



# How To Play Well With Others Outperforming In a Complex World

White paper



**SYMBIO**

Trusted with Excellence

As customers begin to add more and more devices to their networks, the complexity of those networks increases exponentially. With 4 devices on the network, there are 24 possible combinations, and with 10, over 3 million. This leads to an uncountable number of combinations of devices in a typical internet connected home.

Your product sits online in a network of many other devices. If there is a problem with your device, due to the sheer possible combinations of devices on that network, there is no way to be 100% sure where that problem exists - is it an issue with your device, or some other device on the network, or the network itself?

At Symbio, we have a lab built specifically to execute this kind of testing for interoperability. Leveraging our deep legacy of testing, backed by our over 20 years of experience providing testing and QA services for companies like Microsoft, we have built a comprehensive solution to this challenge: The Symbio Interoperability Lab.

Here are some of the tests our lab can provide:

- Interoperability Testing
- Compatibility Testing
- Sustainability Testing
- Benchmarking Services
- Certification/Pre-Certification/Conformance Testing

Your customer's home used to be a much quieter place.

When the internet first made it there, they needed a modem to dial into an internet service provider, like AOL. They would put a floppy disk in the slot of their single desktop computer, loaded up the AOL software, and it picked up the phone line and dialed into a server at the other end, connecting them to the world – email, internet, message forums. A single computer connected via modems and phone lines to another computer, which was their portal to the internet.

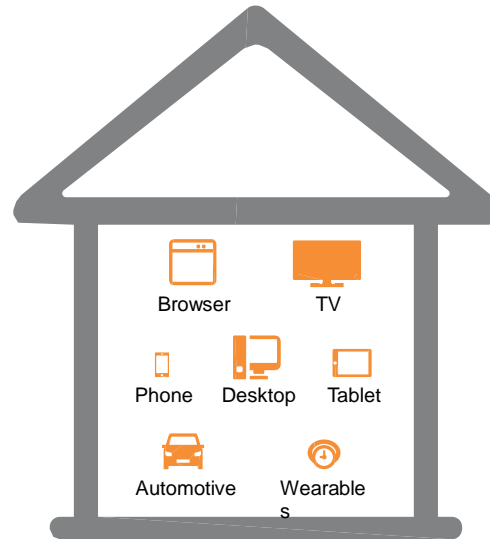
Fast forward to the cable modem. When the first cable modems came out, it was the same kind of one device connection, or if one was really technical, one could connect a router or multiple devices into the cable modem. Even then your customer had a clear and visible view of what was connected to their network. They could physically look and see the devices that were connected to the router itself.

Then came the wireless gateway. Now devices in the home could connect to the internet wirelessly from anywhere inside (or outside) the home, as long as they are within a 100 ft. radius, they could connect to the internet via your router.

At first, there were only a few devices that could use this connection, such as laptops. Then came smartphones (iPhones, Android), tablets (iPads), internet connected streaming devices (Roku and Apple TV), then smart TVs, then 4K smart TVs (requiring much more bandwidth than your typical streaming device). Finally, a plethora of Internet of Things and wearable devices, like IP cameras for security, internet connected thermostats, and all sorts of new devices, including home robots and other helpful home automation devices were added.

An explosion of home devices appeared – but there was no way to really track and manage all permutations and combinations of all devices to detect which device caused an issue. Will your device or app play well with others in this network, or will it cause havoc?

When something goes wrong – who does your customer call?



## The Problem

As customers begin to add more and more devices to their networks, the complexity of those networks increases exponentially. With 4 devices on the network, there are 24 possible combinations, and with 10, over 3 million. This leads to an uncountable number of combinations of devices in a typical internet connected home.

As someone who either provides internet service, or has developed a product which runs in this environment, how can

you possibly test all permutations and combinations of all devices and their effect on the network?

Your product sits online in a network of many other devices. If there is a problem with your device, due to the sheer possible combinations of devices on that network, there is no way to be 100% sure where that problem exists - is it an issue with your device, or some other device on the network, or the network itself?

If your device depends on internet, what if there is another device on that same network using up all of that bandwidth, or interfering with the operation of your device? What if that device is an Internet of Things device which doesn't even have the same ability to report a conflict or an issue with your device?

## Here's an example:

Your customer installs your product on their network, and when installed, it works great, and continues to work great. The customer buys a laptop, an internet connected TV, and IP camera for security and an Amazon Echo. Your product is still not a problem, still works great. Then one day, for no apparent reason, your product just stops working. It appears to no longer be able to connect to the internet. So they call your customer service line. Your agents run through a number of possible scenarios in order to get the product working again, but for some reason, your device is still not able to connect. After a long, detailed troubleshooting session, your customer and your agent determine that it is the customer's laptop, and not your product, which is knocking your product off of the network. Removing the laptop from the network solves the problem with your product, but it doesn't get to the root of the issue. Eventually, it is determined that the customer had just updated a network driver on his laptop, and this network driver had a bug in it. This bug flooded the customer's home network with so much traffic that products which required high network bandwidth (like yours) were affected, while others were not. The typical home network is now a very complex place.

If you look at a typical current home network, you might have 16-20+ devices currently active, and 7 devices inactive. All of these devices have to co-exist with each other - if your customer suddenly can't watch a movie on Netflix on your Apple TV, is it the internet providers fault, or is it the Apple TV's fault, or is it Netflix's fault? It might even be the fault of one of their kids in the household watching a session on Twitch, which is using up bandwidth. There is no way to know where the problem is, what is causing it, and how to fix it, proactively and preemptively, before the customer even experiences it.

The point is – networks have become exponentially complex. There is no possible way that you can test every possible configuration and combination of devices.

Or is it there?

Symbio has the solution.



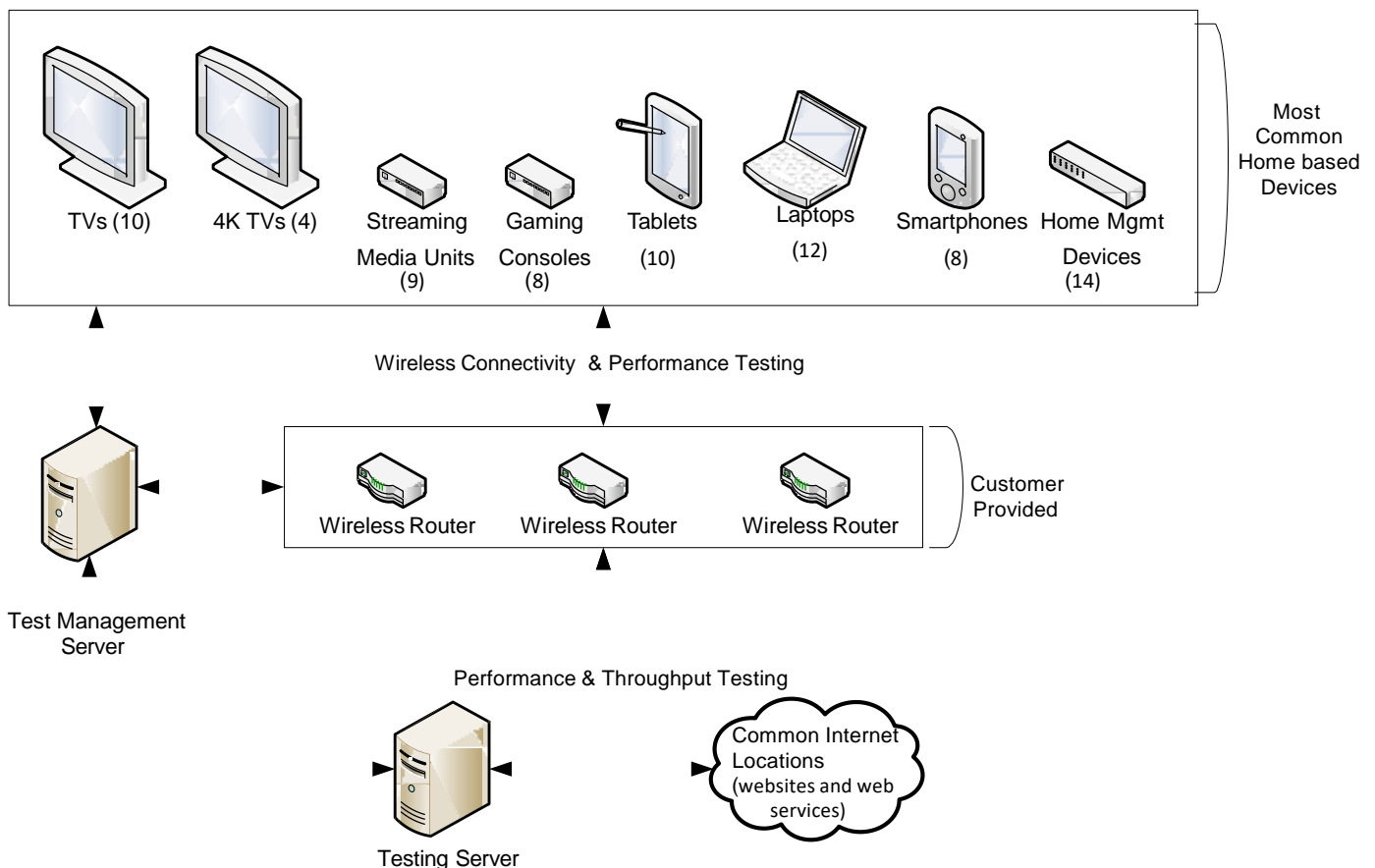
At Symbio, we have a lab built specifically to execute this kind of testing for interoperability. Leveraging our deep legacy of testing, backed by our over 20 years of experience providing testing and QA services for companies like Microsoft, we have built a comprehensive solution to this challenge: The Symbio Interoperability Lab.

This lab is designed from the ground up to test as many combinations of devices as possible, and to mimic combinations in real world networks as closely as possible. We would have easily been able to detect and solve something like the issue outlined above.

## The Symbio Interoperability Lab

The Symbio Interoperability Lab is an on-demand, fully scalable testing service, offered for a common core set of configurations, with custom configurations available as an additional project model option.

Our interoperability lab can do both broad testing (testing a combination of devices for a few tests, such as connectivity and throughput) and deep testing (testing one or few devices with many tests, such as going through every possible permutation and combination in application testing).



This is an example of a small portion of what we've built. In total, we've pulled together hundreds of devices in a number of categories, from laptops, to smartphones, to TVs, to tablets and Internet of Things devices, like IP cameras and internet connected thermostats, which can be tested in thousands of combinations. These devices are continually refreshed and updated with software patches and updates, and new devices are rotated in and out of the lab as they come onto the market.

We test these combinations based on our own research of typical environments, including outliers and combinations provided by our clients. If you have a specific product or a combination of products that you wish to test, we can set up a custom environment to test those combinations.

We are also plugged into most manufacturers' release cycles and can provide you with the ability to foresee issues prior to becoming call drivers for you.

Here is an example of the type of issue the interoperability lab can pre-emptively solve:

For a large internet service provider, all seemed well. Suddenly there was a huge rush of new phone calls – for some reason, a number of their customers were attempting to stream movies from Netflix from their internet connected Smart TVs and found that they couldn't. Most of their customers tried a different app on their TVs to see if that would work, but that didn't work either. They immediately came to the conclusion that the problem must be with the internet. They picked up the phone and dialed the internet service provider, which resulted in the rush of calls. As the calls came in, the agents ran all of the requisite tests – there were no issues with the customer's internet connection. Everything seemed fine.

Eventually, after some extended troubleshooting, they traced the problem back to the TV itself, since other devices on the network were able to connect to the internet. But what had happened to the TV? These TVs had been operating perfectly since they were first installed and connected to the internet. Doing more in-depth troubleshooting revealed that the manufacturer of the Smart TV had invisibly pushed a patch to the TVs operating system down to the TVs currently out in the world. They did this without informing the TV owners that the patch was forthcoming, or even giving them an option to deny the patch. The customer in essence had no idea that the patch had ever been applied. The agents found this out by comparing working TVs operating system version numbers with the version numbers of non-working TVs. As suspected, the non-working TVs had the buggy patch. Normally, these types of minor patches seamlessly install with no effect visible to the user. However, this time, the bug in the patch caused a large number of those TVs to lose their internet connectivity, which led to huge call volumes, all on the internet service provider's dime.

Had that provider used the services of our interoperability lab, they would have at least received a heads up that the patch would cause an issue. They also would have been able to pre-emptively message both their agents and provide that data on a customer self-service portal, thereby deflecting a huge portion of the calls, and measurably shortening call time for others.

Here are some of the tests our lab can provide:

- **Interoperability Testing:** Tests whether a given smart device or software program is compatible with others and promotes cross-use functionality. This kind of testing is increasingly important as many different kinds of technology are being built into architectures made up of many diverse parts, where seamless operation is critical for developing a user base.
- **Compatibility Testing:** Verifies that the product functions as expected on a wide variety of hardware, software, and network configurations which are planned on an identified set of compatibility combinations.
- **Sustainability Testing:** Verifies that the smart device or software program functions as expected on a wide variety of legacy systems.
- **Benchmarking Services:** Compares two or more smart devices or software programs to verify relative performance across a variety of product attributes.
- **Certification/Pre-Certification/Conformance Testing:** Validates that a smart device or software program functions in conformance to a standard, typically either an industry standard (e.g. ISO) or ecosystem platform (e.g. Windows).

Symbio is in the unique position of being able to provide the solutions you need, leveraging our deep expertise and experience in testing, as well as developing software solutions for many Fortune 500 companies.

Contact us today and let's talk about what we can do together.