Student Housing Internet Delivery Design Best Practice: WiFi Density

Student Housing residents are bringing more and more WiFi enabled devices into their on and off campus apartments. Student Housing owners and operators need to provide a WiFi service that answers the demand for always available, always fast WiFi connections, and understanding how to provide enough access points to satisfy that demand is a key part of meeting it.

By Andrew Marshall, Campus Technologies Inc, April 2016

As we referenced in our last white paper *(Student Housing Internet Delivery Design Best Practice: WiFi SNR)* understanding the mechanics of successfully deploying WiFi is not something Student Housing owners and operators get directly involved with in most cases.

The objective of these WiFi best practice white papers is to provide Student Housing owners and operators (and any other interested parties) with enough information to make informed decisions that affect the all-important WiFi amenity at their properties.

The three key factors to Student Housing WiFi success are *coverage* (how much usable wireless signal is available, and where); *density* (how many resident devices are served by a single wireless Access Point, or 'AP'); and *manageability* (making sure that the whole property WiFi system acts as a single, coordinated system and not just a sea of unmanaged islands of WiFi)

In this paper we are going to tackle the second aspect, density, the first having been addressed in *"Student Housing Internet Delivery Design Best Practice: WiFi SNR"* and the last part, manageability, to be covered in a forthcoming white paper.

Density

We refer to density as broadly the number of resident devices in use compared to the number of Wireless Access Points (AP's) provided at the property, and more specifically the actual number of devices that will connect ('associate') with an AP at any one particular time.

It's important to understand that the density you are concerned with is driven not by the

number of residents, units or beds to an Access Point, but the number of *devices* to an Access Point.

So many devices

Student Housing probably contains more WiFi devices on a square footage basis than almost any other form of multi tenanted real estate. The average student housing resident will move in with a laptop, a tablet, a smartphone, a kindle, a wireless printer, a media streaming device or two, one or more games consoles or hand held gaming devices, maybe a wireless smart TV .. the list goes on, and is increasing daily.

When designing a network, the minimum number of devices per resident that should

be planned for is 10 devices, and you need to know how to support as many as 20 devices per resident for the future.

Don't forget that residents don't just stay in their apartments, they move around the building. Have enough density to cope with sixty of seventy residents congregating in the clubhouse to watch a game also needs to be accommodated in a robust and reliable WiFi design.

So – the more devices we have on the property, the better density you need.

Why does density matter?

There's a fundamental difference between connecting to the Internet using WiFi, and connecting using a wired connection.

When you connect with a wire, your connection to the Internet is dedicated to you and your device. Nobody else is sharing or competing with you for that path.

When connecting to an AP using WiFi, if you're the only person connecting to that AP, you're still not competing with anyone else. However, as other devices connect to that AP, you start to get into competition with those other devices – because only one can be transmitting or receiving at the same time, and you have to wait your turn.

The net result is that the more devices that associate with a single AP, the less throughput each user will be able to achieve, and the 'slower' the connection will appear, even if there's plenty of wireless signal. As a result, many problems that appear to be 'bandwidth' are in fact WiFi density problems.

What's the correct density?

A good target at the time of writing is to have an average density of 1 AP for every 3 beds, and plan that in the future you will need the infrastructure to install one AP per bed and one AP for each common room.

The Student Enterprise

All access points are not created equal. A $40 consumer grade AP will not support anything like the throughput or number of connections that a $400 enterprise grade AP will. Simply put, you get what you pay for.

For the record all properly designed and implemented Student Housing WiFi networks should utilize Enterprise-grade AP's. These devices are engineered with better quality and capacity hardware and software and implement the tools needed to manage density.

You still need wiring to run wireless

Don't forget that you always need a wire[1] to connect an AP to the network. This wire carries data and, in most cases, power to the AP. Without suitable wiring, you can't increase or improve density.

A property probably has wiring that is designed to feed a specific number of AP's, and those AP's are in fixed locations. To increase density, a number of strategies can be adopted:

- Pulling new wiring to new AP locations; or
- Repurposing existing wiring drops for AP's; or
- Use of 'high density' AP hardware that contains multiple AP's in a single unit.

Some of those options can be difficult and/or expensive. If you're designing or building a new property, the relatively small cost of adding additional spare wire or extra outlets for future expansion is a lot less than having to open all the walls to pull new wire in a few years' time.

What's your density?

To manage density, you need to have a way of monitoring and managing the wireless clients on your property – both how many there are and where they are. In the third white paper in this series, we'll examine how the management of your WiFi network should look. Monitoring and managing your density should be part of it.

Some Student Housing networks restrict the number of devices a resident can connect, by forcing them to register devices they want to use. We believe that is not a sustainable strategy as it is cumbersome and causes resident frustration. We recommend not using this method to control density.

Don't forget you have wires too

Some devices that use WiFi can use either a wired or a wireless connection.

[1] In most cases a Cat-6 or Cat-5e UTP copper wire

You can reduce WiFi density and improve the resident experience by encouraging residents with certain devices to always plug them into a wired connection.

Typically, any device that doesn't run on a battery (such as TV's, gaming consoles, media streaming devices such as Roku, Fire and Apple TV) needs to plug into an AC receptacle. By definition, it's static, and there should be an Ethernet jack for a wired connection within easy reach. Plug those devices in, don't use WiFi.

Next, educate residents on the fact that they will have a much better streaming or gaming experience by 'plugging in'. Provide them with Ethernet cables on demand to enable them to do just that.

Use your WiFi management system to identify WiFi connected devices in this category and to periodically and proactively reach out to those residents to get them to plug in.

Summary

You need to provide enough AP's at a student housing property to allow many devices per resident without causing an appreciable slowdown in their online experience. Right now that's approximately one AP for every three beds, in the next few years that may well increase to one AP per bed or more. These should always be Enterprise-grade AP's.

Having the physical wired infrastructure in place to allow an increase in AP density is crucial to being able to increase density cost-effectively.

Density needs to measured and managed by your network partner to be able to proactively plan AP density upgrades. Having a WiFi management system in place is a critical element of this process.

It's beneficial to everyone if internet connected devices that connect to a 110v receptacle also connect to a wired connection rather than use WiFi.

If you have any questions about providing a great WiFi experience for Student Housing residents or the contents of this white paper, please contact us.

Andrew Marshall
Campus Technologies Inc
(215) 243-7010
amarshall@campustech.net
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Campus Technologies is a national vertically integrated managed network service provider designing, building and operating highly effective wired and wireless networks exclusively in student housing. See more at www.campustechnologies.com