D-Link®
Building Networks for People

Wireless AC

A numbers game – Wireless AC speeds explained

The figures used to describe the speed of Wi-Fi products can be confusing, here's what the numbers are all about and how they've changed with the introduction of Wireless AC technology.

Next generation Wireless AC products promises four* times the bandwidth of Wireless N and more which, for many of us, is all we need to know. However, Wireless AC can be implemented in a number of ways resulting in products offering varying levels of bandwidth, as indicated by the class numbers (such as AC1200, AC1310) you'll find in various datasheets and other marketing materials.

Understanding what these mean can be taxing so, for the more technical among us, here's an explanation of how those figures are worked out, starting with a little Wi-Fi history.

Before and after Wireless N

Until Wireless N came along it was very easy to work out and understand the speed of a Wi-Fi router or client device. That was, primarily, because there was only one antenna on each side to worry about, supporting just one communication stream between the two (1x1) and resulting in just the one figure when it came to maximum possible throughput, or bandwidth.

For Wireless G (the last standard before the introduction of current Wireless N technology) that worked out at 54 Megabits per second (54Mbps).

Then along came Wireless N with its support for multiple antennae, channel bonding and Multiple Input, Multiple Output (MIMO) technology enabling data to be divided up and transmitted in multiple, simultaneous, streams. All of which made things a little bit more complicated.

With just one antenna on each device it's the same as before, with Wireless N delivering up to 150Mbps – often referred to as N150 in the marketing materials. That then doubles to 300Mbps where two antennae and two streams (2x2) are available, increasing again to 450Mbps with three antennae/streams (3x3) – N300 and N450 respectively.

Not too hard to get to grips with by itself, but Wireless N can also be implemented using 2.4GHz or 5GHz radios or, in a lot of cases, both. So for dual-band products to be able to communicate simultaneously on both wavebands the theoretical throughput you'll see quoted is the sum of what the two radio interfaces are capable of supporting. Hence why you also see N600, N750 and N900 products being advertised, as below:

Wireless N class designation	2.5GHz bandwidth	5GHz bandwidth
N600	300 (2x2)	300 (2x2)
N750	450 (3x3)	300 (2x2)
N750	300 (2x2)	450 (3x3)
N900	450 (3x3)	450 (3x3)

Table 1. Wireless N speeds and feeds (dual-band)

And so to Wireless AC

The enhanced technologies introduced in Wireless AC effectively triple the maximum throughput rate per antenna. So, for example, the 450Mbps currently available using Wireless N with 3 antennae can be achieved using just one antenna with Wireless AC.

OK, so that's allowing for a little rounding up of the actual 433Mbps supported by Wireless AC but you get the idea. Wireless N tops out at 450Mbps overall, whereas with Wireless AC that's more or less where you start.

In order to deliver this up to 4x* bandwidth boost, however, Wireless AC has had to leave the 2.4Ghz spectrum behind and operate solely in the much wider and less crowded 5GHz waveband. A move which is fine when communicating with other Wireless AC devices or Wireless N products using 5GHz radios, whereas the only way of providing backwards compatibility with 2.4Ghz devices is to implement a separate 2.4Ghz Wireless N interface alongside.

As a result of this requirement, virtually all Wireless AC products will be dual-band. And that makes the figures used to indicate overall bandwidth just that little bit harder to decipher as they will be the sum of what the two different technologies and radios support, as in the table below:

Wireless AC class designation	2.5GHz Wireless N bandwidth	5GHz Wireless AC bandwidth
AC580	150 (1x1)	433 (1x1)
AC750	300 (2x2)	433 (1x1)
AC1000	150 (1x1)	867 (2x2)
AC1200	300 (2x2)	867 (2x2)
AC1310	450 (3x3)	867 (2x2)
AC1600	300 (2x2)	1300 (3x3)
AC1750	450 (3x3)	1300 (3x3)

Table 2. Wireless AC speeds and feeds[i]

A second phase of even faster Wireless AC products is in the pipeline which will mean yet more numbers to grapple with. In the meantime this article will help you work out what the first batch of Wireless AC products are capable of delivering although, as with all bandwidth measures, you should treat the figures as a relative rather than absolute measure of performance. Simply because processing, network and other overheads will always have an effect on what you see in practice as can the mixing together of devices with different class designations, interference and the distances involved.

Such considerations aside, the class numbers applied to Wireless N and AC devices can still be very useful when comparing products and are worth looking for when deciding exactly what to buy.

[1] Figures may be rounded for ease of comprehension

* compared with Wireless N300

For more information: www.dlink.com

Updated June 2013

D-Link®
Building Networks for People