TEST REPORT

Tolly.

#215101

March 2015

Commissioned by
Araknis Networks

Araknis Networks AN-300-AP-I-N WLAN Access Point

Dual-Band WLAN Rate/Range Performance versus Luxul, Pakedge & Ubiquiti Networks

EXECUTIVE SUMMARY

Wireless LANs (WLANs) have become the primary communications infrastructure for many homes and organizations. For smartphones and tablets it is typically the only supported communication method. For instance, MacBook Air is a WLAN-only system that no longer comes equipped with wired Ethernet.

Araknis Networks commissioned Tolly to benchmark the performance of its dual-band (2.4GHz+5GHz) AN-300-AP-I-N WLAN Access Point (AP) against comparable dual-band units from Luxul, Pakedge & Ubiquiti Networks at various distances.

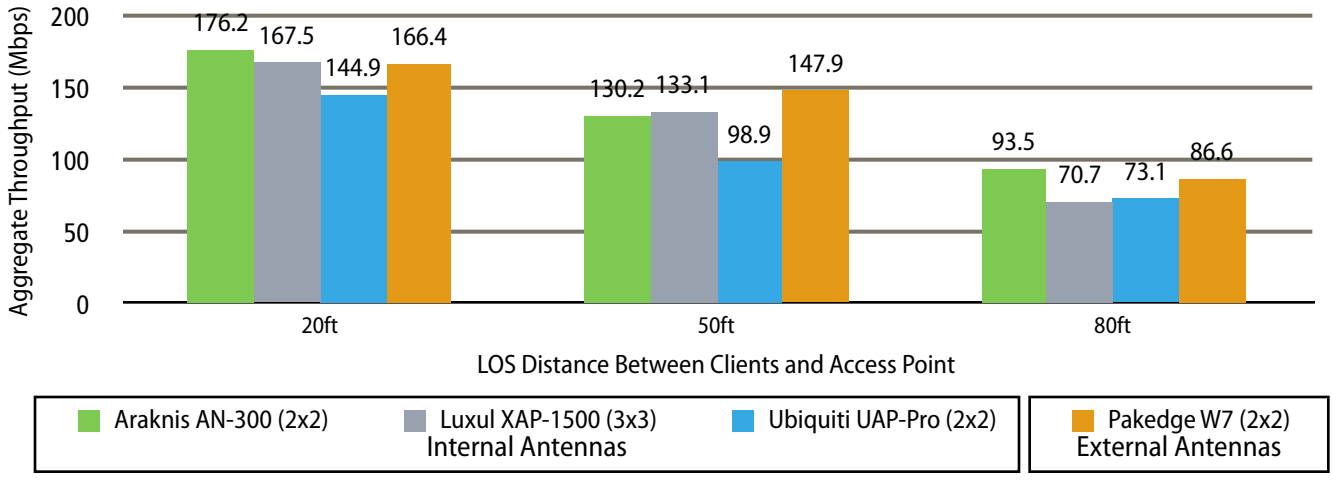
The Araknis Networks AN-300-AP-I-N delivered the highest 5GHz throughput at 20 and 80 feet from the AP. See Figure 1.

THE BOTTOM LINE

The Araknis Networks AN-300-AP-I-N WLAN Access Point delivered:

1. Highest 5GHz throughput at 20 feet
2. Highest 5GHz throughput at 80 feet
3. Highest 2.4GHz throughput at 20 feet

802.11n 5GHz WLAN Access Point Rate/Range 40MHz Channel Performance
Three-Client, Bidirectional Throughput
(as reported by Ixia IxChariot v7.30)



Note:Number of MIMO streams listed after device name. All testing was line of site. All devices used Channel 11 with power set to maximum whenever that option was available. Three runs of 3 minutes each, best used.

Source: Tolly, December 2014

Figure 1

Test Results

Testing was conducted at the various distances in a residential environment with no other wireless LAN access point radios enabled with test channels chosen to minimize any interaction with signals from WLAN systems in nearby buildings.

Tolly engineers deployed comparable APs and, wherever possible, configured them identically. Three systems implemented their antennas internally and one system had external antennas. Systems supported multiple-input, multiple-output (MIMO) technology at either 2x2 or 3x3. For details of systems under test, see Table 1.

Three clients were used representing the common client types of: notebook computer, tablet and smartphone. Tests used Ixia IxChariot to drive traffic between the three WLAN clients and a single, wired Ethernet client. See Table 3.

WLAN Bidirectional Performance

All tests measured traffic running simultaneously "downstream" from the wired client to the WLAN clients as well as "upstream" with the reverse flow. Tests were run three times and the best result used.

5GHz Performance

At 20 feet, the Araknis AN-300-AP-I-N AP with 2x2 MIMO and internal antennas delivered the highest throughput of all devices tested at 91.5Mbps irrespective of antenna configuration or MIMO stream count. The Luxul and Pakedge APs virtually tied for second with 167.5Mbps and 166.4Mbps respectively followed by the Ubiquiti AP at 144.9Mbps. See Figure 1 and Table 2 for all test results.

At 50 feet, the Araknis AN-300-AP-I-N AP delivered 130.2Mbps of throughput. This was on par with the 133.1Mbps from the Luxul AP which had 3x3 MIMO and better than the Ubquitiu AP which is a 2x2 MIMO device.

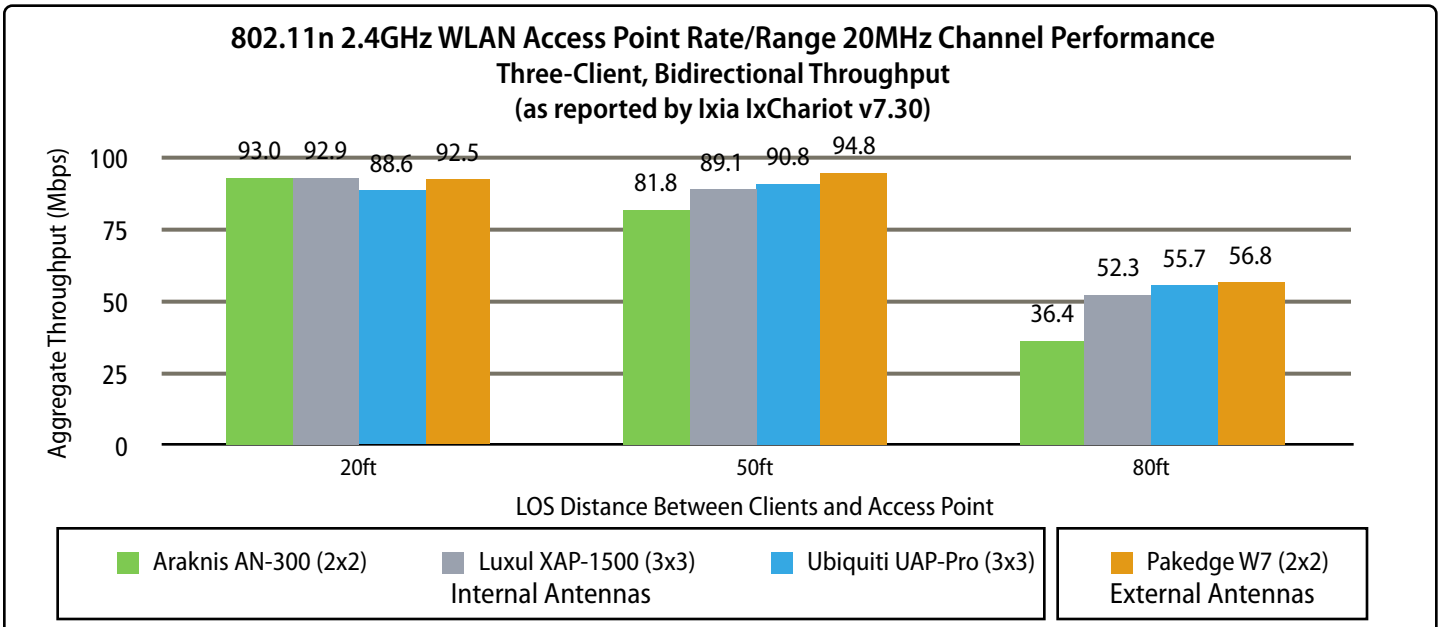
The Araknis solution had the highest 5GHz throughput at 80 feet at 93.5Mbps - better than the 3x3 MIMO solutions from Luxul and Ubiquiti and better than the 2x2 external antenna solution from Pakedge which delivered 86.6Mbps.

Araknis Networks

AN-300-AP-I-N Dual-Band Access Point

Rate/Range Performance

Tested December 2014



Note: Number of MIMO streams listed after device name All testing was line of site. All devices used Channel 11 with power set to maximum whenever that option was available. Three runs of 3 minutes each, best used.

Source: Tolly, December 2014

Figure 2

Dual-Band, 2.4GHz/5GHz WLAN Systems Under Test

Vendor	Model	Description	Version	Configuration Notes	MIMO Streams	Antenna Location
Araknis Networks	AN-300-AP-I-N	300-series dual-band wireless-N Indoor access point	0.9.9.8	Transmit power set to 29 dBm	2x2	Internal
Luxul	XAP-1500	High Power Dual-Band Wireless 900N Low Profile AP	4.0.3 (1/13/14)	No option found to set transmit power	3x3	Internal
Pakedge Device & Software Inc.	W7x	High-powered dual-band AP	Pakedge_v1.9	Transmit power to highest setting of 29 dBm	2x2	4 External
Ubiquiti Networks, Inc.	UniFi AP-Pro (UAP-PRO)	UniFi enterprise WiFi systems. AP long range.	3.2.5.2791	Transmit power to "high"	3x3 (2.4GHz), 2x2 (5GHz)	Internal

Common configuration:. Security set to WPA2-PSK. 2.4GHz channel bandwidth 20Mhz, channel 11m 5GHz channel bandwidth, 40MHz, channel 36. Maximum transmit power.
Firmware used was newest available as of week of December 09, 2014. The Ubiquiti AP required UniFi v3.2.5 controller for management.

Source: Tolly, December 2014 Table 1

2.4GHz Performance

At 20 feet, the Araknis AN-300-AP-I-N AP delivered the highest throughput of all devices tested at 93Mbps irrespective of antenna configuration or MIMO stream count. The Luxul and Pakedge APs tied for a close second with 92.9Mbps and 92.5Mbps respectively followed by the Ubiquiti AP at 88.6. See Figure 2 and Table 3.

Test Setup & Methodology

Objective

The objective of the test was to benchmark the dual-band wireless LAN (WLAN) access points (APs) to determine their throughput at various distances from the test clients.

Systems Under Test

All systems provided access point functionality and were marketed as commercial grade and/or enterprise-class devices. All devices were upgraded to the most current firmware available at time of test. Wherever possible, SUTs were configured with identical settings with respect to bandwidth, channels, transmit power and security. The SUT was connected to a router via a wired Ethernet connection and Gigabit Ethernet switch. The router provided DHCP addressing services for the test clients and was not used during the test runs. For SUT details, please see Table 1.

Traffic Generation Clients

Test traffic was generated using the Ixia IxChariot v7.3 benchmarking system. Three WLAN clients running the IxChariot Endpoint software communicated with a single IxChariot Endpoint that was connected via wired Ethernet connection to the test network via the aforementioned Gigabit Ethernet switch. IxChariot was configured to use the high performance throughput script with two pairs between each WLAN and the wired endpoint. Reporting mode was batch.

Environment & Setup

Testing was conducted in a residence with no other WLAN access points enabled. All testing was line of sight (LOS). SUTs were positioned so that the back of the AP was facing toward the clients. Tests were run at the following distances from the AP: 20, 50, and 80 feet.

For 2.4GHz tests, all systems used Channel 11 with a bandwidth of 20MHz. Wherever possible transmit power was set to the maximum setting.

For 5GHz tests, all systems used Channel 36 with a bandwidth of 40MHz. Wherever possible transmit power was set to the maximum setting.

802.11n 5GHz WLAN Access Point Rate/Range 40MHz Channel Performance
Three-Client, Bidirectional Average Aggregate Throughput
(as reported by IxChariot v7.30)

5GHz Mode									
	Client Distance from AP (feet) vs Average Throughput (Mbps)								
	20			50			80		
AP Under Test	Downstream	Upstream	Total	Downstream	Upstream	Total	Downstream	Upstream	Total
Araknis AN-300-AP-I-N	3.091	173.103	176.194	2.199	128.011	130.210	1.316	92.146	93.462
Luxul XAP-1500	46.288	121.231	167.519	39.279	93.834	133.113	19.957	50.759	70.716
Pakedge W7x	6.181	160.254	166.435	8.391	139.551	147.942	3.515	83.052	86.567
Ubiquiti UAP-Pro	43.039	101.888	144.927	33.978	64.907	98.885	18.50	54.618	73.118

Note: All testing was line of site. All devices used 40MHz Channel 36 with power set to maximum whenever that option was available. Three runs of 3 minutes each, best used.

Source: Tolly, December 2014

Table 2

802.11n 2.4GHz WLAN Access Point Rate/Range 20MHz Channel Performance
Three-Client, Bidirectional Average Aggregate Throughput
(as reported by IxChariot v7.30)

2.4GHz Mode									
	Client Distance from AP (feet) vs Average Throughput (Mbps)								
	20			50			80		
AP Under Test	Downstream	Upstream	Total	Downstream	Upstream	Total	Downstream	Upstream	Total
Araknis AN-300-AP-I-N	1.310	91.702	93.012	1.312	80.461	81.773	0.775	35.633	36.408
Luxul XAP-1500	27.474	65.415	92.889	23.690	65.367	89.057	13.729	38.614	52.343
Pakedge W7x	2.202	90.265	92.467	1.747	93.037	94.784	4.300	52.464	56.764
Ubiquiti UAP-Pro	21.057	67.557	88.614	26.895	63.931	90.826	12.851	42.835	55.686

Note: All testing was line of site. All devices used 20MHz bandwidth on Channel 11 with power set to maximum whenever that option was available. Three runs of 3 minutes each, best used.

Source: Tolly, December 2014

Table 3

Traffic Generation - IxChariot Client Systems

Connection Type	Device Type	Vendor	Model	Configuration	Wi-Fi module	Quantity
Wired	Desktop	Custom build	N/A	Intel Core i7-3770 3.40GHz, Windows Professional SP1 64-bit	N/A (Ethernet: Realtek PCIe GbE Controller)	1
WLAN	Tablet	Lenovo	ThinkPad 8 (20BN-000US)	Intel Z3770 Quad Core, Microsoft Windows 8.1 32-bit	Foxconn M.2 1216 802.11abgn (Broadcom BCM43241 with PA/LNA) (2x2)	1
WLAN	Laptop	Apple Inc.	MacBook Pro	Intel Core i7 2.66GHz OS X 10.7.5	Airport Extreme - Broadcom BCM 43xx 1.0 (802.11a/b/g/n)	1
WLAN	Smartphone	Samsung Electronics	Galaxy S5	Android v4.4	802.11 a/b/g/n/ac MIMO (2x2)	1

Notes: Each client ran IxChariot Endpoint v7.x or 8.x as appropriate. The wired endpoint also ran the IxChariot Console function v7.30 EA.

Source: Tolly, December 2014

Table 4

Tests were run separately for each of the band. Where possible, Tolly engineers disabled the radio for the band not currently being tested via the AP's configuration program. For Pakedge and Ubiquiti Networks, both radios were enabled during testing as no disable option is available but no clients were associated with the band not under test.

Three WLAN clients were run simultaneously for the benchmark testing. Clients were situated at the same distance from the AP under test and were situated within roughly a four foot horizontal space at table level. The AP under test was placed at approximately three feet above the floor. For details of the traffic generation clients, see Table 3.

All testing used the IxChariot High Throughput script. A total of six pairs were used providing bidirectional traffic between each WLAN client and the wired IxChariot endpoint. Run time for each test was three minutes at each test location. Tests were run in batch mode with results reported by endpoints only at the end of each test. In cases where some stations might time out during the 80 feet run, the IxChariot run time option was changed from batch reporting to interactive reporting to be certain that test results could be gathered from the run. Tests were run at least three times at each distance and the best result for each SUT was used. Tolly engineers monitored the AP under test to be certain that three clients were communicating with the appropriate SSID/radio being tested.

Test Equipment Summary

The Tolly Group gratefully acknowledges the providers of test equipment/software used in this project.

Vendor	Product	Web
Ixia	**IxChariot v7.30 EA**	ixia TESTED http://www.ixiacom.com

About Tolly

The Tolly Group companies have been delivering world-class IT services for more than 25 years. Tolly is a leading global provider of third-party validation services for vendors of IT products, components and services.

You can reach the company by E-mail at sales@tolly.com, or by telephone at +1 561.391.5610.

Visit Tolly on the Internet at: http://www.tolly.com

About Araknis Networks

1800 Continental Blvd, Suite 200

Charlotte, NC 28273

Terms of Usage

This document is provided, free-of-charge, to help you understand whether a given product, technology or service merits additional investigation for your particular needs. Any decision to purchase a product must be based on your own assessment of suitability based on your needs. The document should never be used as a substitute for advice from a qualified IT or business professional. This evaluation was focused on illustrating specific features and/or performance of the product(s) and was conducted under controlled, laboratory conditions. Certain tests may have been tailored to reflect performance under ideal conditions; performance may vary under real-world conditions. Users should run tests based on their own real-world scenarios to validate performance for their own networks.

Reasonable efforts were made to ensure the accuracy of the data contained herein but errors and/or oversights can occur. The test/audit documented herein may also rely on various test tools the accuracy of which is beyond our control. Furthermore, the document relies on certain representations by the sponsor that are beyond our control to verify. Among these is that the software/hardware tested is production or production track and is, or will be, available in equivalent or better form to commercial customers. Accordingly, this document is provided "as is," and Tolly Enterprises, LLC (Tolly) gives no warranty, representation or undertaking, whether express or implied, and accepts no legal responsibility, whether direct or indirect, for the accuracy, completeness, usefulness or suitability of any information contained herein. By reviewing this document, you agree that your use of any information contained herein is at your own risk, and you accept all risks and responsibility for losses, damages, costs and other consequences resulting directly or indirectly from any information or material available on it. Tolly is not responsible for, and you agree to hold Tolly and its related affiliates harmless from any loss, harm, injury or damage resulting from or arising out of your use of or reliance on any of the information provided herein.

Tolly makes no claim as to whether any product or company described herein is suitable for investment. You should obtain your own independent professional advice, whether legal, accounting or otherwise, before proceeding with any investment or project related to any information, products or companies described herein. When foreign translations exist, the English document is considered authoritative. To assure accuracy, only use documents downloaded directly from Tolly.com. No part of any document may be reproduced, in whole or in part, without the specific written permission of Tolly. All trademarks used in the document are owned by their respective owners. You agree not to use any trademark in or as the whole or part of your own trademarks in connection with any activities, products or services which are not ours, or in a manner which may be confusing, misleading or deceptive or in a manner that disparages us or our information, projects or developments.

215101 tqj4 -wt-2015-02-25-VerF