritative Server: Address: Non-authoritative Server: Address: Non-authoritative Server: S	<pre>rminal Hdp bgle.com 50.193.68 ggle.com 5000:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 40 alt4.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from: 127.0.0.53 127.0</pre>	Thu 1212 saurwiddwanta-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 % ¥48. eee
Activities Diferminal* Activities Diferminal* The Edit View Search IT Non-authoritatt Name: www.go Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: Non-authoritatt and Grass: Non-authoritatt and Grass: Non-authoritatt and Grass: Non-authoritatt and Grass: Non-authoritatt and Grass: Non-authoritatt and Grass: Non-authoritatt authoritative > set type=A > www.google.c Server: Address:	rmmal Help ive answer: 30,193.68 30,202.81a::2004 127.0.0.53 127.0.0.53 127.0.0.53 mail exchanger = 40 alt4.c mail exchanger = 20 alt2.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from: 127.0.0.53 127.0.0.53 127.0.0.53	The 1212 searwagedwants-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmtp-in.l.google.com.	0 - 9 4 7 4 8 - eeo
Activities ⊡Terminal → File Edit View Search T Name: www.go Address: 142.2 Name: www.go Address: 2404: → gentipe=MX → gentipe=MX → gentil.com gmail.com	<pre>mminal Help pgle.com 30.133.68 30.23.68 300:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 20 alt2.c mail exchanger = 10 alt1.c mail exchanger = 5 gnail-s answers can be found from: pn 127.0.0.53 127.0</pre>	Thu 1212 saurav@dobuto=18- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 • 9 4 7 4 8 • •••
Activities Diferminal*	<pre>rminal Hdp by answer: bgle.com 50.193.68 ggle.com 5000:4002:81a::2004 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 40 alt4.c mail exchanger = 20 alt3.c mail exchanger = 10 alt1.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from: 127.0.0.53 127.0</pre>	Thu 1212 saurwiddwanta-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 % ¥48. eee
Activities Diferminal* Activities Diferminal* Activities Parential Nane: www.go Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: 2404: Mon-authoritat Server: Mon-authoritat Server: Address: Non-authoritat Server: Address: Non-authoritat Server: Address: Non-authoritat Server: Address: Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat Non-authoritat	<pre>rmmail Help ive answer: gle.com 50.193.68 ogle.com 127.0.0.53 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 20 alt2.c mail exchanger = 20 alt2.c mail exchanger = 30 alt3.c mail exchanger = 5 gmail-s answers can be found from: pm 127.0.0.53 127.0.0.5 127.0.0.53 127.0.0.5 127.0.0.5 127.0.0.5 127.0.0.5 127.0</pre>	The 1212 searwd@dents-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 4 7 4 8 - eeo
Activities ⊡Terminal → File Edit View Search T Name: www.go Address: 142.2 Name: www.go Address: 2404: → set type=AX → set type=AX → set type=AX → andress: Non-authoritative > set type=AX Address: Non-authoritative > set type=A Authoritative > set type=A Authoritative > set type=A Name: www.go Address: 142.2 Non-authoritative > set type=A Non-authoritative > set type=A Non-authoritative > set type=A Non-authoritative > set type=A Non-authoritative > set type=A Non-authoritative > set type=A > www.go Address: 142.2 > exit	<pre>mminal Help pgle.com s0.193.68 s0.193.68 s00:4002:81a::2004 127.0.0.53 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 10 alt1.0 mail exchanger = 20 alt2.0 mail exchanger = 5 gnail-s answers can be found from: pn 127.0.0.53 127.0.0.</pre>	Thu 1212 saurav@debuths18 gnail-smtp-in.l.google.com. gnail-smtp-in.l.google.com. gnail-smtp-in.l.google.com. gnail-smtp-in.l.google.com. smtp-in.l.google.com.	0 • 9 4 7 4 8 • •••
Activities Diferminal*	<pre>rminal Hdp  ive answer:     bgle.com     ggle.com     ggle.com     fgle.com     fgle.com</pre>	Thu 1212 saurwiddwanta-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 % ¥48. eee
Activities Diferminal* Activities Diferminal* Activities Parential Nane: www.go Address: 142.2 Address: 142.2 Address: 2404: Server: Address: 2404: Server: Address: 2404: Server: Address: Non-authoritat Address: Non-authoritat Address: Non-authoritative Server: Address: Non-authoritative Set type=A Set type=A Server: Address: Non-authoritative Server: Address: Non-authoritative Server: Address: Non-authoritative Server: Address: Non-authoritative Server: Address: Non-authoritative Server: Address: Non-authoritative Server: Address: Addre	<pre>rmmail Help ive answer: gle.com 50.193.68 ogle.com 127.0.0.53 127.0.0.53 127.0.0.53#53 ive answer: mail exchanger = 20 alt2.c mail exchanger = 20 alt2.c mail exchanger = 30 alt3.c mail exchanger = 3 or ani- sanswers can be found from: 127.0.0.53 127.0.0.5 127.0.0.5 127.0.0.5 127.0.0.5 127.0.0.5 127.0.0.5 127.0.0</pre>	The 1212 searwd@dents-1k- gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. gmail-smtp-in.l.google.com. smtp-in.l.google.com.	0 - 9 · 7 · 7 · 6 -

So, let us open a terminal and I will start with nslookup. So, nslookup is used to find out the IP address which is linked to various URLs. So, whenever our computer accesses a website, then

first it needs to resolve it to an IP address so that it can add that IP address to the packet headers. So, using nslookup we can find out whether it is able to resolve these names or not.

So, let us say I want to find out the IP address of Google.com. So, I will type nslookup Google.com. And it shows me the name server that is used to find out this particular mapping and it shows me both the addresses, one is the IPv4 address and other is IPv6 address and it shows me non-authoritative answer, which means that this particular server is not responsible for this mapping, but it knows this mapping because it was cashed there. So, it might have resolved this Google.com earlier, so it knows that this is the particular mapping.

We can also run this nslookup command in interactive mode. So, we can just type nslookup and press enter and again we can type out various URLs to find out their IP addresses. Another thing that we can find out using nslookup is the addresses for various mail servers. So, for that we need to change the type. So, I will set the type to mail exchange and now I can write various domain names and then it will give me the exchange servers for those domain names.

So, let us find out the mail servers for gmail.com. So, again it gives me these addresses. So, these are various mail exchange servers that are used for the gmail.com domain name. So, we can set the type again to type equal to A and that will again give us the IP addresses. So, we can exit this mode using exit. So, that was about nslookup.

(Refer Slide Time: 02:23)

Activities 🗉 Terminal -		Ð- 🧯	ð 😘	? 📢 🚯 =
	saurav@ubuntu-18: ~			• • •
File Edit View Search Ter	minal Help			
gmail.com gmail.com	mail exchanger = 30 alt3.gmail-smtp-in.l.google.com. mail exchanger = 5 gmail-smtp-in.l.google.com.			
Authoritative a ? > set type=A > www.google.co Server:	nswers can be found from: m 127.0.0.53			
Address:	127.0.0.53#53			
Non-authoritati	ve answer:			
Address: 142.25	gle.com 0.193.68			
<pre>&gt; exit</pre>				
Saurav@ubuntu-1 PING www.google 64 bytes from d 64 bytes from d 70 	8:-5 ping www.google.com .com (142.250.193.68) 56(84) bytes of data. ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=1 ttl=117 time=20.4 ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=2 ttl=117 time=22.6 ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=3 ttl=117 time=22.6 ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=3 ttl=117 time=22.4 ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=3 ttl=117 time=2.2. ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=5 ttl=117 time=2.2. ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=5 ttl=117 time=2.2. ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=3 ttl=117 time=19.4 ns ellisi6-in-f4.1e100.net (142.250.193.68): icnp_seq=3 ttl=117 time=19.9 ns con ping statistics mitted, 9 received, 0% packet loss, time 8011ns			
Saurav@ubuntu-1	/Mdev = 19.48//21.065/22.646/1.251 MS			

So, the next tool that we are going to discuss is ping tool. So, ping is a very useful command. It lets us find out whether our computer is connected to the Internet, whether it is able to send packets to a server successfully or not. So, I can type out the website URL and it will send packets to this particular server and see its response.

So, here you can see that it is, it keeps sending various icmp packets. You can stop it using control plus c. And it shows that it transmitted nine packets and it got back all the nine packets from the server, so there was 0 percent packet close. And here it shows a round trip time for sending this echo packets. So, we can see that it is able to send packets to Google.com successfully and it shows us the various minimum, average, maximum etc. for this round trip time.

(Refer Slide Time: 03:15)

I	Activities 🗆 Terminal -	Thu 12:20	Q - 🔉 🐧 🕬 🔒 -
	nu edu star erret trade	saurav@ubuntu-18: ~	00
	File Edit View Search Terminal Help PING www.google.com (142.250.193.68)	56(84) bytes of data.	
	64 bytes from del11s16-in-f4.1e100.ne 64 bytes from del11s16-in-f4.1e100.ne	t (142.250.193.68): icmp_seq=1 ttl=117 time=23.3 t (142.250.193.68): icmp_seq=2 ttl=117 time=21.6	ms
	64 bytes from del11s16-in-f4.1e100.ne	t (142.250.193.68): icmp_seq=3 ttl=117 time=19.4	MS
	64 bytes from dellisio-in-f4.1e100.ne 64 bytes from dellisio-in-f4.1e100.ne	t (142.250.193.68): tcmp_seq=4 ttt=117 ttme=19.8 t (142.250.193.68): tcmp_seq=5 ttl=117 time=21.1	ms
	64 bytes from del11s16-in-f4.1e100.ne	t (142.250.193.68): icmp_seq=6 ttl=117 time=21.6 t (142.250.193.68): icmp_seq=7 ttl=117 time=19 5	ms ms
	64 bytes from del11s16-in-f4.1e100.ne	t (142.250.193.68): icmp_seq=8 ttl=117 time=20.2	ms
	~ ^C	c (142.250.195.00): (CMp_Seq=9 (CC=117 CCMe=19.0	195
	🕒 www.google.com ping statistics		
	9 packets transmitted, 9 received, 0% rtt min/avg/max/mdev = 19.437/20.716/	packet loss, time 8012ms 23.399/1.273 ms	
	Saurav@ubuntu-18:~\$ traceroute -I www	.google.com	
	socket: Operation not permitted		
	saurav@ubuntu-18:~\$ sudo traceroute -	I www.google.com	
	[sudo] password for saurav:		
	traceroute to www.google.com (142.250	.193.68), 30 hops max, 60 byte packets	
	1 _gateway (192.168.1.1) 3./29 ms	3./04 ms 5.314 ms	
	2 10.230.70.101 (10.230.70.101) 17	20 480 mc 20 476 mc 21 207 mc	
	4 * * *	20.400 M3 20.470 M3 21.277 M3	
	5 * * *		
	6 142.250.160.182 (142.250.160.182)	30.721 ms 18.456 ms 19.305 ms	
	7 142.251.77.187 (142.251.77.187)	16.884 ms 16.783 ms 17.707 ms	
	8 142.251.54.83 (142.251.54.83) 18	.418 ms 18.413 ms 18.521 ms	
	9 del11s16-in-f4.1e100.net (142.250	.193.68) 19.483 ms 19.479 ms 19.474 ms	
	NETEL		

So, let us move on to the traceroute command. The traceroute command is used to show us the route that is taken by the data packets to reach a particular server. So, whenever it sends some packets to let us say the Google servers, then it needs to first pass through various routers and then finally the packet reaches the Google server. So, the traceroute command is used to find out the addresses for each of those routers that are there in the path and also it shows us the roundtrip time to each router.

So, how can we use the traceroute command? So, I will write traceroute www.Google.com and I will give it minus I flag to use icmp packets. So, I need to use sudo. So, here it shows us the IP

address of each of the router that it found in its path before finally reaching the Google server and it also shows us three roundtrip times. So, it sends three packets to each of the router and finds out what is the roundtrip time. So, these times are pretty consistent.

And the final roundtrip time to reach the destination server matches approximately the same with what we found out in the ping command. So, here it shows stars for these two routers which means that they might not be configured to reply to this icmp packets. So, that is all the information that we get from the traceroute command.

(Refer Slide Time: 04:47)

Activities 🗉 Term	inal - Thu 12:22 🚯 - 🚱 🔥	÷ •0 ₽ -
	saurav@ubuntu-1t: -	000
8 142	2.251.54.83 (142.251.54.83) 18.418 ms 18.413 ms 18.521 ms	
9 del	.11s16-in-f4.1e100.net (142.250.193.68) 19.483 ms 19.479 ms 19.474 ms Wubuntu-18:~\$ ifconfia	
enp0s31	f6: flags=4099 <up,broadcast,multicast> mtu 1500</up,broadcast,multicast>	
?	ether 10:62:e5:53:bb:0f txqueuelen 1000 (Ethernet) RX packets 0 bytes 0 (0.0 B)	
THE.	RX errors 0 dropped 0 overruns 0 frame 0	
	IX packets 0 bytes 0 (0.0 B) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0	
<u> </u>	device interrupt 16 memory 0xba400000-ba420000	
🕒 lo: fla	Igs=73 <up,loopback,running> mtu 65536</up,loopback,running>	
×	inet 127.0.0.1 netmask 255.0.0.0 inet6 ::1 prefixlen 128 scopeid Av10chosts	
	loop txqueuelen 1000 (Local Loopback)	
•	RX packets 38172 bytes 9368877 (9.3 MB) RX errors 0 dropped 0 overruns 0 frame 0	
	TX packets 38172 bytes 9368877 (9.3 MB)	
	IX errors 0 dropped 0 overruns 0 carrier 0 collisions 0	
wlp2s0:	flags=4163 <up,broadcast,running,multicast> mtu 1500</up,broadcast,running,multicast>	
	inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20 <link/>	
	ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) PX packets 387715 - butes 486163506 (486 1 MR)	
	RX errors 0 dropped 0 overruns 0 frame 0	
	TX packets 169447 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0	
(A)	hakun da c	
NPTEL	unnira-10:~3	
Activities Term	ital • Thu 1223 Q • 🔿 😘 aaroodubato 18 •	÷ € € -
Activities DTerm	hini+ Thự 1223 Q + ⊙ 14 ew Sarch Temini, Hój ew Sarch Temini, Hój	? €( 6 ●⊙●
Activities ⊡Term 600 File Edit Vi 700 File Solt	mai- The 1223 O - ⊙ ، عدد Starch Terminal Hele flags=4163 <up, broadcast,="" multicast="" running,=""> mtu 1500 inct 192.168.1.4 netnask 255.255.0 broadcast 192.168.1.255</up,>	? €() <u>6</u> ● © <b>6</b>
Activities DTerm	Init         Torizzi         Q + G %           ew Sauch Teminal Hele         avrav@ebonto-18-           flags=4163         UP_BROADCAST_RUNNING_HULTICAST> ntu 1500           inet 192.168.1.4 netmask 255.255.255.0 broadcast 192.168.1.255           inet 156.168.1:4 netmask 255.255.255.0 broadcast 192.168.1.255           inet 157.166.1.4 netmask 255.255.256.0 prefixien 64 scopeid 0x20           other Scieffic for 61.51.5	़•()हि ● <b>○</b> ●
Activities Term	mat- The 1223 O+ O م aurow@dounto=18- ww Starch Terminal Hele flags=4163-4UP_BROADCAST,RUNNING,MULTICAST> ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet5 fe80::bb19:5681:b3ec:25b6 prefixlen 64 scopeid 0x20elink> ether 5cc5f:67:9cc:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 486163306 (486.1M8)	₹ 40 <u>B</u> • 00 <b>0</b>
Activities D'Terr File Edit Vi Wlp2s0:	Inal- To 1223 OF 6 % sarran@ebonto-18- ew Sarch Temmal Hele flags=4163-U/P_BROADCAST,RUNNING,MULTICAST> ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20elink> ether 5c:5f:6f:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 486163300 (486.1MB) RX errors 0 dropped 0 overruns 0 frame 0 TX narchet 160407 hutes 2785041 (7.9 MB)	₹ 40 <u>B</u> - ©©
Activities □Term	mat- Tou 1223 OF S : sarran@ebonto=18- ew Starth Temmal Hele flags=4163-U/P_BROADCAST,RUNNING,MULTICAST> ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet 5680::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20elink> ether 5cc5f:67:9cc:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 486163306 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 169447 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0	₹ 40 <b>G -</b> ©©©
Activities □Term File Edit Vi m wlp2s0: r r saurav@	Init     The 1223     O + O       auron@ebounts-18-       ew Sauch Temmail Hele       flags=41634UP_BROADCAST,RUNNING,MULTICAST> ntu 1500       init 15:168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255       init 15:168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255       init 15:68.1.4 netnask 255.255.255.0 broadcast 192.168.1.255       init 15:68.1.4 netnask 255.255.255.0 broadcast 192.168.1.255       init 15:68.1.4 netnask 255.255.255.0 broadcast 192.168.1.255       init 15:00 prefixien 64 scopeid 0x20       K packets 192.168.1.4       RY packets 187/15 bytes 486163306 (486.1 MB)       RX packets 187/15 bytes 486163306 (486.1 MB)       RX packets 109447 bytes 2780941 (27.8 MB)       TX packets 169447 bytes 2780941 (27.8 MB)       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0       wuburtu-18:-5 sudo ifconfia enp093116 down	⊊ #0 β + ®© <b>0</b>
Activities © Terre Activities © Terre File Edit. Vi Wlp2S0: Wlp2S0: Saurav(0) Saurav(0) Saurav(0) Saurav(0) Saurav(0) Saurav(0)	mail     The 1223     Q + O       ews Starch Terminal Hele     Flags=41634UP, BROADCAST, RUNNING, MULTICAST> into 1500       inter 192.168.1.4 netmask 255.255.255.0 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.255.0 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.255.0 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.16 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.0 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.0 broadcast 192.168.1.255       inter 192.168.1.4 netmask 255.255.18 transmitter       xty packets 30715 bytes 485163306 (486.1 MB)       RX packets 169447 bytes 27859641 (27.8 MB)       TX packets 169447 bytes 27859641 (27.8 MB)       TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0       ubuntu-18:-5 sudo ifconfig enp0s31f6 down       ubuntu-18:-5 ifconfig	₹40 ĝ 600
Activities © Terr Activities © Terr Relative	<pre>imai- To 1223 O+ O i sarrow@obouto=18- ww South Temmail Hele flags=41634UP_BROADCAST,RUNNING,MULTICAST&gt; ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20<link/> ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 187715 bytes 485163300 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 169447 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 ubuntu-18:-\$ sudo ifconfig enp0s31f6 down ubuntu-18:-\$ ifconfig gs=73<up_lodback,runnins> ntu 65366 inet 127.0.01 netnask 255.0.0.0</up_lodback,runnins></pre>	₹40 <b>B</b> - 000
Activities © Term Activities © Term Pile Edit Vi Wlp2s0:	<pre>mai- To 1223 O+ O * sarrow@obonto-18- ws South Tennial Hele flags=41634UP_BROADCAST_RUNNING_MULTICAST&gt; ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20elink&gt; ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 485163300 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 XX packets 169447 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 ubuntu-18:-\$ ifconfig gs=73eUP_LOOPBACK_RUNNING&gt; ntu 65366 inet 127.0.01 netnask 255.0.0.0 inet 127.0.1 netnask 255.0.0.0 inet 127.0.01 netnask 255.0.0.0 </pre>	₹ 40 B - ⊕⊕€
Activities Diem Mile Edit V. Pile Edit V.	<pre>mai- To 1223 OF 6 % sarr#@dobanto-18- ws South Tennial Hele flags=41634UP_BROADCAST_RUNNING_MULTICAST&gt; ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20elink&gt; ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 485163300 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 16947 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 Wbuntu-18:-\$ sudo ifconfig enp0s31f6 down wbuntu-18:-\$ ifconfig gs=734UP_LODBACK_RUNNINc&gt; ntu 65366 inet 127.0.0.1 netnask 255.0.0.0 inet 51:1 prefixlen 128 scopeid 0x10ehost&gt; loop txqueuelen 1000 (Local Loopback) RX packets 38312 bytes 9396925 (9.3 MB)</pre>	₹ 40 <u>B</u> - ⊕⊕ <b>O</b>
Activities Diem Mile Edit V. Mile Edit V.	<pre>imai- To 1223 O+ O i sarrow@obunto-18- ww South Tennial Hele flags=41634UP, BROADCAST, RUNNING, MULTICAST&gt; ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3ec:25b0 prefixlen 64 scopeid 0x20elink&gt; ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 485163300 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 16947 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 Wuburtu-18:-\$ sudo ifconfig enp0s31f6 down wuburtu-18:-\$ ifconfig gs=73cUP,LODBACK,RUNNINc&gt; ntu 65536 inet 127.0.01 netnask 255.0.0.0 inet6 :11 prefixlen 128 scopeid 0x10ehost&gt; loop txqueuelen 1000 (Local Loopback) RX packets 38312 bytes 9396925 (9.3 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 38312 bytes 9396925 (9.3 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 38312 bytes 9396925 (9.3 MB)</pre>	₹ 40 <u>B</u> - ®©©
Activities Diem Activities Diem	<pre>https://www.initedimediatestation.com/particle/initedimediatestation/initedimediate</pre>	<b>₽ 40 B -</b> ®©©
Activities Diem File Edit V.	<pre>https://www.initedimediatestation.com/page/page/page/page/page/page/page/page</pre>	₹ 40 @ - @@@
Activities Diem File Edit V. WLP2S0: Saurav( Sa	<pre>hai- To 1223 O+ O * surreqCobustorSta- we South Tennel Hele flags=41634UP, BROADCAST, RUNNING, MULTICAST&gt; ntu 1500 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet6 fe80::bb19:5681:b3e::25b0 prefixlen 64 scopeid 0x20elink&gt; ether 5c:5f:67:9c:45:1e txqueuelen 1000 (Ethernet) RX packets 387715 bytes 485163300 (486.1 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 10447 bytes 27859641 (27.8 MB) TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 Wbuntu-18:-\$ sudo ifconfig enp0s31f6 down Wbuntu-18:-\$ ifconfig gs=73cUP,LODBACK,RUNNING&gt; ntu 65366 inet 127.0.0 1. netnask 255.0.0.0 inet 51: 1 prefixlen 128 scopeid 0x10ehost&gt; loop txqueuelen 1000 (local loopback) RX packets 38312 bytes 9396925 (9.3 MB) TX errors 0 dropped 0 overruns 0 frame 0 TX packets 38312 bytes 9396925 (9.3 MB) RX errors 0 dropped 0 overruns 0 frame 0 TX packets 38312 bytes 9396925 (9.3 MB) RX errors 0 dropped 0 overruns 0 carrier 0 collisions 0 flags=41634UP,BROADCAST,RUNNING,MULTICAST&gt; ntu 1500 inet 17.0.8.14, netnask 255.255.255.0 broadcast 192.168.1.255 inet 6127.0.0 fo.1.4 thetask 255.255.255.0 broadcast 192.168.1.255 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet 192.168.1.4 netnask 255.255.255.0 broadcast 192.168.1.255 inet 27.0.0 fo.1.4 thetask 255.255.255.0 broadcast 192.168.1.255 inet 27.0.0 fo.1.4 fo.1.4</pre>	₹ 40 Q - @@@
Activities Diem File Edit V.	<pre>wait to the text of text</pre>	₹ 40 @ - @@@
Activities Ditent Activities Ditent File Edit Vi Wlp2s0: Saurav( Saura	<pre>hai- To 1223 OF 6 % summittee To 1223 of 6 % summittee To 1223 summittee To 122</pre>	₹ 40 Q - 000
Activities Ditent Activities Ditent File Edit Vi Participation Partico Participation Participation Parti	<pre>mai- Transformation (%) The set of the</pre>	₹ 40 Q - 000
Activities Diterri Activities Diterri Tele Edic Vi Participation Participatio	<pre>hai- training the set of the</pre>	₹ 40 @ - @@@
Activities Diterri Activities Diterri Tele Edite Vi Participation Participati	<pre>hai- transdoctory to the state of the s</pre>	₹ 40 @ - @@@



So, the final command that we will cover is ifconfig. The ifconfig command is used to list all the interfaces which are up in our computer. So, if I just type ifconfig and press enter, it shows me that there are three interfaces. This is the Ethernet interface, then the loop back interface and this is for the wifi. So, here if we see that the Ethernet is not running, because I am currently using wifi network. So, here it is running. And we can also see some transmitted and received packets here.

aurav@ubuntu-18:~\$

So, let us go through what all information it shows. So, it shows me this interface is up and we can broadcast or multicast and it is running. Then it shows me the maximum transmission unit. And what is this mean. This means that 1,500 bytes is the maximum packet size that you can

send using this interface. Then it shows me the IPv4 address and the IPv6 address which are linked to this interface. And some other details such as queue length and the received packets, received bytes or the transmitted packets or transmitted bytes.

We can use ifconfig to turn any interface up or down. So, let us say I want to shut down this Ethernet interface. I can write ifconfig enp0s31f6 down and I need to use pseudo. So, this will turn it down. So, now, if I type ifconfig, then it will list only two interfaces, because only these two interfaces are up. And how can I see all the interfaces, I can use ifconfig -a flag to see all the interfaces. And I can turn it up again using the same command. So, I will just change down to up. And now it will show me all the interfaces again.

Also, we can change various IP address or the netmask etc. of any interface using ifconfig command if you want to do so. So, those are some of the network debugging tools. If you want to go in detail about any of the tool you can see the man page of any of this. So, let us say we open the man page of nslookup, so here it lists various options that we can use with this command. Similarly, you can go through man page of any command. So, that is it for this video. Thanks and have a nice day.