



**Validating Dexor's Reliable
Multidestination Transport Protocol
(RMDT) Using the Aukua Network
Impairment Emulator**



This application note describes how the Aukua **Network Impairment Emulator (NIE)** was used to verify and validate Dexor's **Reliable Multidestination Transport Protocol (RMDT)**. By applying precise network impairments such as latency, packet loss, and packet jitter (also known as packet delay variation or PDV), the Aukua NIE created reproducible test conditions that enabled side-by-side comparisons between RMDT and traditional TCP implementations. The results confirmed RMDT's superior efficiency and scalability while highlighting the critical role of the hardware-based Aukua NIE in demonstrating these advantages through path-specific impairments, repeatable tests with no performance bottlenecks, and intuitive graphical statistics.

Introduction

Modern applications in data transport and content delivery increasingly strain the limits of traditional transport protocols. While TCP has long served as the backbone for reliable data transmission, it was not designed with today's requirements for high-speed, multi-destination, and latency-tolerant communication in mind. As a result, TCP-based systems often fail to achieve optimal performance in networks where bandwidth fluctuates or where destinations experience different impairment levels.

Dexor has addressed this gap with the development of RMDT, a UDP-based transport protocol engineered to deliver both speed and reliability across single and multiple destinations. The protocol's strength lies in its sophisticated bandwidth analysis algorithms and efficient management of data in the protocol stack. These innovations make it possible for RMDT to outperform not only TCP, but also proprietary transport solutions that attempt to address similar challenges.

To demonstrate and verify these advantages, Dexor employed the Aukua NIE. By introducing precise and configurable impairments into the data path, the Aukua NIE enabled engineers to recreate a variety of network conditions in a fully controlled and repeatable laboratory setting. This ensured fair and reproducible comparisons between protocols while providing clear visibility into performance differences through Aukua's industry-leading, accurate, graphical statistics.

Background

Validating transport protocols under real-world conditions presents a unique challenge. Network performance is influenced by factors such as latency, packet jitter, and packet loss, but these conditions are inherently unpredictable in live environments. Reproducibility is essential for meaningful testing, yet it is almost impossible to achieve on production networks.

The customer initially attempted to conduct lab validation tests with a software-based appliance (a physical chassis running software under the hood). They quickly realized that when testing with sustained multigigabit Ethernet traffic, with the required path-specific impairments enabled, the software-based appliance could not keep up, producing erroneous and non-repeatable results. In contrast, the Aukua NIE provided an FPGA-based hardware solution which is purpose-built to deliver accurate and repeatable results under full-line-rate conditions. The Aukua NIE proved to be an indispensable tool as it only did what it was configured to do, and nothing more or less.

Solution Overview

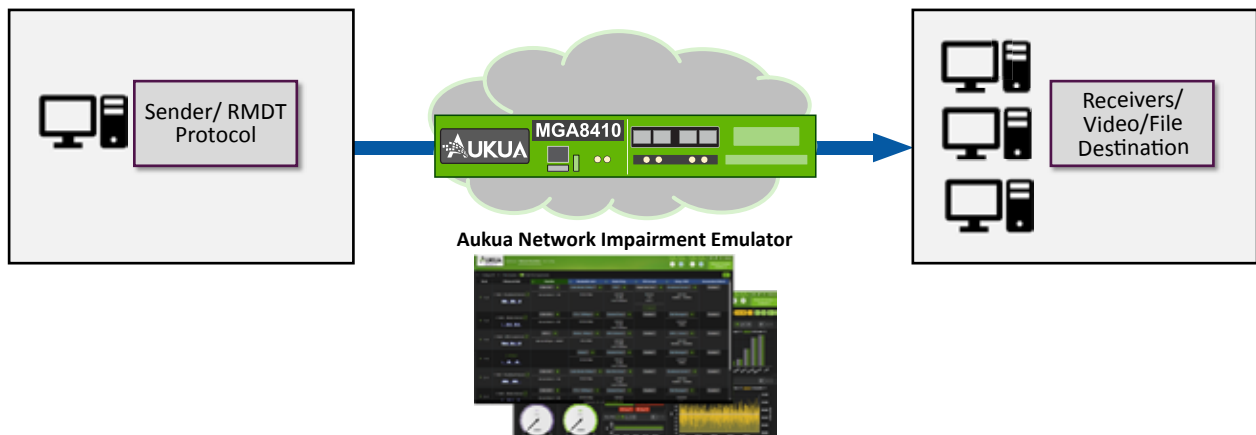
The Aukua NIE provided the ideal platform for evaluating RMDT in both single-path and multi-destination environments. Its path-specific impairment capability was particularly important in this project. By applying impairments selectively to individual data streams, engineers were able to mimic the conditions experienced by different destinations in a multi-destination scenario. This was critical in demonstrating RMDT's unique strength in handling multiple delivery paths simultaneously, even when those paths are subject to uneven levels of congestion or loss.

In addition, the Aukua's built-in graphical statistics made it possible to monitor and visualize the behavior of both protocols under test. These statistics offered immediate, intuitive feedback on throughput, packet delivery, and delay, providing compelling evidence of RMDT's performance advantages.

Test Methodology

The test setup consisted of a baseline TCP implementation and Dexor's RMDT implementation, both transmitting data streams through the Aukua NIE. The NIE was configured to introduce a variety of impairment conditions. Delays were adjusted across a range of values to simulate different path lengths, packet loss was introduced in controlled increments, and packet delay variation was applied to recreate the packet jitter observed in real-world networks.

The results of each test were logged and displayed using Aukua's graphical statistics features, which provided visual comparisons of throughput, latency, and overall stability across TCP and RMDT transmissions.



The Aukua NIE impairing traffic and providing visual validation of results

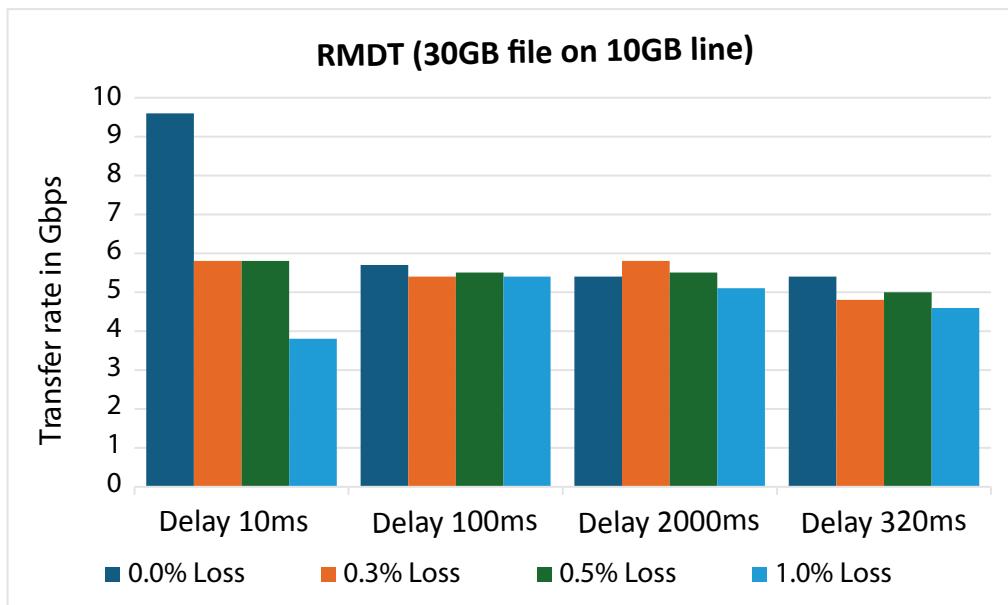
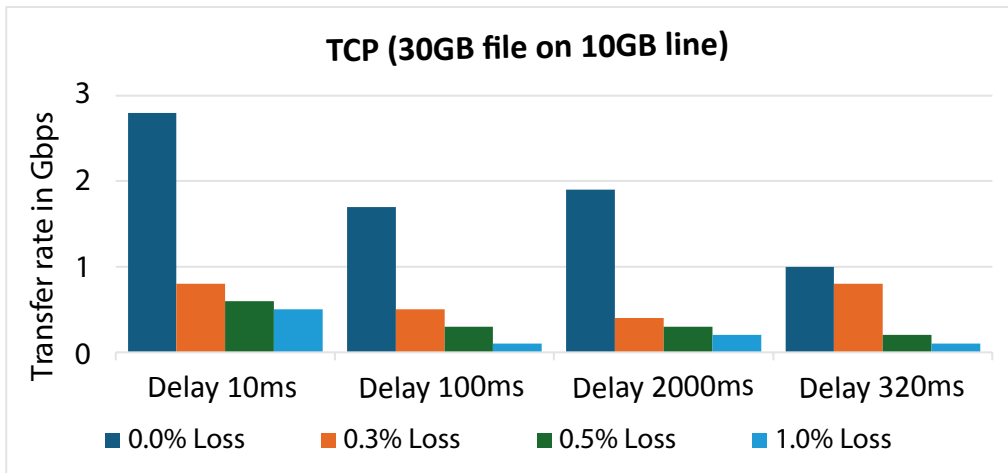
Results and Observations

The evaluation demonstrated that RMDT delivered consistently higher throughput than TCP when subjected to network impairments. Under conditions of increasing delay, TCP performance degraded rapidly while RMDT continued to sustain efficient data transmission. Packet loss had a similarly detrimental effect on TCP throughput, whereas RMDT proved more resilient, maintaining stable performance even as loss rates increased.

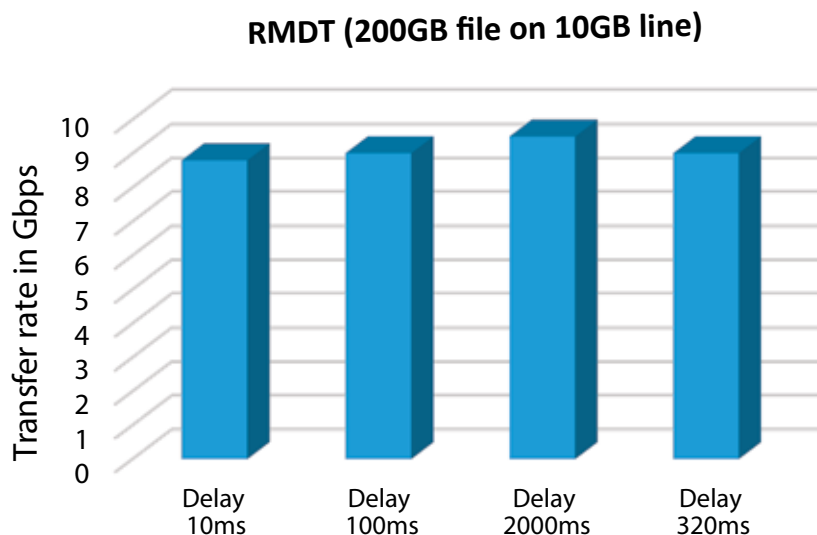
RMDT delivered consistently higher throughput than TCP.

Let's review the test results.

The following charts illustrate the performance of TCP (Linux stack) versus RMDT in a 30 GB file transfer.



The following chart illustrates how a RMDT transfer of a 200GB file, with Aukua impairments configured, receives traffic near full line speed.



Although the 30-Gbps run did not present a perfectly flat line rate, this is expected and by design. RMDT's startup phase is deliberately gentle: it probes available capacity conservatively to protect coexisting cross-traffic and avoid inducing queue build-up and packet loss. Consequently, only a small initial fraction of bytes is sent below peak speed; once the probing completes, the flow quickly converges to an efficient, stable steady state. Over longer transfers and under realistic latency, loss, and packet delay variation conditions, measured results show RMDT sustaining higher throughput and stability than TCP. These tests demonstrated that RMDT provided faster, cleaner, and more reliable end-to-end delivery which was validated with Aukua's hardware-based Network Impairment Emulator.

Additional Details

- By introducing PDV (delay 290–320 ms), TCP drops to 0.004 Gb, while RMDT maintains the high transmission rate.
- Performing the test with a video stream (4K), TCP showed initial effects at a packet loss of 0.1% and a delay of 100 ms. When packet loss increased to 0.5%, image freeze occurred.
- RMDT even showed error-free video at a packet loss of >10% and a delay of 320 ms. Ultimately, the application crashed at 90% packet loss.

Note: During these tests, the intuitive HTML5-based user interface of the Aukua NIE allowed the configuration to be changed with just a few clicks. A RESTful API is also available across the full range of Aukua functions, allowing test series to be executed automatically.



Conclusion

The combination of Dexor's RMDT protocol and the Aukua NIE provides a compelling case study in the validation of next-generation transport protocols. RMDT has demonstrated clear performance improvements over TCP and proprietary solutions, particularly in networks subject to delay, packet loss, and packet jitter.

The Aukua NIE was instrumental in making these advantages visible and measurable. Its precise impairment capabilities, rock solid performance, path-specific testing features, and built-in graphical statistics enabled reproducible, rigorous testing while also presenting results in an intuitive and compelling way. These unique strengths are the reason that Dexor selected the Aukua NIE as their test platform. For engineers seeking to validate and demonstrate the benefits of innovative transport technologies, the Aukua NIE is an indispensable test tool.



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