



## QUICK GUIDE FOR Measuring VPC Network Performance

Numerous factors affect VPC network performance, most of which are outside your control, such as physical location of your machine instances in the data center, “noisy neighbors,” the physical network interface of your cloud machine and the virtual switch, connections to cloud services outside your VPC network, and more. Because VPC network performance can have a big impact on your applications and users, it is important to test it to make sure you are getting your money’s worth for your cloud investment.

### WHAT SHOULD YOU MEASURE?

The basic performance is end-to-end performance. How long does it take for a request originating from a computer in your enterprise network to reach a VPC-based server and return a response? How long does it take for an external user to make a request and get a response from that same VPC server?

Below we illustrate a typical path users will take when a network request is made on a VPC resource, as well as the path taken by VPC servers that need to communicate with other cloud services.

Ixia makes it easy to continuously test your virtual private cloud’s network performance, ensuring users inside and outside your organization are satisfied with their experience.

### NETWORK PATH OF AN ENTERPRISE VPC USER

1. User machine
2. Virtual private network (VPN)
3. Internet gateway on the cloud provider
4. Network address translation (NAT)
5. Public Subnet on the VPC
6. Private Subnet on the VPC—this is where the service is located

#### — AND BACK —

7. Public Subnet on VPC
8. NAT
9. Internet gateway
10. VPN
11. User machine

### NETWORK PATH OF A REQUEST TO AN EXTERNAL CLOUD SERVICE (LIKE S3 ON AMAZON)

1. Machine on your Private Subnet
2. (Public Subnet)
3. (NAT)
4. (Internet Gateway)
5. Cloud Service

The steps in brackets may or may not be required. On AWS, there is now support for direct communication between machines inside a VPC Private Subnet and Amazon services, like S3, RDS, etc., which saves steps 2, 3, and 4.

If you have not configured this using Amazon “endpoints,” or if you are working on a cloud provider network or in a context that does not allow direct access, your request may have to go through the Internet to get to the cloud service, even on the same cloud provider.

This highlights the importance of performance testing—you need to understand how long network activity is taking and not take things for granted, even something supposedly trivial like connecting Amazon machines to another Amazon service.

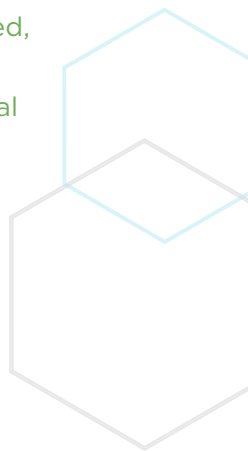
### NETWORK PATH OF AN EXTERNAL VPC USER

1. User machine  
(querying a domain name)
2. Local internet gateway
3. Internet Service Provider (ISP)
4. Domain Name System (DNS) server
5. Internet gateway on the cloud provider
6. NAT
7. Public Subnet on the VPC
8. Private Subnet on the VPC  
—where the service is located

#### — AND BACK —

9. Public Subnet on VPC
10. NAT
11. Internet gateway on the cloud provider
12. Internet service provider (ISP)
13. Local Internet gateway
14. User machine

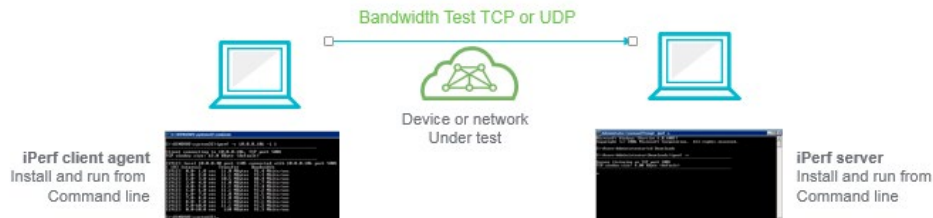
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## BASIC MEASUREMENT OF END-TO-END NETWORK PERFORMANCE

Below we provide a simple procedure, based on an open source tool called iPerf, which is used for network load testing. You can follow these procedures to get a sense of your end-to-end VPC network performance.

The following diagram illustrates the architecture of iPerf and many similar open source testing tools:



Further in this document, we explain the limitations of this basic test and how to get a full picture of network performance using Ixia's specialized software and equipment.

## BASIC PERFORMANCE TEST FOR ENTERPRISE USER

1. Install the server version of iPerf on a machine in your VPC Private Subnet (the “server”). You will need root/admin access on the machine.
2. Install the client version on a device inside your enterprise network (the “client”). Similarly, you will need root/admin access.
3. Disable your firewall and leave all ports open on the server machine in the VPC Private Subnet.
4. Run the following command from the client device inside your enterprise network:
5. `iPerf -c 192.xxx.xxx.xxx -u -b 2m -P 5`  
Where “-c” specifies client, “192.xxx” is the IP of your server on the wired network; “-u” specifies UDP protocol; “-b 2m” specifies that the device should use 2MB of bandwidth; and “-P 5” specifies that there should be five concurrent network connections from the device to the VPC machine. So we are testing 5 connections in total with 5MB bandwidth each = 10 MB.
6. iPerf will display the output indicating the result of the test. The output should look like something like this:
7. Server Report: 0.0-10.0 sec xx MBytes 1.9 Mbits/sec 0.167 ms 49/69507 (0.07%)  
**Mbits/sec** is the actual bandwidth your device got from the VPC machine for each connection.

## BASIC PERFORMANCE TEST FOR EXTERNAL USER

Repeat the procedure above, but this time installing the iPerf client on an external machine connecting to the VPC machine via a regular Internet connection.

*If you are seeing no packet loss, the test is successful and there is a good connection between the external user location and the VPC.*

## LIMITATIONS OF THE BASIC MEASUREMENT

Running the test we described above is a good way to get a feel for performance between your internal network and/or external locations and your virtual private cloud. However, testing with iPerf or similar open source tools has a number of significant limitations. Our discussion below focuses on iPerf, but is applicable to most other open source network testing tools:

- **Direct access:** The tester needs direct access to all the endpoints when running the test (screen, Secure Shell (SSH), telnet, etc). For a simple test like we suggested above, with only one server endpoint and one client endpoint, this is practical. In realistic tests with hundreds of endpoints, open source tools become impractical.
- **Results displayed on command line only:** Test results are displayed on the command line, with no visualization or data analysis options. There is no way to centrally view results from multiple endpoints; each endpoint displays the results within the console of that specific machine and data is not centrally stored. This is acceptable in a small setup but not practical when testing large configurations.
- **Direct access to tested machines:** To test performance from a remote site to the virtual private cloud, iPerf requires direct access to the machines on both sides and will not work if there are security devices such as a NAT server, a firewall, or security hardening of the network.
- **Preparation work and expertise:** Because of the need for an open connection between endpoints, performing a test of your virtual private cloud with open source tools will require a lot of preparation work. The tester will need to open ports, disabling security devices, and provide open access to the remote site. This requires time, advanced knowledge of VPC configuration, and customization. In some scenarios this may not be possible.
- **Security risk:** Because of the need to open up the connection for open source tools and disable security devices, there is an obvious security risk while the test is being performed. There is an additional risk of human error when security devices and configuration are restored. A small mistake in how an admin re-configures security can open up sensitive systems to the Internet and create gaping vulnerabilities. If you conduct testing on a regular basis, disabling and enabling security each time will be risky and ultimately prohibitive.
- **Only basic traffic simulated:** iPerf and similar open source tools are only able to generate basic throughput traffic (TCP/UDP) from point to point. They cannot

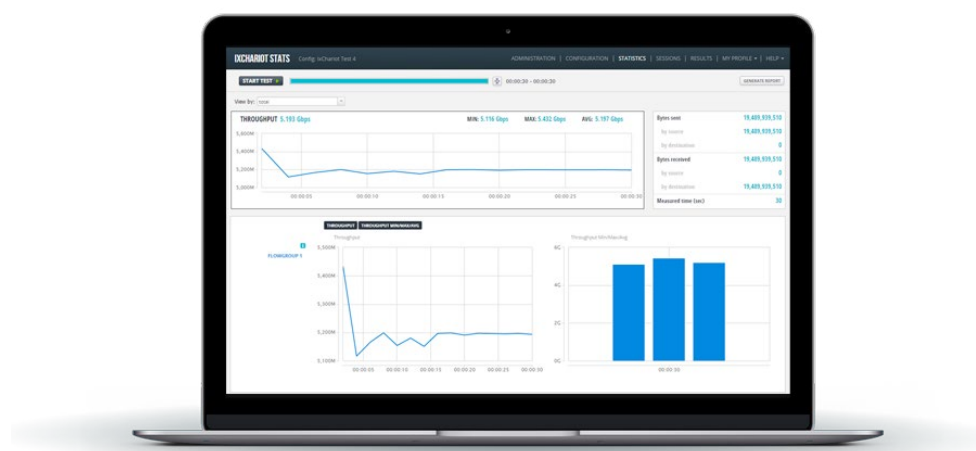
simulate additional layers of network traffic, such as voice, video, or mixes of different types of traffic, which may significantly affect network performance. The iPerf test can verify that a user in your enterprise network can view a web page or download a file from the cloud, but it cannot verify that an IP telephony system deployed in the VPC offers acceptable performance.

- Only basic performance metrics: iPerf and similar tools cannot provide in-depth performance metrics such as jitter, loss, latency, and application response times. They are limited to testing and reporting on network throughput.

## MEASURING VPC NETWORK PERFORMANCE LIKE THE PROS WITH IXCHARIOT® AND IXIA® HAWKEYE™

Ixia's solution for virtual private cloud monitoring includes two products:

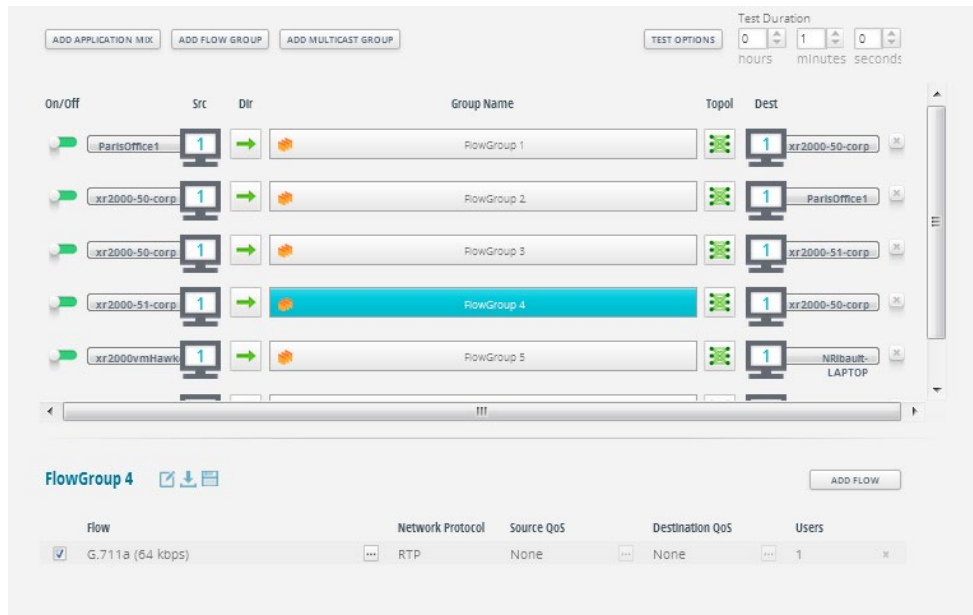
- Ixia IxChariot lets you create a testing “endpoint” within any part of your cloud infrastructure or corporate network—hypervisor, machine instances, user devices including mobile phones and tablets, and even servers in different data centers. You can then actively emulate traffic and get an on-demand network performance assessment between any or all of the endpoints.



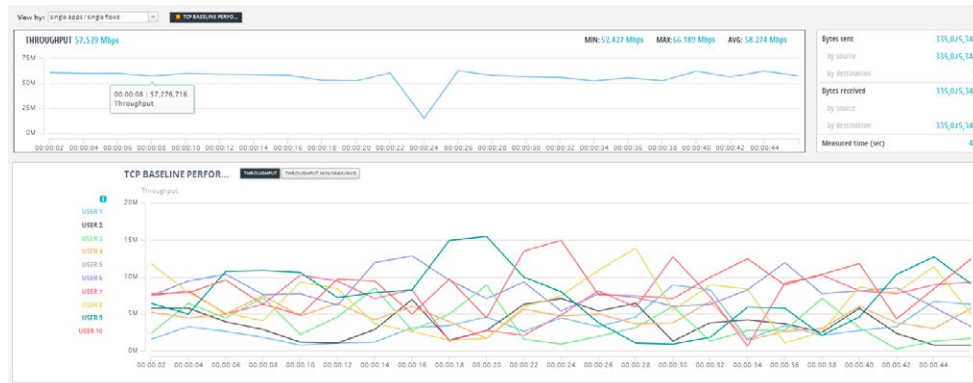
- **Ixia Hawkeye** is also a platform for managing probes or endpoints deployed in your cloud infrastructure. It actively emulates traffic and performs accurate service quality metrics, including throughput, packet loss, jitter, delay, MOS, and application experience, as well as effective SLA pass/fail with alerts to existing NMS or remediation systems.

## HOW IXCHARIOT AND HAWKEYE IMPROVE VPC TESTING BEYOND THE CAPABILITIES OF OPEN SOURCE TOOLS

- **Central control for large numbers of endpoints**—IxChariot and Hawkeye provide a central management server, enabling full remote control of the endpoints. This makes it possible to deploy dozens or even hundreds of endpoints across your internal network, external site and VPC, and measure performance between any two endpoints. The screenshot below shows how multiple endpoints are managed in the IxChariot interface.



- **Easy deployment without the need to disable security:** Using patented technology, IxChariot and Hawkeye endpoints can operate seamlessly behind a NAT or firewall. The central controller itself can be deployed on the public cloud or within your VPC. There is no need for advanced skills or any preparation to enable access from external locations to the cloud.
- **Web-based, intuitive interface:** Reports are displayed as user-friendly graphs, centrally for all deployed endpoints, and can be stored, exported, and printed into reports. Data can be aggregated and displayed across some or all of the deployed endpoints.



- **Realistic traffic flow simulation**—IxChariot and Hawkeye allow you to select from a rich library of applications and decide what type of test traffic you want to stream over the TCP/UDP tunnel. The solution enables simulating video, VoIP, Skype and Skype for Business (Lync), web browsing, Hyper Text Transfer Protocol (HTTP) streaming, Citrix, and more.

There is no need for advanced skills or any preparation to enable access from external locations to the cloud

FLOW LIBRARY			
<input type="text" value="enter search criteria"/>		Parameter	Current Value
NetShowu		Default Value	
Realaud		Codec	G711a
Realmed		Packet Loss Conceal...	Disabled
<input checked="" type="checkbox"/> VoIP		Voice Activity Rate	100
G.711a (64 kbps)		Delay Between Voice ...	20
G.711u (64 kbps)		Initial Delay (ms)	0
G.723.1-ACELP (5.3 kbps)		Additional Fixed Dela...	0
G.723.1-MPMLQ (6.3 kbps)		Jitter Buffer Size (ms)	40
G.729 (8 kbps)		Source Port	Auto
		Destination Port	Auto

- **In-depth metrics:** Ixia solutions provide detailed metrics across types of traffic simulated and numerous endpoints. Metrics include jitter, loss, latency, and response time of specific applications.
- **Professional support:** Unlike open source tools, IxChariot and Hawkeye come with Ixia's expert support. Our team, which has worked on many of the largest network testing projects in the world, can help you set up the right tests and interpret results to derive true insights.

As soon as testing goes beyond simple, ad-hoc bandwidth verification between two end-points, open source tools do not provide an adequate solution. Ixia's IxChariot and Hawkeye make it easy to continuously test your virtual private cloud's network performance, ensuring users inside and outside your organization are satisfied with their experience.

SEE HOW TO USE IXCHARIOT AND HAWKEYE TO VALIDATE VPC PERFORMANCE. [SCHEDULE A DEMO](#)

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