

Subject : Software Engineering

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Topic : Exploring Software Tool

Group -2

Assignment – 4

Enrollment no.	Name
2020CSB007	ARATRIKA PAL
2020CSB009	MAYANK MANAVENDRA KUMAR
2020CSB010	GOURAV KUMAR SHAW
2020CSB011	TAMOGHNA ROY
2020CSB013	ABDUL KHAZMUDDIN
2020CSB014	SIDDARTHA JANA

5. Case studies - the kind of experiments done using this tool.

Iperf is a commonly used tool for measuring network performance. It is an open-source tool that can be used to measure the bandwidth and the quality of a network connection. Iperf allows to generate and measure network traffic to test the performance of a network.

Here are a few examples of case studies that can be conducted using Iperf:

1. Testing network bandwidth:

Iperf can be used to measure the maximum available bandwidth of a network connection. We can use Iperf to generate network traffic between two hosts and measure the bandwidth. This test can help us to identify if there are any network bottlenecks that are affecting performance.

To test network bandwidth using Iperf, we can use the following command on the client machine:

- `iperf -c <server_ip_address> -t <test_duration> -i <interval> -P <num_threads>`
- This command will instruct Iperf to connect to the server at <server_ip_address>, run the test for <test_duration> seconds, report results every

`<interval>` seconds, and use `<num_threads>` threads to generate network traffic.

- For example, to test the bandwidth between a client machine with IP address `192.168.1.10` and a server machine with IP address `192.168.1.20` for 60 seconds, reporting results every 10 seconds, and using 4 threads, we can run the following command on the client machine:
- `iperf -c 192.168.1.20 -t 60 -i 10 -P 4`
- This test will measure the maximum available bandwidth between the client and server machines.
- Testing network bandwidth refers to the process of measuring the amount of data that can be transmitted over a network connection between two devices in a given amount of time.
- The bandwidth is usually measured in bits per second (bps), kilobits per second (Kbps), megabits per second (Mbps), or gigabits per second (Gbps).

```

gouravkr@Ubuntu:~/Desktop$ iperf -c 192.168.89.211 -t 60 -i 10 -P 2
-----
Client connecting to 192.168.89.211, TCP port 5001
TCP window size: 2.50 MByte (default)
-----
[  1] local 192.168.89.211 port 53818 connected with 192.168.89.211 port 5001
[  2] local 192.168.89.211 port 53832 connected with 192.168.89.211 port 5001
[ ID] Interval           Transfer     Bandwidth
[  1] 0.0000-10.0000 sec   46.4 MBytes 38.9 Mbits/sec
[  2] 0.0000-10.0000 sec    2.50 MBytes 2.10 Mbits/sec
[SUM] 0.0000-10.0000 sec   48.9 MBytes 41.0 Mbits/sec
[  1] 10.0000-20.0000 sec   39.6 MBytes 33.2 Mbits/sec
[  2] 10.0000-20.0000 sec    0.000 Bytes 0.000 bits/sec
[SUM] 10.0000-20.0000 sec   39.6 MBytes 33.2 Mbits/sec
[  1] 20.0000-30.0000 sec   39.8 MBytes 33.3 Mbits/sec
[  2] 20.0000-30.0000 sec    0.000 Bytes 0.000 bits/sec
[SUM] 20.0000-30.0000 sec   39.8 MBytes 33.3 Mbits/sec
[  1] 30.0000-40.0000 sec   39.6 MBytes 33.2 Mbits/sec
[  2] 30.0000-40.0000 sec    0.000 Bytes 0.000 bits/sec
[SUM] 30.0000-40.0000 sec   39.6 MBytes 33.2 Mbits/sec
[  1] 40.0000-50.0000 sec   40.5 MBytes 34.0 Mbits/sec
[  2] 40.0000-50.0000 sec    0.000 Bytes 0.000 bits/sec
[SUM] 40.0000-50.0000 sec   40.5 MBytes 34.0 Mbits/sec
[  1] 50.0000-60.0000 sec   40.5 MBytes 34.0 Mbits/sec
[  2] 50.0000-60.0000 sec    0.000 Bytes 0.000 bits/sec
[SUM] 50.0000-60.0000 sec   40.5 MBytes 34.0 Mbits/sec
[  1] 60.0000-122.2212 sec  128 KBytes 16.9 Kbits/sec
[  1] 0.0000-122.2212 sec  247 MBytes 16.9 Mbits/sec
[  2] 0.0000-122.2205 sec    2.50 MBytes 172 Kbits/sec
[SUM] 0.0000-61.5414 sec  249 MBytes 33.9 Mbits/sec
[ CT] final connect times (min/avg/max/stdev) = 0.059/0.113/0.168/0.077 ms (tot/err) = 2/0
gouravkr@Ubuntu:~/Desktop$

```

2. Evaluating network performance under different conditions:

Iperf can be used to test network performance under different network conditions. For example, we can use Iperf to measure network performance when using different protocols, such as TCP and UDP, or when using different packet sizes.

- To evaluate network performance under different conditions using Iperf, we can change the test parameters to simulate different network conditions. For example, to test network performance with different protocols, we can use

the `-u` option to switch to UDP protocol instead of the default TCP protocol.

- UDP is useful for measuring network performance under conditions with high packet loss, while TCP is useful for measuring performance under normal network conditions.
- To run a UDP test for 60 seconds with a packet size of 1000 bytes and report results every 10 seconds, we can run the following command:
- `iperf -c 192.168.1.20 -u -b 100M -l 1000 -t 60 -i 10`

This test will measure the network performance using UDP protocol with a 100 Mbps bitrate and a 1000 byte packet size.

```
gouravkr@Ubuntu:~/Desktop$ iperf -c 192.168.89.211 -u -b 100M -l 1000 -t 60 -i 10
-----
Client connecting to 192.168.89.211, UDP port 5001
Sending 1000 byte datagrams, IPG target: 76.29 us (kalman adjust)
UDP buffer size: 208 KByte (default)
-----
[ 1] local 192.168.89.211 port 51861 connected with 192.168.89.211 port 5001
[ ID] Interval      Transfer    Bandwidth
[ 1] 0.0000-10.0000 sec   125 MBytes  105 Mbits/sec
[ 1] 10.0000-20.0000 sec   125 MBytes  105 Mbits/sec
[ 1] 20.0000-30.0000 sec   125 MBytes  105 Mbits/sec
[ 1] 30.0000-40.0000 sec   124 MBytes  104 Mbits/sec
[ 1] 40.0000-50.0000 sec   126 MBytes  105 Mbits/sec
[ 1] 50.0000-60.0000 sec   125 MBytes  105 Mbits/sec
[ 1] 0.0000-60.0000 sec   750 MBytes  105 Mbits/sec
[ 1] Sent 786433 datagrams
```

3. Testing network performance with different network configurations:

Iperf can also be used to test network performance with different network configurations. For example, we can use Iperf to test the *performance of a network* with different levels of congestion or with different routing configurations.

- To test network performance with different network configurations using Iperf, we can change the network configuration on the server machine and run the test again.
- For example, we can test the performance of a network with different levels of congestion by running the test during a period of high network traffic.
- To simulate a congested network, we can run a file transfer on the server machine during the Iperf test. To do this, we can use the following command on the server machine:
- ```
dd if=/dev/zero bs=1M count=1000 | nc -l 1234
```
- This command creates a stream of 1000 MB (1 GB) of zeros using the `dd` command and sends it to port 1234 using `nc` (netcat) command. The `|` character pipes the output of the `dd` command as input to the `nc` command.

- The `nc` command listens on port 1234 and waits for a client to connect. Once a client is connected, it will send the stream of zeros to the client.

Running this command during the Iperf test will simulate a congested network and allow us to test network performance under these conditions.

#### **4. Evaluating network performance with different hardware configurations:**

Iperf can also be used to test network performance with different hardware configurations. For example, we can use Iperf to test the performance of a network with different network interface cards (NICs) or with different CPU configurations.

- To evaluate network performance with different hardware configurations using Iperf, we can change the hardware configuration on the client or server machine and run the test again.
- For example, we can test the performance of a network with different network interface cards (NICs) by switching the NIC on the server machine and running the test again.

- To switch the NIC on the server machine, we can use the following command on the server machine:
- `ifconfig eth0 down`  
`ifconfig eth1 up`

This command will disable the `eth0` NIC and enable the `eth1` NIC. Running the Iperf test again after this change will allow us to test network performance with the new NIC.