

# iSAM: Simplifying Ethernet Testing for Today's Network Reality

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## THE BUSINESS REALITY

As a result of ever-increasing competition in the telecom industry, service providers need to turn up next-generation Ethernet services more quickly to get to revenue faster. What's more, they need to manage a multitude of ever-evolving technologies and deploy mobile backhaul, data-center interconnect and Ethernet business services more efficiently. Conversely, field technicians need to rapidly learn and gain proficiency in all these new technologies to keep pace with a host of new testing requirements. This poses a challenge to many service providers, who have limited budgets for test equipment and training, and are struggling to reduce repeat calls and network issues.

## ETHERNET SERVICE TESTING TODAY

Over 15 years ago, the RFC 2544 test methodology was created to validate the performance of Ethernet network equipment. As most are probably aware, RFC 2544 is no longer adequate for turn-up of next-generation Ethernet services. However, it has been in use for so long that many consider it the de-facto standard test methodology. The reality of the situation is that it is easier to test with the familiar than to learn and adapt to a new test methodology.

In addition, because many service providers do not have clearly defined testing methods and procedures (M&Ps), many field technicians revert to manual testing. As a result, due to the multitude of new and emerging technologies, field technicians often require tier-2/tier-3 support to properly set up and perform network turn-up tests.

## CURRENT STATE OF AFFAIRS

Service providers who are still using RFC 2544 should take note that this test methodology was designed to test Ethernet equipment in a lab environment, and as such, does not properly qualify the Ethernet network. Indeed, it leaves issues undetected, which leads to downtime, recalls and poor network quality. With RFC 2544, tests are done sequentially, resulting in a very slow testing process. Furthermore, RFC 2544 is not designed to test multiple services simultaneously, which is the hallmark of today's next-generation Ethernet networks.

A few aspects that are often overlooked when considering the purchase of test equipment are simplicity, clarity and ease of use. In many cases, field technicians' productivity levels are not optimized, and a lot of time and money are spent on setup and support alone. Across the industry, we estimate that more than half of all calls from field technicians to tier-2/tier-3 support are related to setup issues involving test units. This is reflective of the fact that Ethernet test applications often require complex setup. When this complexity is combined with a lack of Ethernet training in the field, the result is more time being spent on setting up tests than on actual testing itself.

In addition, when it comes time to invest in test equipment, service providers are well aware of the traditional renting versus purchasing models. However, they may not be aware that there are various equipment purchasing options available that can optimize CAPEX. Scaling testing requirements to specific needs provides the flexibility and agility to address any testing situation and maximize test asset investments.

## SIMPLIFYING ETHERNET SERVICE ACTIVATION

How many times have field technicians started a test application only to realize that someone with a high level of technical expertise is required to configure and perform the test? The goal of iSAM is clear-cut: to simplify Ethernet service-activation testing for field technicians of all skill levels.

iSAM does this by making service turn-ups what they should be: **simple and quick**. Inspired by the feedback and field-testing knowledge of customers around the world, iSAM was designed to simplify field technicians' daily tasks by focusing on the most common Ethernet service turn-up configurations used in the industry today, from 10M all the way up to 100G.

Imagine that field technicians could set up an Ethernet service test within a single page, automatically connect to their remote unit, complete testing, and then have the test report automatically uploaded to a cloud-based storage location. iSAM makes this possible.

In today's test and measurement (T&M) market, field technicians often waste valuable time going through a multitude of test setup pages. Thanks to its innovative new approach, iSAM can be configured entirely within a single page for maximum efficiency.

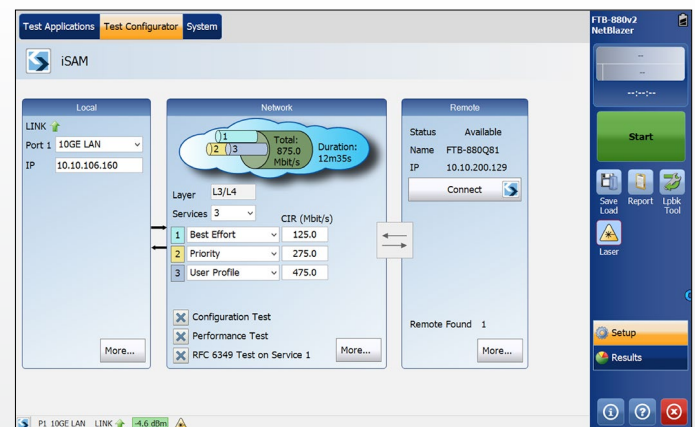


Figure 1. iSAM—simple one-page test setup

## TACKLING THE TRANSMISSION-CONTROL-PROTOCOL (TCP) LAYER

Given the intense competition in the telecom industry today, service providers need to ensure the best possible quality of experience for their customers in order to prevent customer churn and increase customer loyalty. As such, complete validation of Ethernet and Internet protocol (IP) layers (layers 2 and 3), as well as TCP layer 4, is a must for service providers who need to understand their network and the quality of services being delivered to their customers.

Due to the shift in customer usage patterns and the demand for bandwidth-intensive applications, service providers must also adapt their testing requirements to meet customer expectations. Fifteen years ago, service providers rarely talked about testing or validating the TCP layer. However, today they need to go beyond traditional RFC 2544 testing, and even ITU-T Y.1564 service activation testing.

With the simplicity that iSAM brings to the table, service providers also have the ability to easily validate their services right up to TCP layer 4. Simply enabling the RFC 6349 test in the iSAM setup page will allow the TCP Throughput validation test to be performed automatically after layers 2 and 3 have been tested. This will ensure validation of the base layers (Ethernet and IP) along with the TCP layer, thereby delivering a true end-to-end service activation test.

The RFC 6349 test will automatically determine the path maximum transmission unit (MTU) to avoid packet fragmentation. The test will also measure the baseline round-trip time (RTT), which constitutes the minimum round-trip time required for a TCP packet to be sent out and acknowledged by the receiver. From the baseline RTT and the user-entered committed information rate (CIR), the bandwidth delay product (BDP), or optimum window size, will be calculated. The BDP (optimum window size) will be used to perform the TCP throughput test. Field technicians will then be able to quickly determine whether the circuit under test is operating at the expected level.

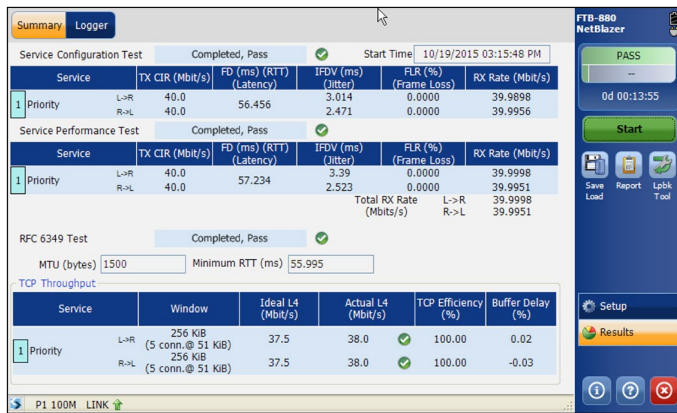


Figure 2. Layer-2/3 and layer-4 (TCP) service validation

## Remote-Unit Testing

The Ethernet service-testing procedure always involves testing to a remote device. The remote device might be a simple third-party loopback device, or an EXFO smart loopback device returning the received Ethernet frames back to the local tester. The remote device can also be a more advanced device capable of bidirectional operation, where each direction is independent. At EXFO, this type of operation is referred to as Dual Test Set (DTS) mode, which is the most accurate method for turn-up and validation of any Ethernet circuit.

DTS can be used to test asymmetrical Ethernet networks, where each direction is capable of operating at different rates. Also, using DTS, field technicians are able to quickly determine which direction is at fault when network issues occur.

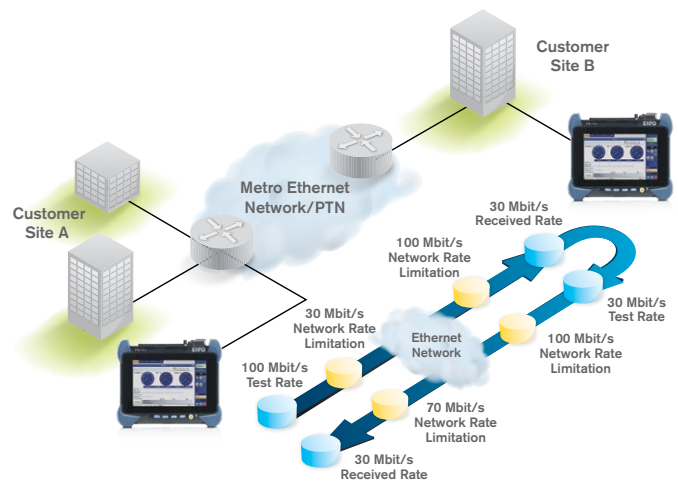


Figure 3. Ethernet testing using EXFO's Smart Loopback capability

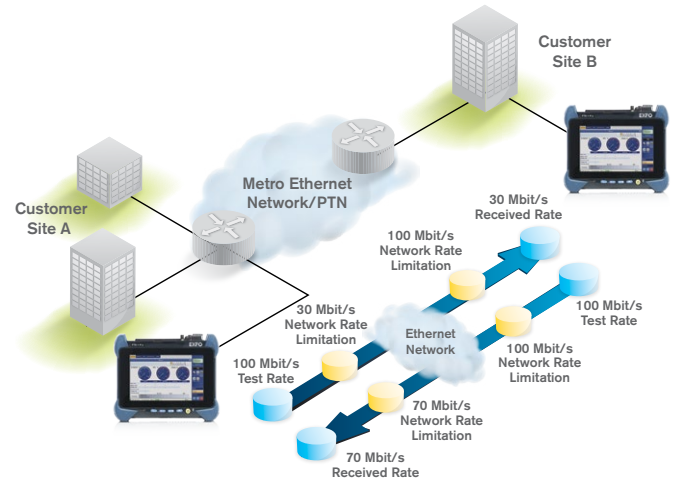


Figure 4. Ethernet testing using EXFO's Dual Test Set capability

When using iSAM, field technicians can quickly select the desired remote-unit operation mode from the configuration page: DTS, loopback to an EXFO device, or simple loopback to a third-party loopback device.

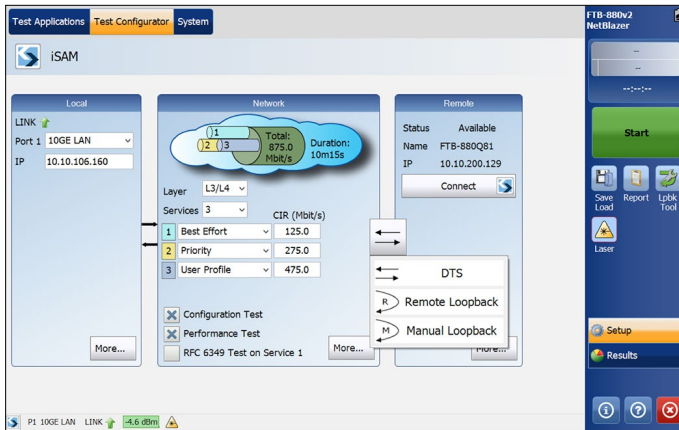


Figure 5. iSAM remote capabilities

### Autodiscovery

iSAM is revolutionary in terms of remote device connectivity: there's no need to scan the network to discover EXFO remote devices, and no need to connect to those devices before starting the test. With iSAM, simply opening the test application will enable automatic discovery of any available EXFO device in the network, and the most appropriate device will then be selected. In the case of multiple testing choices, the field technician will be able to quickly see the alternative units available for remote connectivity. If a preferred device (for example, a centralized network probe such as EXFO's BV-3100) has been previously defined as a favorite, the selection will automatically be made to that device. If multiple devices are found, the field technician simply selects the desired device for remote testing. In a situation where only one device is found and available, auto-selection of that test unit will be carried out.

### Auto-Connect

When the iSAM test is launched, there is no need to connect to the discovered unit. Connection to the remote unit will be established automatically.

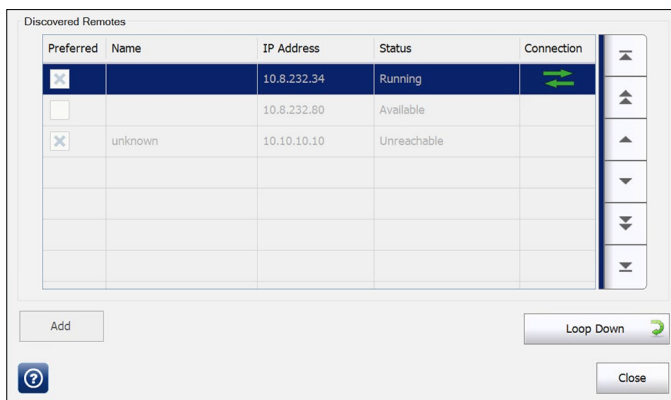


Figure 6. Automatically discovered remote devices

Turning up and testing Ethernet services should not be complicated. iSAM's autoremove features with autodiscovery and auto-connect allow field technicians to connect to the remote unit seamlessly with maximum automation and minimal intervention.

### Autoreporting

iSAM is all about making Ethernet testing simple and easy for all field technicians. So, what about test reports? With iSAM, field technicians no longer have to perform any tedious tasks such as saving test reports to USB flash drives and then having to e-mail these reports. Once the iSAM test is complete, the test reports are automatically sent to a cloud storage server with EXFO Connect, and within seconds these test reports are made available to supervisors/managers. This means jobs are closed out much quicker, and service providers can get to revenue much faster.



Figure 7. EXFO Connect—test reports are made available instantly

## MAKING THE MOVE FROM RFC 2544 TO iSAM

EtherSAM, EXFO's Ethernet service activation methodology based on ITU-T Y.1564, was created for advanced users requiring the ability to configure multiple services along with all parameter-setting capabilities, such as burst testing with committed burst size (CBS)/ excess burst size (EBS), traffic policing, ramp throughput settings, and much more. EtherSAM is a very powerful and comprehensive test application for Ethernet services testing. For additional details, please refer to [EXFO's EtherSAM application note](#). Many service providers today are using EtherSAM to turn up Ethernet services, and it is therefore important to note that iSAM was not created to replace EtherSAM.

That said, in many cases, service providers are still using the legacy RFC 2544 Ethernet testing methodology. Many in the telecommunication industry will confirm that RFC 2544 is no longer adequate for testing and validating next-generation Ethernet services. However, because RFC 2544 is widely used, making the move to a more powerful Ethernet test methodology may pose a challenge to service providers and their field technicians.

This is where iSAM comes into play. A simplified version of EtherSAM, EXFO's new iSAM Ethernet service-activation test application boasts a design based on the most common Ethernet service-activation profiles seen in the Ethernet service testing industry today. For service providers who have not yet made the switch to ITU-T Y.1564, iSAM provides the easiest path to the new Ethernet testing reality.

## PERFORMANCE CRITERIA— CLEARING THE CONFUSION

In addition to the simplicity it brings to the Ethernet testing world, iSAM also includes the latest cutting-edge Metro Ethernet Forum (MEF) standard. Using predefined performance metric profiles from MEF 23.1, field technicians can quickly select the MEF service type they need to test, and validate Ethernet services in a consistent, repeatable and automated manner. In this respect, iSAM uses a simple test methodology specifically adapted to today's next-generation Ethernet networks in order to properly qualify the complete service-level agreement (SLA).

Designed according to the same principles as EtherSAM, iSAM also integrates the concept of two subtests: the configuration test and the performance test. The configuration test verifies the performance according to per-service-basis criteria. This test verifies that the performance metrics defined by the MEF, such as frame loss ratio (FLR), frame delay (FD) and inter-frame delay variation (IFDV), are met at the CIR for each individual Ethernet service. The performance test, on the other hand, verifies that the performance metrics are met while all services are operating simultaneously at the combined CIR.

### Performance-Metric Naming Convention

Traditional	MEF
Frame loss	Frame loss ratio (FLR)
Latency	Frame delay (FD)
Jitter	Inter-frame delay variation (IFDV)

Over the years, many service providers have searched for guidance regarding the proper performance metric settings needed to test Ethernet services. For instance, should the FLR be below 0.5% for a short-span service such as the metro service? Should the FD be less than 10 ms, 20 ms, or 30 ms? There has been quite a bit of confusion concerning the right metrics needed based on the type of Ethernet service provided. iSAM clears up this confusion by providing MEF performance profiles to field technicians. With iSAM, service providers and field technicians can now easily test according to these guidelines based on the Ethernet service being delivered.

MEF 23.1 specifies three performance objectives and four performance tiers (PTs). The performance objective relates to the class of service (CoS) being delivered, whereas the performance tier relates to the span of the Ethernet service.

### Performance Objectives

H	High	Stringent performance, such as timing distribution
M	Medium	Real-time applications, e.g., voice-over-Internet protocol
L	Low	Best-effort applications (web traffic)

### Performance Tier (PT)—Span (km)

Metro	< 250 km
Regional	< 1200 km
Continental	< 7000 km
Global	< 27 500 km

The combination of these performance objectives and performance tiers defines 12 different classes of Carrier Ethernet services. The table below outlines examples of the performance criteria for some of these services.

	FLR (%)	FD (ms)	IFDV (ms)
Metro L	≤ 0.1%	≤ 37 ms	Not specified
Continental M	≤ 0.025%	≤ 115 ms	≤ 40 ms
Global H	≤ 0.05%	≤ 230 ms	≤ 32 ms

Because iSAM includes an extensive list of Ethernet services, service providers no longer have to play a guessing game when turning up and validating Ethernet services. Field technicians can easily select the desired performance criteria based on the Ethernet service being delivered to the end customer.

## PERFORMANCE-CRITERIA CUSTOMIZATION

What happens when the MEF predefined performance criteria do not meet the user's needs? With iSAM, users also have the ability to modify the predefined MEF performance criteria or create their own user-defined performance-criteria profiles. Some service providers may even have their own Ethernet service offering (e.g., Gold, Silver and Bronze) with associated performance criteria for these services. With iSAM, custom performance-criteria profiles can easily be created.

These custom performance-criteria profiles are created using master templates that are accessible on the platform (not within the test application), and can be restricted to managers and/or supervisors. Also, if a user has modified an MEF performance-criteria template, an asterisk will appear near the performance-criteria name to indicate that some modifications to the metrics have been carried out.

## SUMMARY

Service providers today are under tremendous pressure to keep their costs low while providing leading-edge telecom services to their customers. To be more competitive, these service providers need to quickly deliver quality Ethernet services and avoid repeat calls in order to achieve sustained business and customer loyalty. iSAM is the perfect tool for today's most advanced Ethernet service turn-ups, delivering greater operational efficiency and faster time-to-revenue.

With the industry's first cutting-edge MEF 23.1 standard performance metric profiles, performance-criteria customization and built-in autoremove capabilities, iSAM enables field technicians to perform Ethernet service turn-ups in an efficient, consistent and automated manner. With iSAM's simple one-page test setup, endless hours of training and tier-2/tier-3 support calls are a thing of the past.

Moreover, when iSAM is combined with FTB Anywhere—EXFO's floating test-license system, and FTB OnDemand—EXFO's time-based license system, service providers can further optimize their test-equipment budget by paying only for the test options that they need. Sample test options include 10GE, TCP throughput, IPv6, among many others.

iSAM was designed based on years of field experience and customer feedback from around the globe in order to help service providers and their field technicians seamlessly transition from RFC 2544 to a simpler and more powerful Ethernet test methodology. By combining iSAM's simple and cutting-edge capabilities with EXFO's flexible licensing options, service providers now have access to an Ethernet testing solution that can minimize CAPEX while maximizing testing efficiency.