

# 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.

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.

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

## 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 Libvirt 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 running state, 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 % VCPU : 1 Platform resource profiles
Profile Name CPU(unit) Memory(MB) Disk(MB) -----
----- Attached devices Type Name Alias -----
serial/shell iox_console_shell serial0 serial/aux iox_console_aux serial1 serial/syslog
iox_syslog serial2 serial/trace iox_trace serial3 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
```

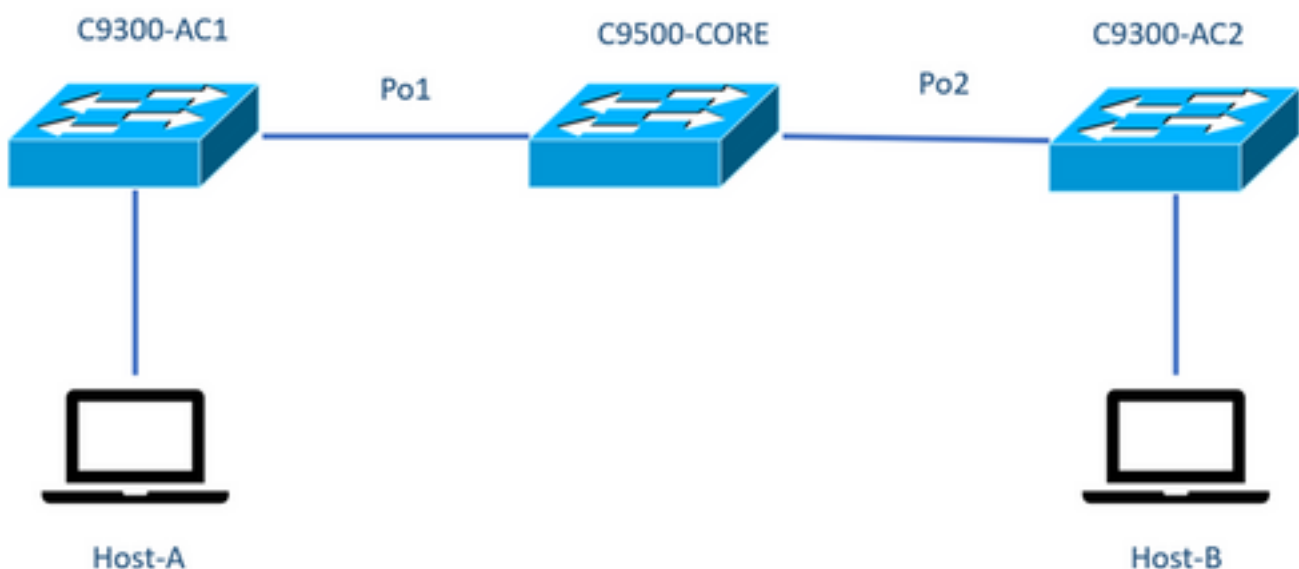
In order to verify details in the application container, you can use `app-hosting connect appid [app-name]` sessionprivileged EXEC command:

```
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.

## 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.

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

## 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.

## 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](#)