# Wireless LANs in your schools – how to make wise decisions

***Brett Liddle***

Mobile devices are the pencil, paper, and textbooks for students today. The number of Wi-Fi devices is increasing at a phenomenal rate, with students bringing two, three or even more devices to school every day. The use of tablets, netbooks and laptops enables the electronic delivery of textbooks, learning materials and pulling resources off the internet. Administration, teaching and learning are streamlined, improving school operations to provide uninterrupted learning.

Wireless networks have gone from being a convenience to mission critical as schools become more dependent on mobile computing both in and out of the classroom. This means that the network infrastructure must be fast, reliable and pervasive. However wireless LANs may seem complex as Wi-Fi standards and technology continue to evolve and improve.

This article will give you a few simple guidelines to evaluate WLAN solutions in order to install a network that will support your education applications today and well into the future.

How can you be sure that your team is making the right infrastructure deployment decisions to support these new digital learning trends? Historically the focus of Wi-Fi in education has been on wireless coverage – in a few classrooms, labs and perhaps the assembly hall. It wasn't as critical to take a 'deep dive' into the technology. 'Coverage' was the key for getting campus Wi-Fi right. With limited applications, the learning experience was about safe Internet connectivity in the classroom and bandwidth in the lab. Now it's more than just how many Wi-Fi bars show up in your tool bar icon.

Today's story is different, and technology decision makers need to have more robust discussions with their suppliers about some of the key underlying technologies in order to deliver the best mobility experience for students and staff alike. To avoid 'interrupted learning' it's critical to understand the best practices of school-wide Wi-Fi deployment to support BYOD, 1:1 computing and digital curriculum delivery.

Let's take a look at the primary factors to consider when looking at and assessing your wireless solution.

**1. Coverage versus density**: Clearly campus coverage is important, however it is only one component of deploying your Wi-Fi network. Consider the amount of coverage required with a school full of students using multiple devices, anywhere and anytime.

It is just as critical to consider your WLAN density requirements, which depend more on how many devices you expect to connect in any given area. Density requirements can be broken down into three categories:

- The number of devices actively using Wi-Fi at the same time.
- The number of devices associated to Wi-Fi but not transmitting at same time.
- Devices that are not connected but are still actively looking for Wi-Fi, or even broadcasting their own Wi-Fi hotspot.

In addition, it's important to remember that the further away a client is from the access point, the slower the throughput will be. This has driven a major shift in WLAN deployment to ensure the best and most reliable performance; for example, having access points not just in the hallway, but in classrooms as well

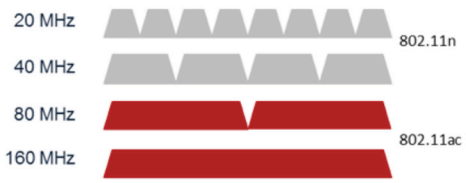
**2. Applications and devices**: The other key component to evaluate is the use of education applications, including:

- The types of applications that will run over the network such as streaming video, voice and data.
- The number of client devices that will have concurrent access to applications that require high bandwidth or high quality of services.
- Mobile applications that cannot drop off the network as students move across campus – for example from the classroom to the library.
- The usage of Apple devices and software that depend on the Apple Bonjour protocol, which can impact network traffic.

### The basics of gigabit Wi-Fi

We can start to address the topics above by understanding some basic 'rules-of-the-road' for successful wireless network deployments.

There are a number of well accepted 'must haves' in educational Wi-Fi deployments. These include, security, guest access, controller-based or cloud enabled architectures and client roaming.




*802.11ac Channel Bonding 1*

However, on top of these fundamentals, 802.11ac represents a better way to deploy Wi-Fi in part by using the 5GHz radio band. Historically 5GHz has been an underutilised band, creating a congested network with most traffic using 2.4GHz. Now that most mobile devices, such as laptops, tablets, and smartphones have 802.11ac built-in, there is much more opportunity to leverage the 5GHz band. The improvements in both access point and client devices enable more efficient deployment.

With operation in the 5GHz band, 802.11ac speed comes primarily from increased channel width and better use of MIMO. A simple metaphor may help in understanding how these technologies improve overall WLAN performance.

You know how frustrating it can be, when even on a multi-lane highway the slower cars never seem to move over for other cars to pass. This creates congestion and slows all traffic on the highway, which is 'unfair' to the faster cars. (Driving within the speed limit of course)! While there are plenty of roads (coverage) the lanes are too narrow.

What if it were possible to combine those narrow lanes and build a wider highway with guaranteed passing lanes? This is a significant advantage of 802.11ac over .11n. With increased channel bonding there are fewer, but much wider channels. Two 80MHz channels combined with 3x3 MIMO is exactly what enables gigabit Wi-Fi. One double-wide lane adds capacity AND allows faster cars the ability to pass the slower cars, alleviating bottlenecks.

**Rules for the road**

As you work with your wireless LAN provider the following discussion topics will help you address the important considerations above. You can probe your vendor on the educational network they propose will match these requirements.

- Future-proof your network. Plan for campus wide coverage and more capacity, then you need to today. With good upfront planning you can make it simple to add more access points later as your needs grow and budget allows.
- Plan for a wireless network that enables every student in a single classroom to concurrently run real-time collaborative software, streaming videos and moving about the campus. With 802.11ac providing up to gigabit speeds, schools today are deploying networks that enable all of these applications.
- Determine that the solution can handle the Apple Bonjour® protocol to ensure that it can properly route traffic to the correct Apple device and secure it as well. You don't want students streaming content to Apple TVs in the next classroom, nor do you want to have them printing across campus.

Onboarding, authentication, and guest management – the task of ensuring authorized devices connect easily and securely while other devices do not – should be easy. Network bandwidth and RF spectrum must be protected and leveraged for teaching and learning, not gaming and Netflix.

**Summary**

With the rapid migration to 802.11ac educators can deploy a wireless network infrastructure that is ready to support current and future applications. Even the most bandwidth intensive applications such as video streaming are well supported by 802.11ac gigabit performance. The need for coverage plus density to support these applications will drive purchase decisions. Identify vendors who can best support your existing networks, while migrating to 802.11ac. Plus make sure they can handle a well-managed, wide-open and client-fair highway.

For further information please read the Meru authored white paper: *12 Important Considerations When Selecting Your K-12 Wireless Vendor* ET

**The Nuts and Bolts of 802.11ac**

802.11ac is a big technical and market advancement over 802.11n, offering the promise of gigabit wireless. It builds upon 802.11n by improving data rates, network robustness, reliability, and RF bandwidth utilization efficiency. The 802.11ac standard brings five major enhancements over 802.11n:

**Wider channels**

802.11ac supports 20, 40, and 80MHz channels, with optional support for 160 MHz channels. This effectively doubles the channel width and data rate of 802.11n.

**Improved modulation**

Enables more data to be encoded in the same packet size. More bits per packet means higher data rates. .

**Increased number of spatial streams**

802.11ac defines up to eight spatial streams, with a maximum of four streams per client. Each additional spatial stream increases the aggregate data rate. A single-stream 802.11ac client operating in an 80MHz channel may achieve a 450Mbps raw data rate. A three-stream 802.11ac client will be able to operate at 1.3 Gbps.

**Beamforming standard**

Beamforming, which enables a focused Wi-Fi signal, is optional in the 802.11n standard resulting in incompatibilities. 802.11ac specifies a standard implementation that facilitates interoperability and increases the effective range of 802.11ac-based systems.

**Multi-user MIMO (MU-MIMO)**

Multi-User MIMO (MU-MIMO) defines how an access point can communicate with up to four clients simultaneously. Leveraging the capability of beamforming, this feature incrementally increases the total active client capacity for the network. While not supported in the current generation of 802.11ac client chipsets, this functionality should be available in the second-generation chipsets expected to reach market in 2016.

**Brett Liddle** has a long history in IT Management and spent almost five years as the head of IT at the MCG. "I left my IT management career for Meru because they have the RF architecture down pat. Every time I present the Meru solution to a customer it is more a consultative discussion around technology rather than sales exercise. While not always needed, we welcome a robust technical discussion to explain the unique advantages Meru delivers to address density issues."