Maya Global Solutions
Internet Quality Service (IQS™)

Performance Testing White Paper

Remote Workers and Learners Stress the Home Network

Since the COVID-19 virus outbreak, and the massive increase in telecommuting it has spawned, many organizations are struggling to provide their remote professional workers with a high-quality experience. Poor voice and video quality as well as poor responsiveness of cloud applications impacts productivity as well as employee morale.

Compounding those issues, our schools have no choice but to rely on some level of remote learning to educate our students. Home schooling is difficult enough without having issues hearing the teacher, seeing the material being presented or just being able to stay online.

Add in the proliferation of Internet of Things (IoT) devices from security cameras, to TV's, to thermostats and you may have dozens of devices competing for bandwidth.

The "Magic" of Maya's IQS

Maya Global Solutions delivers unmatched quality of service for voice, video and data using a unique and patented technology. Maya's Internet Quality Service was purpose built to resolve the common frozen video, choppy voice and dropout problems experienced by remote workers and students using video conferencing and remote learning tools over commodity broadband internet connections. What's more, we can do this without the expensive of adding additional circuits or bandwidth.

In this white paper, we will demonstrate how Maya's IQS solution can deliver vastly improved Quality of Service even in an extremely unfriendly environment.

Quantifying What IQS Can Do

We ran both MOS[1] tests using a Linux Ubuntu laptop and a MacBook. Both were directly connected to a Cisco GS3000 Switch, which was connected directly to an AT&T Fiber Modem providing a Symmetrical Gigabit connection.

In both tests, we simultaneously ran ten unlimited TCP streams with iPerf3[2] and 3,150 concurrent UDP streams with the Net Performance Tester (NetPerfTool[3]). NetPerfTool also provided the final MOS score in each case.

Quality	MOS
Very Good	4.3 - 5.0
Good	4.0 - 4.3
Just Ok	3.6 - 4.0
Bad	3.1 - 3.6
Very Bad	2.6 - 3.1
Not Recommended	1.0 - 2.6

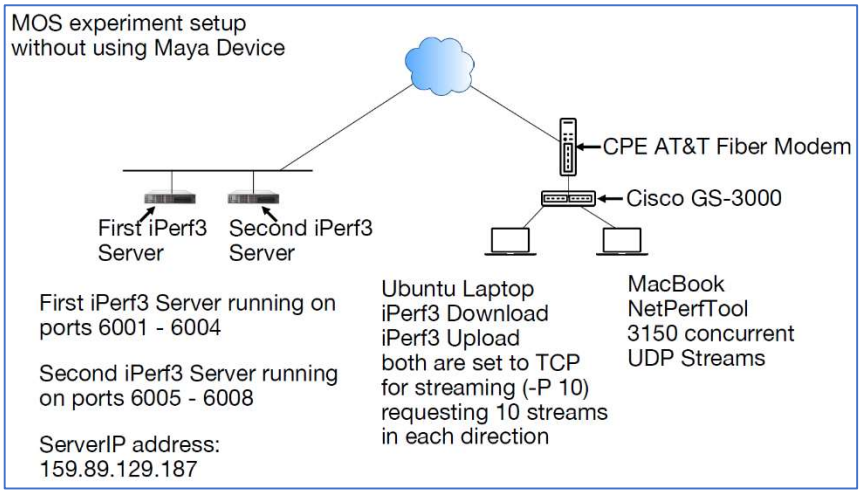
MOS is expressed as a single rational number, typically in the range 1–5, where 1 is lowest perceived quality, and 5 is the highest perceived quality.

[1] Mean opinion Score (MOS) is a commonly used measure for video, audio, and audiovisual quality evaluation: "ACC Telecom" (n.d.)
[2] iPerf3 is a tool for active measurements of the maximum achievable bandwidth on IP networks. It supports tuning of various parameters related to timing, buffers and protocols (TCP, UDP, SCTP with IPv4 and IPv6). " iperf.fr web page"
[3] NetPerfTool is a graphical front end to iPerf3 and can accurately measure Jitter, Packet Loss, Latency, and derive the MOS score.

The MOS score **WITHOUT** the Maya device in the path was 3.5

iPerf3 was running 10 unlimited streams (in each direction) to a Maya virtual machine in an AWS cloud instance.

The NetPerfTool created 3,150 concurrent UDP streams.



iPerf3's Maximum and Average speeds were as follows:

Download:

Max: 942.0 Mbits/sec

Avg: 937.0 Mbits/sec

Upload:

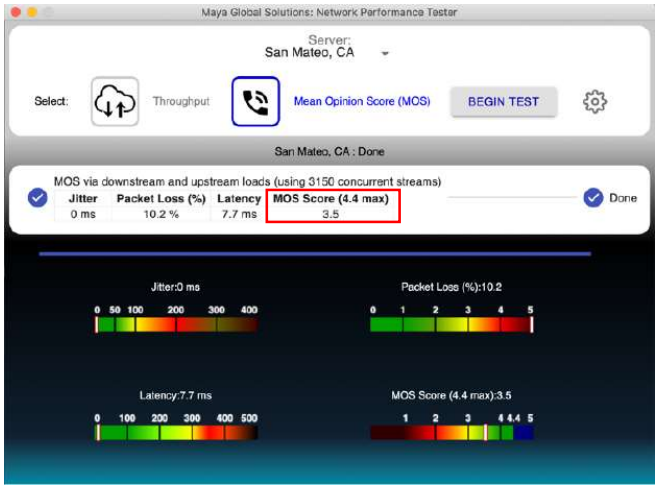
Max: 895.3 Mbits/sec

Avg: 262.6 Mbits/sec

The Test Duration was set to 60 seconds

The output from the NetPerfTool in the test "without" the Maya device, you can see that:

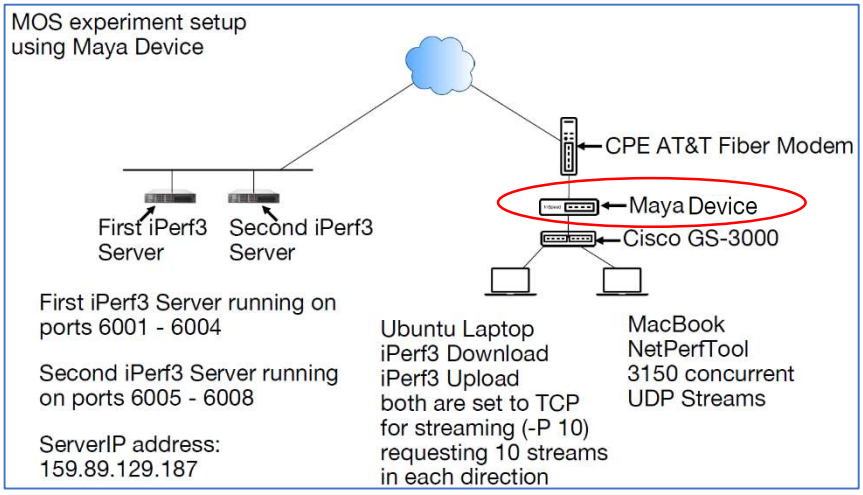
- There was no Jitter (0ms)
- Packet Loss % was 10.2% which is high but without any traffic management, was to be expected
- Latency was 7.7ms which was also expected on a 1Gig Fiber Internet connection



The MOS score WITH the Maya device in the path was 4.3

We ran the exact same experiment using the same tools; ten unlimited TCP streams with iPerf3 and the 3,150 concurrent UDP streams with NetPerfTool.

The only change in the configuration for the next test was that both the MacBook running NetPerfTool and the Linux system running iPerf3 are passing traffic through the Maya device. The Maya device is between the AT&T Fiber Modem and the Cisco GS-3000 switch.



iPerf3's Maximum and Average speeds were as follows:

Download:

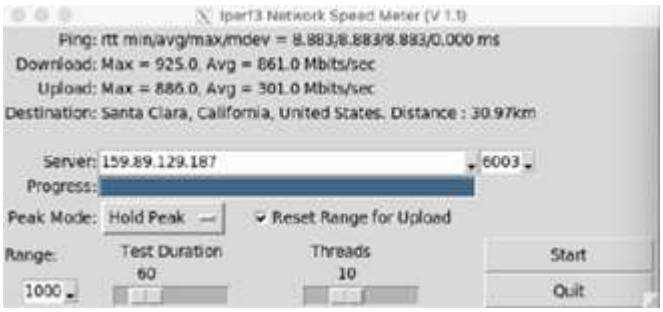
Max: 925.0 Mbits/sec

Avg: 861.0 Mbits/sec

Upload:

Max: 886.0 Mbits/sec

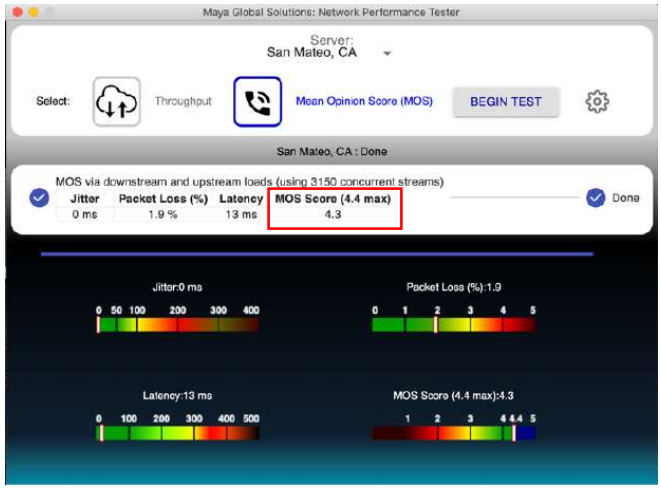
Avg: 301.0 Mbits/sec



The upload and download averages slowed down as expected. Maya's Dynamic Bandwidth was "managing" the TCP traffic to ensure the higher priority UDP traffic was being serviced.

In the NetPerfTool test "with" the Maya device installed you can see that:

- There was no change in Jitter (0ms in each case)
- Packet Loss % went down significantly to 1.9% as Maya's Dynamic Bandwidth managed the traffic versus letting it compete
- Latency moved from 7.7ms to 13.3ms as we slowed some TCP traffic down to manage the flow



Analysis of Results

This is one test case out of hundreds of combinations of network equipment and bandwidth we could have chosen. We chose a high tech, high bandwidth configuration to prove our point. The results show that under stress even a 1Gbit Fiber network will have issues and that Maya's IQS service can mitigate those issues and protect the real time voice and video traffic.

Test	MOS (4.4 Maximum)	User
With Maya	4.3	Very Good
Without Maya	3.5	Bad

[1] https://www.acctelecom.com/blog/mos-score-relate-

- **Maya's Control Center** portal gives you visibility into to the traffic on your network and allows you to see how your ISP is performing
- **Maya IQS prioritized** the traffic to make sure the high priority packets went first
- **Maya IQS managed** the traffic to reduce Congestion and Bufferbloat
- **Maya IQS applied** these actions for both downstream and upstream traffic
- **Maya IQS compensated** for fluctuations in bandwidth from the ISP