

Performance Study: Ranger Wireless Bridges

Introduction

The data throughput numbers on datasheets usually only represent the best case scenario obtained in a tightly controlled environment. These numbers do not take into account any overhead on the link such as the handshake, efficiency of protocols used, varying packet size or type of media transmitted. In the testing performed in this paper EION subjected two bridge products from its Rugged Wireless Communications Solution (RWCS) to some real world throughput testing. EION has a deep understanding of wireless technology and how it will perform under specific conditions. Proper understanding of the products and their capabilities is critical to any successful wireless deployment. This knowledge and experience gives EION's customers the confidence that they will receive a working network and not a trial-and-error science project.

This report highlights the results of an exhaustive testing session where selected products were tested under traffic conditions characterized by a mixture of data and multimedia sessions transmitted in different packet sizes. The main objective of these tests was to determine the maximum capacity of each tested product, but more importantly, to find out if product will collapse or survive under severe traffic conditions.

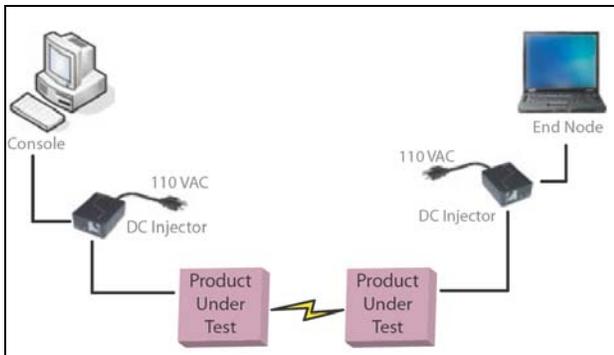


Figure 1. Connectivity diagram testing set-up

Test Setup

The testing was separated in three phases: TCP/IP data sessions only, UDP video streaming sessions only, and mixed media where data and video sessions were transmitted simultaneously. For these tests, a wireless point-to-point link was established as shown in Figure 1. Testing was performed under the conditions of a 3 km link.

TCP/IP Sessions Data Testing

For data throughput testing, the test system transmitted a pre-defined number of unidirectional and bidirectional TCP/IP sessions at full rate. These tests were conducted using both fixed and varying buffer sizes ranging in from 64 bytes to 1460 bytes. Fixed Tx buffer size testing is useful to evaluate the performance of each radio system as a function of the transmitted packet size. The varying Tx buffer size tests simulated real-life data traffic conditions. Data throughput testing was first performed without encryption and repeated with DES encryption for the Ranger 5110 and AES encryption for the Ranger 5050.

Streaming Video Testing

The video streaming test was conducted using different levels of CIF video resolution streaming at different bit rates. The number of simultaneous streams was measured from 4 streams at 4096 Kbps to 48 streams at 512 Kbps for both unidirectional and bidirectional traffic.

Mixed Media Testing

The total Mixed Media transport capacity was measured by adding TCP/IP data sessions on top of multiple video streams. For Mixed Media testing, the Video Streaming test was repeated with the addition of a pre-defined number of TCP/IP sessions at full rate, to evaluate data transport capacity of the radio link when saturated with video streams. The maximum number of simultaneous streaming and data sessions was obtained by trial-and-error, finding the largest possible number of error-free sessions supported by the test system without reporting errors throughout the entire test. The number of streaming sessions measured from the Video Streaming test was used as the reference largest number of streaming sessions for any given CIF/FPS combination.

Results

TCP/IP Sessions Data Testing

In this test, the Ranger 5110 demonstrated the most predictable throughput, showing very little variation under any test conditions. The Ranger 5110 delivered a solid 10.5 Mbps of effective data throughput with as little as 10% of variation in performance.

The Ranger 5050 demonstrated a higher performance overall with a throughput peak of 28.8 Mbps under optimal conditions but degraded to 10~12 Mbps at smaller packet sizes. In real-life data traffic simulations where packet size was varied according to statistical distributions, the Ranger 5050 delivered a constant 15 Mbps of throughput.

Both the Ranger 5110 and 5050 were fully re-tested with strong encryption enabled, DES for Ranger 5110 and AES for Ranger 5050, with less than 1% decrease in performance for both products.

Streaming Video Testing

The Ranger 5050 delivered flawless performance and very little packet loss (.05% average) in all these tests.

The Ranger 5110 was stable during unidirectional streaming tests, delivering a predictable 8 Mbps throughput shared between the streams, with an average packet loss of 1%. However, the Ranger 5110 experienced difficulties handling bidirectional streaming and as a result the number of supported streams was much lower than expected.

Mixed Media Testing

The Ranger 5050 performed extremely well, carrying a predictable number of streams and delivering an aggregate throughput ranging from 20 to 30 Mbps while keeping a packet loss rate below 0.05%. The results of this test are shown in Figure 2.

The Ranger 5110 performed well in unidirectional tests, delivering a predictable number of streams while delivering a full 11 Mbps of aggregate throughput; the packet loss was measured at 1.5%. These results are shown in Figure 3. The Ranger 5110 was not able to sustain a link during bidirectional testing. Because of this, the entire test plan for bidirectional mixed media could not be completed. The test tools used could not demonstrate if this issue was attributable to the wired Ethernet interface or the wireless transport protocol of the Ranger 5110.

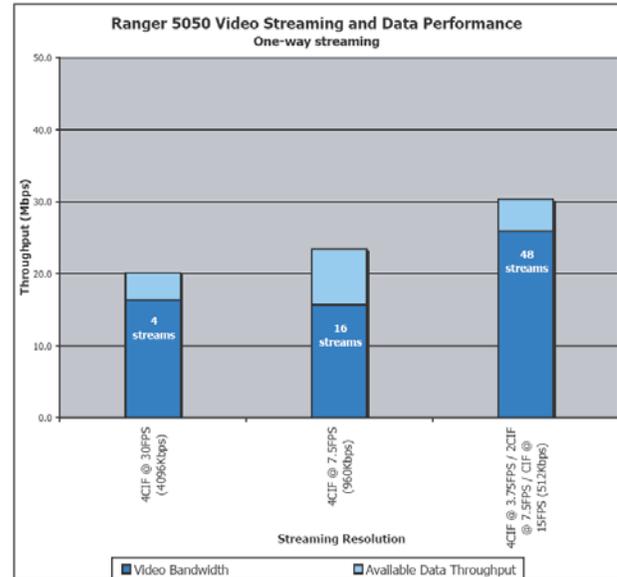


Figure 2. Ranger 5050 Mixed Media Individual Performance Chart

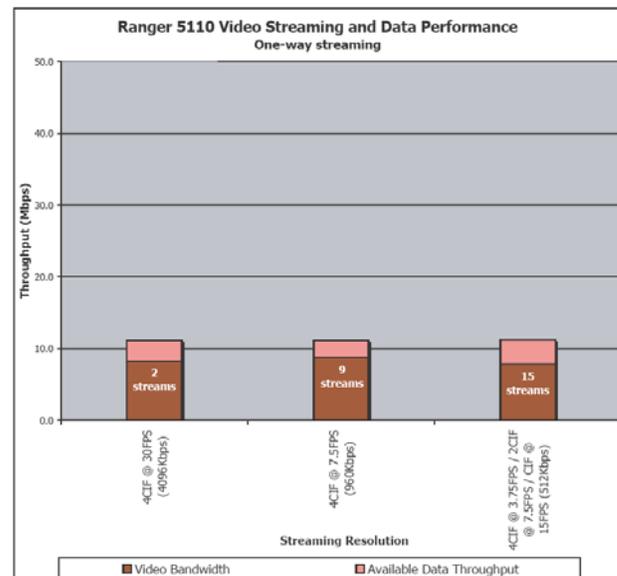


Figure 3. Ranger 5110 Mixed Media Individual Performance Chart

Summary

True data throughput was measured in these tests, not simply the raw coding rate capabilities of the hardware. It is important to be aware that all wireless products are different and the unique combinations of hardware and software can produce wholly different results. In the case of these two products, the Ranger 5110 is able to maintain its throughput performance over much longer distances. For this reason, it is crucial when deploying wireless networks to know the true performance of products and to be aware of their specific strengths and limitations. In-depth knowledge of wireless networks is an area of expertise that EION cultivates and promotes, making EION unique in the wireless marketplace.

Ranger 5050

The Ranger 5050 delivered throughput performance ranging from 15 to 30 Mbps under different conditions, and exhibited predictable behaviour throughout all tests. The EION Ranger 5050 demonstrated its ability to deliver high-bandwidth performance for triple-play data, voice and high-definition video.

Ranger 5110

The Ranger 5110 delivered solid performance in all data and unidirectional video and mixed media tests, with an aggregate throughput ranging from 9 to 11 Mbps. The EION Ranger 5110 offers a very stable performance as evidenced by a low variance in the test results across all conditions.



Corporate Headquarters
320 March Road, Suite 500
Ottawa, ON K2K 2E3
Phone: +1 (613) 271-4400
Fax: +1 (613) 241-7040

Calgary Office
2923 – 5th Avenue
Calgary, AB T2A 6T8
Phone: +1 (403) 273-5100
Fax: +1 (403) 207-0275

Toll Free (North America)
Phone: +1 (866) 346-6555

www.eionwireless.com