



**MAKING A CASE FOR
802.11N WI-FI IN
HIGHER EDUCATION**

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Tablets, laptops and smartphones are creating new pathways for learning in higher education. Core curriculum is going digital and today's students thrive on technology and digital interactivity. Technology-based learning, with the ability to adapt learning to individuals and measure the outcome, will reshape the campus experience as we know it.

Students and faculty have embraced mobility, but the proliferation of wireless devices on campus creates new challenges for the current network and resource constraints in IT. The current network was not designed to support the typical usage of today's mobile users. Students want highly responsive Wi-Fi coverage no matter where they are, from the classroom to the dorm room. Students and professors juggle multiple Wi-Fi-connected devices and consume massive amounts of rich media.

Many colleges and universities are migrating their legacy 802.11b/g wireless LANs (WLANs) to high-performance 802.11n to deliver the performance, capacity and scalability in demand today. This paper provides an overview of the key reasons to upgrade the campus network and explains why the Aruba Networks WLAN solution is best suited to deliver the performance, scalability, and security to ensure a high-quality and productive Wi-Fi user experience.

A Growing Appetite for Wi-Fi

Seventy-eight percent of students identified Wi-Fi availability as “extremely valuable” for academic success, according to a 2011 student survey conducted by Educause Center for Applied Research (ECAR). This aligns with Aruba’s recent survey of nearly 300 IT managers in higher education that showed colleges and universities are prioritizing Wi-Fi budget over every other IT project.

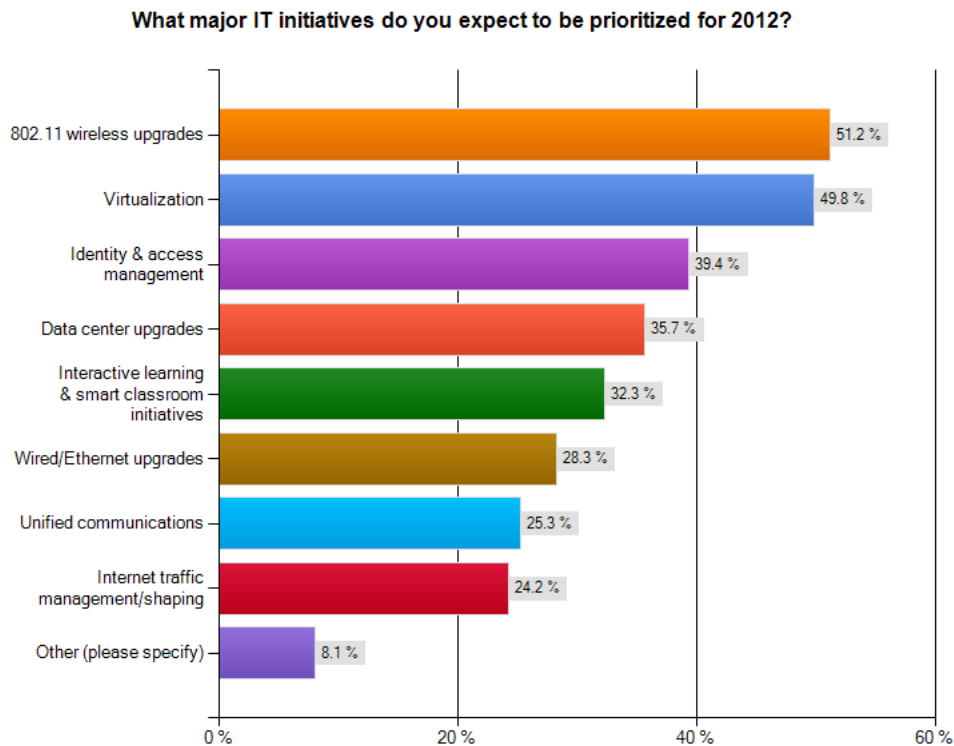


Figure 1: Aruba Networks' survey of 298 IT managers in higher education showed that colleges and universities are prioritizing Wi-Fi over every other IT project.

There are five key trends that are driving universities to prioritize WLAN budget.

1. Device proliferation – The upsurge of mobile device usage on college campuses causing a significant capacity strain on existing WLAN infrastructure. Mobile service providers are facing a similar challenge, and the demand for capacity and improved single-device throughput is driving the transition from 3G to 4G networks. The following chart shows how quickly each categories of device is expected to grow worldwide through 2015.

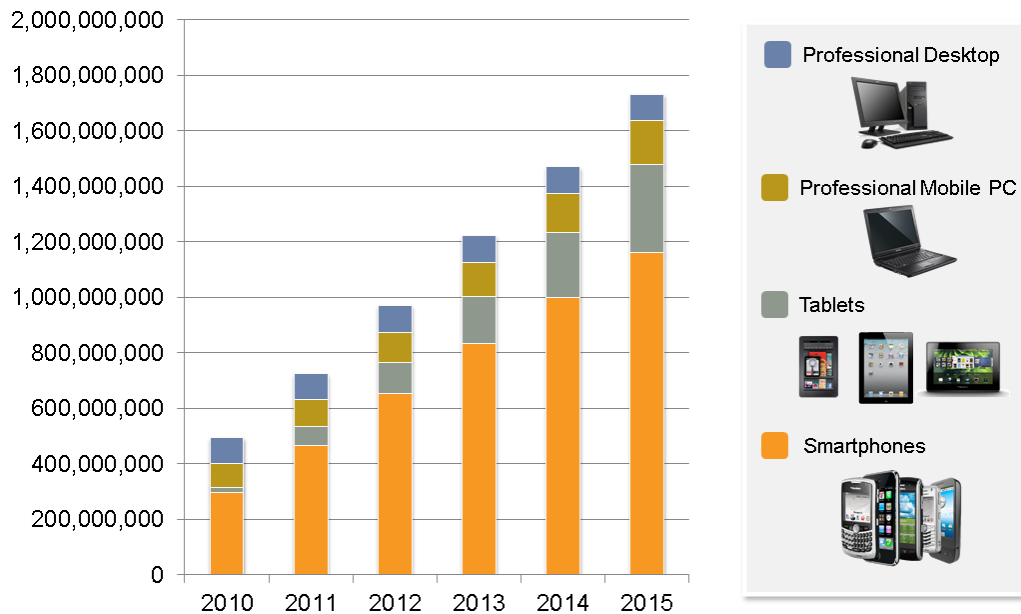


Figure 2: Smartphones and tablets are in high demand, according to Gartner.

Wi-Fi is a shared medium, which means that every device that associates to the network consumes a fixed pool of network resources. The existing network at the university is not designed to handle this impending demand.

The other challenge with density in higher education is that it is not fixed. A student population is transient by nature. Having 300 different mobile devices associate to Wi-Fi simultaneously in a classroom every one to two hours is a use case that the existing WLAN was not built to handle.

2. Device diversity – A few years ago, the WLAN primarily supported laptops for occasional use. Today, the WLAN supports smartphones, tablets, gaming systems, printers, and music players, some of which are used all day and night.

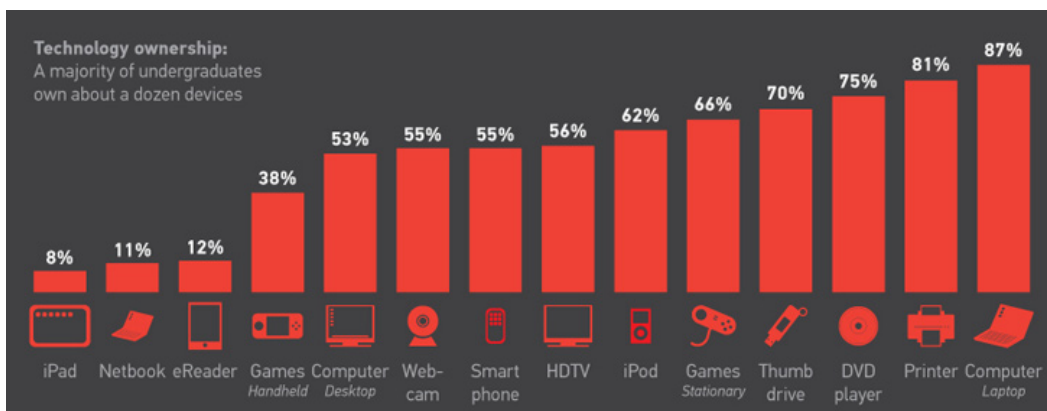


Figure 3: A majority of undergraduates own about a dozen devices, according to a study by Educause Center for Applied Research.

The problem is that different devices tend to operate differently over Wi-Fi, which becomes a significant challenge when a small number of devices consume more than their fair share of capacity. The problem is exacerbated in dense environments like classrooms and result in laptops and tablets disconnecting from the network and applications stalling.

3. Multimedia and interactive learning applications – Students, professors and administrative staff use their myriad mobile devices for more than email and web surfing. These devices are mostly optimized for high definition video and multimedia learning applications and this usage can cause periodic strain on Wi-Fi capacity and can be a major source of user dissatisfaction.

Using real-time communications applications, such as Facebook and Skype, as well as streaming video and iTunes video downloads from their mobile devices are fast becoming unbreakable habits among students, professors and administrative staff.

Research and department-specific applications, such as scientific imaging, are pushing bandwidth requirements even farther. These applications once ran exclusively over the wired network, but they are quickly transitioning to tablets and other mobile devices that require Wi-Fi for connectivity.

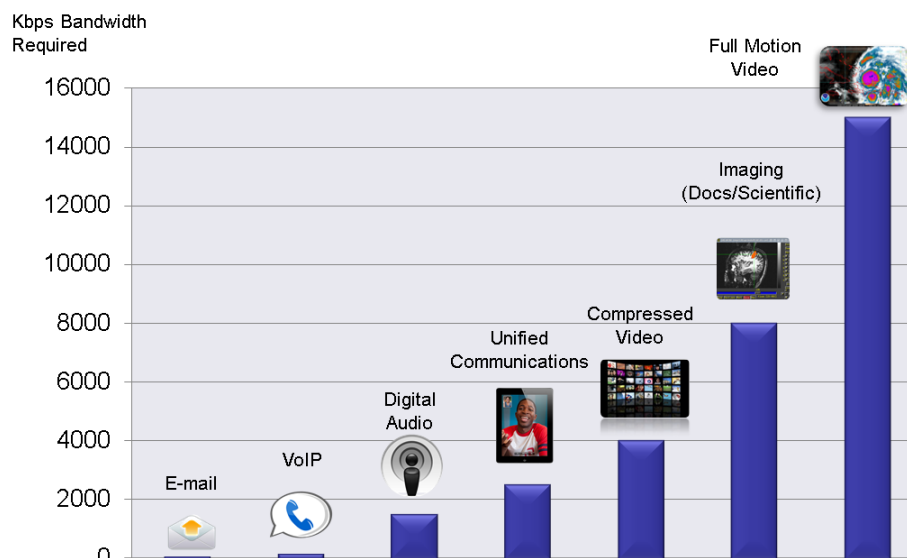


Figure 4: Full motion video, scientific imaging, compressed video and unified communications must be delivered with high fidelity and require a Wi-Fi network with low latency and high bandwidth.

4. Broadcast video – Campus video broadcasts and IPTV are particularly challenging for legacy Wi-Fi networks because the video is delivered via IP multicast. While multicast is useful for reducing network bandwidth consumption and latency, it typically doesn't work reliably over legacy WLANs.

Multicast video has traditionally been used only on the wired network, but it is no longer realistic to expect that users will be satisfied with running video only from desktops with wired network connections. Consumers of video content are increasingly mobile and want to watch from their

laptops, smartphones, tablets and televisions. Wired Ethernet is simply not a suitable video delivery mechanism for today's on-the-go students and faculty.

Not only does requiring a wired connection to view video run counter to the behavior of students and faculty alike, but it is prohibitively expensive to build and maintain wired networks that are optimized for IP multicast.

5. Network and device management – Lastly, the tools to manage and automate settings on a wireless network at scale are significantly different from what is currently deployed for today's wireless.

Not only is the demand for wireless greater, but there are also new factors at play that weren't even a consideration when most existing wireless systems were built. For instance, the air is increasingly noisy, devices are much more likely to move while they are being used, and network threats extend to outdoor areas and parking lots. The deployment, maintenance and management of wireless are fundamentally different now that wireless is the primary access method.

Why Aruba Networks and Why Now?

Aruba is the leader in Wi-Fi networking for the higher education community. With more than 1,700 university customers and recognized by Gartner as the leading innovator for Wi-Fi, Aruba is designed for universities planning next-generation WLAN.

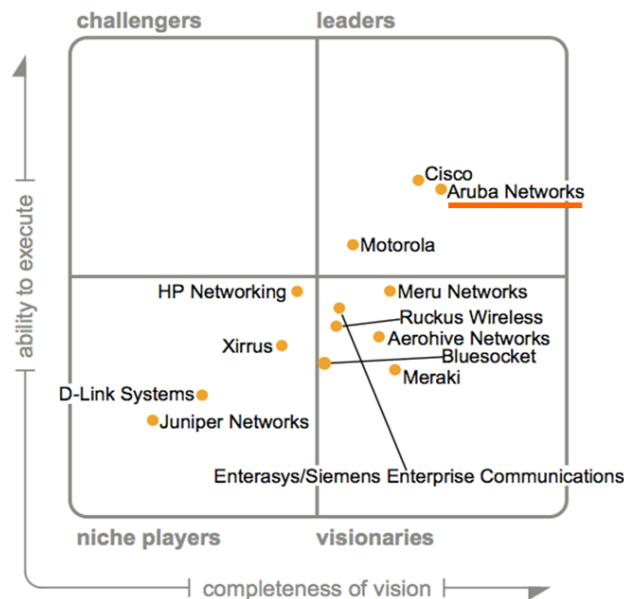


Figure 5: Aruba was ranked as the visionary leader in the 2011 Gartner Magic Quadrant for Wireless LAN Infrastructure.

Several new wireless advancements make Aruba the clear choice, including device-aware and device-specific policies, application performance, broadcast video, over-the-air performance, RF resiliency, flexible deployment, and simplified management.

Device-awareness and device-specific policies – As students and faculty bring a greater diversity of personal devices on campus, the security policies and network service-level agreements (SLAs) must take the device type into consideration.

Aruba can solve ongoing challenges such as:

- **Security and access** – “If the university staff starts connecting with Amazon Kindles (which don’t require a screen password and have limited network security capabilities), what do we let them access?”
- **Capacity** – “To minimize Internet bandwidth expenses, can we set lower bandwidth limits for smartphones?”
- **Device provisioning and support** – “How do we quickly and easily onboard new devices that students and staff bring to school?”

Aruba’s device-specific policies can secure student and staff personal devices and reduce the impact to the IT service desk.

Application performance – The applications running on mobile devices today are far more likely to use multimedia or be learning-critical. These are applications that traditionally ran on wired networks because of latency and bandwidth requirements. In fact, they are intolerant of poor RF conditions, demanding high signal levels with good signal-to-noise ratios.

Aruba networks can handle real-time applications with ease. An Aruba network can recognize and classify specific applications even when traffic is encrypted. It can then prioritize traffic and optimize RF conditions for specific applications once it knows what they are.

The result is that higher education institutions can reliably support applications, such as interactive learning, computer-based assessment, and videoconferencing, over Wi-Fi.

Broadcast video – To deliver high fidelity broadcast video, the Aruba solution uses intelligent multicast services and leverages infrastructure-based client and radio management techniques. The result is reliable, multichannel high definition (HD) video to fixed and mobile devices over the air.

Aruba not only reduces the cost structure of delivering video, but also improves accessibility to video content and interactive media.

Over-the-air performance – Aruba delivers significant performance improvements over the air by fairly allocating wireless capacity to mobile devices using patented Adaptive Radio Management™ (ARM™) technology.

The Aruba Wi-Fi examines each capacity constraint in the network, such as the number of APs in the room, the number of radios per AP, the number of bands per radio, and the number of channels per band to airtime available on each channel. It then automatically makes the best use of all these constraints.

Aruba is the only Wi-Fi solution in the industry that can load balance at every one of these levels. And the result is a 60% increase in fairness and over 220% more bandwidth available in dense environments like lecture halls.

An Aruba network continually monitors itself and optimizes performance. Because the network is user-, device-, application- and RF-aware, it makes real-time adjustments to keep applications running uninterrupted and the network up.

For instance, If 400 students turn on their laptops and tablets simultaneously in a classroom, an Aruba network balances the load automatically. If the network is inundated with low priority data traffic and an individual tries to initiate a videoconference, Aruba adjusts the priority on the fly to keep latency-sensitive applications running reliably. Best of all, this happens without any IT intervention.

Enhanced hardware performance and capacity – Wireless APs have advanced significantly in bandwidth availability and antenna technology. APs can deliver 450 Mbps per radio. Antenna diversity can push Wi-Fi coverage to areas that were traditionally hard to reach.

Controller capacity has also improved significantly. The Aruba 6000 Mobility Controller provides 80 Gbps of throughput and an identity-based stateful firewall for leading performance and security in campus deployments.

RF resiliency – A primary reason that wireless has been less resilient than wired Ethernet is RF interference. Most legacy WLANs rely on dynamic RF channel and power management techniques to help Wi-Fi remain available in the presence of Wi-Fi based noise and interference.

However, little attention has been paid to automatically identifying sources of non-Wi-Fi interference. A Bluetooth headset, a microwave oven, or a video bridge can easily bring a Wi-Fi network down.

So while dynamic RF management can serve to move away from these sources of interference, institutions need a better way to easily identify sources of RF noise and remove them physically from the network.

With respect to visibility, Aruba can fingerprint these sources of RF interference. Unlike other solutions, Aruba can perform wireless security scanning and spectrum analysis simultaneously. For instance, Cisco CleanAir spends only 2.5% of its time to collect spectrum analysis information. Aruba APs spend 100% of their time collecting spectrum analysis information, which is a clear benefit of using a system-on-a-chip within Aruba APs. That's 40 times better visibility on each AP radio.

Management and troubleshooting – Aruba makes problem resolution quicker and less resource-intensive with context-aware network management. IT gets an accurate picture of everything that affects service quality for users on campus, including the wired infrastructure, the RF environment, controllers and access points.

Aruba gives each IT team member a personalized view of the network. Administrative privileges can be tailored to specific job responsibilities.

Aruba also provides comprehensive reporting and root cause analysis to cover everything from capacity planning to rogue device detection to compliance reporting.

Deployment flexibility – Most colleges and universities are faced with a campus population that expects consistent and secure access everywhere – in classrooms, common areas, outdoors, retail locations, auditoriums and stadiums. However, each of these deployment areas has different requirements.

Unlike wired networks, where it was just a question of where to put a port and the port speed, Wi-Fi needs to consider the RF environment, mobile use case, application use, security, management and visibility.

Aruba offers the broadest set of wireless capabilities for higher education campus deployments. For instance, IT can choose the controller model (virtual vs. physical appliance), AP forwarding (tunnel, split, decrypt or bridge), tunneling mode (Secure IPsec vs. GRE), and configuration parameters (by AP, AP group or global). Greater flexibility means that users' expectations are met in a way that is efficient for IT and the university.

Investment protection – Aruba APs offer a lifetime warranty, which gives additional investment protection and savings on yearly maintenance.

Upgrading Wi-Fi

Students are bringing armloads of mobile devices to campus. Professors are increasingly incorporating video and interactive media into lessons. Most Wi-Fi deployments in place today were designed for an era before the explosion of mobile devices and simply can't stand up to the performance and scalability demands of 21st century learning – and living.

Colleges and universities can bolster student satisfaction with the network and enhance learning and campus services by addressing the WLAN now. With Aruba, these institutions can meet the requirements of today's campus – across classrooms, residence halls, public venues and remote sites – in a way that delivers a quality experience and is affordable and sustainable.

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