TEST REPORT

Tolly.

#214138

November 2014

Commissioned by
Huawei Technologies Co., Ltd.

# Huawei AP7030DE and AP5030DN 802.11ac Access Points

## 802.11ac Rate/Range Comparative Performance Evaluation versus Aruba Networks

## EXECUTIVE SUMMARY

The advent of high-availability wireless has led to an increase in personal devices such as smartphones, tablets and of course, the portable computer, which all allow users to connect from anywhere within the office. All these different ways to connect ultimately means that there are many devices - usually several per person - competing for the same wireless bandwidth. Huawei access points are built upon a dual-core CPU with independent control plane and forwarding plane architecture with advanced technologies including Huawei's High Density Boost, SNR-based protection, etc.

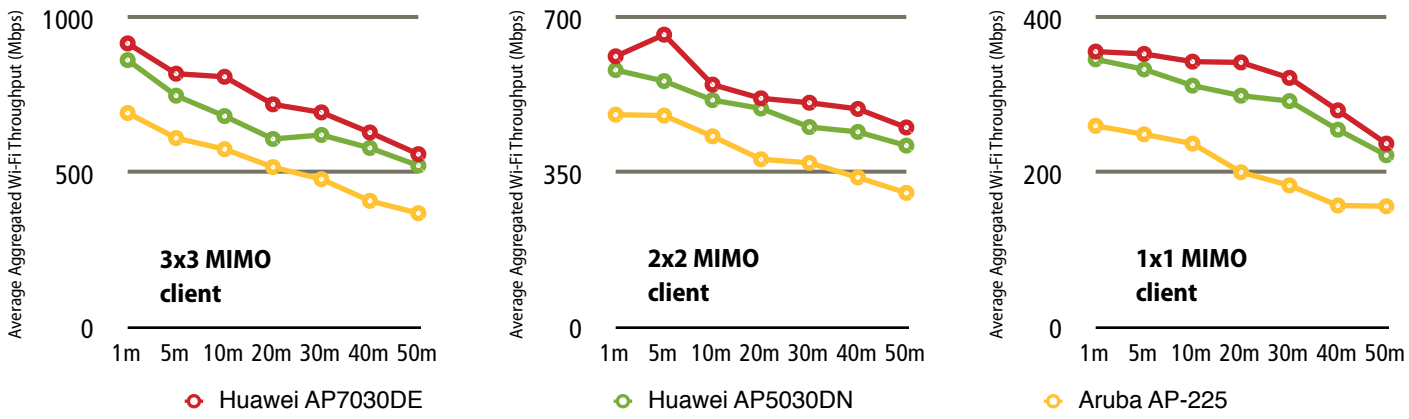
Huawei Technologies Co., Ltd. commissioned Tolly to evaluate their AP7030DE and AP5030DN 3x3 MIMO three-spatial-stream 802.11ac access points versus the Aruba AP-225. In addition to AP7030DE's Gigabit WiFi performance benefits, Huawei's 802.11ac access points outperformed Aruba Networks' AP-225 3x3 MIMO three-spatial-stream 802.11ac access point in coverage, multi-client and anti co-channel interference tests.

## THE BOTTOM LINE

The Huawei 802.11ac access points:

1. Delivered the highest throughput numbers Tolly has validated thus far, with up to 952 Mbps aggregated upstream and downstream WLAN 802.11ac throughput in the 5GHz band with the AP7030DE
2. Delivered 41% and 29% higher average throughput than the Aruba AP-225 for all coverage tests with the Huawei AP7030DE and AP5030DN respectively
3. Delivered 32% to 156% and 20% to 106% higher average throughput than the Aruba AP-225 in the multi-client tests with the Huawei AP7030DE and AP5030DN respectively
4. Experienced 5.1% and 4.2% performance degradation with co-channel interference compared to 25.9% for the AP-225

**Coverage Test Results**
**802.11ac, Single-client, 5GHz, 80MHz Bandwidth, Aggregated Throughput**
**(as reported by IxChariot v7.1)**




Note: One Apple MacBook Pro Retina laptop was used as the 3x3 MIMO 802.11ac client. One Apple MacBook Air laptop was used as the 2x2 MIMO 802.11ac client. One Samsung Galaxy Note 3 was used as the 1x1 MIMO 802.11ac client. The same client at the exact same locations was tested for each AP.

Source: Tolly, October 2014

Figure 1

# Test Results

## Coverage Test

Single-client, aggregated throughput of upstream and downstream traffic from 1 meter to 50 meters was tested to evaluate each access point's coverage performance with different types of 802.11ac clients.

Huawei AP7030DE outperformed the Aruba AP-225 at all test locations with a 32% to 54% advantage using the 3x3 client, 27% to 49% advantage with the 2x2 client, and 37% to 78% advantage with the 1x1 client. See Figure 1 and Table 1 for details.

## Multi-client Test

Multi-client tests were run with 3x3 and 2x2 802.11ac clients to evaluate the aggregated throughput that each AP can provide with multiple devices.

The aggregated throughput of 5, 10, 25, ..., 50 users was evaluated for all APs under test.

With the help of Huawei's High Density Boost technology, the Huawei AP7030DE and AP5030DN provided 32% to 156% and 20% to 106% higher aggregated throughput than the Aruba AP-225. The advantage ratio of Huawei's AP to Aruba's AP increased with the client density. See Figure 2 and Table 2 for details.

## Maximum Throughput

With a single client, Tolly engineers tested the maximum aggregated upstream and downstream throughput that each AP could provide - choosing the best result at either 1 meter or 5 meter distance.

Building upon the independent control plane and forwarding plane architecture, Huawei AP7030DE provided 952 Mbps aggregated throughput with the 3x3 MIMO 802.11ac three-spatial-stream client. This result is the highest aggregated throughput result for a single AP in all WLAN tests Tolly has performed to date (Nov 2014).

The Huawei AP5030DN provided maximum 865Mbps and the Aruba AP-225 provided maximum 694Mbps aggregated throughput during the test. See Figure 3 for details.

**Huawei Technologies Co., Ltd.**

**802.11ac Access Points**

**Performance/ Coverage Evaluation**

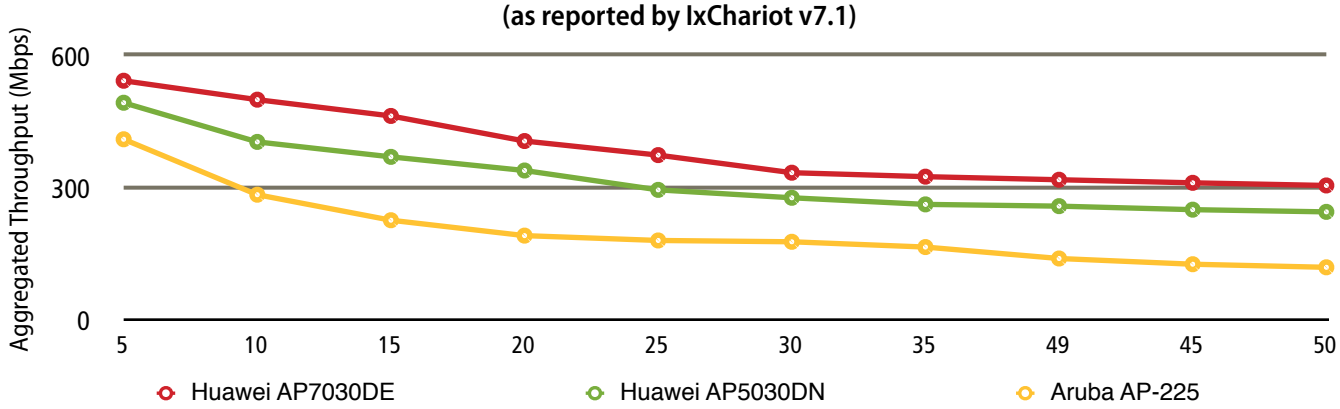
*Tested October 2014*

## Anti Co-channel Interference Test

One key factor to provide optimal wireless performance is avoiding interference. Co-channel interference typically degrade the AP's throughput significantly.

Huawei's access points leverage multiple detection mechanisms such as collision detection, multipath time delay detection,

**Multi-client Test Results**
**802.11ac, 5GHz, 80MHz Bandwidth, Aggregated Throughput**
**(as reported by IxChariot v7.1)**




Note: 15 PCs with the ASUS PCIE-AC68 3x3 802.11ac adapter, 25 PCs with with the ASUS USB-AC56 2x2 802.11ac adapter, and 10 PCs with the Netgear USB-A6200 2x2 802.11ac adapter were used as the clients. The same clients at the exact same locations were tested for each AP.

Source: Tolly, October 2014

Figure 2

and SNR-based protection measures to mitigate interference to wireless signals.

While with the same co-channel interference, the Huawei AP7030DE and AP5030DN's throughput dropped 5.1% and 4.2% respectively while the Aruba AP-225's throughput dropped 25.9%.

# Test Methodology

## Test Environment

Single client coverage tests and maximum throughput tests were performed at an empty large office floor. The AP under test was mounted on a rack and faced the client. One 15" Apple MacBook Pro Retina 2013 was used as the 3x3 MIMO 802.11ac client. One 13" Apple MacBook Air 2013 was used as the 2x2 MIMO 802.11ac client. One Samsung Note 3 smartphone was used as the 1x1 MIMO 802.11ac client.

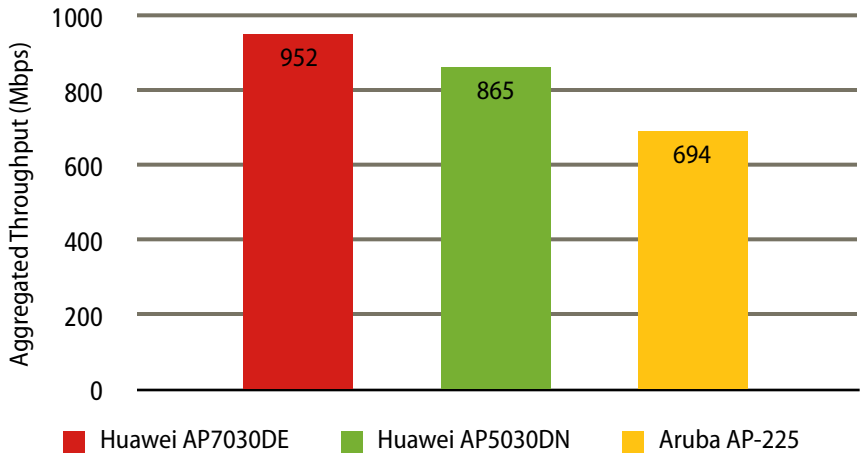
The multi-client tests and the anti co-channel interference tests were taken in a lab as shown in Figure 5. The AP under test was mounted on the ceiling. Each AP was mounted at the same location while it was under test. Clients were placed around the APs on the ground beside the tables. 15 PCs with the ASUS PCI-E-AC68 3x3 MIMO 802.11ac adapters, 25 PCs with the ASUS USB-AC56 2x2 MIMO 802.11ac adapters and 10 PCs with the Netgear USB-AC6200 2x2 MIMO 802.11ac adapters were used.

All tests were run for 2 minutes. Average throughput for the 2 minutes duration was reported. All tests used the built-in UDP high performance script in Ixia IxChariot. The default settings were used for each AP. Engineers only configured the necessary changes including SSID, channel, band, etc.

## Maximum Throughput Test

With a single Apple MacBook Pro Retina late 2013 3x3 MIMO 802.11ac client, Tolly engineers evaluated the maximum aggregated throughput for each AP under 5GHz band and 80MHz bandwidth.

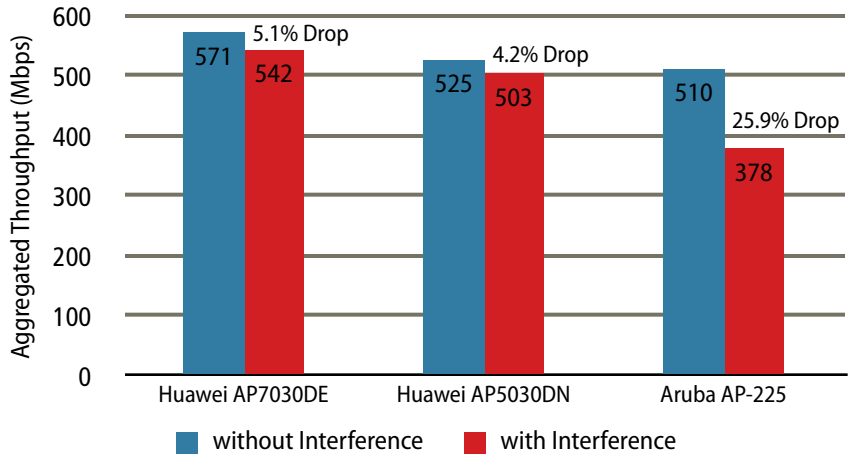
**Maximum Throughput Test Results**
**Single-client, 3x3 802.11ac client, 5GHz, 80MHz Bandwidth**
**(As reported by Ixia IxChariot 7.1)**




Note: One Apple MacBook Pro Retina 3x3 MIMO 802.11ac laptop was used as the client.

Source: Tolly, October 2014 Figure 3

**Anti Co-channel Interference Test Results**
**Single-client, 3x3 802.11ac client, 5GHz, 80MHz Bandwidth, Channel 149**
**(As reported by Ixia IxChariot 7.1)**




Notes: One Huawei AP6010DN-AGN 802.11n AP running on Channel 149 with 40MHz bandwidth was used as the source of interference. One upstream traffic was running with the 802.11n AP to generate the interference. The same client at the exact same location was used for each AP under test.

Source: Tolly, October 2014 Figure 4

Engineers tried several combinations of upstreams and downstreams and used the average of the best 3 iterations to report.

## Coverage Test

The same settings were used for each AP as in the maximum throughput test. The same client at the same locations (1m, 5m, 10m, ..., 50m to the AP) were used for each AP under test. Each location was evaluated with 3 iterations. The average result of the 3 iterations was reported.

## Multi-client Test

50 upstreams and 50 downstreams were used as the total for all clients under test in each density. For example, in the 5 clients test, each client had 10 upstreams and 10 downstreams; in the 30 clients test, the first 20 clients had 2 upstreams and 2 downstreams while the other 10 clients had 1 upstream and 1 downstream.

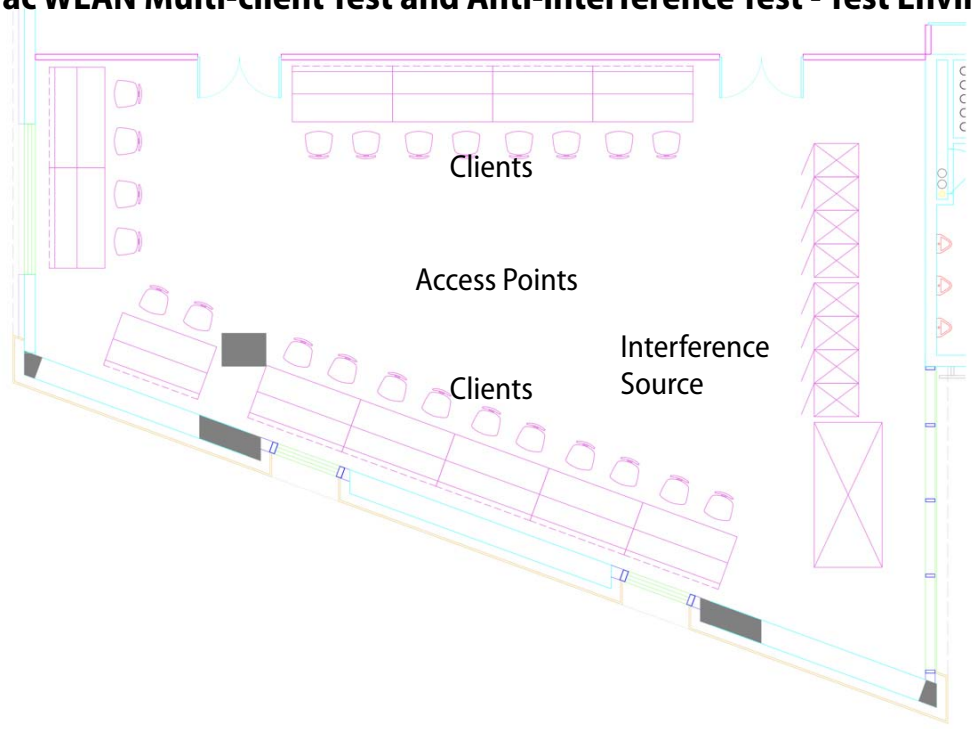
5GHz band, channel 149, 80MHz bandwidth were used for each AP under test.

## Anti Co-channel Interference Test

All APs under test used 5GHz band, channel 149, 80MHz bandwidth. One Huawei AP6010DN-AGN 802.11n AP running on Channel 149 with 40MHz bandwidth was used as the source of interference. One upstream traffic was running with the 802.11n AP to generate the interference.

For each AP under test, engineers first measured the aggregated throughput of one PC with the ASUS PCI-E-AC68 3x3 MIMO 802.11ac adapter using 10 upstreams and 10 downstreams. Then engineers connected the 802.11n AP and started its traffic. With the interference, engineers measured the aggregated throughput of the AP under test again and compared the throughput degradation ratio due to the co-channel interference.

**802.11ac WLAN Multi-client Test and Anti-interference Test - Test Environment**




Notes: 1. In the multi-client test, the AP for interference was not running.
2. In the Anti-interference test, the AP for interference was running on the same channel with the AP under test and passing traffic. One PC with the ASUS PCIE-AC68 3x3 802.11ac adapter was used as the client.

Source: Tolly, October 2014

Figure 5

## Detailed Results of the Coverage Tests - Aggregated Single Client Throughput (Mbit/s)

| | Distance | 1m | 5m | 10m | 20m | 30m | 40m | 50m |
|---|---|---|---|---|---|---|---|---|
| 3x3 MIMO 802.11ac client | Huawei AP7030DE | 919 | 821 | 811 | 722 | 696 | 631 | 561 |
| | Huawei AP5030DN | 865 | 750 | 684 | 610 | 623 | 581 | 524 |
| | Aruba AP-225 | 694 | 613 | 577 | 519 | 480 | 410 | 370 |
| 2x2 MIMO 802.11ac client | Huawei AP7030DE | 614 | 663 | 550 | 519 | 509 | 495 | 453 |
| | Huawei AP5030DN | 583 | 558 | 515 | 496 | 454 | 443 | 412 |
| | Aruba AP-225 | 482 | 480 | 433 | 381 | 373 | 340 | 305 |
| 1x1 MIMO 802.11ac client | Huawei AP7030DE | 357 | 354 | 344 | 343 | 323 | 281 | 238 |
| | Huawei AP5030DN | 347 | 334 | 313 | 300 | 293 | 256 | 223 |
| | Aruba AP-225 | 261 | 250 | 238 | 201 | 184 | 158 | 157 |

Source: Tolly, October 2014 Table 1

## Detailed Results of the Multi-client Tests - Aggregated Throughput (Mbit/s)

| Number of Clients | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|
| Huawei AP7030DE | 543 | 500 | 463 | 406 | 374 | 334 | 325 | 318 | 311 | 305 |
| Huawei AP5030DN | 493 | 404 | 370 | 339 | 295 | 277 | 262 | 258 | 250 | 245 |
| Aruba AP-225 | 410 | 284 | 226 | 191 | 180 | 177 | 165 | 139 | 126 | 119 |

Source: Tolly, October 2014 Table 2

## Systems Under Test

| Vendor | Access Point Model | Access Point Type | Access Controller Model | Version |
|---|---|---|---|---|
| Huawei Technologies Co., Ltd. | AP7030DE | (3x3 MIMO three-spatial-stream 802.11ac AP, internal antennas) | AC6605 | V200R005C10 |
| Huawei Technologies Co., Ltd. | AP5030DN | | | V200R005C10 |
| Aruba Networks, Inc. | APIN0225 | | AC3200 | ArubaOS_MMC_6.3.1.4_42768 |

Source: Tolly, October 2014 Table 3

## 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.

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## Test Equipment Summary

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

| Vendor | Product | Web |
|---|---|---|
| **Ixia** | **IxChariot 7.1** | http://www.ixiacom.com |

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