

MGA2510 Ethernet Test Platform

Network Impairment Emulation Testing

Executive Summary

Unified Communication as a Service, UCaaS for short, has taken the world by storm of late. The Covid crisis necessitated remote working and remote working fueled UCaaS adoption. Assuring the quality of end-user experience (EUE) for VoIP and other UCaaS applications is an essential requirement. Understanding how VoIP apps behave under varying network conditions is a prerequisite for providing good EUE. Aukua System's MGA2510 Ethernet Test Platform provides a network impairment capability to do just that.

Aukua Systems commissioned Tolly to evaluate the network impairment capabilities and ease-of-use of its MGA2510 Ethernet Test Platform configured as a network impairment generator. The MGA2510 is FPGA-based and can be reconfigured with a few clicks to serve as an inline network capture/analysis device or a network traffic generator.

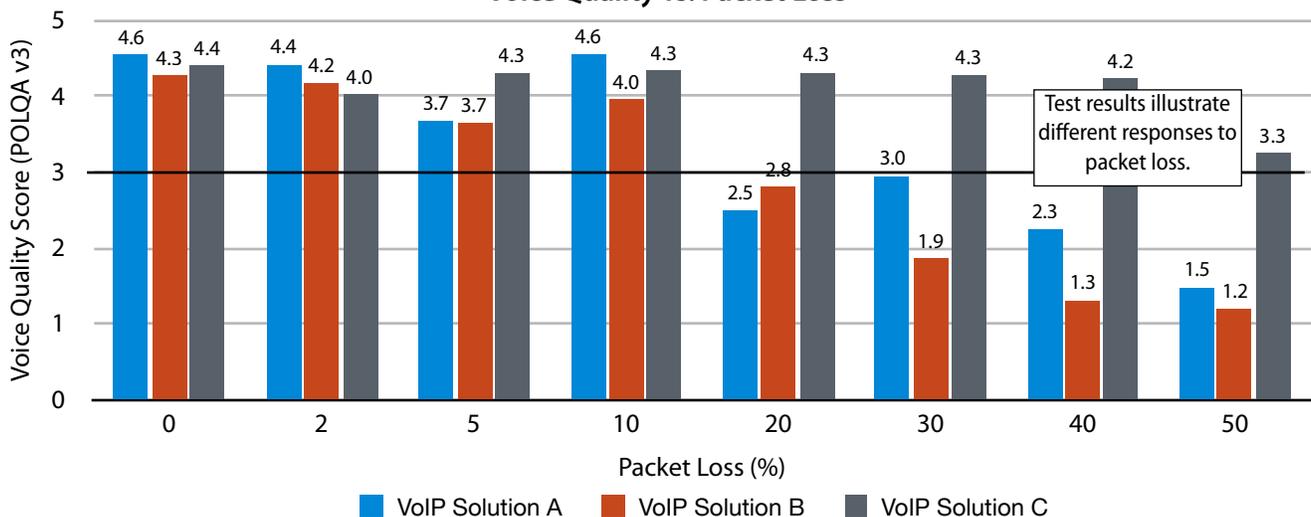
Tolly tests confirmed the need for benchmarking UCaaS/VoIP applications showing that different VoIP solutions respond differently to network impairments such as packet loss and deliver different levels of EUE. See Figure 1. Tolly found the Aukua MGA2510 simple to set up, configure and run. Tests also showed the ease of which the platform can be reconfigured to serve as a network capture device.

The Bottom Line

Aukua's MGA2510 Ethernet Test Platform provides:

- 1 Easy-to-use, flexible network impairment features
- 2 Transparent, layer 1 operation. No network reconfiguration needed
- 3 Self-contained, browser-managed system. No separate management system or software required
- 4 Multi-function platform configurable to create impairments, generate traffic, or capture/analyze traffic

Aukua Systems MGA2510 Ethernet Test Platform - Network Impairment Mode
Voice Quality vs. Packet Loss



Notes: POLQA score below 3.0 is usually considered unacceptable. Good quality is usually considered 3.5 or above. POLQA is an ITU-T standard that is a more sophisticated successor to MOS and PESQ scoring.

Source: Tolly, August 2020

Figure 1



The Need for Network Impairment Testing

Just a quick glance at Figure 1 reveals the important fact that not all UCaaS/VoIP solutions respond to network impairments in the same way. That is apparent when one observes the impact of frame loss on the POLQA v3¹ voice quality score that represents the quality of the conversation.

Unless one benchmarks voice quality and other application performance characteristics (such as file download time for remote storage or cloud based applications and services) using a network impairment generator, the impact of network issues on end-user experience cannot be known.

Some might be surprised by the disparity in voice quality results shown in Figure 1. After all, one might say, VoIP protocols are standard, shouldn't the results be standard?

While protocols are standard, implementations are not. Some UCaaS vendors route all VoIP packets via their cloud - even when the clients communicating are on the same LAN and local to each other. Due to latency and bandwidth constraints, this, by itself, can degrade quality even without packet loss. Other solutions can detect when clients have a more efficient network path between them and route the traffic directly between the two clients once the session is setup.

Some UCaaS solutions are able to detect when packet loss is occurring and attempt to remediate that loss by sending duplicate packets. While this certainly uses more bandwidth it can provide an effective remedy and help deliver a good end-user experience.

Testing With The Aukua MGA2510

This report will focus on the benchmarking tool rather than the UCaaS/VoIP systems under test.

The Aukua Systems Ethernet Test Platform is a 1U box that is a self-contained 3-in-1 test system. The Tolly test was focused primarily on its use as a network impairment emulator but also exercised its network capture/analysis functions.

Device Setup

Tolly engineers make use of many different solutions and understand how a steep learning curve can impact the productivity of a test team. Thus, it is important to consider how quickly your team can get up to speed on any test tool.

The Aukua Systems MGA2510 was quick to set up and Tolly engineers found it quite intuitive. No training was required.

As noted, no separate management application is required. The MGA2510 is managed completely via any standard browser.

Once unboxed, engineers connected the management port to the lab network and browsed to the unit's default management address. The dashboard presented a clean interface with seven tabs providing one-click access to all network impairment functions along with an icon showing the present configuration mode of the platform and its hardware port configuration. See Figure 2.

Aukua Systems

MGA2510
Ethernet Test
Platform

Network
Impairment
Emulation



Tested
August
2020

Integration With Test Environment

Some network impairment emulators are implemented as IP routers. In such cases, a layer 2 test bed would need to be reconfigured as two layer 3 IP subnets to run network impairment tests. Such reconfiguration is not needed with the MGA2510.

The Aukua Systems MGA2510 is implemented at layer 1. That is, it behaves the way a physical cable would behave. It is invisible to the devices to which it is connected. The benefit of this approach is that the MGA2510 can be connected to any network environment without requiring any reconfiguration of any network gear.

Avoiding reconfiguration of the network and client stations allows for quick deployment and use of the MGA2510. It is also important that testing can be done without disturbing any existing network configuration.

¹ Perceptual Objective Listening Quality Analysis v3 (POLQA v3) is ITU-T standard P.863 <http://www.polqa.info/index.html>.

Impairment Configuration

The MGA2510 provides two network ports for testing in addition to its separate management port. Impairments can be generated on just one port or independently on both ports as required.

The system provides for packet drop, FCS corrupt, bandwidth policing, and delay impairments which can be used alone or in combination. For the Tolly test described here, packet drop (loss) was the required function.

One click from the dashboard brings one to the "Network Emulation" screen where impairments are configured and activated (enabled). Figure 2 shows both the overview

and detail configuration screens for network impairments.

The MGA2510 comes preloaded with various impairment profiles but it is a simple matter to customize one of the existing profiles or create your own. The MGA2510 employs an impairment library approach which means a user creates impairment objects with descriptive custom names which can be selected from a library list going forward and without having to configure again.

A summary of the currently loaded impairment is shown with a "plain English" name in the Network Emulation screen. Its current state (enabled or disabled) is also shown.

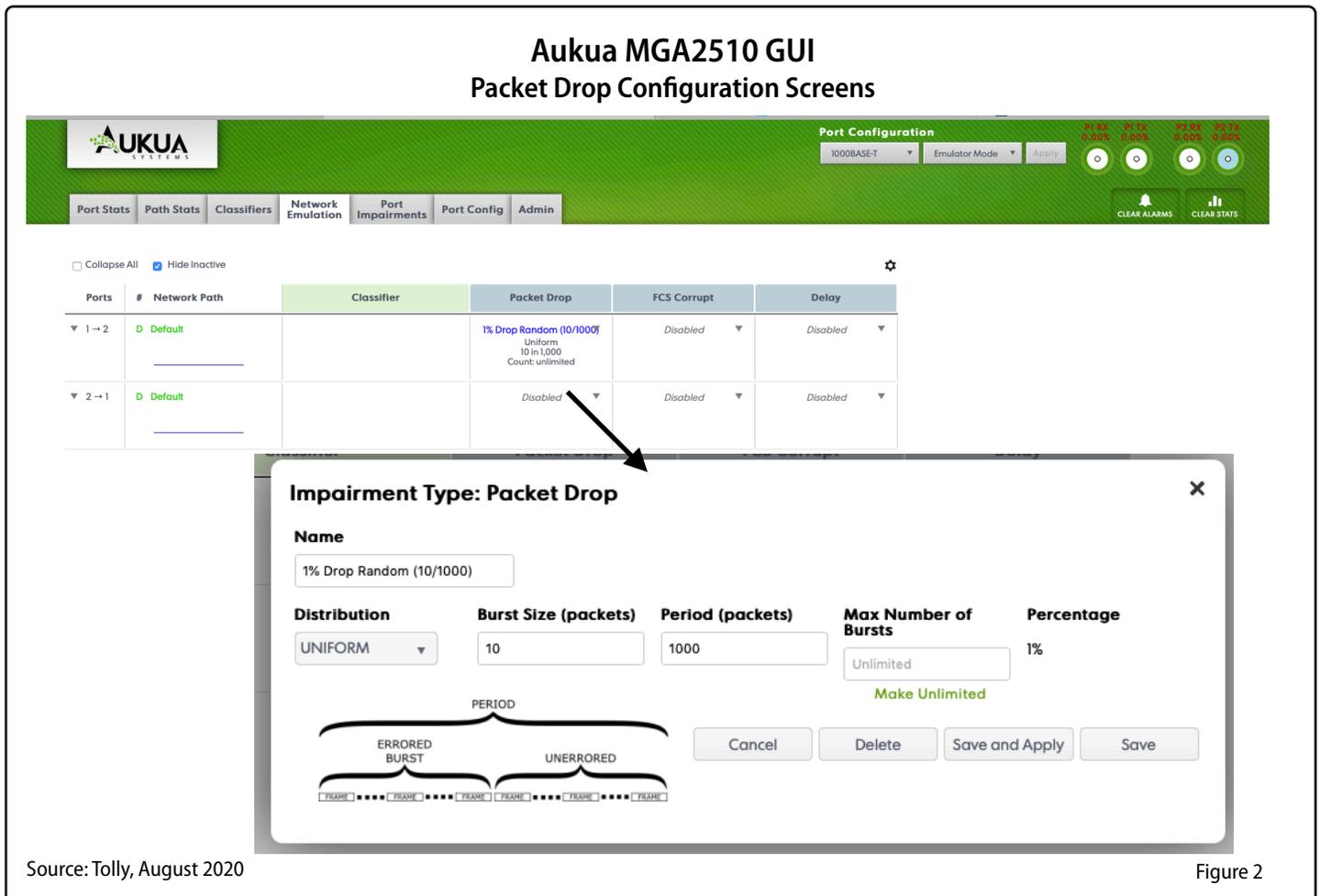
Clicking on the impairment summary brings up the detail screen. Here the specifics of the impairment can be tuned.

For packet drop, Tolly engineer could choose the loss rate, the drop algorithm, and the number of packets which would constitute one period before repeating.

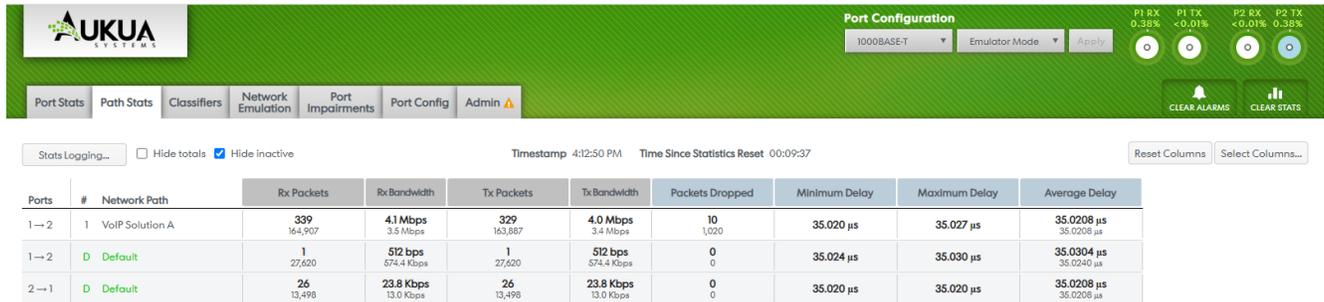
Once the configuration was customized, the impairment profile could be saved and even simultaneously "applied" (enabled) to begin impairing the network. Simple and fast. No "start, stop, reset, etc" required.

Impairment Monitoring

Once the network impairment is activated, it is very useful to monitor network level



Aukua Systems MGA2510 GUI Path Statistics Screen



Source: Tolly, August 2020

Figure 3

statistics in conjunction with whatever end-to-end benchmarking tools you are using and metrics that you are recording.

One click on the “Path Stats” tab summons real time statistics. These can be cleared with a single click to focus on statistics for a newly-activated profile. See Figure 3.

The statistics provided include both running averages and totals with metrics that include Tx/Rx bandwidth and packets, count of dropped packets and min/max/average delay. This provides a simple way to cross-check that you have configured the correct link with the desired impairment characteristics.

At one point in the test process, Tolly found some unexpected and unexplained FCS errors on the test network. It was a simple task to reconfigure the FPGA of the MGA2510 into Inline Analyzer mode and set a trigger to capture frames related to this error without needing to capture volumes of frames not relevant to the error condition.

In summary, Tolly found the MGA2510 to be a sophisticated yet simple tool for benchmarking the impact of network impairments on applications.

The device was unboxed and fully functional in less than an hour. Tolly performed a simple firmware upgrade that leveraged the browser interface to import the firmware

from the client PC. No training was required to use the MGA2510. Tolly found the device interface intuitive, had no learning curve and

found no need even to reference any PDF documentation.

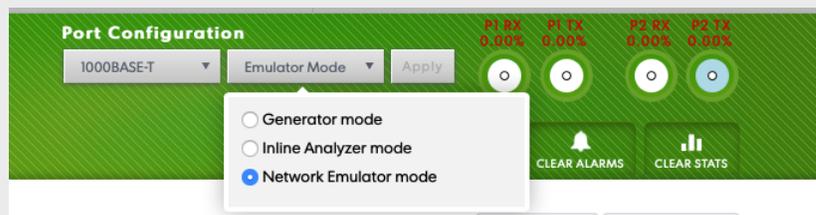
Aukua Systems MGA2510 Modes of Operation



The MGA2510 is a unique three-products in one platform solution which is hardware (FPGA) based. In addition to running as a Network Impairment Emulator providing networks and link impairment capabilities, the platform has two other modes of operation accessible by a click and apply.

The MGA2510 can be used as an Inline Analyzer to capture any traffic on the link with filtering and triggering. In fact, during a Tolly test, that mode was invoked to track down some Bit Errors. Comprehensive interface support for all speeds from 10MbE to 10GbE including 2.5G/5.0G and a large variety of media support from BASE-FX, BASE-R, BASE-X, BASE-T and BASE-T1.

Finally, the MGA2510 can be used as a Traffic Generator/Analyzer to test various network links and devices. The screen below shows how easily modes can be accessed and switched.



Source: Tolly, August 2020



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