

# Use iPerf on Catalyst 9000 Switches to Perform Bandwidth Tests

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## Introduction

This document describes how to use iPerf on Catalyst 9000 series switches to perform bandwidth tests.

## Prerequisites

### Requirements

Cisco recommends that you have knowledge of these topics:

- Application Hosting on Catalyst 9000 series switches
- Linux

### Components Used

The information in this document is based on these software and hardware versions:

- C9300
- Cisco IOS® XE 17.3.5
- Cisco IOS® XE 17.6.4



**Note:** Consult the appropriate configuration guide for the commands that are used to enable these features on other Cisco platforms.

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The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

## Related Products

This document can also be used with these hardware and software versions:

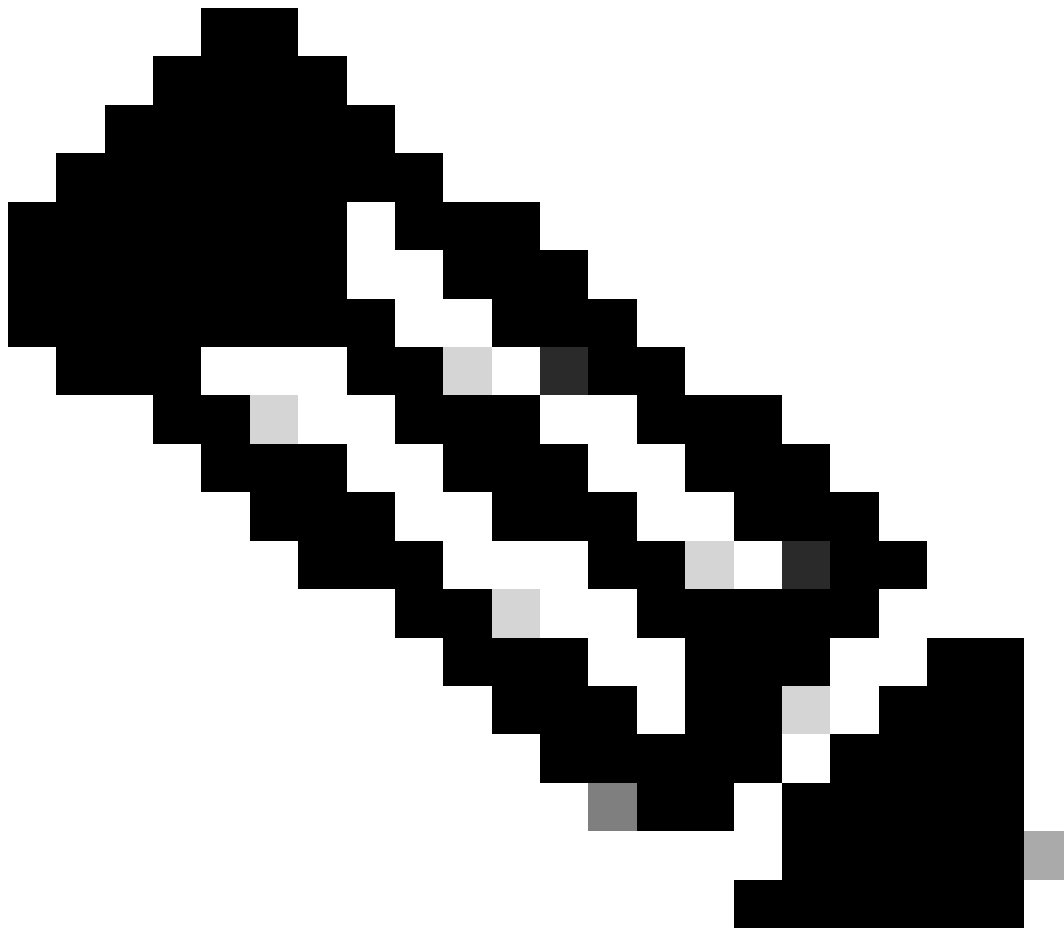
- C9300X
- C9400

## Background Information

iPerf3 is a tool for active measurements of the maximum achievable bandwidth on IP networks. iPerf uses

the different capacities of TCP and UDP to provide statistics about bandwidth.

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**Note:** Consult iPerf official documentation for more information related with this tool.

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## Video

## iPerf Installation

### Restrictions

- Application hosting is not virtual routing and forwarding aware (VRF-aware).
- In releases prior to Cisco IOS® XE Amsterdam 17.3.3, application hosting requires dedicated storage allocations, and is disabled on the bootflash.
- In Cisco IOS® XE Amsterdam 17.3.3 and later releases, application hosting is enabled on the bootflash, however, only Cisco-signed applications are hosted.
- The front-panel Universal Serial Bus (USB) stick is not supported.
- Cisco Catalyst 9300 Series Switches support only back-panel Cisco-certified USB.
- Cisco Catalyst 9500-High Performance Series Switches and Cisco Catalyst 9600 Series Switches do

not support front-panel USB for application hosting.

- Cisco Catalyst 9500 and 9500-High Performance Series Switches and Cisco Catalyst 9600 Series Switches do not support AppGigabitEthernet interfaces.
- Cisco Catalyst 9410R Switches do not support application-hosting in release prior to Cisco IOS® XE Bengaluru 17.5.1.
- Configure the enable command on the AppGigabitEthernet interfaces to enable application hosting on Cisco Catalyst 9410R Switches.

## Installation Steps

1. Download the latest iPerf image and verify it is stored into the USB SSD:

```
C9300-AC1#dir usbflash1:/
Directory of usbflash1:/

12      -rw-          6043136  Jan 26 2023 21:55:35 +00:00  iPerf.tar
```

2. Choose a VLAN or configure a new one for iPerf connectivity:

```
C9300-AC1(config)#interface vlan 10
C9300-AC1(config-if)#ip add 192.168.10.11 255.255.255.0
```

3. Configure the AppGigabitEthernet interface:

```
C9300-AC1(config)#int Ap1/0/1
C9300-AC1(config-if)#switchport mode trunk
```

4. Configure iPerf docker and associate it with a VLAN:

```
C9300-AC1(config)#app-hosting appid iPerf
C9300-AC1(config-app-hosting)#app-vnic AppGigabitEthernet trunk
C9300-AC1(config-config-app-hosting-trunk)#vlan 10 guest-interface 0
C9300-AC1(config-config-app-hosting-vlan-access-ip)#guest-ipaddress 192.168.10.21 netmask 255.255.255.0
```

5. Configure as a default gateway for the application the IP of the SVI that you chose for iPerf connectivity:

```
C9300-AC1(config)#app-hosting appid iPerf
C9300-AC1(config-app-hosting)#app-default-gateway 192.168.10.11 guest-int
```

6. Start the IOX service and verify it is in running state with `show iox-service` privileged EXEC command:

```
C9300-AC1(config)#iox
C9300-AC1(config)#do show iox-service
```

IOx Infrastructure Summary:

```

-----
IOx service (CAF)           : Running
IOx service (HA)           : Running
IOx service (IOxman)       : Not Ready
IOx service (Sec storage)  : Not Running
Libvirtd 5.5.0             : Running
Dockerd 18.03.0           : Running
Sync Status                 : Disabled

```

### 7. Install iPerf application from SSD and verify it is deployed:

```
C9300-AC1#app-hosting install appid iPerf package usbflash1:iPerf.tar
Installing package 'usbflash1:iPerf.tar' for 'iPerf'. Use 'show app-hosting list' for progress.
```

```

C9300-AC1#show app-hosting list
App id                               State
-----
iPerf                                DEPLOYED

```

### 8. Activate and start iPerf application:

```
C9300-AC1#app-hosting activate appid iPerf
iPerf activated successfully
Current state is: ACTIVATED
```

```

C9300-AC1#show app-hosting list
App id                               State
-----
iPerf                                ACTIVATED

```

```
C9300-AC1#app-hosting start appid iPerf
iPerf started successfully
Current state is: RUNNING
```

```

C9300-AC1#
C9300-AC1#show app-hosting list
App id                               State
-----
iPerf                                RUNNING

```

---

**Note:** Once iPerf is in `runningstate`, it runs as a server by default.

---

## Verification

In order to verify application details, you can use `show app-hosting utilization appid [app-name] privileged EXEC` command:

```
C9300-AC1#show app-hosting detail appid iPerf
App id           : iPerf
Owner            : iox
State            : RUNNING
Application
  Type           : docker
  Name           : mlabbe/iperf3
  Version        : latest
  Description     :
  Author         :
  Path           : usbflash1:iPerf.tar
  URL Path       :
Activated profile name : default
```

Resource reservation

Memory : 409 MB
Disk : 10 MB
CPU : 1480 units
CPU-percent : 20 %
VCPUs : 1

Platform resource profiles

Profile Name CPU(unit) Memory(MB) Disk(MB)
-----

Attached devices

Table with 3 columns: Type, Name, Alias. Rows include serial/shell, serial/aux, serial/syslog, serial/trace.

Network interfaces

eth0:
MAC address : 52:54:dd:d2:df:af
IPv4 address : 192.168.10.21
IPv6 address : ::
Network name : mgmt-bridge-v10

Docker

Run-time information

Command :
Entry-point : iperf3 -s
Run options in use :
Package run options :

Application health information

Status : 0
Last probe error :
Last probe output :

In order to verify application utilization, you can use show app-hosting utilization appid [app-name]privileged EXEC command:

C9300-AC1# show app-hosting utilization appid iPerf

Application: iPerf
CPU Utilization:
CPU Allocation: 1480 units
CPU Used: 0.00 %
CPU Cores:
Memory Utilization:
Memory Allocation: 409 MB
Memory Used: 1064 KB
Disk Utilization:
Disk Allocation: 10 MB
Disk Used: 0.00 MB

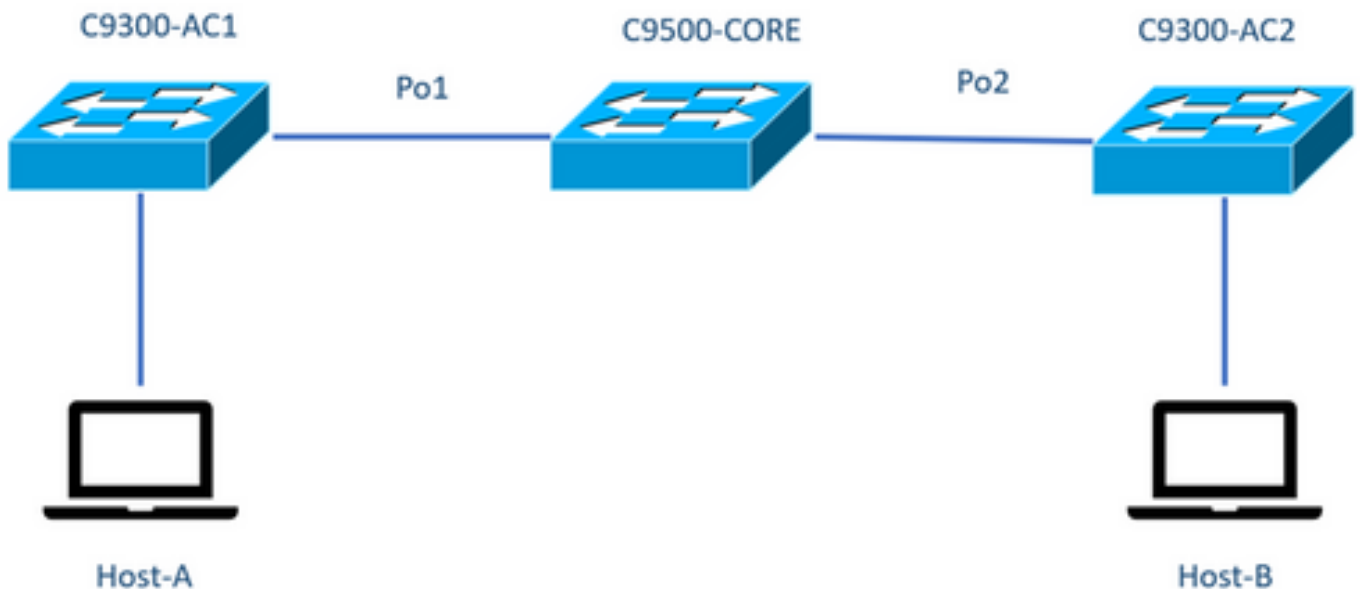
In order to verify details in the application container, you can use `app-hosting connect appid [app-name] sessionprivileged EXEC` command:

```
C9300-AC1#app-hosting connect appid iPerf session
/ $
/ $ #Verify IP address assigned
/ $
/ $ ifconfig
eth0      <snip>
          inet addr:192.168.10.21  Bcast:0.0.0.0  Mask:255.255.255.0
          <snip>
/ $
/ $ #Verify iPerf is running as server
/ $
/ $ ps
PID      USER     TIME   COMMAND
   1     iperf    0:00   iperf3 -s
  390     iperf    0:00   /bin/sh
  398     iperf    0:00   ps
/ $
```

## Bandwidth Tests

### Network Diagram

The methods to perform bandwidth tests explained in this document are based on the network diagram below:







**Note:** Configuration examples from section **iPerf installation** were taken from the same lab environment.

---

IP address assignment for devices above:

C9300-AC1	C9300-AC2
SVI 192.168.10.11	SVI 192.168.10.12
iPerf 192.168.10.21	iPerf 192.168.10.22

---

**Note:** All devices used in these examples are in the same VLAN domain, VLAN 10.

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### Method 1: Switch as a Client

In this example, bandwidth from C9300-AC1 to C9300-AC2 is measured. C9300-AC1 is the client.

1. Run command `app-hosting connect appid iPerf session` to enter application container prompt:

```
C9300-AC1#app-hosting connect appid iPerf session
/ $
```

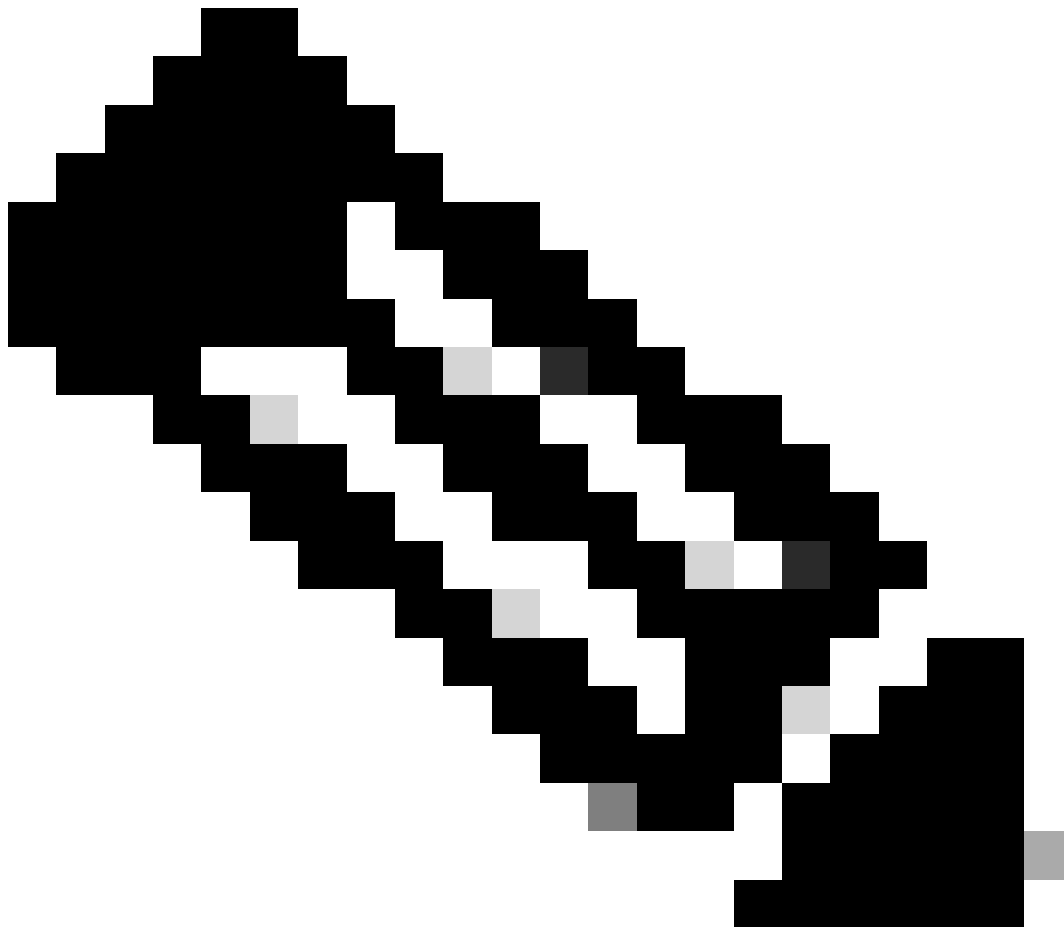
2. Once you are in application container prompt, use `iperf3 -c` command to start the bandwidth test:

```
/ $ iperf3 -c 192.168.10.22
Connecting to host 192.168.10.22, port 5201
[ 5] local 192.168.10.21 port 34906 connected to 192.168.10.22 port 5201
```

[ ID]	Interval		Transfer	Bitrate	Retr	Cwnd	
[ 5]	0.00-1.00	sec	114 MBytes	955 Mbits/sec	2	833 KBytes	
[ 5]	1.00-2.00	sec	113 MBytes	947 Mbits/sec	3	923 KBytes	
[ 5]	2.00-3.00	sec	111 MBytes	934 Mbits/sec	77	974 KBytes	
[ 5]	3.00-4.00	sec	113 MBytes	945 Mbits/sec	1	1.03 MBytes	
[ 5]	4.00-5.00	sec	112 MBytes	940 Mbits/sec	109	1.08 MBytes	
[ 5]	5.00-6.00	sec	111 MBytes	931 Mbits/sec	395	820 KBytes	
[ 5]	6.00-7.00	sec	111 MBytes	933 Mbits/sec	198	882 KBytes	
[ 5]	7.00-8.00	sec	112 MBytes	944 Mbits/sec	2	970 KBytes	
[ 5]	8.00-9.00	sec	111 MBytes	933 Mbits/sec	9	1.02 MBytes	
[ 5]	9.00-10.00	sec	111 MBytes	933 Mbits/sec	524	1.04 MBytes	
-----							
[ ID]	Interval		Transfer	Bitrate	Retr		
[ 5]	0.00-10.00	sec	1.09 GBytes	940 Mbits/sec	1320		sender
[ 5]	0.00-10.01	sec	1.09 GBytes	937 Mbits/sec			receiver

iperf Done.  
/ \$

3. After the test finishes, type `exit` to return to switch CLI.



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**Note:** Since iPerf runs as server by default, no further command is needed on server side.

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## Method 2: PC as a Client

In this example, bandwidth from Host-A to C9300-AC2 (iPerf server) is measured.

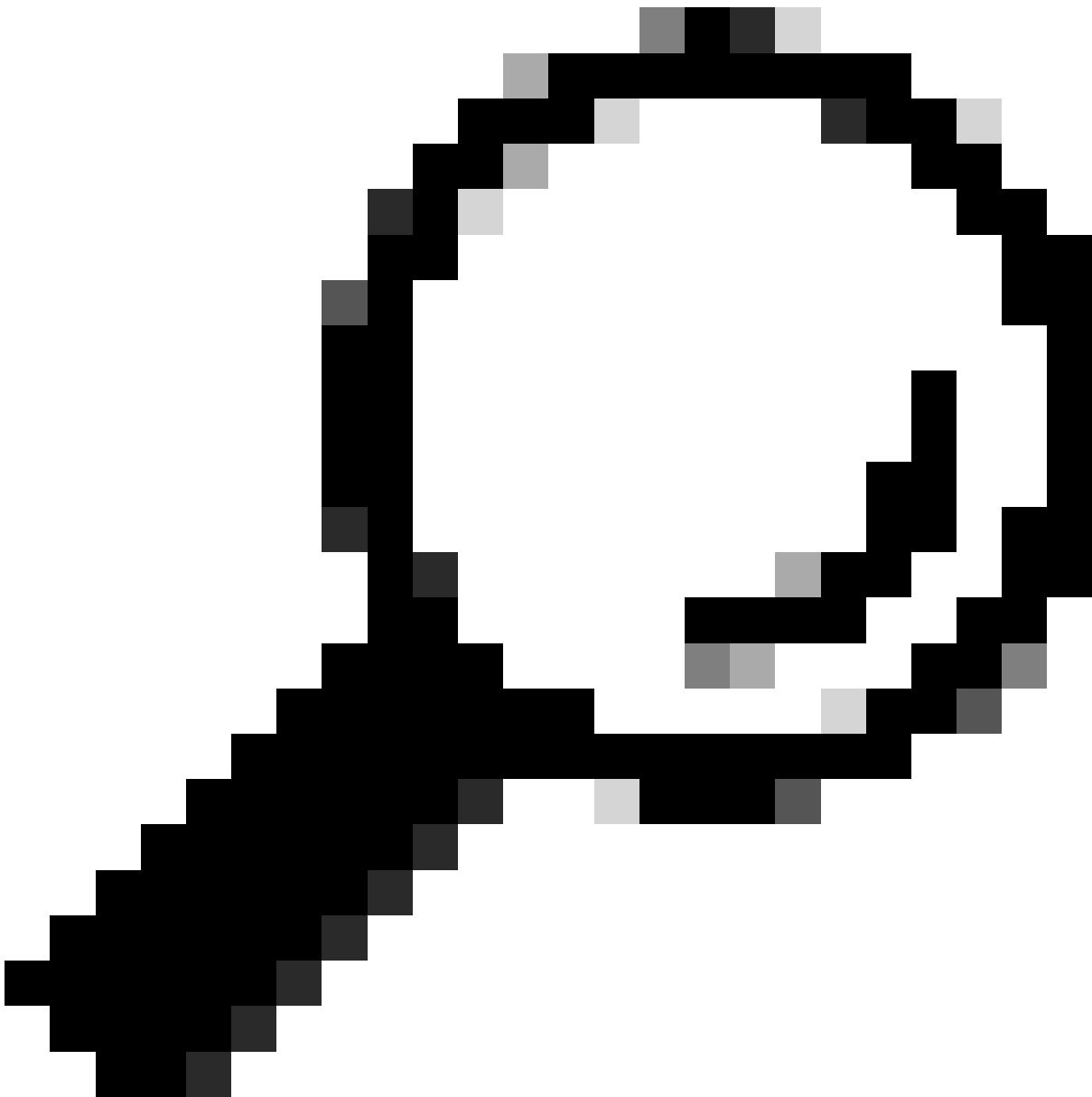
1. Ensure you have iPerf downloaded in your PC.
2. Once you have iPerf stored in your PC, navigate to iperf3.exe from your command prompt:

```
C:\Users\user\Downloads\iperf-3.1.3-win64\iperf-3.1.3-win64>iperf3.exe
```

3. From your PC use **-c** option. This indicates the PC is the client:

```
C:\Users\user\Downloads\iperf-3.1.3-win64\iperf-3.1.3-win64>iperf3.exe -c 192.168.10.22
Connecting to host 192.168.10.22, port 5201
[ 4] local 192.168.10.2 port 56009 connected to 192.168.10.22 port 5201
[ ID] Interval           Transfer     Bandwidth
[ 4]  0.00-1.00    sec    109 MBytes   916 Mbits/sec
[ 4]  1.00-2.00    sec     0.00 Bytes   0.00 bits/sec
[ 4]  2.00-3.00    sec     0.00 Bytes   0.00 bits/sec
[ 4]  3.00-4.00    sec   93.6 MBytes   786 Mbits/sec
[ 4]  4.00-5.00    sec   15.1 MBytes   127 Mbits/sec
[ 4]  5.00-6.02    sec     0.00 Bytes   0.00 bits/sec
[ 4]  6.02-7.00    sec   78.2 MBytes   666 Mbits/sec
[ 4]  7.00-8.00    sec   42.9 MBytes   360 Mbits/sec
[ 4]  8.00-9.00    sec     0.00 Bytes   0.00 bits/sec
[ 4]  9.00-10.00   sec   49.4 MBytes   414 Mbits/sec
-----
[ ID] Interval           Transfer     Bandwidth
[ 4]  0.00-10.00   sec   388 MBytes   326 Mbits/sec      sender
[ 4]  0.00-10.00   sec   388 MBytes   326 Mbits/sec      receiver

iperf Done.
```



**Tip:** For traditional method, you need to use 2 PCs, one as a server and one as a client. For the PC acting as a server, use `iperf3.exe -s` command.

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## Related Information

- [Application Hosting on the Cisco Catalyst 9000 Series Switches White paper](#)
- [Programmability Configuration Guide, Cisco IOS® XE Bengaluru 17.6.x](#)
- [Network Performance Monitoring with Catalyst 9300 Application Hosting](#)