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WiFi in the New Education Environment

The Current Environment

It is very hard not to notice an almost seismic shift in the way data networks within schools and colleges are being used today compared to say 5 to 10 years ago. At NETbuilder Education we have witnessed a steep upward trend in the use of WiFi enabled mobile devices within both primary and secondary schools and it isn't that difficult to see why.

The way education establishments are adapting to the "Digital Age" or the "Internet of Things" and applying it to curriculum delivery is, in my view, the most significant and palpable evidence of this not-so-subtle change.

A "traditional" school data network would, in simplistic terms, look something like this:

- A Cat5e or more latterly a Cat6 cabled network from the classroom or office to a core Gigabit switch. Data outlets for teacher desks, Building Management, WiFi Access Points, CCTV, IT suites, printers and Interactive White Boards
- Cat5 or Cat6 copper inter-switch trunks limited to Gigabit Ethernet speeds connected local hard-wired devices back to a main Data Cabinet. In some case Multi-Mode fibre may have been installed but still connected to single Gigabit Ethernet switches
- The core Ethernet switch connected to a broadband or Leased Line firewall/router as well as central on-site or in some cases cloud-based application servers.
- Campus wide WiFi connectivity used as a back-up to the more robust, faster and resilient cabled network.
- WiFi Access Points operating at legacy slow data rates (See table 1 below)
- We are seeing the upgrade of core networks to 10Gbit now – mostly driven by large scale high speed/density WiFi access points.

In essence, the demands on the network were driven by a traditional hard-wired device model i.e. PC or Laptop as used by either office staff for general email and school application usage or teaching staff for the same reasons plus occasional delivery of curriculum material.

Fairly predictable and importantly generally static.

What's Changing and Why and what does this mean for the education network?



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The perfect storm of high-speed mobile devices operating within the commoditised 4G mobile band, the pervasive nature of social media applications and the increasing development of Cloud based services. This concoction has created a generation of users who experience and interact with the world in a very different way in which networks were originally designed to fulfil. Information and knowledge, despite its provenance is at the fingertips with a request/response transaction turned around in milliseconds – and with rich high definition graphical content as well. The expectation of this generation of users is also that mobility should not negatively impact the experience either.

So now move this generation of users to the classroom environment. Quite simply, the world is changing and methods of delivering education have to change with it or they soon become irrelevant and not fit for purpose.

Many education establishments have sought to embrace the new world of ubiquitous data by developing and rolling out “Digital Learning Programmes” the foundations of which are based on a 1:1 ratio of Smart Tablet devices to pupils, access to Cloud based applications and services and near total campus mobility with zero loss of connectivity. These new digital platforms are designed to complement and enrich the traditional methods of teaching in the classroom but in order to do so they have to be able to meet the instant demands at any given time. We all know that we give technology a bit of a chance but soon ignore it if it becomes cumbersome to use, difficult to set up or unreliable in delivery.

A “new” education managed data network would now look something like this:

- A 10Gigabit core and edge Ethernet switched network connected via Single Mode fibre
- Cat6/6a data cable installed to the desktop for administration and teaching staff as well as other services such as HD CCTV, BMS etc
- Existing WiFi Access Points (WAPs) replaced with new high speed, high density variants based on 802.11ac Wave 2 technology and connected via new Cat6 data cable
- Following a WiFi site survey, new 802.11ac WAPs installed to ensure high speed, high density coverage is available throughout the campus. (See Table 1 for typical data rates)
- The need for near real-time WiFi network management will prevail as the WiFi network becomes more “mission critical” than ever before
- Network security and GDPR compliance will force “Guest Network” and BYOD security policies within the WiFi network.
- The need to segregate data traffic into Virtual LANs based on traffic types and profiles will become more widespread



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- High speed WiFi access will be required for lock down, register and fire drill type scenarios within playground and muster areas of the school.
- As more education services such as MIS, Finance and even pupil homework access/storage move to The Cloud then the need for higher speed, resilient broadband services increases.

Fundamentally we need to upgrade the backbone network to 10Gigabit and deploy a WiFi solution that can support higher speeds with more concurrent connected users and that can be managed remotely.

At NETbuilder Education we have implemented new “WiFi for Education” networks as per the above criteria in both school refurbishments and new builds. In both cases the prominent factor was the roll out of WiFi enabled Laptops or Smart Tablets to a complete classroom of pupils/students at a time – in some cases up to 60 or more and with the requirement that the lesson could move from one room to another but still need to be connected.

So, high data throughput to enable streaming of rich content applications, high client density and uninterrupted mobility or “roaming”.

What is the new “WiFi for Education” Network?

A WiFi for Education network will at least consist of the following attributes:

- Support for the latest 802.11ac Wave standards with greater than 3 Gbit/s combined data throughput rates per WAP
- Support multiple antennas and spatial streams to permit **high client density** in excess of 150 concurrent users per WAP
- Support multiple BSSIDs per WAP – typically no more than 4 should be required
- Support advanced remote radio management features to enable real-time radio configuration and tuning by experienced and qualified personnel.
- Designed and implemented based on detailed WiFi site survey heat map data and calibrated against capacity and usage parameters.
- Consist of a single vendor solution and ideally with legacy 802.11b/g standards switched off.
- WAPs would be located correctly to ensure optimum coverage and Signal-to-Noise Ratio (SNR)

In summary, the new “WiFi for Education” network cannot be based around the traditional “fit and forget” approach as so often adopted in the past.



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What can NETbuilder Education do to help?

At NETbuilder education our approach is to offer a free-of-charge* WiFi Heat Map Survey of your school or college campus as per Diagram 1 below. We will analyse the data and make recommendations as to how we would improve your WiFi network to meet the anticipated demand. We would offer a choice of vendors to suit your budget both of which meet or exceed the requirements highlighted in the survey.

Ground Floor WAP Locations and WiFi Heatmap Coverage

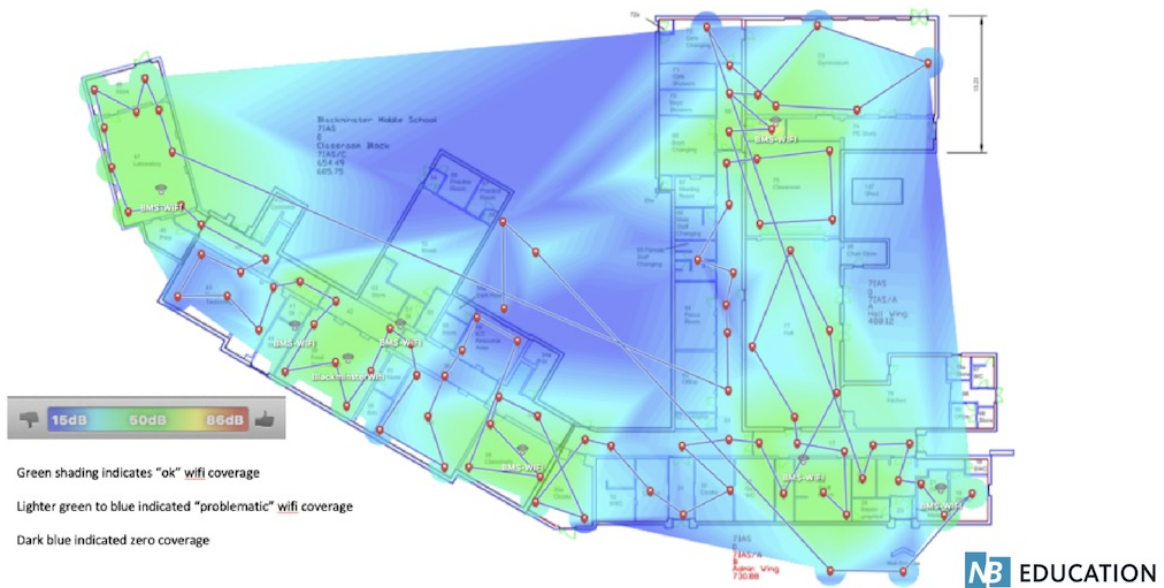


Diagram 1 – WiFi Heatmap Survey

Should we be asked to implement the WiFi network for you then we ensure that the WAPs are placed in the optimal positions i.e. centrally located within a classroom as opposed to the corridors or corner of the classroom that backs onto the corridor. We would re-survey the WiFi network and adjust, improving data throughput, mobility and concurrent connectivity. (Diagram 2)



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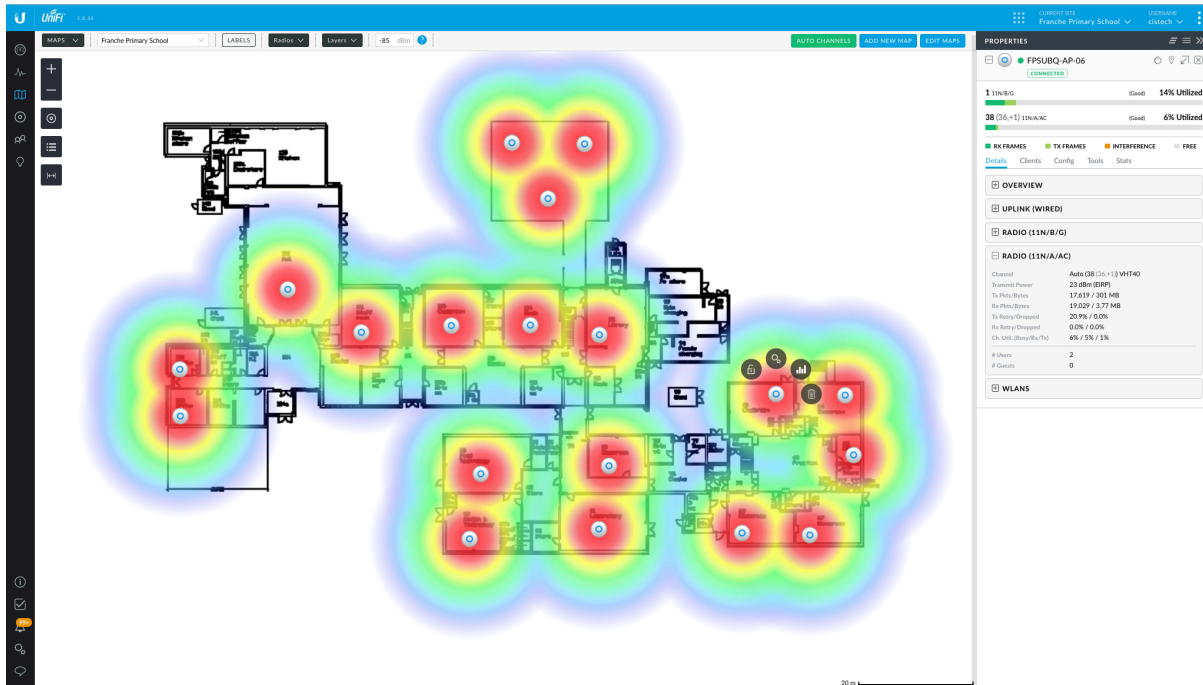


Diagram 2 – WiFi Access Point – Signal Coverage Visualisation

Finally, we would configure remote management access** which would enable WAP configuration, statistical analysis and troubleshooting of the entire WiFi network including network switches if they are from the same vendor. Advanced management tools as depicted in Diagrams 3 and 4 permit NETbuilder Education to remotely troubleshoot and configure your WiFi estate to ensure optimum connectivity and performance.



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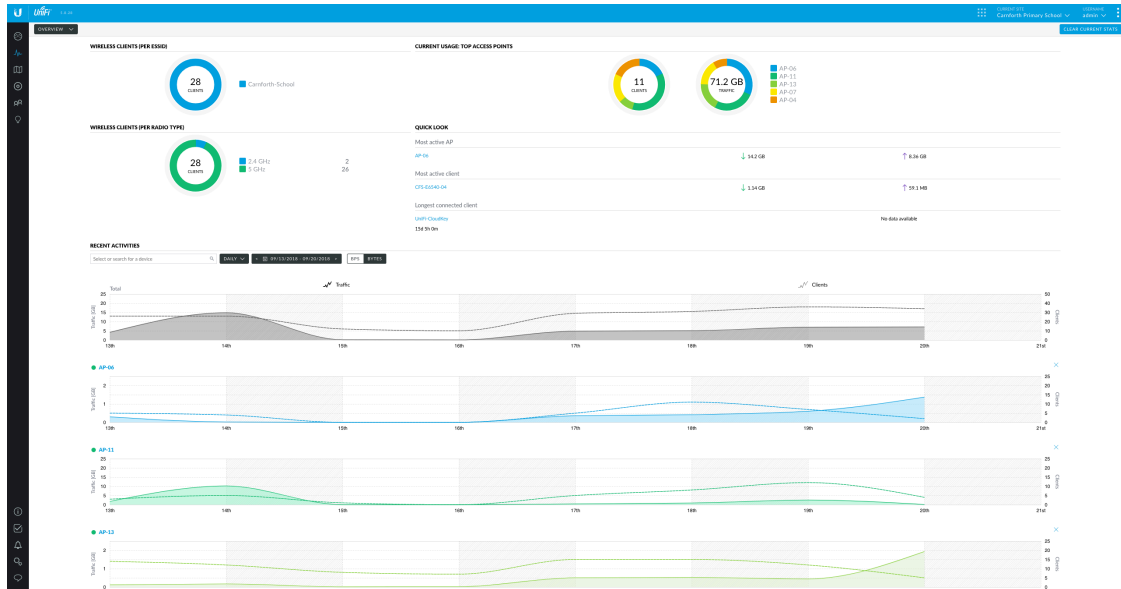


Diagram 3 – WiFi Access Point Performance Analysis

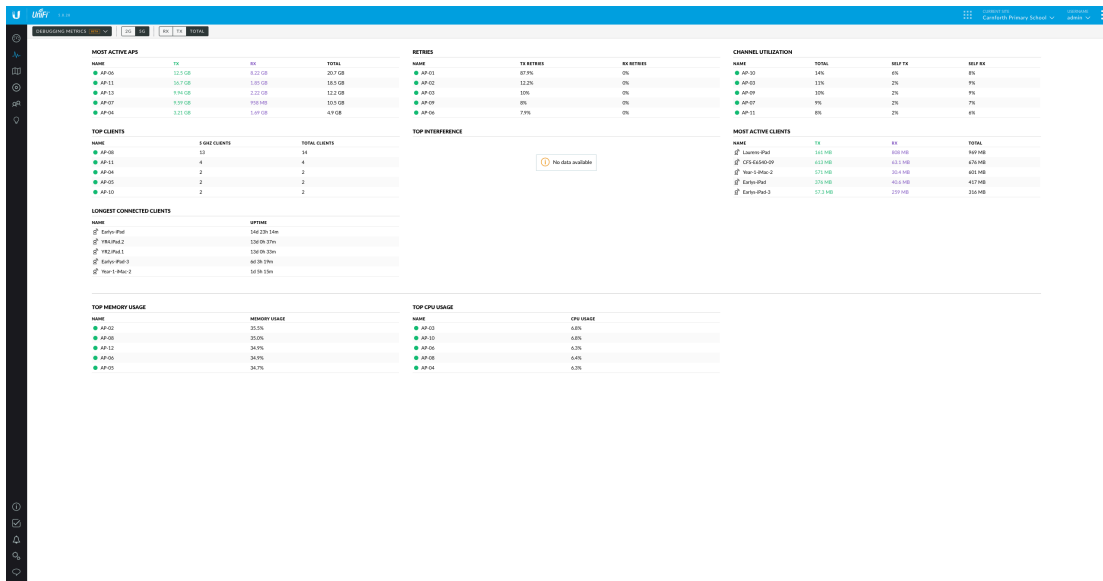


Diagram 4 – WiFi Network Debugging Metrics



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Summary

At NETbuilder Education, we believe in doing the right thing for our customers. Educational establishments preparing for the next generation of pupils, students and teaching methods require the next generation of technologies and support partners to help them on their journey.

If you recognise the need for your school or college to embrace this “next generation” then our highly trained and very friendly staff would love to talk to you about what we can do to help.

* Subject to location and physical size of the campus and if the education establishment requested the detailed report analysis document

** Subject to the education establishment entering into a WiFi Service Level Agreement with CIS-Tech

Wireless Transmission 802.11 Protocols					
Standards	Year Established	Band Frequency	Maximum Data Transfer	Channel Bandwidth	Antenna Configuration
802.11a	1999	5 GHz	54 Mbps	20 MHz	1 x1 SISO
802.11b	1999	2.4 GHz	11 Mbps	20 MHz	1 x1 SISO
802.11g	2003	2.4 GHz	54 Mbps	20 MHz	1 x1 SISO
802.11n	2009	2.4 & 5 GHz	600 Mbps	20 & 40 MHz	Up to 4x4 MIMO
802.11ac	2013	5 GHz	1.3 Gbps	20, 60, 80, 160 MHz	Up to 3x3 SU-MIMO
802.11ac Wave 2	2015	5 GHz	3.47 Gbps	20, 60, 80, 80+80, 160 MHz	Up to 4x4 SU-MIMO & MU-MIMO

Table 1. Wireless Transmission 802.11 Protocols.