



Use Cases: Application Hosting

This chapter describes use cases for running applications on IOS XR.

- [Hosting iPerf in Docker Containers to Measure Network Performance using Application Manager, on page 1](#)

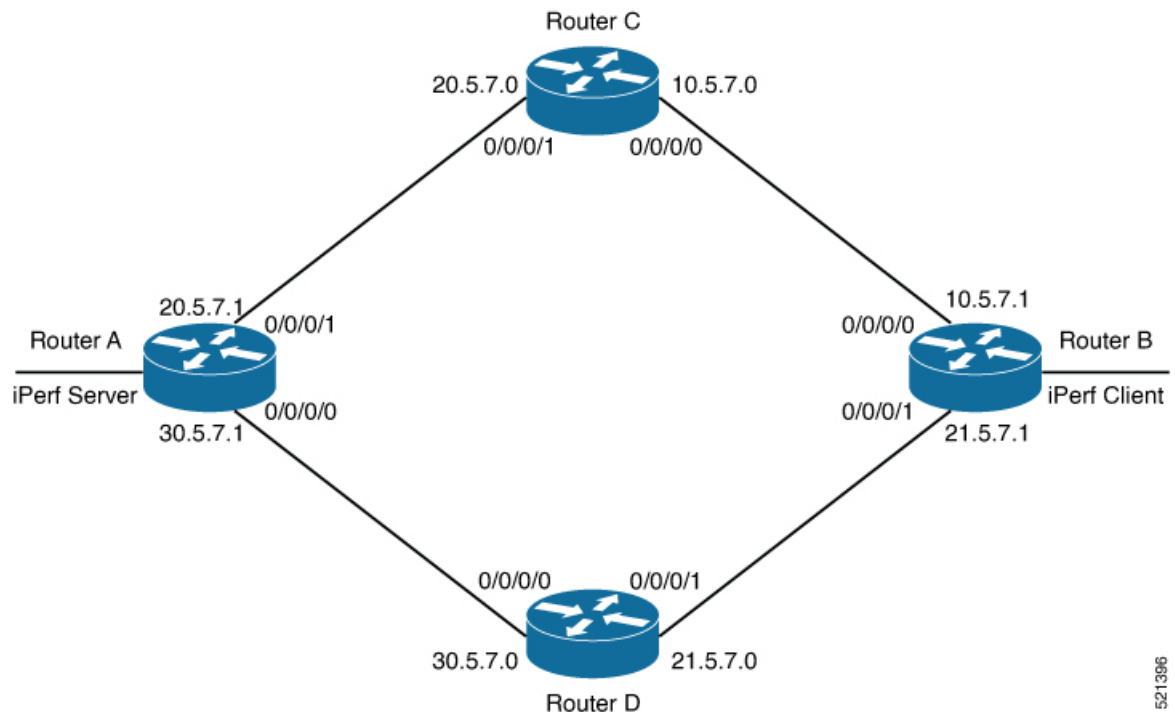
Hosting iPerf in Docker Containers to Measure Network Performance using Application Manager

Measuring the network performance is important to test the efficiency of the network. Network throughput, bandwidth, latency, and packet loss are some of the parameters used to measure the network performance. iPerf is a commonly used application for measuring network performance. The iPerf application is hosted on systems at both ends of the connection that is measured. One system is used as the server, and the other system is used as the client. At least one system must be a Cisco IOS XR router, the other system can be any other external entity like a controller or another router.

This use case illustrates the procedure for hosting the iPerf application in docker containers on two Cisco IOS XR routers, Router A and Router B to measure network performance. Router A hosts the iPerf server and Router B hosts the iPerf client.

In this usecase, we demonstrate the example of testing network bandwidth when a route update takes place. Router A hosts the iPerf Server and Router B hosts the iPerf Client. Router C and Router D are intermediate routers that allow traffic flow from Router A to Router B and vice-versa.

Figure 1: Hosting iPerf Application in Cisco IOS XR Routers



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Verify Connection between the iPerf Server and iPerf Client Applications

Verify whether the connection is established between iPerf server and iPerf clients by executing the **bash netstat -anput** command on Router A. When the iPerf client is up and running, the entry in the **State** field displays "ESTABLISHED".

```
Router#bash netstat -anput
Thu Dec 3 10:00:33.535 UTC
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:646             0.0.0.0:*               LISTEN      8585/mpfs_ldp
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      8567/ssh_server
tcp        0      0 0.0.0.0:830             0.0.0.0:*               LISTEN      8567/ssh_server
tcp6       0      0 :::5201                 :::*                   LISTEN      20829/iperf3
tcp6       0      0 :::22                   :::*                   LISTEN      8567/ssh_server
tcp6       0      0 :::830                  :::*                   LISTEN      8567/ssh_server
tcp6       0      0 30.5.7.1:5201           100.0.0.9:65322        ESTABLISHED 20829/iperf3
tcp6       0      0 30.5.7.1:5201           100.0.0.9:65302        ESTABLISHED 20829/iperf3
udp        0      0 0.0.0.0:646             0.0.0.0:*               8585/mpfs_ldp
udp        0      0 0.0.0.0:3232            0.0.0.0:*               6833/pim
udp        0      0 0.0.0.0:3503            0.0.0.0:*               10762/lspv_server
udp        0      0 0.0.0.0:68              0.0.0.0:*               10704/xr_dhcpd
udp        0      0 0.0.0.0:496             0.0.0.0:*               6833/pim
udp6       0      0 :::3503                 :::*                   10762/lspv_server
```

Install the iPerf Server Application

Step 1 Install the iPerf application RPM on Router A. Only the RPM file format is supported.

```
Router#appmgr package install rpm /misc/disk1/iperf-0.1.0-XR_7.3.1.x86_64.rpm

Router#show appmgr source-table
Thu Dec  3 09:57:40.808 UTC
Name      File
-----
iperf     iperf.tar.gz
Router#
```

Step 2 Configure the application to run as iPerf server.

```
Router#config
Thu Dec  3 09:57:54.034 UTC
Router(config)#appmgr
Router(config-appmgr)#application iperf-server-app
Router(config-application)#activate type docker source iperf docker-run-opts "--net=host" docker-run-cmd
"iperf3 -s -d"
Router(config-application)#commit
Thu Dec  3 09:57:54.398 UTC
```

Step 3 Verify the basic details (application name and state) about the activated iPerf server application.

```
Router#show appmgr application-table
Name      Type      Config State  Status
-----
iperf-server-app  Docker    Activated    Up 2 seconds
Router#
Thu Dec  3 09:57:54.398 UTC
Router#show appmgr application name iperf-server-app info summary
Thu Dec  3 09:58:15.569 UTC
Application: iperf-server-app
  Type: Docker
  Source: iperf
  Config State: Activated
  Container ID: 0118f9006cde2787e9809eb7c62ad8b552925b559a689c7aaa80f80d7ce43c02
  Image: alpine1:latest
  Command: "iperf3 -s -d"
  Status: Up 7 seconds
Thu Dec  3 09:57:54.398 UTC
Router#show appmgr application name iperf-server-app info detail
Thu Dec  3 09:58:26.401 UTC
Application: iperf-server-app
  Type: Docker
  Source: iperf
  Config State: Activated
  Docker Information:
    Container ID: 0118f9006cde2787e9809eb7c62ad8b552925b559a689c7aaa80f80d7ce43c02
    Container name: iperf-server-app
    Labels:
    Image: alpine1:latest
    Command: "iperf3 -s -d"
    Created at: 2020-12-03 09:58:08 +0000 UTC
    Running for: 18 seconds ago
    Status: Up 18 seconds
    Size: 0B
    Ports:
    Mounts:
    Networks: host
```

```

LocalVolumes: 0
Router#show appmgr application name iperf-server-app stats
Thu Dec 3 09:58:39.594 UTC
Application Stats: iperf-server-app
  CPU Percentage: 0.00%
  Memory Usage: 624KiB / 31.23GiB
  Memory Percentage: 0.00%
  Network IO: 0B / 0B
  Block IO: 0B / 0B
  PIDs: 1
Router#

```

Step 4 Verify if the iPerf server is listening on the default port (5201) by using the netstat command inside the container.

The appmgr application exec name *app_name* docker-exec-cmd command can be used to execute any commands inside the container.

```

Router#appmgr application exec name iperf-server-app docker-exec-cmd name netstat -lntup
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 127.0.0.11:46727       0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:5201          0.0.0.0:*               LISTEN      -
udp        0      0 127.0.0.11:39552       0.0.0.0:*
Router#

```

Install the iPerf Client Application

Step 1 Install the iPerf application RPM on Router B.

```

Router#appmgr package install rpm /misc/disk1/iperf-0.1.0-XR_7.3.1.x86_64.rpm
Router#show appmgr source-table
Thu Dec 3 09:57:40.808 UTC
Name      File
-----
iperf      iperf.tar.gz
Router#

```

Step 2 Configure the application to run as iPerf client with a timeout (600s in this case).

```

Router#config
Thu Dec 3 09:57:54.034 UTC
Router(config)#appmgr
Router(config-appmgr)#application iperf-client-app
Router(config-application)#activate type docker source iperf docker-run-opts "--net=host" docker-run-cmd
"iperf3 -c 30.5.7.1 -t 600"
Router(config-application)#commit
Thu Dec 3 09:57:54.398 UTC

```

Note Hosting the iPerf client application on Router B by providing the iPerf server physical interface IP address (30.5.7.1) establishes communication between Router B and Router A.

Step 3 Verify the basic details (application name and state) about the activated iPerf client application.

```

Router#show appmgr application-table
Thu Dec 3 09:59:47.628 UTC
Name      Type    Config State  Status
-----
iperf-client-app  Docker  Activated  Up 2 seconds

```

```

Router#
Thu Dec  3 09:57:54.398 UTC
Router#show appmgr application name iperf-client-app info summary
Thu Dec  3 09:59:54.534 UTC
Application: iperf-client-app
  Type: Docker
  Source: iperf
  Config State: Activated
  Container ID: 40e1730a97666b2b44c8c9313b94b0138925c9198ae63244ff3bd386132d9c9c
  Image: alpine1:latest
  Command: "iperf3 -c 30.5.7.1 -t 600"
  Status: Up 9 seconds
Router#show appmgr application name iperf-client-app info detail
Application: iperf-client-app
  Type: Docker
  Source: iperf
  Config State: Activated
  Docker Information:
    Container ID: 40e1730a97666b2b44c8c9313b94b0138925c9198ae63244ff3bd386132d9c9c
    Container name: iperf-client-app
    Labels:
    Image: alpine1:latest
    Command: "iperf3 -c 30.5.7.1 -t 600"
    Created at: 2020-12-03 09:59:45 +0000 UTC
    Running for: 20 seconds ago
    Status: Up 20 seconds
    Size: 0B
    Ports:
    Mounts:
    Networks: host
    LocalVolumes: 0
Router#show appmgr application name iperf-client-app stats
Thu Dec  3 10:00:18.079 UTC
Application Stats: iperf-client-app
  CPU Percentage: 0.11%
  Memory Usage: 720KiB / 31.23GiB
  Memory Percentage: 0.00%
  Network IO: 0B / 0B
  Block IO: 0B / 0B
  PIDs: 1
Router#

```

Verify Connection between the iPerf Server and iPerf Client Applications

Verify whether the connection is established between iPerf server and iPerf clients by executing the **bash netstat -anput** command on Router A. When the iPerf client is up and running, the entry in the **State** field displays "ESTABLISHED".

```

Router#bash netstat -anput
Thu Dec  3 10:00:33.535 UTC
Active Internet connections (servers and established)

```

Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State	PID/Program name
tcp	0	0	0.0.0.0:646	0.0.0.0:*	LISTEN	8585/mpls_ldp
tcp	0	0	0.0.0.0:22	0.0.0.0:*	LISTEN	8567/ssh_server
tcp	0	0	0.0.0.0:830	0.0.0.0:*	LISTEN	8567/ssh_server
tcp6	0	0	:::5201	:::*	LISTEN	20829/iperf3
tcp6	0	0	:::22	:::*	LISTEN	8567/ssh_server
tcp6	0	0	:::830	:::*	LISTEN	8567/ssh_server
tcp6	0	0	30.5.7.1:5201	100.0.0.9:65322	ESTABLISHED	20829/iperf3

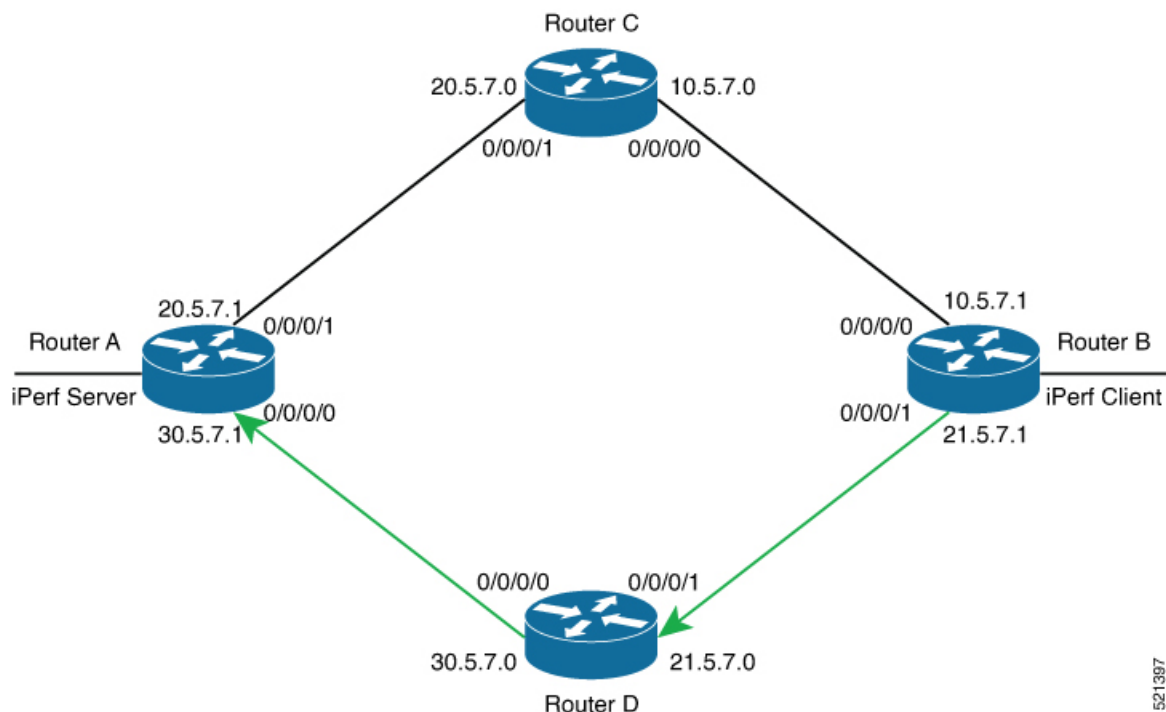
```

tcp6      0      0 30.5.7.1:5201      100.0.0.9:65302    ESTABLISHED 20829/iperf3
udp       0      0 0.0.0.0:646        0.0.0.0:*          8585/mps_ldp
udp       0      0 0.0.0.0:3232       0.0.0.0:*          6833/pim
udp       0      0 0.0.0.0:3503       0.0.0.0:*          10762/lspv_server
udp       0      0 0.0.0.0:68         0.0.0.0:*          10704/xr_dhcpd
udp       0      0 0.0.0.0:496        0.0.0.0:*          6833/pim
udp6      0      0 :::3503            :::*               10762/lspv_server

```

Measure Network Performance

Step 1 Verify the traffic route from Router B to Router A using the **show ip route** command, on Router B.



```

Router#show ip route 30.5.7.1
Thu Dec  3 10:08:01.859 UTC

Routing entry for 30.5.7.0/31
  Known via "ospf 10", distance 110, metric 2, type intra area
  Installed Dec  3 04:49:22.281 for 05:18:39
  Routing Descriptor Blocks
    21.5.7.0, from 100.0.0.7, via FourHundredGigE0/0/0/1
    Route metric is 2
  No advertising protos.
Router#

```

Step 2 Check the network performance between iPerf client and iPerf server (on Router B and Router A).

You can view the network monitoring parameters by executing the **show appmgr application name iperf-client-app logs** command, on Router B that hosts the iPerf client.

```

Router#show appmgr application name iperf-client-app logs
Tue Dec 1 12:50:27.862 UTC
Connecting to host 30.5.7.1, port 5201
[ 4] local 100.0.0.9 port 61384 connected to 30.5.7.1 port 5201
[ ID] Interval          Transfer          Bandwidth Retr      Cwnd
[ 4] 0.00-1.00 sec 1.05 MBytes      8.82 Mbits/sec  0       80.6 KBytes
[ 4] 1.00-2.00 sec 1.26 MBytes      10.6 Mbits/sec  0       136 KBytes
[ 4] 2.00-3.00 sec 1.18 MBytes      9.90 Mbits/sec  0       191 KBytes
[ 4] 3.00-4.00 sec 1.24 MBytes      10.4 Mbits/sec  0       246 KBytes
[ 4] 4.00-5.00 sec 1.18 MBytes      9.90 Mbits/sec  0       301 KBytes
[ 4] 5.00-6.00 sec 1.37 MBytes      11.5 Mbits/sec  0       362 KBytes
[ 4] 6.00-7.00 sec 1.37 MBytes      11.5 Mbits/sec  0       423 KBytes
[ 4] 7.00-8.00 sec 1.43 MBytes      12.0 Mbits/sec  0       486 KBytes
[ 4] 8.00-9.00 sec 1.30 MBytes      11.0 Mbits/sec  0       547 KBytes
[ 4] 9.00-10.00 sec 1.43 MBytes      12.0 Mbits/sec  0       611 KBytes
[ 4] 10.00-11.00 sec 1.62 MBytes      13.6 Mbits/sec  0       707 KBytes
[ 4] 11.00-12.00 sec 1.62 MBytes      13.6 Mbits/sec  0       875 KBytes
[ 4] 12.00-13.00 sec 1.93 MBytes      16.2 Mbits/sec  0       1.07 MBytes
[ 4] 13.00-14.00 sec 1.68 MBytes      14.1 Mbits/sec  0       1.29 MBytes
[ 4] 14.00-15.00 sec 1.06 MBytes      8.86 Mbits/sec  0       1.56 MBytes
[ 4] 15.00-16.00 sec 891 KBytes       7.30 Mbits/sec  0       1.83 MBytes
[ 4] 16.00-17.00 sec 970 KBytes       7.95 Mbits/sec  0       2.12 MBytes
[ 4] 17.00-18.00 sec 1.24 MBytes      10.4 Mbits/sec  0       2.58 MBytes
[ 4] 18.00-19.00 sec 885 KBytes       7.24 Mbits/sec  0       2.65 MBytes
[ 4] 19.00-20.00 sec 1.55 MBytes      13.0 Mbits/sec  0       3.10 MBytes
[ 4] 20.00-21.00 sec 820 KBytes       6.71 Mbits/sec  0       3.10 MBytes
[ 4] 21.00-22.00 sec 1.72 MBytes      14.4 Mbits/sec  6       2.42 MBytes
[ 4] 22.00-23.00 sec 0.00 Bytes       0.00 bits/sec  5       2.30 MBytes
[ 4] 23.00-24.00 sec 256 KBytes      2.10 Mbits/sec  0       1.35 MBytes
[ 4] 24.00-25.00 sec 1.56 MBytes      13.1 Mbits/sec  237     1.83 MBytes
[ 4] 25.00-26.00 sec 1.90 MBytes      15.9 Mbits/sec  0       2.17 MBytes
[ 4] 26.00-27.00 sec 382 KBytes       3.12 Mbits/sec  61      1.95 MBytes
[ 4] 27.00-28.00 sec 0.00 Bytes       0.00 bits/sec  0       1.39 MBytes
[ 4] 28.00-29.00 sec 3.35 MBytes      28.1 Mbits/sec  0       1.52 MBytes
[ 4] 29.00-30.00 sec 954 KBytes       7.82 Mbits/sec  0       1.58 MBytes
[ 4] 30.00-31.00 sec 1018 KBytes      8.34 Mbits/sec  0       1.64 MBytes
[ 4] 31.00-32.00 sec 1.24 MBytes      10.4 Mbits/sec  0       1.71 MBytes
[ 4] 32.00-33.00 sec 1.25 MBytes      10.5 Mbits/sec  0       1.76 MBytes
[ 4] 33.00-34.00 sec 1.61 MBytes      13.5 Mbits/sec  0       1.80 MBytes
[ 4] 34.00-35.00 sec 1.46 MBytes      12.2 Mbits/sec  0       1.82 MBytes
[ 4] 35.00-36.00 sec 1.18 MBytes      9.89 Mbits/sec  0       1.83 MBytes
[ 4] 36.00-37.00 sec 1.36 MBytes      11.4 Mbits/sec  0       1.84 MBytes
[ 4] 37.00-38.00 sec 1.36 MBytes      11.4 Mbits/sec  0       1.84 MBytes
[ 4] 38.00-39.00 sec 1.24 MBytes      10.4 Mbits/sec  0       1.84 MBytes
[ 4] 39.00-40.00 sec 1.25 MBytes      10.5 Mbits/sec  0       1.85 MBytes
[ 4] 40.00-41.00 sec 1.25 MBytes      10.5 Mbits/sec  0       1.86 MBytes
[ 4] 41.00-42.00 sec 1.40 MBytes      11.8 Mbits/sec  0       1.88 MBytes
[ 4] 42.00-43.00 sec 1.12 MBytes      9.37 Mbits/sec  0       1.91 MBytes
[ 4] 43.00-44.00 sec 1.12 MBytes      9.40 Mbits/sec  0       1.96 MBytes
[ 4] 44.00-45.00 sec 1.20 MBytes      10.1 Mbits/sec  0       2.02 MBytes
[ 4] 45.00-46.00 sec 1.27 MBytes      10.7 Mbits/sec  0       2.11 MBytes
[ 4] 46.00-47.00 sec 1.30 MBytes      10.9 Mbits/sec  0       2.22 MBytes
[ 4] 47.00-48.00 sec 1.25 MBytes      10.5 Mbits/sec  0       2.36 MBytes
[ 4] 48.00-49.00 sec 1.43 MBytes      12.0 Mbits/sec  0       2.53 MBytes

```

Step 3 Bring down the interface on Router D using the **shut** command to trigger a route update.

```

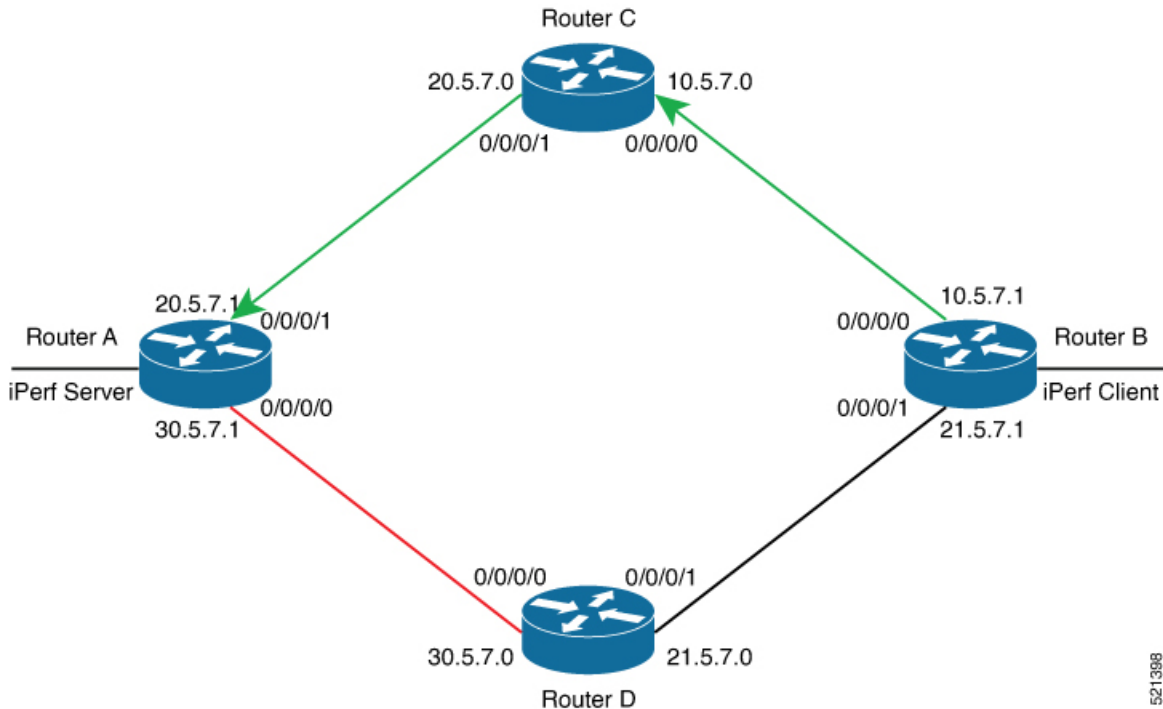
Router(config)#interface FourhundredGig0/0/0/0
Router(config-if)#shut
Router(config-if)#commit

```

Note Because of the interface shutdown, the route to 30.5.7.1 needs to be updated and hence momentarily there will be no route to this address.

Step 4 During the route update, check the network performance by executing the **show appmgr application name *app_name* logs** command.

You will notice that the entries in the **Bandwidth** field is Zero for a short duration, when the new route is installed.



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```
Router#show appmgr application name iperf-client-app logs
Tue Dec 1 12:59:40.349 UTC
Connecting to host 30.5.7.1, port 5201
[ 4] local 100.0.0.9 port 61384 connected to 30.5.7.1 port 5201
15
[ ID] Interval          Transfer Bandwidth    Retr    Cwnd
[ 4] 0.00-1.00 sec 1.05 MBytes 8.82 Mbits/sec 0      80.6 KBytes
[ 4] 1.00-2.00 sec 1.26 MBytes 10.6 Mbits/sec 0      136 KBytes
[ 4] 2.00-3.00 sec 1.18 MBytes 9.90 Mbits/sec 0      191 KBytes
[ 4] 3.00-4.00 sec 1.24 MBytes 10.4 Mbits/sec 0      246 KBytes
[ 4] 4.00-5.00 sec 1.18 MBytes 9.90 Mbits/sec 0      301 KBytes
[ 4] 5.00-6.00 sec 1.37 MBytes 11.5 Mbits/sec 0      362 KBytes
[ 4] 6.00-7.00 sec 1.37 MBytes 11.5 Mbits/sec 0      423 KBytes
[ 4] 7.00-8.00 sec 1.43 MBytes 12.0 Mbits/sec 0      486 KBytes
[ 4] 8.00-9.00 sec 1.30 MBytes 11.0 Mbits/sec 0      547 KBytes
[ 4] 9.00-10.00 sec 1.43 MBytes 12.0 Mbits/sec 0      611 KBytes
[ 4] 10.00-11.00 sec 1.62 MBytes 13.6 Mbits/sec 0      707 KBytes
[ 4] 11.00-12.00 sec 1.62 MBytes 13.6 Mbits/sec 0      875 KBytes
[ 4] 12.00-13.00 sec 1.93 MBytes 16.2 Mbits/sec 0      1.07 MBytes
[ 4] 13.00-14.00 sec 1.68 MBytes 14.1 Mbits/sec 0      1.29 MBytes
[ 4] 14.00-15.00 sec 1.06 MBytes 8.86 Mbits/sec 0      1.56 MBytes
[ 4] 15.00-16.00 sec 891 KBytes 7.30 Mbits/sec 0      1.83 MBytes
[ 4] 16.00-17.00 sec 970 KBytes 7.95 Mbits/sec 0      2.12 MBytes
[ 4] 17.00-18.00 sec 1.24 MBytes 10.4 Mbits/sec 0      2.58 MBytes
[ 4] 18.00-19.00 sec 885 KBytes 7.24 Mbits/sec 0      2.65 MBytes
[ 4] 19.00-20.00 sec 1.55 MBytes 13.0 Mbits/sec 0      3.10 MBytes
[ 4] 20.00-21.00 sec 820 KBytes 6.71 Mbits/sec 0      3.10 MBytes
[ 4] 21.00-22.00 sec 1.72 MBytes 14.4 Mbits/sec 6      2.42 MBytes
[ 4] 22.00-23.00 sec 0.00 Bytes 0.00 bits/sec 5      2.30 MBytes
[ 4] 23.00-24.00 sec 256 KBytes 2.10 Mbits/sec 0      1.35 MBytes
```

```

[ 4] 24.00-25.00 sec 1.56 MBytes 13.1 Mbits/sec 237      1.83 MBytes
[ 4] 25.00-26.00 sec 1.90 MBytes 15.9 Mbits/sec 0        2.17 MBytes
[ 4] 26.00-27.00 sec 382 KBytes 3.12 Mbits/sec 61         1.95 MBytes
[ 4] 27.00-28.00 sec 0.00 Bytes 0.00 bits/sec 0          1.39 MBytes
[ 4] 28.00-29.00 sec 3.35 MBytes 28.1 Mbits/sec 0         1.52 MBytes
[ 4] 29.00-30.00 sec 954 KBytes 7.82 Mbits/sec 0          1.58 MBytes
[ 4] 30.00-31.00 sec 1018 KBytes 8.34 Mbits/sec 0          1.64 MBytes
[ 4] 31.00-32.00 sec 1.24 MBytes 10.4 Mbits/sec 0          1.71 MBytes
[ 4] 32.00-33.00 sec 1.25 MBytes 10.5 Mbits/sec 0          1.76 MBytes
[ 4] 33.00-34.00 sec 1.61 MBytes 13.5 Mbits/sec 0          1.80 MBytes
[ 4] 34.00-35.00 sec 1.46 MBytes 12.2 Mbits/sec 0          1.82 MBytes
[ 4] 35.00-36.00 sec 1.18 MBytes 9.89 Mbits/sec 0          1.83 MBytes
[ 4] 36.00-37.00 sec 1.36 MBytes 11.4 Mbits/sec 0          1.84 MBytes
[ 4] 37.00-38.00 sec 1.36 MBytes 11.4 Mbits/sec 0          1.84 MBytes
[ 4] 38.00-39.00 sec 1.24 MBytes 10.4 Mbits/sec 0          1.84 MBytes
[ 4] 39.00-40.00 sec 1.25 MBytes 10.5 Mbits/sec 0          1.85 MBytes
[ 4] 40.00-41.00 sec 1.25 MBytes 10.5 Mbits/sec 0          1.86 MBytes
[ 4] 41.00-42.00 sec 1.40 MBytes 11.8 Mbits/sec 0          1.88 MBytes
[ 4] 42.00-43.00 sec 1.12 MBytes 9.37 Mbits/sec 0          1.91 MBytes
[ 4] 43.00-44.00 sec 1.12 MBytes 9.40 Mbits/sec 0          1.96 MBytes
[ 4] 44.00-45.00 sec 1.20 MBytes 10.1 Mbits/sec 0          2.02 MBytes
[ 4] 45.00-46.00 sec 1.27 MBytes 10.7 Mbits/sec 0          2.11 MBytes
[ 4] 46.00-47.00 sec 1.30 MBytes 10.9 Mbits/sec 0          2.22 MBytes
[ 4] 49.00-96.00 sec 1.48 MBytes 12.4 Mbits/sec 0          1.82 MBytes
[ 4] 96.00-97.00 sec 1.25 MBytes 10.5 Mbits/sec 0          1.83 MBytes
[ 4] 97.00-98.00 sec 1.25 MBytes 10.5 Mbits/sec 0          1.83 MBytes
[ 4] 98.00-99.00 sec 1.49 MBytes 12.5 Mbits/sec 0          1.84 MBytes
[ 4] 99.00-100.00 sec 1.25 MBytes 10.5 Mbits/sec 0         1.86 MBytes
[ 4] 100.00-101.00 sec 1.21 MBytes 10.2 Mbits/sec 0         1.89 MBytes
[ 4] 101.00-102.00 sec 1.34 MBytes 11.2 Mbits/sec 0         1.94 MBytes
[ 4] 102.00-103.00 sec 1.25 MBytes 10.5 Mbits/sec 0         2.01 MBytes
[ 4] 103.00-104.00 sec 1.30 MBytes 10.9 Mbits/sec 0         2.09 MBytes
[ 4] 104.00-105.00 sec 1.25 MBytes 10.5 Mbits/sec 0         2.17 MBytes
[ 4] 105.00-106.00 sec 1.39 MBytes 11.6 Mbits/sec 0         2.33 MBytes
[ 4] 106.00-107.00 sec 1.01 MBytes 8.47 Mbits/sec 0         2.46 MBytes
[ 4] 107.00-108.00 sec 526 KBytes 4.31 Mbits/sec 0         2.54 MBytes
[ 4] 108.00-109.00 sec 0.00 Bytes 0.00 bits/sec 0         2.54 MBytes
[ 4] 109.00-110.00 sec 0.00 Bytes 0.00 bits/sec 0         2.54 MBytes
[ 4] 110.00-111.00 sec 0.00 Bytes 0.00 bits/sec 0         2.54 MBytes
[ 4] 111.00-112.00 sec 0.00 Bytes 0.00 bits/sec 1         1.41 KBytes
[ 4] 112.00-113.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 113.00-114.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 114.00-115.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 115.00-116.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 116.00-117.00 sec 0.00 Bytes 0.00 bits/sec 1         1.41 KBytes
[ 4] 117.00-118.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 118.00-119.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 119.00-120.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 120.00-121.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 121.00-122.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 122.00-123.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 123.00-124.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 124.00-125.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 125.00-126.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 126.00-127.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 127.00-128.00 sec 0.00 Bytes 0.00 bits/sec 1         1.41 KBytes
[ 4] 128.00-129.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 129.00-130.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 130.00-131.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 131.00-132.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 132.00-133.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 133.00-134.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes
[ 4] 134.00-135.00 sec 0.00 Bytes 0.00 bits/sec 0         1.41 KBytes

```

```

[ 4] 135.00-136.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 136.00-137.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 137.00-138.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 138.00-139.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 139.00-140.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 140.00-141.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 141.00-142.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 142.00-143.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 143.00-144.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 144.00-145.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 145.00-146.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 146.00-147.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 147.00-148.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 148.00-149.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 149.00-150.00 sec 0.00 Bytes 0.00 bits/sec 0 1.41 KBytes
[ 4] 150.00-151.00 sec 700 KBytes 5.73 Mbits/sec 847 600 KBytes
[ 4] 151.00-152.00 sec 954 KBytes 7.82 Mbits/sec 993 1.32 MBytes
[ 4] 152.00-153.00 sec 509 KBytes 4.17 Mbits/sec 0 1.79 MBytes
[ 4] 153.00-154.00 sec 1.08 MBytes 9.07 Mbits/sec 0 1.85 MBytes
[ 4] 154.00-155.00 sec 1.38 MBytes 11.6 Mbits/sec 0 1.90 MBytes
[ 4] 155.00-156.00 sec 1.55 MBytes 13.0 Mbits/sec 0 1.98 MBytes
[ 4] 156.00-157.00 sec 1.16 MBytes 9.71 Mbits/sec 0 2.04 MBytes
[ 4] 157.00-158.00 sec 1.21 MBytes 10.2 Mbits/sec 0 2.10 MBytes
[ 4] 158.00-159.00 sec 1.26 MBytes 10.6 Mbits/sec 0 2.17 MBytes
[ 4] 159.00-160.00 sec 1.14 MBytes 9.56 Mbits/sec 0 2.23 MBytes
[ 4] 160.00-161.00 sec 1.29 MBytes 10.8 Mbits/sec 0 2.27 MBytes
[ 4] 161.00-162.00 sec 1.24 MBytes 10.4 Mbits/sec 0 2.34 MBytes
[ 4] 162.00-163.00 sec 1.42 MBytes 11.9 Mbits/sec 0 2.41 MBytes
[ 4] 163.00-164.00 sec 1.11 MBytes 9.34 Mbits/sec 0 2.46 MBytes
[ 4] 164.00-165.00 sec 1.39 MBytes 11.7 Mbits/sec 0 2.56 MBytes
[ 4] 165.00-166.00 sec 995 KBytes 8.16 Mbits/sec 0 2.69 MBytes
[ 4] 166.00-167.00 sec 1.88 MBytes 15.7 Mbits/sec 0 2.94 MBytes
[ 4] 167.00-168.02 sec 950 KBytes 7.69 Mbits/sec 0 3.12 MBytes
[ 4] 168.02-169.00 sec 1.79 MBytes 15.2 Mbits/sec 0 3.12 MBytes
[ 4] 169.00-170.01 sec 1.27 MBytes 10.6 Mbits/sec 0 3.12 MBytes
[ 4] 170.01-171.00 sec 1.25 MBytes 10.5 Mbits/sec 23 1.60 MBytes
- - - - -
[ ID] Interval          Transfer      Bandwidth      Retr
[ 4]   0.00-600.00 sec  704 MBytes  9.84 Mbits/sec 12069  sender
[ 4]   0.00-600.00 sec  702 MBytes  9.82 Mbits/sec          receiver

```

iperf Done.

<!--On Router A!>

Router#show appmgr application name iperf-server-app stats

Thu Dec 3 11:45:47.790 UTC

Application Stats: iperf-server-app

CPU Percentage: 0.00%

Memory Usage: 816KiB / 31.23GiB

Memory Percentage: 0.00%

Network IO: 0B / 0B

Block IO: 0B / 0B

PIDs: 1

<!--On Router B!>

Router#show appmgr application name iperf-client-app stats

Thu Dec 3 11:45:59.418 UTC

Application Stats: iperf-client-app

CPU Percentage: 0.00%

Memory Usage: 0B / 0B

Memory Percentage: 0.00%

Network IO: 0B / 0B

```
Block IO: 0B / 0B
PIDs: 0
```

Stop iPerf Applications

Stop the iPerf applications on Router A and Router B using the **appmgr application stop name *app_name*** command. The **application stop** command can only be used for applications that are registered, activated, and are currently running. The **application stop** command stops only the application and does not clean up the resources used by the application.

You can verify the status of the application using the **show appmgr application-table** command. The **Status** is displayed as **Exited** if the application has been stopped successfully.

```
Router#appmgr application stop name iperf-server-app
Mon Nov 30 13:38:36.202 UTC
Router#show appmgr application-table
Mon Nov 30 13:38:36.999 UTC
Name                Type      Config State  Status
-----
iperf-server-app    Docker    Activated    Exited (1) Less than a se
Router#
```

Start iPerf Applications

Start or restart an application that has been stopped (and not deactivated) using the **appmgr application start name *app_name*** command.

```
Router#appmgr application start name iperf-server-app
Tue Dec 1 13:06:21.996 UTC
Router#show appmgr application-table
Mon Nov 30 13:38:36.999 UTC
Name                Type      Config State  Status
-----
iperf-server-app    Docker    Activated    UP(1) Less than a second
Router#
```

Deactivate iPerf Applications

Step 1 Deactivate the iPerf applications using the **no appmgr application *app_name*** command. You deactivate the installed application when you want to release all resources used by the application.

```
Router#config
Router(config)#no appmgr application iperf-server-app
Router(config)#commit
```

Step 2 Verify the status of the application by using the **show appmgr application-table *app_name* stats** command.

```
Router#show appmgr application-table
Mon Nov 30 13:39:51.197 UTC
Router#
```

Note You can activate a deactivated application using the **appmgr application *app_name* activate type docker source *source_name*** command.

Uninstall iPerf Applications

Uninstall the applications using the **appmgr package uninstall package *package_name*** command.

After the application is successfully uninstalled, executing the **show appmgr source-table** command displays no result.

```
Router#appmgr package uninstall package iperf
table
Mon Nov 30 13:41:05.155 UTC
Router#show appmgr source-table
Mon Nov 30 13:41:05.936 UTC
Router#
```
