High-speed Networks, Cybersecurity, and Software-defined Networking Workshop

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Lab 2: Introduction to iPerf3
Content

• Bandwidth and iPerf3
• Using iPerf3 (client and server commands)
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  ➢ Export results to JSON
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Section 1: Bandwidth and iPerf3
Bandwidth

• Bandwidth is a physical property of a transmission media that depends on factor such as the construction and length of wire or fiber
• To network engineers, bandwidth is the maximum data rate of a channel, a quantity measured in bits per second (bps)
Bandwidth

- Principal metric prefixes (common in data rate and time):

<table>
<thead>
<tr>
<th>Exp.</th>
<th>Explicit</th>
<th>Prefix</th>
<th>Exp.</th>
<th>Explicit</th>
<th>Prefix</th>
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<td>$10^{-3}$</td>
<td>0.001</td>
<td>milli</td>
<td>$10^3$</td>
<td>1,000</td>
<td>Kilo</td>
</tr>
<tr>
<td>$10^{-6}$</td>
<td>0.000001</td>
<td>micro</td>
<td>$10^6$</td>
<td>1,000,000</td>
<td>Mega</td>
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<tr>
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<td>0.000000001</td>
<td>nano</td>
<td>$10^9$</td>
<td>1,000,000,000</td>
<td>Giga</td>
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<td>$10^{-12}$</td>
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<td>femto</td>
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<td>1,000,000,000,000,000</td>
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<tr>
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<td>atto</td>
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<tr>
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<td>zepto</td>
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<tr>
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<td>0.000000000000000000000001</td>
<td>yocto</td>
<td>$10^{24}$</td>
<td>1,000,000,000,000,000,000,000,000</td>
<td>Yotta</td>
</tr>
</tbody>
</table>

- Examples: milliseconds (msec), micro (µsec), nanoseconds (nsec); Kilobits/sec (Kbps), Megabits/sec (Mbps), Gigabits/sec (Gbps)
Bandwidth

- Media include wires, fiber optics, wireless
- Each medium has properties that impact signal propagation, which in turn impact the bandwidth, delay, packet loss rate (e.g., attenuation, noise)
Throughput

- Throughput is the rate in bps at which the sending process can deliver bits to the receiving process.
- The available throughput can fluctuate with time because sessions will be sharing the bandwidth.
iPerf3

- iPerf3 is a real-time network throughput measurement tool
- It is an open source, cross-platform client-server application that can be used to measure the throughput between the two end devices
- A typical iPerf3 output contains a timestamped report of the amount of data transferred and the throughput measured
- Measuring throughput is particularly useful when experiencing network bandwidth issues such as delay, packet loss, etc.
iPerf3

- iPerf3 can operate on TCP, UDP, and SCTP, unidirectional or bidirectional way
- In iPerf3, the user can set client and server configurations via options and parameters
- iPerf3 outputs a timestamped report of the amount of data transferred and the throughput measured
Section 2: Using iPerf3
(client and server commands)
iPerf3

• The user interacts with iPerf3 using the `iperf3` command
• The basic `iperf3` syntax used on both the client and the server is as follows
  • `iperf3 [-s|-c] [options]`
• To launch iPerf3 in server mode, run the command `iperf3 -s`
• To launch iPerf3 in client mode, run the command `iperf3 -c 10.0.0.2`

Introduction to iPerf3
Useful Options (Test Duration)

- To change the default transmission time, use the –t option followed by the number of seconds on the client
- E.g., `iperf3 -c 10.0.0.2 -t 5`

![iperf3 output example](image)
Useful Options (Reporting Interval)

- The \(-i\) option allows setting the reporting interval time in seconds
- E.g., `iperf3 -c 10.0.0.2 -i 2`
Useful Options (Bytes to Transmit)

- By default, iPerf3 performs the throughput measurement for 10 seconds
- Using the `-n` option, the client will send packets until all the bytes specified by the user were sent
Useful Options (Specifying transport-layer protocol)

- In order to change the protocol to UDP, the option `-u` on the client side is used
- Similarly, the option `-sctp` is used for the SCTP protocol
Useful Options (Port Number)

• If the user wishes to measure throughput on a specific port, the `-p` option is used.
Useful Options (Export Results to JSON)

- JSON (JavaScript Object Notation) is a lightweight data-interchange format
- iPerf3 allows exporting the test results to a JSON file, which makes it easy for other applications to parse the file and interpret the results
Useful Options (Handle One Client)

• By default, an iPerf3 server keeps listening to incoming connections
• To allow the server to handle one client and then stop, the -1 option is added to the server

```
root@admin-pc:~# iperf3 -s -1
Server listening on 5201
```