Miercom

Lab Testing Summary Report

December 2014

Report 141214

Product Category:

Wireless Access Points

Vendor Tested:

CISCO

Products Tested:

Cisco Aironet 2702i

Aruba Networks AP-225

Ruckus Wireless R700

Miercom PERFORMANCE VERIFIED™

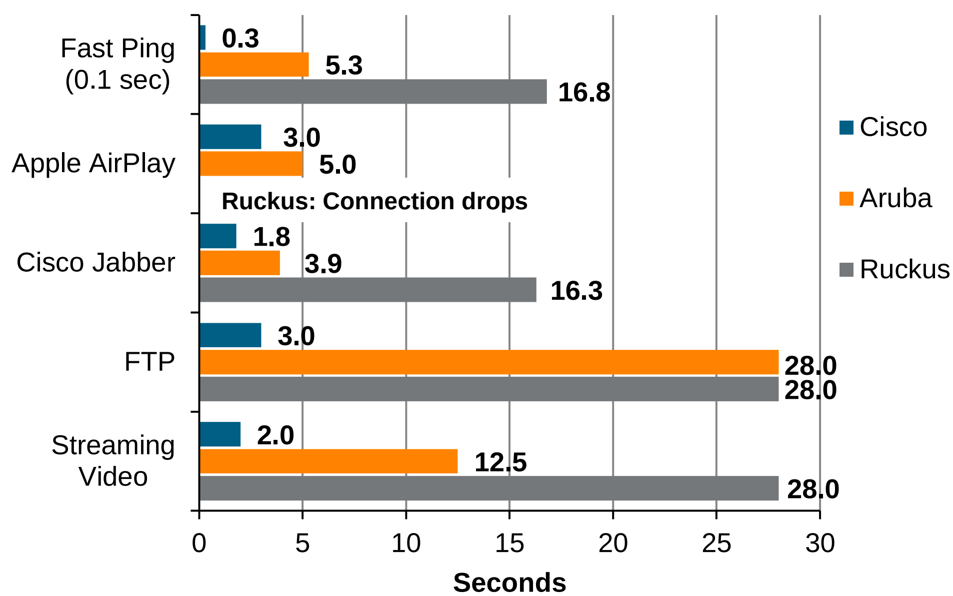
Key findings and conclusions:

- **Tests found the Cisco Aironet 2702 and 5508 controller can sustain more good-quality voice-and-video sessions than either Aruba or Ruckus, along with higher speed data downloads**
- **Cisco's 5508 wireless LAN controller and Client Stateful Switch-Over (SSO), delivers faster WiFi-network recovery and shorter application-flow interruption than either Aruba Fast-Failover or Ruckus Smart Redundancy configurations**
- **On average, Jabber sessions resume twice as fast with Cisco SSO than Aruba, and nine times faster than Ruckus; streaming video sessions resume six times faster with Cisco than Aruba, and 14 times faster than Ruckus**

Cisco engaged Miercom to compare characteristics of the Aironet 2702 wireless access point with comparable products from Aruba Networks, the AP-225, and Ruckus Wireless' R700 AP. One of the key characteristics tested was more related to the vendors' wireless LAN controllers (WLCs) and, in particular, the performance of the WLCs in a high-resilience, primary-standby failover configuration.

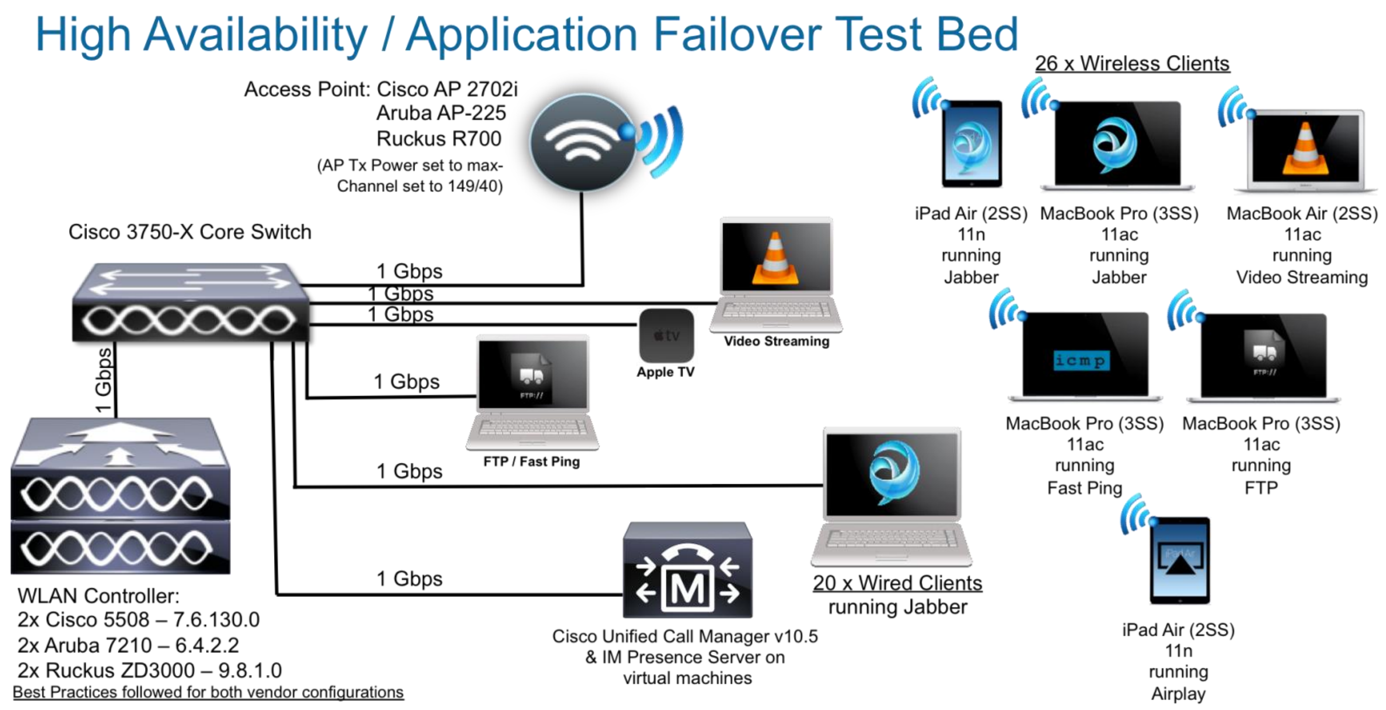
A second test assessed the vendors' AP-and-WLC capability to sustain quality voice and video sessions to all clients in the AP's serving area while also sustaining data downloads.

Figure 1: How Long Are Apps Interrupted?
After primary WiFi controller fails, before sessions resume



Source: Miercom, December 2014

Fastest recovery. *The most resilient wireless-control packages from Cisco, Aruba and Ruckus were individually tested. Applications were run and then the primary wireless controller was failed. The times for application resumption are shown above. These are the average values of multiple test runs.*



Source: Cisco

Fail-over test bed. *Each vendor's high-availability package – wireless Access Point (AP) and redundant Wireless LAN Controllers (WLCs) – were tested separately to determine the impact of a failed WLC and fail-over on active sessions. The Cisco package enabled application sessions to resume quicker, in all cases.*

Wireless Controller High Availability

What can a user organization do to maximize its WiFi network uptime? Wireless vendors support various high-availability configurations, in which a redundant Wireless LAN Controller (WLC) is set up to take over if the primary WLC fails.

But how do these resiliency packages compare? That's what we wanted to find out in this series of tests. Three vendor packages were assembled:

- The Cisco 2702i wireless Access Point (AP) with Cisco 5508 Wireless LAN Controller, configured redundantly for Client Stateful Switch-Over (SSO).
- Aruba Networks' AP-225 AP with the Aruba 7210 WLC, arranged redundantly in a Fast Fail-Over configuration.
- Ruckus Wireless' R700 AP with the Ruckus ZD3000 WLC, arranged redundantly in a Smart Redundancy configuration.

The objective: To test how long it takes each to recover from a Wireless LAN Controller failover.

As the test bed diagram above shows, an assortment of background applications was launched and running before the primary WLC was failed (by pulling its power cord). Background traffic included:

- 20 wired clients (laptops) running Cisco Jabber video sessions, along with 20 Apple MacBook Pro and iPad wireless clients, also running Jabber sessions.
- A MacBook Air was streaming video.
- A MacBook Pro was accepting a long FTP file transfer.
- An iPad wireless client was running a timer, using Apple TV to display the time reading on a large TV monitor (see picture next page).
- A fast ping (0.1-second intervals) was running from a wired to a wireless client.

We intentionally selected this mix of clients and application traffic to gauge the effect of a WLC fail-over on different applications running in active sessions. The clients included:

- The Apple iPad Air wireless clients, supporting IEEE 802.11n wireless operation, with two spatial streams.
- The MacBook Pro wireless clients supporting the latest IEEE 802.11ac specification, with three spatial streams.
- The MacBook Air wireless client supporting the latest IEEE 802.11ac, with two spatial streams.

The tests proceeded: one at a time the vendors' WLC fail-over configurations were exercised.

When the active WLAN controller was failed (the plug pulled), the video, FTP and timer on the TV would freeze until the standby WLC took over and the connections returned.

The time for the standby WLC to take over is measured by the fast-ping output – by counting the number of ping failures between the fail of one WLC and the restart of the other.

Most applications would eventually restart successfully, and the time that each restarted was measured by reviewing the external video and noting the time of the video freeze until its restart. This test procedure was repeated for each vendor's AP/WLAN controller package.

Each vendor configuration was tested multiple times, and the application-interruption times shown here and in *Figure 1* on *page 1* are an average of those results.

Fast Ping Results

Vendor	Average Outage Time (Seconds)
Cisco	**0.3**
Aruba	**5.3**
Ruckus	**16.8**

Apple Airplay

Vendor	Average Outage Time (Seconds)
Cisco	**3.0**
Aruba	**5.0**
Ruckus	**Connections dropped**

Cisco Jabber (avg for MacBooks and iPads)

Vendor	Average Outage Time (Seconds)
Cisco	**1.8**
Aruba	**3.9**
Ruckus	**16.3**

FTP Download

Vendor	Average Outage Time (Seconds)
Cisco	**3.0**
Aruba	**28.0**
Ruckus	**28.0**

Streaming Video

Vendor	Average Outage Time (Seconds)
Cisco	**2.0**
Aruba	**12.5**
Ruckus	**28.0**

All caught on camera. *The various client displays and timers were all recorded by an external video camera. This was used to time the individual application outages as each of the wireless LAN controllers were failed over, until the backup took over, connections were re-established and sessions resumed.*

Cisco maintains constant memory synchronization from the primary to the secondary controller, so the AP does not notice a controller failover and the failover times are fast.

In a few cases, the connections did not always automatically re-establish themselves. Especially where the fail-over times were long, some connections would drop and require manual intervention to re-establish.

This was the case with Ruckus in a few instances. In all the tests with Ruckus, Apple Airplay connections would drop and not reconnect. In at least one case Jabber sessions would drop, too, apparently due to long fail-over times by the Ruckus configuration.

Voice, Video and Data Capacity

In another test, we sought to find out how much traffic each AP can handle, while still maintaining good-quality voice and video calls.

The set-up for this test, depicted in the diagram on *page 5*, was a little different. Ten standard-sized office 'cubes' were set up, each equipped with an Apple iPad Air and a MacBook Pro.

This typical office environment was served by a single wireless AP, wired through a switch to its corresponding wireless LAN controller (WLC). As in the previous test, each vendor's AP/WLC package was tested separately, and each vendor's configuration was tested multiple times.

At the beginning of the test, each of the 20 clients would set-up and run a Cisco Jabber voice and video session. A simple scale was established to rate the usability of each session for business communications:

- Good: Smooth video motion
- Bad: Jerky motion
- Unusable: Mostly frozen
- Dropped connection

Only the Cisco 2702i / 5508 wireless package provided quality real-time video sessions to and from all clients, while simultaneously delivering more download data throughput when compared to the Aruba AP-225 / 710 and the Ruckus R700 / ZD3000.

This is how the vendor's packages were rated for the 20 Jabber sessions:

	Cisco	Aruba	Ruckus
"Good" video connections	20	15	20

Then, while Jabber voice and video sessions were running, data downloads to each of the ten MacBook clients were launched using Ixia's IxChariot tool. IxChariot also carefully measured the amount of data successfully delivered to each client.

While data download was underway, another rating of the video quality was done, with these results:

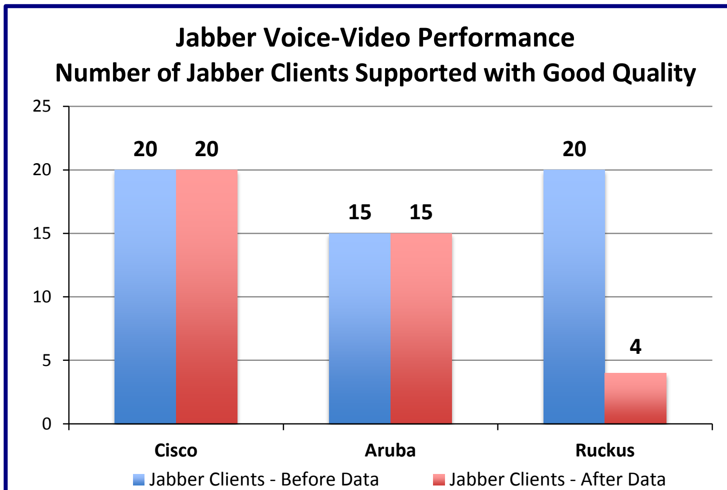
	Cisco	Aruba	Ruckus
"Good" video connections (with data)	20	15	4

Ruckus did not drop any calls, but the rating of most of the video connections dropped to "Bad" or "Unusable."

The rate of successful data download to the ten MacBook clients, concurrent with the Jabber sessions, was also recorded:

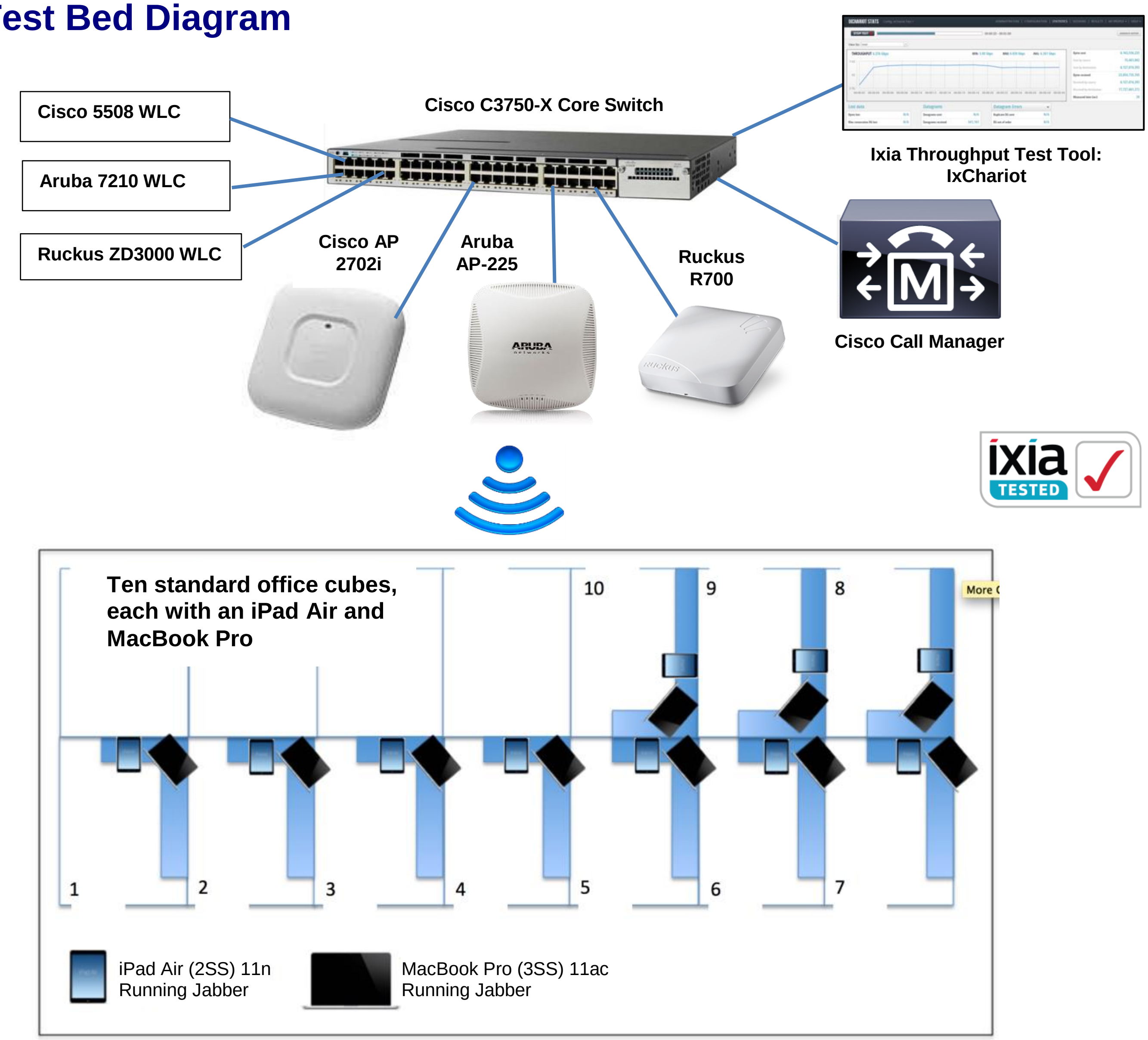
Mbps	Cisco	Aruba	Ruckus
Aggregate	39.3	14.7	9.9
Per client (/10)	3.9	1.5	1.0

With everything else being equal, only the Cisco 2702i / 5508 wireless package was able to maintain quality real-time video sessions to and from all clients, while at the same time delivering more download data throughput, compared to either the Aruba AP-225 / 7210 or the Ruckus R700/ ZD3000.



Source: Miercom. December 2014

Test Bed Diagram



How We Did It

The diagram above shows the configuration for the wireless "Voice, Video and Data-Capacity" testing conducted for this report. Ten standard office cubes were set up, and each equipped with an Apple MacBook Pro and iPad Air. At the start of testing, a Cisco Jabber voice and video call was established to each of the 20 clients, which were then rated for business usability. Then, using IxChariot, data downloads were launched to the ten MacBook Pro clients. The Jabber video sessions were again rated during the data download, and the aggregate data throughput measured.

For both test cases, vendor best practices were followed and configurations were identical, where applicable. For example, low data rates were disabled (12 Mbps lowest) and Application Visibility and Control (Cisco)/ AppRF (Aruba)/ Application Recognition and Control (Ruckus) were enabled.

Miercom recognizes IxChariot by Ixia (www.ixiacom.com) as a leading test tool for simulating real-world applications for predicting device and system performance under practical load conditions. Consisting of the IxChariot Console, Performance Endpoints and IxProfile, the IxChariot product family provides network performance assessment and device testing by testing hundreds of protocols across several kinds of network endpoints. IxChariot is used to accurately access the performance characteristics of any application running on wired and wireless networks.

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 engineers are available to assist customers for their own custom analysis and specific product deployments on a consulting basis. Contact Miercom Professional Services via reviews@miercom.com for assistance.

Miercom Performance Verified

When deployed with the Cisco 5508 Wireless LAN Controller, the Aironet 2702i Access Point provides a resilient, fast-recovering wireless environment.

Testing showed that, when configured redundantly with Client Stateful Switch-Over (SSO), the Cisco wireless package can fail-over and restore application connections much more quickly than the high-availability configurations of either Aruba Networks or Ruckus Wireless. Other testing found that the Cisco wireless solution can sustain more good-quality voice and video sessions and higher data-download volumes than either Aruba or Ruckus.

These comparative and competitive test results substantiate the award of this Miercom Performance Verified Certification to the Cisco Aironet 2702.

Cisco Aironet 2702i Wireless Access Point

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