Lab Testing Summary Report

March 2012

Report SR120221B

AR Series Routers

Performance and Reliability

Vendor Tested:

HUAWEI

Products Tested:

AR207V-P
AR1220VW
AR3260
Enterprise Routers

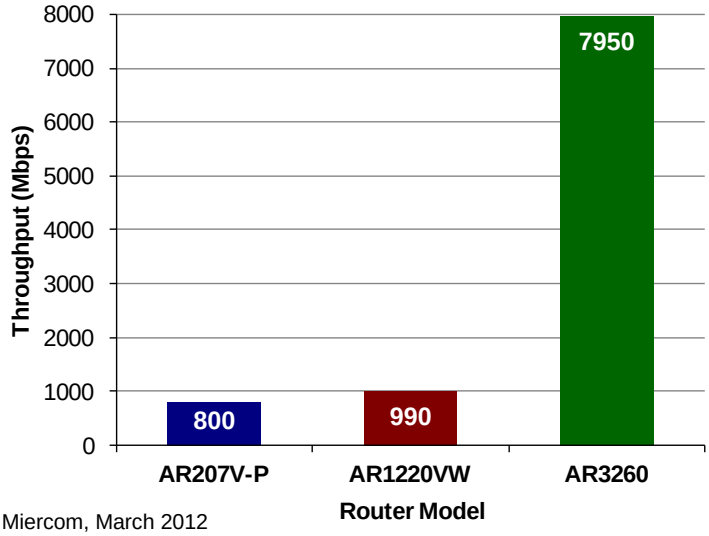
Key findings and conclusions:

- **Huawei AR207V-P router achieved 177.5 Mbps throughput with IMIX traffic and IPsec security enabled**
- **Using 1500-byte frames, the AR1220VW router was capable of forwarding 990 Mbps**
- **AR3260 forwarding rate was 7,950 Mbps using 1500-byte frames, exceeding vendor specifications**
- **Hot-swappable fan modules and interface cards, as well as LACP load balancing on LAN cards, reduce downtime and maintain high availability in networks**

Huawei Technologies engaged Miercom to evaluate several series of enterprise routers for performance and reliability. The features of each individual router are common to the rest of the router series product line. The features and capabilities discussed in this report by product can be supported in the entire family of products.

In the AR200 series of routers, Miercom tested the AR207V-P, while the AR1220VW model was tested from the AR1200 series, and AR3260 was tested from the AR3200 series. These routers provide a rich set of functions including routing, switching, voice, security, and wireless capabilities. They are ideal for small branches or can be used on larger network deployments. The AR200 series are fixed port devices without modules, and the AR1200/AR3200 have two or six slots.

Figure 1: Huawei Enterprise Routers
1500-byte Frame Forwarding Performance



Source: Miercom, March 2012

Comparison of 1500-byte forwarding performance for the AR207V-P, AR1220VW, and AR3260. Product testing proved all routers exceed the rated specifications.

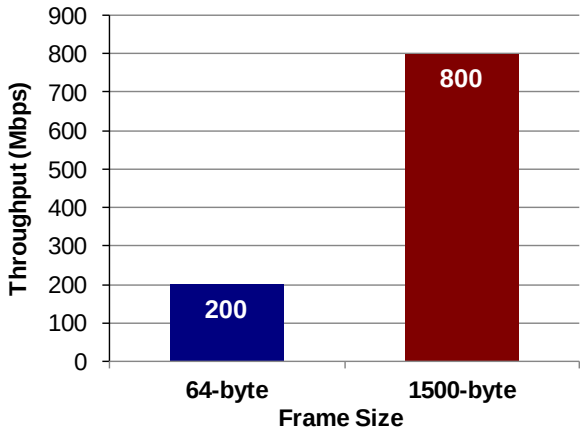
The AR200 series supports plug-and-play configuration and deployment using a USB flash drive. Building an enterprise network is therefore expedited, and an IP address does not need to be configured manually. The AR200 router series are fixed configuration, offering eight FE ports, and two WAN uplinks, which provide both load balancing and link redundancy. The AR200 series also reduces office noise with its fan-free design, and can be deployed in a severe environment, thanks to a 6kV surge protection capability.

Miercom tested the AR1220VW router. The AR1220VW is a small branch router for an enterprise network. The AR1200 series of routers has four models available, the AR1220, 1220V, 1220W, and 1220VW. The 1220V model has voice features and DSP with 32 supported channels. The 1220W is a wireless router with 802.11 b/g/n capabilities. These routers have two card slots for various interface cards supporting different network uses and deployments. These cards include Layer 2 and Layer 3, FXO voice, and E1 / T1 multifunction cards.

Miercom evaluated the AR3260 enterprise router for voice capabilities, feature verification, and interoperability with third party routers.

The AR3200 series of routers provides routing, switching, voice, security, and wireless capabilities such as 3G and Wi-Fi. These routers are for use in an enterprise environment such as headquarter offices. The AR3260 series of routers has six card slots for Layer 2 / Layer 3, FX0 voice, and serial port cards.

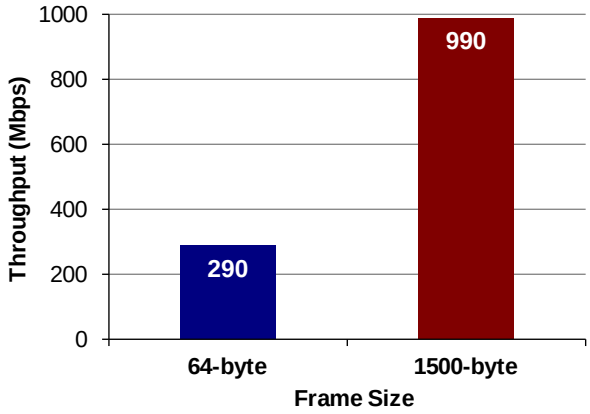
Figure 2: Huawei AR207V-P Router Forwarding Performance



Source: Miercom, March 2012

Throughput for the AR207V-P router with 64-byte and 1500-byte frames.

Figure 3: Huawei AR1220VW Router Forwarding Performance



Source: Miercom, March 2012

AR1220VW router with 64-byte and 1500-byte frames throughput.

Forwarding Performance

To test the forwarding performance of the AR G3 routers, we connected each router to a traffic load generator. *Figure 1* displays the forwarding results for all three model routers when transmitting 1500-byte frames. For more information on the throughput results of the AR G3 routers, see *Table 1* on *page 3*.

The first router that was evaluated for forwarding performance was the AR207V-P device. This router was connected to the load generator using eight ports. Two different types of traffic were sent to the router in two separate tests. In the first test, we sent 64-byte frames to the router at 100% load. A forwarding performance rate of 200 Mbps was recorded. The second test for the AR207V-P router was performed using 1500-byte frames. This test resulted in a forwarding performance rate of 800 Mbps. See *Figure 2*.

The second router evaluated for forwarding performance was the AR1220VW. With the router connected to the load generator using two ports, two types of traffic were sent in two separate tests. Shown in *Figure 3,* the forwarding rate for 64-byte frame sizes was observed *continued on page 4*

Table 1: Throughput Performance Tests RFC 2544

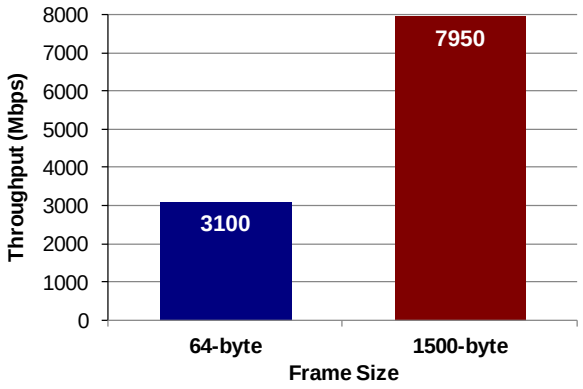
	RFC 2544 Throughput	AR G3 Series				
	Device Under Test	**AR200**	**AR1220**	**AR2220**	**AR2240**	**AR3260**
64-byte packets	IPv4 Forwarding (Mbps)	200	290	800	1700	3100
	NAT (Mbps)	96	150	400	900	1700
	IPsec (3DES) (Mbps)	40	50	140	350	740
IMIX packets	IPv4 Forwarding (Mbps)	600	850	1600	5200	7000
	NAT (Mbps)	300	800	1000	4000	5500
	IPsec (3DES) (Mbps)	100	220	500	1000	2662.5
1500-byte packets	IPv4 Forwarding (Mbps)	800	990	1900	5900	7950
	NAT (Mbps)	390	900	1600	4700	5900
	IPsec (3DES, 1460-byte packets) (Mbps)	114	340	1300	3000	5600

We conducted a series of tests to stress product performance at different packet sizes with various combinations of features enabled as shown in the above table.

RFC 2544 is a standard test methodology from the Internet Engineering Task Force (IETF) that defines a consistent way of testing network equipment. The Throughput test calculates the maximum number of frames per second that can be transmitted without error. We tested with 64- and 1500-byte sized packets and IMIX packets, then compared the number of transmitted and received frames. When frame loss was encountered, the transmission rate was divided by two and the test was restarted. If during this test there was no frame loss, we increased the transmission rate by half of the difference from the previous test. This methodology is repeated until there is no frame loss and an Mbps value is found.

For IPsec, the focus is on throughput and scalability. The packet size must be reduced to account for the additional packet headers when using IPsec. IPsec throughput is measured using a single tunnel with 1460-byte packets, with ESP encapsulation and 3DES encryption.

Figure 4: Huawei AR3260 Router Forwarding Performance



Source: Miercom, March 2012

64-byte and 1500-byte frames throughput for AR3260 router.

to be 290 Mbps. When tested with 1500-byte frames, the forwarding rate was observed to be 990 Mbps.

We then evaluated the AR3260 router. This device used the same setup and test criteria as the other two routers and was connected to the load generator using eight ports. Using the same types of traffic, the forwarding rate for the 64-byte frame test was 3,100 Mbps. The forwarding performance for the 1500-byte frame size was 7,950 Mbps. See *Figure 4*.

IPsec Performance

Throughput was tested with security services enabled for the AR G3 routers. Identical testing topologies were used for all three AR series of routers. To perform the test, the router was configured with IPsec policies enabled. Two identical routers were then connected to each other using static routes. Once the routers were connected, a load generator was introduced into the network.

The throughput test was run twice, to determine the throughput performance for two types of traffic profiles. For the first test, 1400-byte frame sizes were sent to the router. The second test utilized an IMIX distribution for throughput measurement. The identical setup was used to perform testing for all three router models.

Throughput results for the AR207V-P router were 192.5 Mbps for 1400-byte frames. With IMIX traffic 177.5 Mbps throughput was observed.

The AR1220VW router delivered even higher performance. For the 1400-byte frame size, throughput values were 350 Mbps and IMIX was 220 Mbps.

The highest throughput values came from the AR3260 router. The 1400-byte frame size test yielded a result of 5,737.5 Mbps and the IMIX resulted in 2,662.5 Mbps throughput.

HQoS

The AR3260 router supports HQoS functionality. HQoS allows prioritization of traffic to ensure the best QoS for the most important traffic on a network. In the event of network congestion, the highest priority traffic is delivered first. This policy is used to guarantee business critical traffic.

To test this feature, five queues were set up with one assigned as EF (Expedited Forwarding) and the remainder as AF (Assured Forwarding). EF guarantees immediate or first delivery, while AF requires guaranteed delivery and is higher priority than best-effort. Bandwidth was set to 5,000 Mbps for each queue in the system. Sending traffic over a load generator at 7,000 Mbps, we observed that the traffic in the EF queue was delivered first and subsequent traffic was delivered after, verifying the HQoS settings of the router worked as expected.

Hot-Swapping

The AR1200 and AR3200 series of routers support hot-swappable interface cards, which give the routers added resiliency. If an interface card fails while the router is in operation, the router does not need to be powered down. Instead, the damaged card can be pulled and replaced without any network downtime. To test that this feature worked properly, we set up a router with multiple interface cards installed. While the router was operating, an interface card was physically removed. After we verified that the removed card no longer appeared in the CLI display, a new interface card was then re-inserted in the router and the CLI was checked again to make sure the new card was recognized by the router. This test performed as expected without any unexpected behavior observed.

LACP Between Different LAN Cards

The AR3200 series of routers support LACP load balancing between different LAN cards. To fully test this feature, two AR3260 routers were connected to each other and then connected to a traffic generator.

Each router had two LAN cards installed. The first LAN card from the first router was connected to a port on the first LAN card of the second router. The second LAN card of each router was then connected to each other in the same manner as the first LAN cards. Traffic was sent from the traffic generator to the routers. Using the interface of the routers and the load generator, we verified that traffic was load balanced between the two LAN cards. Each router has the ability to display the load being transmitted over its interfaces in the CLI. LACP between LAN cards operated as expected, without any issues during testing.

AR3260 Supports 147 GE Ports

The AR3260 router can support a total of 147 GE ports using the six service slots available on the router. Each one of the interface cards that can be installed in the service slots supports 24 ports. Installing the six cards gives the router a total of 144 ports, and the additional three static ports on the front of the router total to 147 GE ports. To verify that the router does in fact recognize all the ports, we installed all six interface cards and viewed the CLI to make sure the device displayed all the ports available for use. Once the test was performed, all 147 ports were available to use and were operational.

Bottom Line

AR G3 routers have a variety of performance features that allow the routers to perform efficiently and maintain reliability in a network deployment.

AR G3 routers contain redundant modules, such as fan and power, to reduce downtime in the event of a module failure. The routers also contain hot-swappable interface cards in case a card goes bad and needs to be replaced. It is not necessary to interrupt router operations or cause network outages.

Table 2: Huawei AR G3 Routers Feature Comparison

Model	AR200 Series	AR1220 Series	AR3200 Series
Service Slots	N/A	2 Slots	6 Slots
IPsec	✱	✱	✱
Hot-Swappable	N/A	✱	✱
USB Ports	1	2	2
QoS	✓	✓	✱
IPv6 Routing	✓	✓	✓
Voice Features	✱	✱	✱
Memory	512 MB	512 MB	2 GB
Multicast	✓	✓	✓

Source: Miercom, March 2012

✱ - Tested Feature
✓ - Vendor Data

The AR3260 router can support LACP between different LAN cards. This is particularly useful when heavy traffic is being sent across the router to ensure that no one LAN card is overwhelmed with traffic, which could result in a bottleneck causing packets to be delayed or dropped.

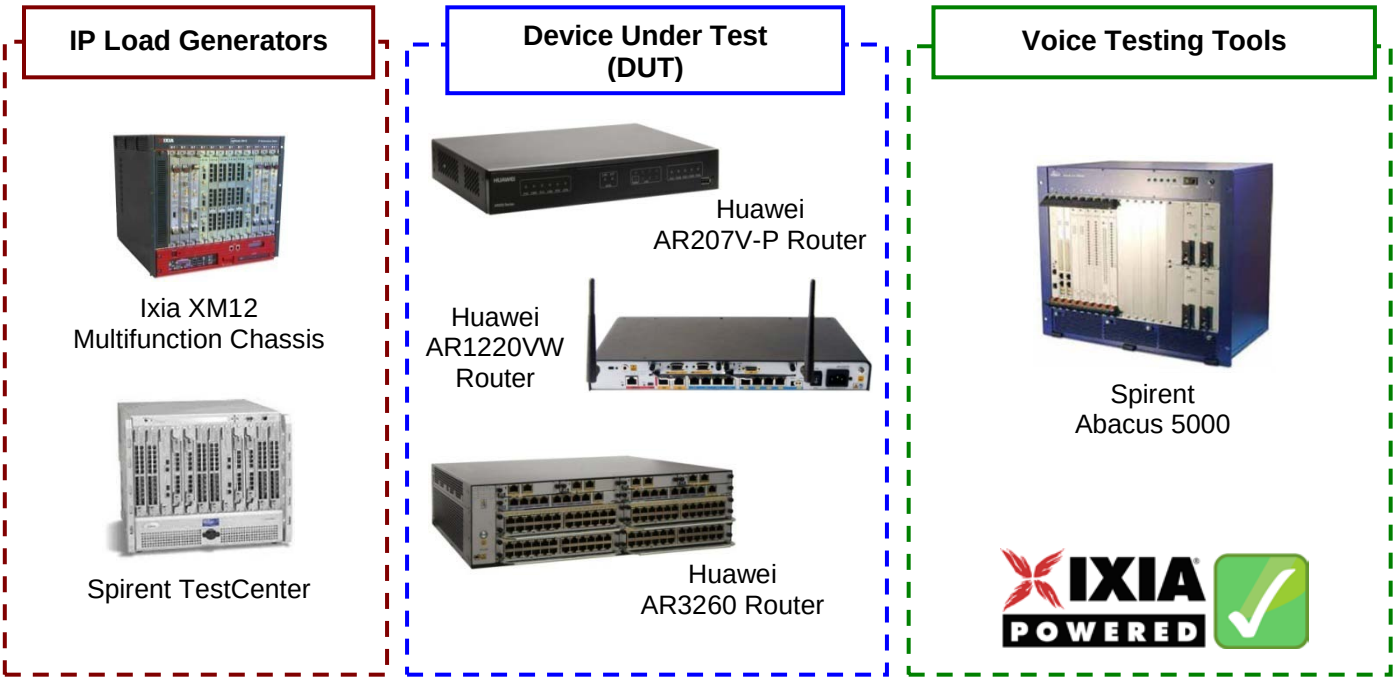
The AR3260 router also supports HQoS functionality. This allows network administrators to prioritize traffic to ensure the best QoS for users on the network.

All AR G3 routers have high throughput when forwarding traffic. The AR3260 router has a high throughput rate of 7950 Mbps when passing 1500-byte frame sizes. The AR1220VW was able to achieve a forwarding rate of 800 Mbps for the same frame size.

All routers were tested for their individual performance features. All features outlined in this report operated as described with no unexpected errors in operation.

The ARG3 routers have exceptional speed and performance. They are excellent choices for enterprise network deployments.

Test Bed Diagram



Source: Miercom, March 2012

How We Did It

The Huawei AR207V-P, AR1220VW, and AR3260 routers were fully evaluated for throughput and IPsec capabilities as well as other performance features. Testing was conducted to verify that each of the features outlined in this report operated as described. Although we tested each individual router, the features in the model are supported on the other devices in the router series making the results applicable for the entire series.

Some of the testing required the use of a traffic generator to evaluate the features of the router. Two different traffic generators were used during the course of the testing, Ixia XM12 running IxNetwork version 5.50.121.48 and Spirent TestCenter running version 3.76.0076.

We used the Spirent Abacus 5000 to generate voice and SIP calls and to stress the voice portion of the router. The Abacus 5000 is capable of testing scalability, voice quality, and load handling.

Miercom recognizes Ixia (www.ixiacom.com) as an industry leader in energy efficiency testing of networking equipment. Ixia's unique approach utilizes coordination of energy measurements with network traffic load – allowing energy consumption to be graphed against network traffic volume. Real-world traffic is generated by Ixia's test platform and test applications, principally IxNetwork for Layer 2-3 routing and switching traffic and IxLoad for Layer 4-7 application traffic.

The tests in this report are intended to be reproducible for customers who wish to recreate them with the appropriate test and measurement equipment. Current or prospective customers interested in repeating these results may contact reviews@miercom.com for details on the configurations applied to the Device 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 product selection.

Miercom Performance Verified

The performance and reliability of Huawei AR Series of routers was verified by Miercom. In hands-on testing, Huawei demonstrated exceptional performance by:

- 177.5 Mbps throughput with IMIX traffic and IPsec security enabled was recorded on AR207V-P
- Hot-swappable fan modules and interface cards reduce downtime and offers high resiliency
- Using 1500-byte frames, the AR1220VW router was capable of 990 Mbps forwarding capacity
- AR3260 handles forwarding at a rate of 7,950 Mbps using 1500-byte frames

AR207V-P Router

AR1220VW Router

AR3260 Router

Huawei Technologies Co., Ltd.
http://enterprise.huawei.com

About Miercom's Product Testing Services

Miercom has hundreds of product-comparison analyses published over the years in leading network trade periodicals including Network World, Business Communications Review, Tech Web - NoJitter, Communications News, xchange, Internet Telephony and other leading publications. Miercom's reputation as the leading, independent product test center is unquestioned.

Miercom's private test services include competitive product analyses, as well as individual product evaluations. Miercom features comprehensive certification and test programs including: Certified Interoperable, Certified Reliable, Certified Secure and Certified Green. Products may also be evaluated under the NetWORKS As Advertised program, the industry's most thorough and trusted assessment for product usability and performance.

