

Lab Testing Summary Report

September 2009
Report 090815B

Product Category:

**Wide Area
Network
Optimization**

Products Tested:

**Cisco WAAS vs.
Riverbed RiOS WAN
Optimization**



Key findings and conclusions:

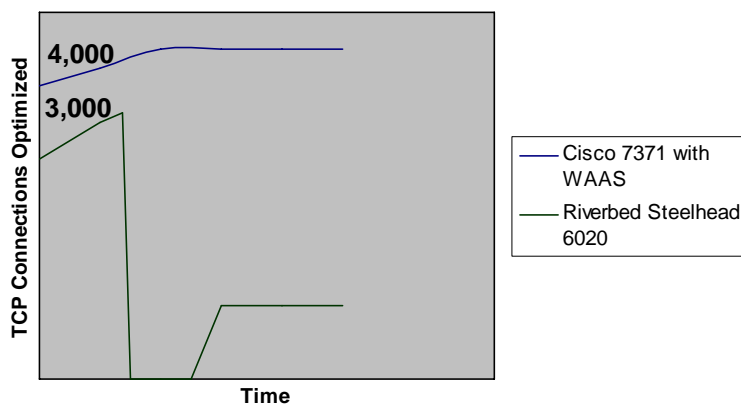
- Cisco WAAS exhibited no signs of system instability or blocking of traffic under heavy traffic load
- Reporting for Cisco WAAS was proven accurate; performance reporting matched measured efficiency
- Configuration changes were proven in testing to be non-disruptive with the Cisco WAAS appliance
- Cisco WAAS modular architecture proved in testing to offer superior scalability and stability, high performance, high availability and improved fault management

Cisco Systems commissioned this test report which is an excerpt from an independent Industry Assessment on Wide Area Network (WAN) Optimization products that Miercom conducts annually.

The tests depicted in this report provide an overview of key areas of performance, stability and reporting the difference between the Cisco Wide Area Application Services (WAAS) solution as tested using the Cisco WAAS appliance and the Riverbed RiOS software on Steelhead appliances.

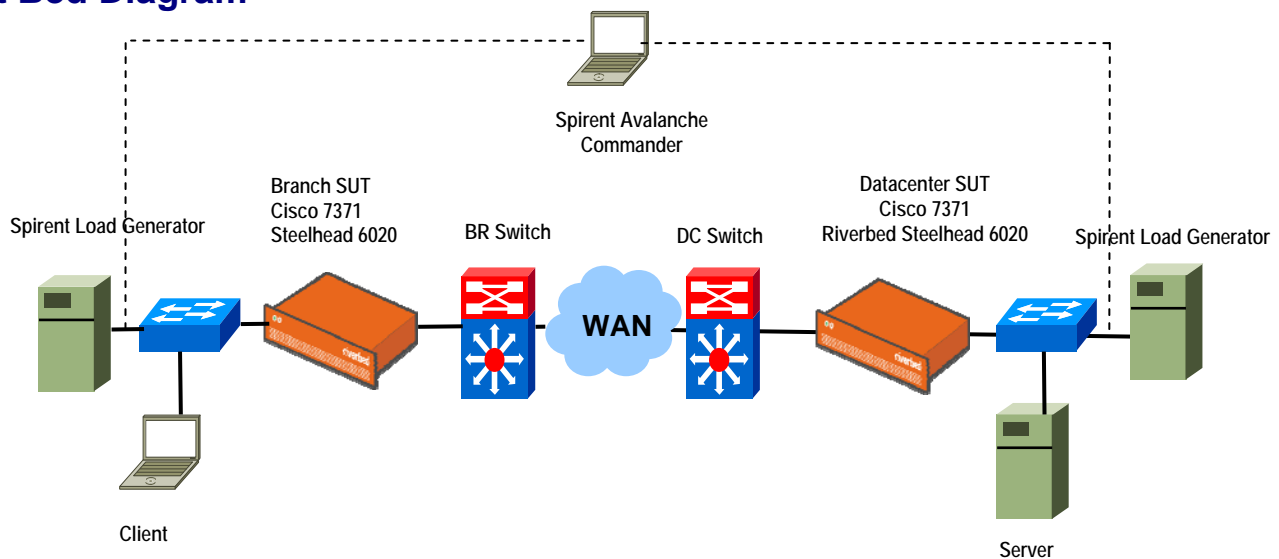
Cisco WAAS is a unified platform, supporting application acceleration and WAN optimization solutions, with proven advanced performance of TCP based applications delivered across the WAN. The modular architecture offers scalability and high performance throughput, graceful restart from a system overload or crash, and provides advanced security, stability and high availability. (*continued on page 3*)

**Figure 1: Cisco WAE-7371 vs. Riverbed Steelhead 6020
TCP Sessions Optimized Under Heavy Load**



Cisco WAE-7371 appliance achieved full target 4,000 concurrent sessions, while the Riverbed Steelhead 6020 appliance exhibited system instability, and process crash at 3,012 concurrent sessions. The Riverbed Steelhead appliance took an additional 16 minutes to recover before TCP optimization resumed, as the device completed system dump of log information. This recovery time could vary between 30 to 45 minutes.

Test Bed Diagram



How We Did It

We employed a Spirent (www.spirent.com) Avalanche System with a 2500 Reflector and 2500 Generator controlled with Avalanche Commander. We used version 7.51 build 42389 with OS 6212 for the test system. Also utilized in testing for the WAN Optimization Industry Assessment, was the Ixia's (www.ixiacom.com) IxLoad to generate the HTTP and FTP traffic. IxLoad is a scalable solution for testing converged multiplay services and application delivery platforms. IxLoad emulates data, voice, and video subscribers and associated protocols for performance testing.

The Systems Under Test (SUTs) included the Cisco (www.cisco.com) WAE-7371 device with WAAS running version 4.1.3, and the Riverbed (www.riverbed.com) Steelhead 6020 device with operating systems tested including RiOS 5.5.0, 5.5.1. We tested with multiple versions of the operating system and found the same test results as discussed in this report.

We spot checked other Cisco WAAS appliances to verify that the product architect and operating system are consistent within the product family line. Appliances supported for Cisco and Riverbed:

Cisco WAAS appliances:

- WAVE 274,474,674, WAE 512,612,7341,7371, NME-302,502,522

Riverbed RiOS appliances:

- SH-50,100,200,250 L,250M,250H, 550, 1050, 2050, 5050, 6020, 6050

We conducted several iterations of each test, rebooted test systems and systems under test frequently during the testing process to ensure that the test results were repeatable, consistent, and that previous tests conducted would not impact the subsequent measurements. Additional tests to simulate normal to light load conditions were conducted specifically on the Riverbed Steelhead 6020 to ensure that the device did in fact work properly and that it was not defective.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Contact reviews@miercom.com for additional details on the configurations applied to the system under test and test tools used in this evaluation. Miercom recommends customers conduct their own needs analysis study and test specifically for the expected environment for product deployment before making a selection.

(continued from page 1) The Cisco WAE-7371 with WAAS proved better overall stability under high traffic loads as explained in the section “Test Stability Under Load”. As shown in Figure 1 on page 1, the Cisco WAAS appliance achieved full target concurrent session, compared to the Riverbed RiOS Steelhead appliance.

Stability Under Load

We looked at several devices in the Cisco WAAS product family and reviewed the architecture, operations and the common thread between the products.

We included overall results based on the architecture, and what can happen when processes crash, for the Riverbed and Cisco WAAS product lines.

Both products, tested under moderate to light load, could optimize traffic including multiple concurrent TCP get requests without difficulty, and up to the rated concurrent session rated capacity, according to vendor specifications.

However, under periods of heavier traffic load

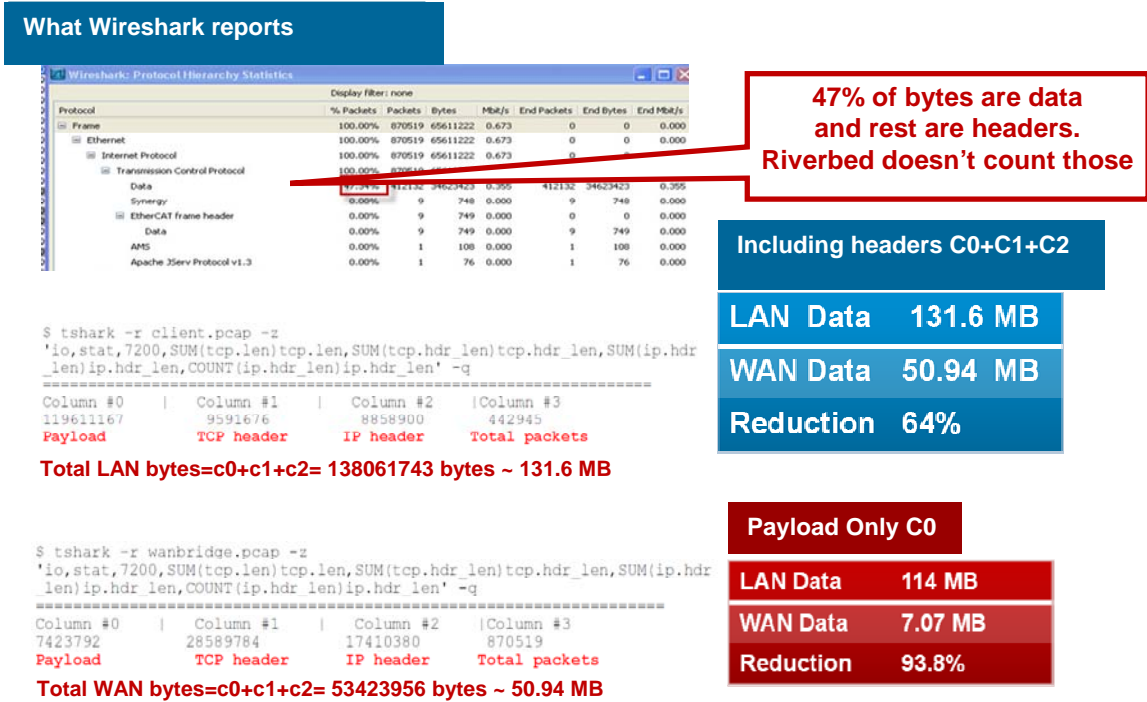
only the Cisco WAAS appliance was able to pass stability and throughput tests, whereas the Riverbed RiOS Steelhead appliance exhibited signs of system instability and actually blocked TCP traffic even when failing over to pass through mode.

The test results shown in Figure 1 on page 1, illustrate that Cisco WAAS appliance achieved full target 4,000 concurrent sessions, while the Riverbed RiOS Steelhead appliance exhibited system instability and process crash at 3,012 concurrent sessions. In a three minute period of complete TCP blocking, the Riverbed Steelhead appliance took an additional 16 minutes to recover before TCP optimization resumed, as the device completed the system dump of log information. This recovery time could vary between 30 to 45 minutes as illustrated in Riverbed technical notes.

The tests conducted using the Spirent Avalanche System were repeated at different rates of session “Ramp Time”, allowing the systems additional time to respond and establish TCP sessions.

The setting for Spirent Avalanche was 4,000

Figure 2: Cisco WAN Optimization Efficiency



Actual bandwidth reduction calculated was 64% whereas, the Riverbed Steelhead appliance reported 93% from the Data Center device, which correlates to payload only optimization.

concurrent sessions, with a 500 second ramp-up time and 1,000 second steady state time. The Riverbed Steelhead 6020 appliance crashed before we could achieve the 4,000 concurrent sessions we were targeting. At 3,012 sessions, the device exhibited a “SPORT” crash due to a memory resource constraint.

The system’s instability “SPORT” crash anomalies seem to be related to the Riverbed RiOS software, as opposed to the specific hardware device tested.

We observed 16 minutes for the system process and memory dump as expected, and explained in Riverbed technical notes, after the occurrence of a “SPORT” crash. It is the time the system requires logging information to help debug the anomaly which caused the instability. Documentation indicates it is not uncommon for this occurrence to take 30 minutes or longer depending on the amount of information in the system cache at the time of the crash.

In this test, we attempted up to 6,000 concurrent TCP sessions with a 300 second ramp-up time, and 1,000 second steady state time.

Due to modular application architecture, Cisco WAE-7371 with WAAS exhibited no signs of system instability or blocking of traffic even under heavy traffic load scenarios, which caused competitive products with monolithic application architecture to fail.

Reporting Accuracy

Traffic optimization efficiency was gauged for both products tested. Based on previous testing and analysis of the Riverbed Steelhead product, Miercom is aware of the product’s reported WAN optimization performance using “payload” only, and discounts the frame header. This is significant for heavy load, small frame size including transactional based traffic. Based on hands-on testing, we further observed that the other “overhead” WAN traffic was also not accurately reported or taken into account by Riverbed WAN optimization reporting. In one testing scenario, the actual bandwidth reduction was 64%, whereas the Riverbed Steelhead reported 93% from the Data Center device, which correlates to “payload only” optimization.

The bottom line - if there are smaller packets, for example in transactional based traffic, the Riverbed

Steelhead appliance will not accurately report the optimization efficiency. [Figure 2](#) on page 3 shows that Cisco WAAS accurately reports the optimization efficiency. The Cisco WAAS product proved to be accurate and reporting matched the performance efficiency as observed on the WAN. Competitive products were inaccurate and exaggerated performance improvement.

Disruptive Configuration Changes Analysis

We conducted several configuration changes to each of the systems under test to measure the impact of configuration changes on the devices. In our testing example, we disabled and re-enabled CIFS (Common Internet File System) traffic acceleration. In testing the Riverbed Steelhead products, we observed that that once this minor configuration change was made, the device required a system reset. Interruption of all traffic optimization occurred as the device switched to “pass through” mode. The Cisco WAAS configuration changes were made on the fly, and did not interfere with other “threads” of traffic being optimized. Only a minor detection of any CIFS traffic optimization disruption was experienced. Overall, we deem the configuration changes as non-disruptive for the Cisco product, whereas the Riverbed RiOS product required service resets after configuration changes.

Operating System Revision Cycle

Miercom conducted an audit of the software revision changes for both the Cisco WAAS and the Riverbed RiOS. In a one year period April 2008 to March 2009, there were 100 reported releases of the Riverbed RiOS from version 3.X to 5.X, whereas, Cisco had eight releases 4.0.x to 4.1.x. The cycle of updates required for the Riverbed Steelhead product is deemed overly excessive. Due to the Riverbed monolithic architecture, any small bug can be critical and crash the Riverbed core WAN optimization process “SPORT”.

Bottom Line

The Riverbed product tested with RiOS 5.5.0 and 5.5.1, utilize one monolithic process with few threads found in testing to have a single point of failure, once the “SPORT” crashes occurred. The Cisco products tested with WAAS 4.1.3 were found stable and resilient.

Miercom Performance Verified

The Cisco WAAS 4.1.3 (tested with Spirent Avalanche System) proved superior performance and overall stability under high level of TCP session optimizations. The Cisco WAE-7371 with WAAS also proved more accurate in reporting capability, than other products tested in its class, particularly regarding WAN Optimization Efficiency.

In recognition for completion of the hands-on testing and independent analysis conducted by Miercom, the Cisco WAAS is rated Miercom Performance Verified. Testing conducted in this report is deemed repeatable and accurate. Miercom will assist customers with specific needs analysis and reproduction of these tests included in this report upon request.



**Performance
and Stability**



**Cisco WAAS 4.1.3 with
WAE-7371 Appliance**



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