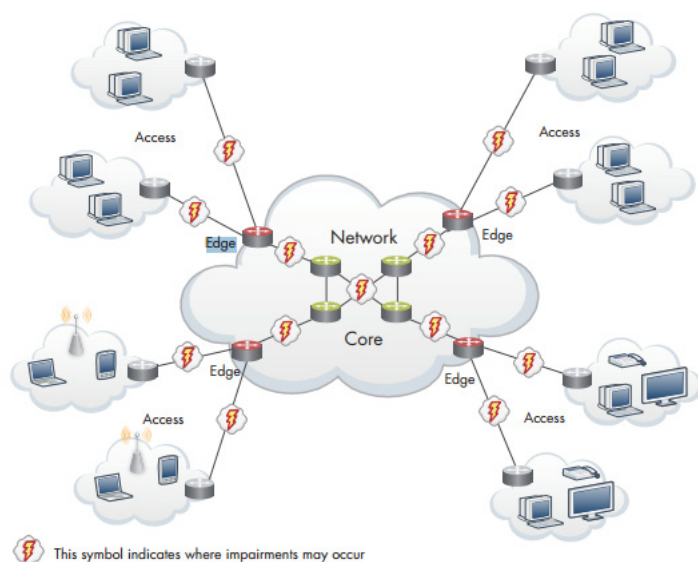




## Network Emulation – The Missing Link to Realistic Network and Application Testing

### The Challenge of Realistic Testing

All networks experience unique delays and bandwidth limits that directly impact application and network performance. Network imperfections, or impairments, can put network performance at risk and jeopardize key aspects of a company's operation. User dissatisfaction is fueled by packet delay, jitter, packet loss, and other problems that disrupt vital services and affect subscribers' quality of experience (QoE). These network imperfections are unavoidable, inherent impediments that network designers and application authors must consider when testing. The network diagram below illustrates how network impairments can occur at any link within your network.



### Network Emulation – The Missing Link

It is no longer enough to validate and characterize performance of services or applications against ideal lab conditions alone. This testing must be realistic, repeatable and precise. Network Emulation brings a real-world network environment into the lab. This allows for testing and validation under realistic network conditions.

#### HIGHLIGHTS

Ixia network emulation products are the missing link to realistic network testing. Network emulation and impairment bring realistic, repeatable, and precise testing to your network test setup.

#### SOLUTION FEATURES

- 1GE/10GE/40GE speeds
- Fibre Channel and SONET/SDH
- Line rate precision and repeatability
- Robust impairment features
- Network Profiling and Playback
- Data Capture/Data Replay

#### SOLUTION BENEFITS

- Reproduce your actual network conditions within the lab
- Focus on all traffic or utilize granular profiling to impair specific application traffic
- Impairment testing is easily added to existing test setups
- Choose either ImpairNet, which is fully integrated into IxNetwork and IxLoad, or choose the full-featured Network Emulator

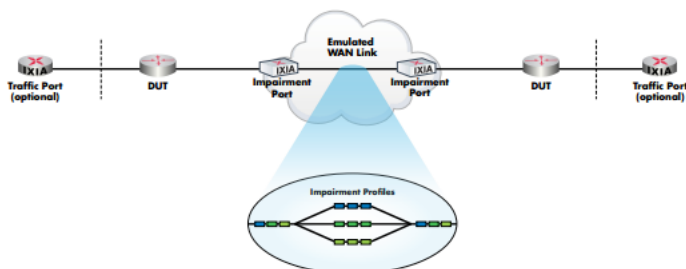
### The ImpairNet Solution

Ixia's ImpairNet® is the industry's highest-density network test solution, supporting 1GE, 10GE, and 40GE load modules that emulate real-world network impairments. These load modules offer unparalleled scaling, ease-of-use, and measurement accuracy, and test a variety of applications that run over the network. It is a precision hardware solution that introduces impairments to network traffic.

ImpairNet works seamlessly with Ixia's IxNetwork and IxLoad test tools, allowing for unified introduction of impairment into typical traffic emulation test environments. ImpairNet's load module is plug-and-play with the Ixia chassis – saving rack space, cost, and effort. It is the only impairment solution that also has traffic and control-plane protocol configuration in the same system. This saves time and effort by combining both live network simulation and impairment application.

## The Ixia Network Emulator Solution

Ixia Network Emulators enable users to test products and services against the delay, impairment, and bandwidth conditions that occur on real production networks. Network emulators are used in the lab to test applications, protocols, and end user experience under real-world conditions prior to deployment. A wide range of features, line speeds, and



protocols are supported to meet your current and future needs.

## Application Use Case

Real-world networks do not behave in a deterministic manner, and network impairments must be discovered and accommodated for by the application. Testing the performance against real-world conditions found in live production networks allows network related issues to be discovered early saving time and money while ensuring a smooth rollout.

A large distributed corporation with many branch offices faced the challenge of testing their applications prior to rollout. They had experienced rollout failure on several occasions due to unique network issues. The network was spread across North America, reaching numerous branch offices and used numerous links and link type connections – each with their own impairment profile.

The first step was to identify and understand the critical links to be emulated. The corporation's technical staff studied the network and identified all critical infrastructure that should be modeled. The Network Emulator Profiler was used on each link in question to record the impairment profile of the link and save these characteristics for later playback.

The next step was to model the physical network within the lab. Matching network links were setup within the lab and a test version of the application was added to the test setup. The Profiler had previously logged the characteristics of each link using the Profiler to record this information. These characteristics were then loaded into the Network Emulator on each link. This allowed the Network Emulator to playback the impairment profile of that specific link recreating the real world environment within the lab.

The last step was performing the actual application test. Care was taken to ensure that the application was executed over every link type and link type combination that would be found in the actual network. This application testing simulated the demands placed on the system and application by generating realistic traffic/transaction loads, and modeling realistic user behavior while executing the test over an impaired network that matches the real world network. The end result was a robust test environment that closely matched the network challenges found in the real world.

Testing and evaluating realistic traffic loads on a lab network can create a false sense of confidence that applications will perform similarly after deployment. Testing as outlined here provides a concrete methodology to answer important questions about application readiness and to set performance expectations.

## Impair to be Aware

Network impairments can cause noticeable service disruptions, customer churn and application failure. Network operators need to pair acceptable impairment thresholds with each type of service offering and then test prior to deployment to ensure QoE. NEMs must ensure that their equipment does not cause unnecessary impairment and can compensate for a certain level of impairment. Application providers need to take the network impairment profile into account during testing.

ImpairNet and the Network Emulator provide robust functions for line rate impairment for all frame sizes with no packet loss. Testing with Ixia's network emulation solutions allows the flexibility to create the wide range of impairments found in real-world networks and bring realism to the application test environment.

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