CTRL V SYMPHONY

Harmony in IT Orchestration

INDUSTRY SPOTLIGHT: WIRELESS IN HIGH-DENSITY ENTERPRISE DEPLOYMENTS

The Challenge

In today's corporate environment, mobile access to data and applications is a necessity, with the WiFi Alliance reporting that 71% of all mobile communications flow over WiFi. Corporate WiFi networks are expected to provide seamless connectivity and supply adequate bandwidth to every end user device. In addition, modern WLAN deployments are now commonly expected to support BYOD (bring your own device) networks and IoT devices, drastically expanding the number of devices that require connectivity. Enterprises planning a WLAN deployment to support a high client density environment are challenged with ensuring that all performance expectations are met.

The Solution

Enterprises must take a multi-step approach to high-density enterprise wireless deployments. Firstly, determine the target aggregate bandwidth requirement and estimate the number of access points required. This calculation should be based on the number of client devices expected within a specific area as well as the types of applications these devices will utilize. Different application types have varying bandwidth requirements for optimal performance.

Secondly, real world performance statistics should be considered along with any specific challenges the site itself may present. Enterprises should perform a comprehensive onsite wireless survey to gather accurate data for planning the design. During an active survey, the desired access point model is used to measure how the RF signal propagates throughout the environment. Access point locations can then be determined, proper transmit power levels can be identified to ensure that defined coverage cells are maintained per access points, and the correct amount of signal overlap between access points can be confirmed.

Real-world example

Management of a multi-floor office building planned to completely redesign the internal office layout in order to accommodate additional staff. All access points were to be upgraded to support the high client density that would be present once the office was fully staffed. In order to identify the aggregate bandwidth that would be required to support an estimated 700 client devices, specific application throughput requirements were analyzed.

A concurrent 3 Mbps was planned per device to support video streaming as well as applications with lower bandwidth requirements. The number of access points required to support these data rates was then calculated based on the client count.

(700 clients) x (3Mbps) = 2,100 Mbps aggregate throughput

To calculate the number of required access points, the specifications of the client devices had to be considered. The following hardware was considered when designing and planning for the network.

Cisco 3802i access points (802.11ac, 4x4 MU-MIMO supporting 3 spatial streams)
Company supplied laptops (802.11ac, 2x2 MIMO supporting 2 spatial streams)

Even though the Cisco access point supported the use of three spatial streams, the supported laptops only allowed for two spatial streams, so the calculation had to be based around this number. The network also allowed connections for cell phones and while these devices were not standardized on a specific model or manufacturer, many current-generation phones support two spatial streams as well.

Utilizing the fastest modulation and coding protocols supported by the 802.11ac standard (256-QAM), the fastest data rate achievable with two spatial streams is 173 Mbps. As WiFi is a half-duplex medium and only one device can send or receive at any given time, this 173.3 Mbps is then divided in half. With many access points deployed in close proximity, co-channel interference must be mitigated as best as possible. It is for this reason that access points are configured to broadcast utilizing 20MHz wide channels so that the maximum number of non-overlapping channels can be used throughout the deployment.

The table below shows examples for typical bandwidth requirements for common applications.

Application	Bandwidth
Basic web browsing	500 Kbps
VoIP	320 Kbps
1080p video streaming	2 to 5 Mbps
Video conferencing	1.5 Mbps

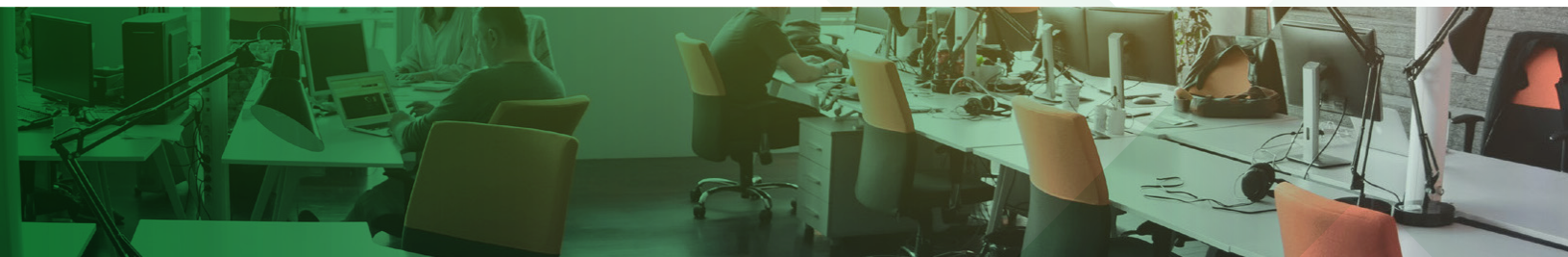
Key Facts

- WLAN for high density office building
- 700 client devices
- 3 Mbps per device
- 2,100Mbps aggregate throughput
- 35 access points

Maximum possible data rates using two spatial streams at 256-QAM

- 20MHz=173.3 Mbps
- 40MHz=400 Mbps
- 80MHz=866.7 Mbps
- 20MHz max. (possible data rate)
  173 Mbps ÷ 2=87 Mbps

For more details about this WLAN deployment or for help with determining your wireless requirements for a high-density enterprise environment, contact CTRL+V Symphony at **www.controlvsymphony.com**



The last step in this calculation was to account for MAC overhead in the data frame. 802.11ac has a surprisingly large amount of overhead, taking up airtime utilization that would otherwise be used for data transmission. The reason for this is that while the data itself can be sent at much higher data rates than previous 802.11 standards, the management traffic must still be sent at lower data rates to support legacy clients. After accounting for this overhead, the enterprise was presented with the following equation:

Approx. 2,100Mbps aggregate throughput ÷ 61Mbps throughput (with overhead accounted for) = Approx. 35 access points

Example of floorplan with proposed access point locations based on active wireless survey

For real world performance metrics, an active wireless survey was performed throughout the entirety of the office space. Access point hardware was used to accurately measure how the proposed access points would perform within the new office layout.

The survey was used to successfully redesign the office building's WLAN in support of a high-density enterprise deployment. Documentation was provided that highlighted new access point locations with photos, recommendations for transmit power/channel allocation, estimated cable runs for all access points, and additional configuration best practices to support the high client density requirement.

For more details about this WLAN deployment or for help with determining your wireless requirements for a high-density enterprise environment, contact CTRL+V Symphony at **www.controlvsymphony.com**