



Cisco High Density Experience (HDX) for 802.11ac

The introduction of 802.11ac, the latest Wi-Fi standard, brings higher data rates, better performance, and better coverage compared to earlier standards. The 802.11ac standard uses a wider channel and an improved modulation scheme that also supports more clients. It is built on the success of the 802.11n standard, improving and enhancing the best practices and making it one of the most efficient standards to date. In addition, the presence of 802.11ac can provide more efficiency for 802.11n clients.

For some organizations, the technological efficiencies of 802.11ac is creating a race to upgrade their wireless networks. The race to upgrade is also being driven by the fact that the Wave 1 portion of 802.11ac, with a maximum data rate of 1.3 Gbps, could be the last Wi-Fi solution that organizations can expect before having to upgrade their switches. This combination of factors is causing 802.11ac adoption to increase at a rapid rate, resulting in better performance and coverage for wireless networks.

With increased performance and coverage comes increased traffic. There has also been an increase in the demand for client access, including 802.11ac-enabled clients, a trend that started before 802.11ac was approved as a standard. Many businesses and organizations in industries ranging from higher education and K-12 to healthcare, manufacturing, and retail are facing the same challenges: more users are coming onto the network, users are bringing more devices, more devices offer only wireless connectivity (no Ethernet port), security demands are greater, there are more operating systems to support, and lastly, application updates are needed on each of the devices. All this leads to the larger problem of high density.

However, not all 802.11ac access points are alike and some are not designed to handle higher density. To get the most out of an 802.11ac deployment, an organization must take into account certain fundamental considerations.

Enter Cisco® High Density Experience (HDX) technology. Available on the Cisco Aironet® 3700 and 2700 Series Access Points, Cisco HDX technology is a suite of solutions combining a feature set designed specifically to alleviate the introduction of more clients, more access points, bandwidth-hungry applications, and high-density network strain while providing an unparalleled user experience.

Aironet 3700 Series



Aironet 2700 Series



HDX helps optimize performance, mitigation, scalability, and roaming for high-density wireless networks. Additionally, HDX is a hardware-based solution on a Wi-Fi chipset designed by and for Cisco. It is not simply a set of software features based on a merchant silicon Wi-Fi chipset. It is a purpose-built application-specific integrated circuit (ASIC) that allows networks to get the most out of 802.11ac while also improving the overall performance of their wireless network.

Cisco HDX Technology: Ideal for 802.11ac Networks



- CleanAir 80 MHz
- ClientLink 3.0
- Turbo Performance
- Optimized Roaming
- RF Noise Reduction



HDX features include the following:

Cisco CleanAir for 80-MHz Channels

With Cisco CleanAir® for 80-MHz channels, Cisco has fundamentally retooled the award-winning CleanAir technology to support the entire 80-MHz channel supported by 802.11ac while providing the same level of granularity and accuracy of RF interference detection as before.

The benefit of an 80-MHz channel is the potential to double usable throughput in comparison to the 40-MHz-wide channel used by 802.11n. However, a wider RF channel is also more susceptible to interference. In other words, 802.11ac devices “hear more” than 802.11n devices, primarily due to the wider channel support. Not all 802.11ac access points perform well in the presence of interference. With the increasing number of clients per access point, number of access points in a given wireless network, and number of wireless networks themselves, wireless network operators and administrators are challenged to maintain performance when interference exists. In brief, for high-performance and high-density environments, spectrum intelligence continues to matter. When interference can be detected and identified, it can be mitigated.

For these reasons, Cisco CleanAir technology is a key feature in Cisco’s HDX solution. Because of the increased channel bandwidth for 802.11ac networks, and the increasing density of wireless networks, CleanAir is essential to help assure that no significant degradation or suboptimal performance results from the migration to 802.11ac and the concurrent growth in high-density deployments.

ClientLink 3.0

Cisco ClientLink 3.0, as part of HDX, can perform Cisco’s patented beamforming technology with 802.11ac clients as well as 802.11a/g/n clients. In fact, ClientLink 3.0 complements standards-based Explicit Compressed Beamforming Feedback (ECBF) in which more and more 802.11ac clients will actively participate. ClientLink 3.0 improves the downstream performance and throughput from the access point to the client as well as improving the upstream performance and throughput from the client to the access point. This improves the quality of the connectivity between client and access point, resulting in a more stable network connection.

ClientLink 3.0 will also benefit the wireless network transition from 802.11n to 802.11ac. Every new wireless standard adoption comes with the challenge of a mixed-device environment. We saw it when running 802.11n with the mix of

802.11a/g devices, and we are now seeing it with 802.11ac and a more convoluted mix of 802.11a/n devices. There is a high chance that your office or enterprise will have a blended presence of legacy 802.11a, 802.11n, and 802.11ac client devices coexisting together. ClientLink 3.0 helps solve issues involved in mixed-client networks by enabling higher data rates for both legacy and newer clients, even when they are connected to the same access point. With ClientLink 3.0, networks will be able to enjoy the benefits of 802.11ac with a more efficient and higher-performing Wi-Fi experience.

Turbo Performance

Turbo Performance with HDX technology allows the supporting access points to scale to 60 clients or more, with each client running media-rich video or interactive traffic, without any performance degradation. This is especially important in networks with high client density, in which some competitors fall short at 10 or 20 clients.

Turbo Performance is important with 802.11ac because of the higher data rates, which equate to more packets per second (PPS) flowing through the access point. For example, with 802.11n, an access point might have had to push 30,000 1500-byte packets per second (PPS) through the access point’s data plane. Today, with 802.11ac, that could be 75,000 PPS or more. More PPS means more load on the access point’s CPU, so to really keep up with the demands of 802.11ac, a redesigned access point is needed.

With Turbo Performance, Cisco has fundamentally retooled its access point design specifically for 802.11ac. The result is much less CPU-intensive processing and a much more efficient packet scheduler delivering 802.11ac speeds at a much larger scale than the competition. 802.11ac allows for speeds never before seen on a Wi-Fi access point. Cisco understood the demands caused by these increased speeds and, with HDX Turbo Performance, has fundamentally reworked the data plane in order to enable unrivaled 802.11ac performance and scalability.

Optimized Roaming

Optimized Roaming allows clients to roam more intelligently and cleanly between access points as well as between unlicensed and licensed cells. It addresses a fundamental problem called stickiness in which the client stubbornly stays connected to an access point that it connected to earlier, even though the client has physically moved closer to another access point.



With Optimized Roaming, a Cisco access point continuously evaluates the quality of the Wi-Fi connection for each associated device and can actively disconnect a device upon detecting that the device is moving into a region of poor coverage. This disconnection forces the client to enter its scanning mode much earlier than it ordinarily would, terminating a connection that is becoming essentially unusable and allowing the client to connect to an access point with better performance.

Optimized Roaming not only benefits the end user but also improves the overall performance of the access points and therefore the experience of other users. A client that is gradually degrading in performance (and possibly degrading faster than it can dynamically rate-adapt to or compensate for) may cause a large number of retransmissions, which consume airtime. If enough clients are being sticky, the performance of the access point can be degraded. Therefore, sticky clients that maintain poor connections can easily affect well-behaved clients.

Optimized Roaming helps prevent a negative experience for Wi-Fi users by monitoring the connection quality of all devices and proactively prompting poorly performing client devices to seek a better connection much sooner.

RF Noise Reduction

RF Noise Reduction allows the access point to be more efficient in its use of the RF spectrum and possibly to recycle channels. This feature allows neighboring or adjacent access points to use the same channel to increase overlay density and mitigate configuration errors. With RF Noise Reduction, it is possible to deploy more access points in a given area to meet strenuous service-level agreements (SLAs). This is important for networks with extremely high client density, because it allows the deployment of additional access points to handle the higher client demand. RF Noise Reduction will be available in a future release.

Summary

If you are an enterprise IT manager and you are considering deploying 802.11ac for your wireless network, you must ask yourself if all 802.11ac access points are alike. 802.11ac has some great benefits, such as wirelike speed and the ability to handle a high concentration of clients. However, there is more to consider when deploying 802.11ac. For instance, how do you handle RF interference now that 802.11ac supports 80-MHz channels? Will legacy devices such as 802.11a/g/n allow you to achieve the best performance that 802.11ac is capable of? How can you ensure that your users get the best wireless performance when they roam across a building? And lastly, as more clients join the network, is your performance going to suffer? These are all valid concerns that Cisco addresses with its HDX solution. HDX is a necessary component of a wireless network, complementing 802.11ac while helping ensure that you get the best performance out of your wireless network.