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

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Lab 2: Introduction to iPerf3

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- Using iPerf3 (client and server commands)
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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

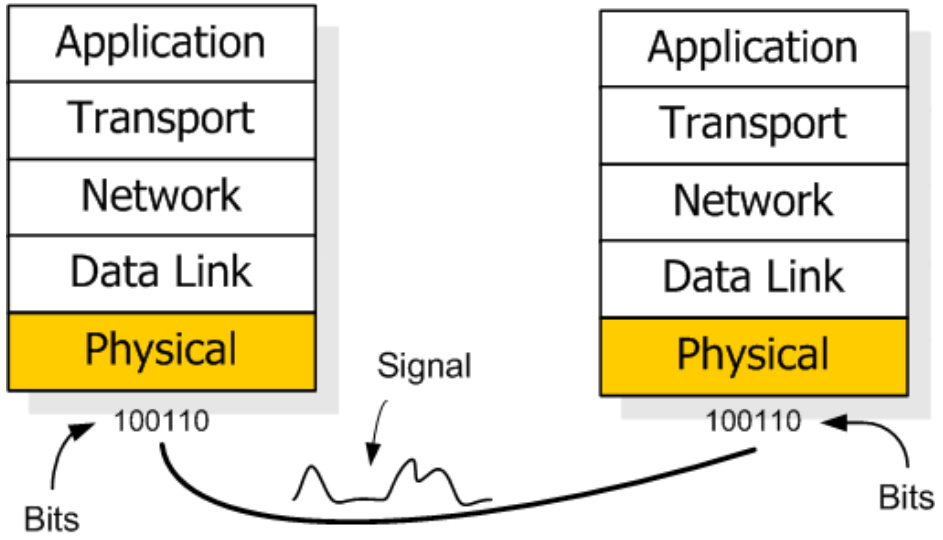
- Principal metric prefixes (common in data rate and time):

Exp.	Explicit	Prefix	Exp.	Explicit	Prefix
10^{-3}	0.001	milli	10^{3}	1,000	Kilo
10^{-6}	0.000001	micro	10^{6}	1,000,000	Mega
10^{-9}	0.000000001	nano	10^{9}	1,000,000,000	Giga
10^{-12}	0.000000000001	pico	10^{12}	1,000,000,000,000	Tera
10^{-15}	0.000000000000001	femto	10^{15}	1,000,000,000,000,000	Peta
10^{-18}	0.000000000000000001	atto	10^{18}	1,000,000,000,000,000,000	Exa
10^{-21}	0.000000000000000000001	zepto	10^{21}	1,000,000,000,000,000,000,000	Zetta
10^{-24}	0.000000000000000000000001	yocto	10^{24}	1,000,000,000,000,000,000,000,000	Yotta

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

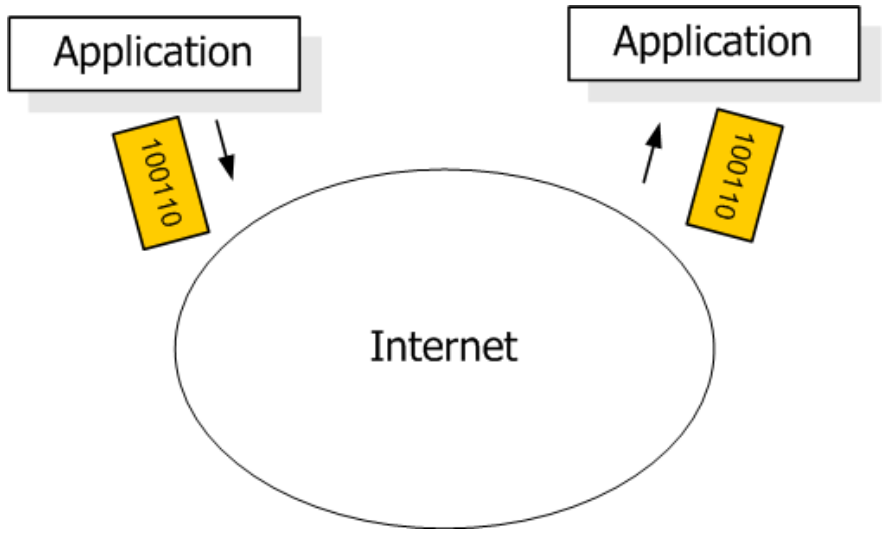
Bandwidth

- 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)



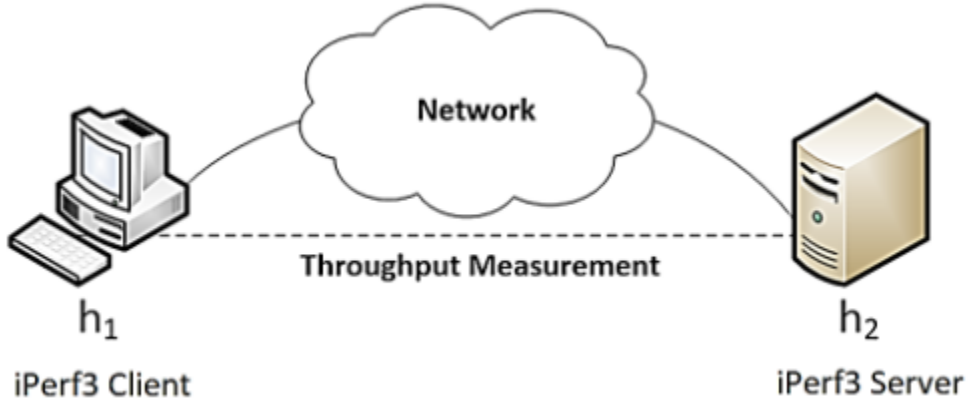
Throughput

- 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



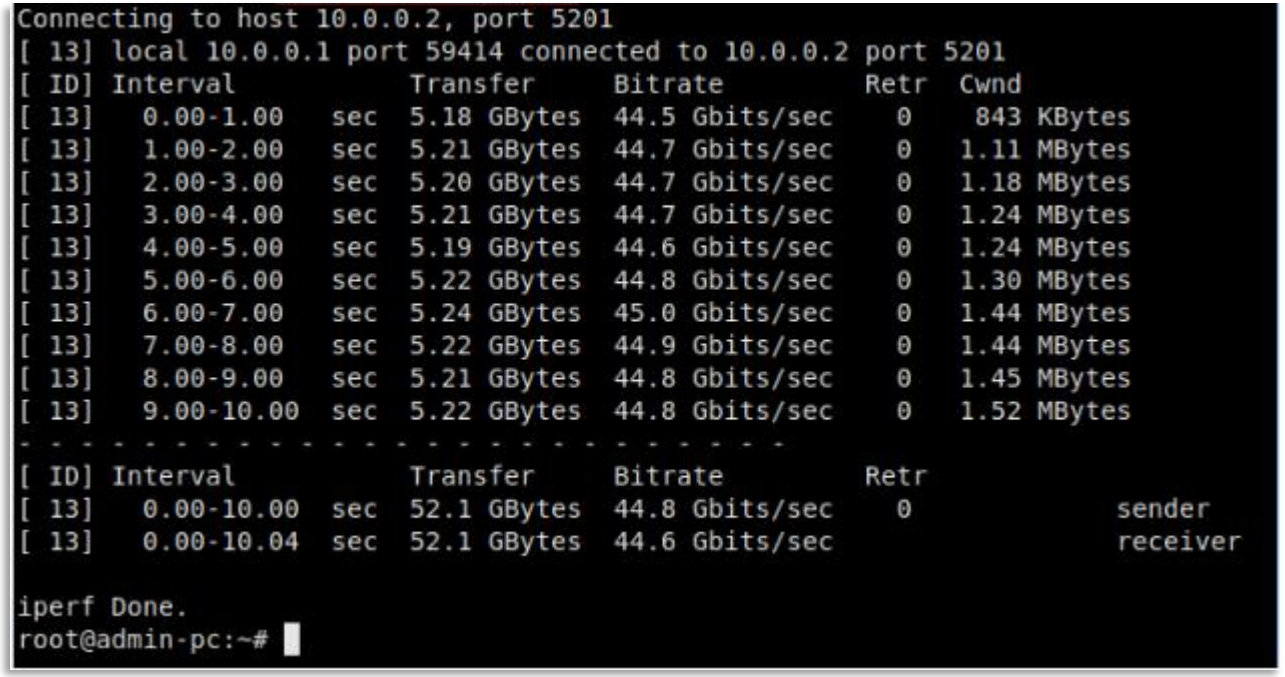
iPerf3

- 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

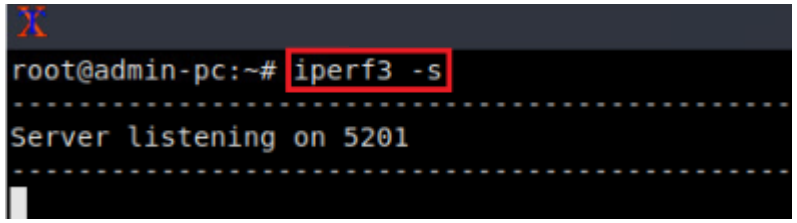
- iPerf3 can operate on TCP, UDP, and SCTP, unidirectional or bidirectional way
- In iPerf3, the user can set *client* and *server* configurations via options and parameters
- iPerf3 outputs a timestamped report of the amount of data transferred and the throughput measured



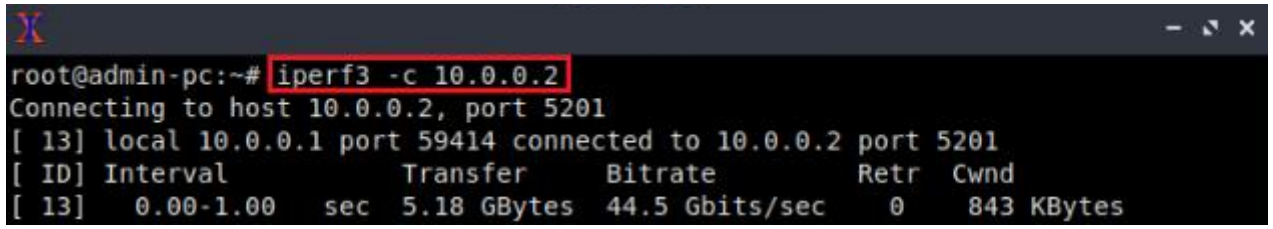
Section 2: Using iPerf3
(client and server commands)

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*



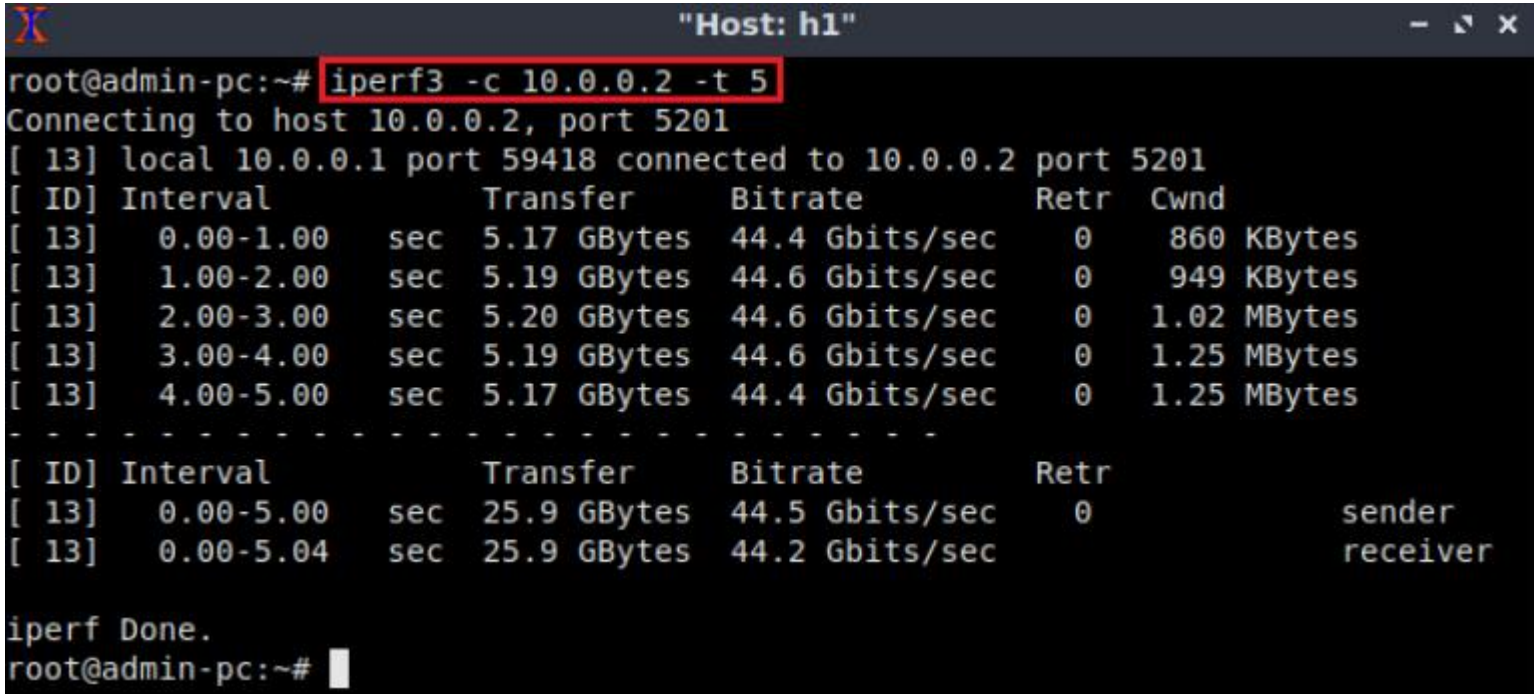
Server



Client

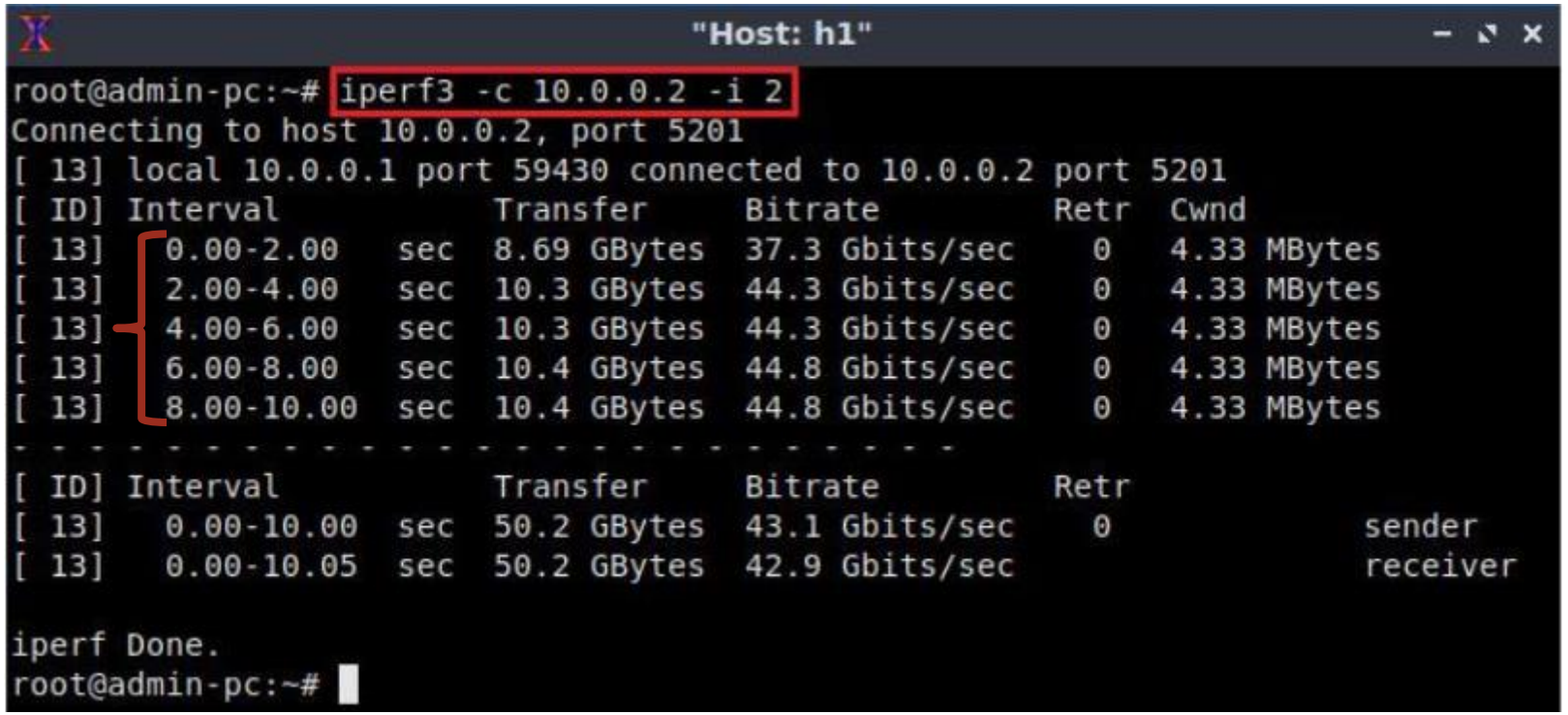
Useful Options (Test Duration)

- 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*



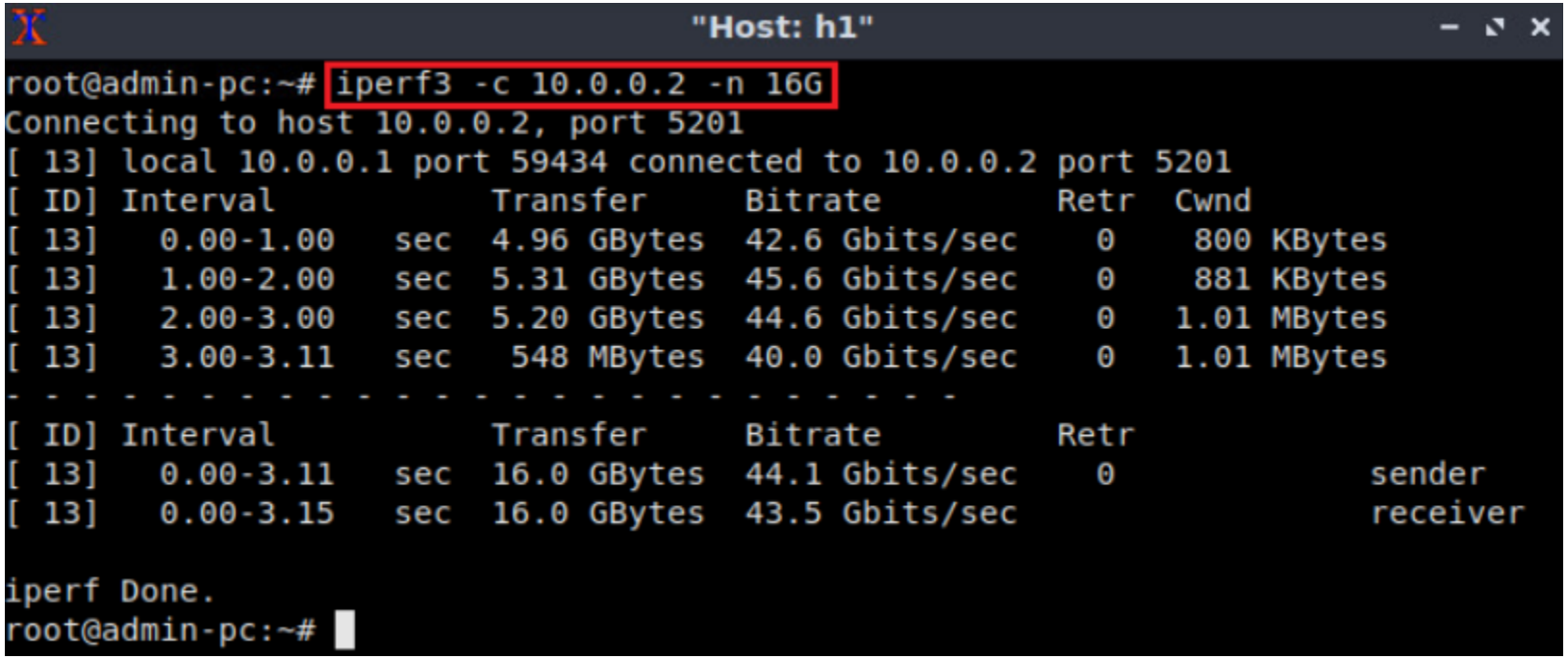
Useful Options (Reporting Interval)

- The *-i* option allows setting the reporting interval time in seconds
- E.g., *iperf3 –c 10.0.0.2 -i 2*



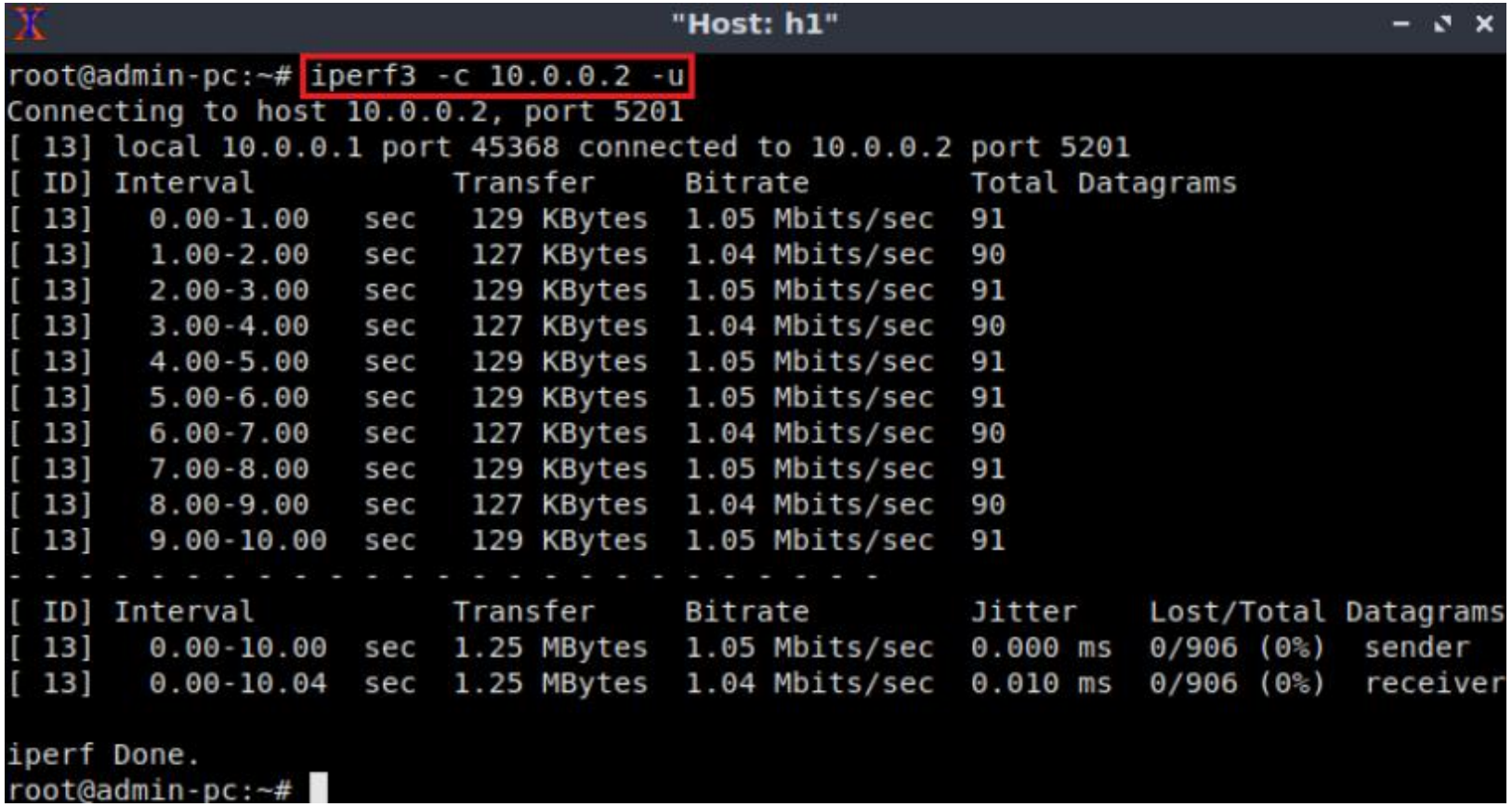
Useful Options (Bytes to Transmit)

- 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



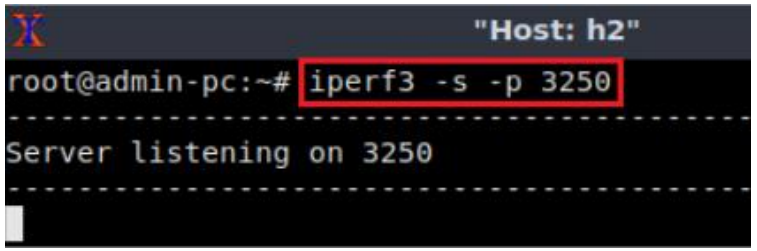
Useful Options (Specifying transport-layer protocol)

- 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

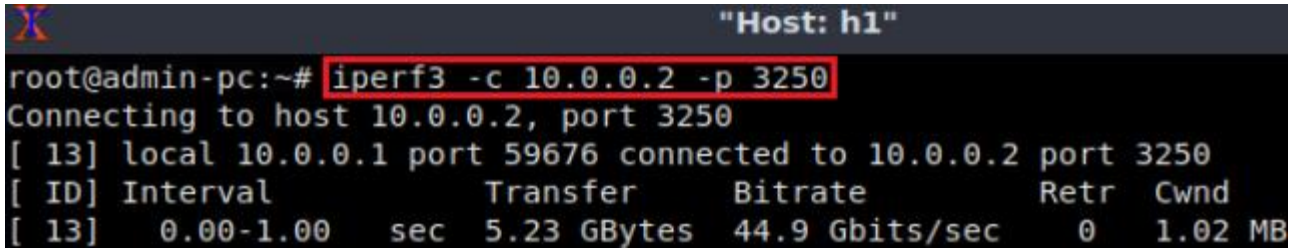


Useful Options (Port Number)

- If the user wishes to measure throughput on a specific port, the *-p* option is used



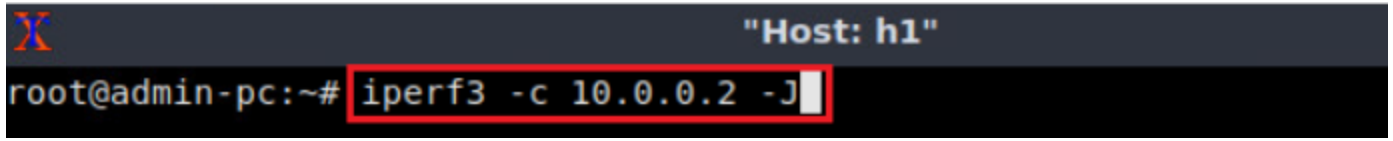
Server



Client

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