



White Paper:
Reinventing the
21st Century Higher
Education Experience

The Three C's of Higher Education—Convergence, Collaboration, Connectedness

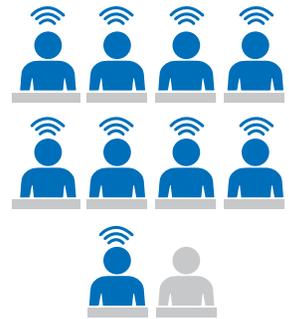
Technology has transformed higher education with its expanded, multi-touch learning environments that includes innovative teaching methods, smart spaces and disruptive technologies. The constantly changing and improving technologies continue to modify the way instructors transfer knowledge and the way student take in information. The learning process has become a collaborative engagement between faculty and students, where today's students graduate with relevant 'real-life work experience' vs. 'book smarts', a significant advantage over those who matriculated even just a decade ago.

As institutes of higher learning embrace technology to welcome a new generation of students, mainly younger millennials and Generation Z, one underlying theme has come to define the experience they offer—

connectedness. Combined with other key elements—a flexible learning environment and an active and more engaging experience—greater connectedness offsets the inequalities and fragmentation in higher education.

With faculty and IT administrators adapting to innovative models in higher education, the need for a robust wireless infrastructure has become mission-critical. Wi-Fi has become the pre-dominant layer for access and is laying a strong foundation for the present and future of the network.

This whitepaper describes how technology is driving a transformation in higher education, the role that Wi-Fi is playing in addressing the “triple threat” and raising the standards in higher education, and the challenges that current Wi-Fi networks present.



9 out of 10 students say that reliable, high quality Wi-Fi is important to their academic success.¹



1. <http://go.7signal.com/view-college-wi-fi-infographic>

Technology is Driving Transformation in Higher Education

Nearly 20.5 million students attend colleges and universities.² These students demand mobility, flexibility and personalized learning experiences, driving institutes to adopt new delivery models, technologies and practices. The result is better student engagement, greater enrolment, improved student retention and higher success rates.

Mobility— Defining the New Higher Education Student

Today's higher ed student body is accustomed to instant access; instant access to information, gaming, communicating with their peers, parents, you name it. With mobile technology becoming closely intertwined with students' daily lives, institutes are adopting new engagement models that leverage the capabilities of mobile platforms. The always-connected higher education student of today is much more informed, shares everything and recognizes the value of experience. This student is here to stay, driving institutes toward digital transformation.



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38%

Students say that the quality of their campus Wi-Fi is a deciding factor in choosing a school.³



30%

Students say that they would recommend a school based on the quality of the Wi-Fi.⁴

2. <http://nces.ed.gov/fastfacts/display.asp?id=372>

3. <http://go.7signal.com/view-college-wi-fi-infographic>

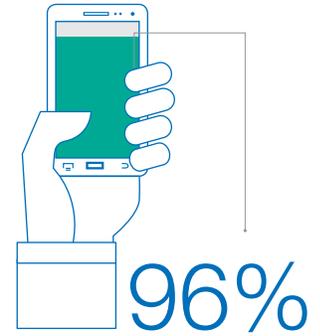
4. <http://go.7signal.com/view-college-wi-fi-infographic>

Smart Rooms—Supporting Mobility and Flexibility

Smart Rooms are the new black. They are functional and fashionable. Institutions continue to adopt the smart room designs as they support collaborative project work that foster the ‘real-world’ readiness aspect of the learning experience. Video training, interactive whiteboards, instant communication with local and distributed students...all and more culminate to produce a highly effective learning environment.

Mobile Apps— Keeping the “Always Connected” Student Engaged

Mobile apps are being hailed as a game changer in higher education. With 96% of students preferring to use apps over mobile-ready portals, apps are driving the future of student engagement.⁵ Apps not only enable students to deliver better results but also provide licensing opportunities to universities.



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Mobile App Functions for Better Student Engagement:



Registration for classes



Student information including grades, class schedules, and lists of courses



Campus map



Campus parking and ticketing
Dining hall menus



Digital student identification card



Campus news



Event calendar



Alerts, reminders, push notifications



Campus directory including faculty phone numbers



Check financial accounts



Social media integration



Discussion forums

5. <http://www.campusm.com/>



Gamification—Making Learning Fun

Gamification is an excellent training tactic based on spaced learning, repetition, and immediate feedback, and has been proven to build long-term memory of facts, procedures, and processes. Many higher learning institutes have adopted or are looking to adopt gamification as a way to keep students interested and engaged. In fact, in the spirit of collaboration, students and teachers are working together to create their own custom gamification learning sets that take complex concepts and break them into consumable components, allowing students to work at their own pace and track their subject matter acumen progress.



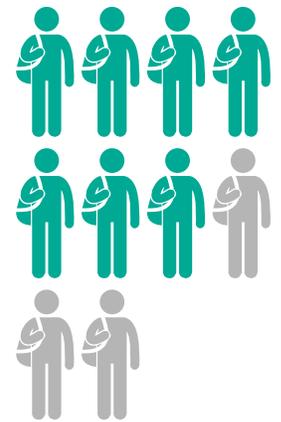
Augmented and Virtual Reality—Making Real World Connections

Augmented and virtual reality has the potential to significantly impact the delivery and content of online education. The technologies add interactivity to course materials, enabling students to connect what they learn with real-life situations. A study by EDUCAUSE suggests that students who embrace technology are more inclined to value its ability to connect them with other people and their institution. About 7 in 10 students with the highest technology inclination scores agreed that technology makes them feel connected to peers and instructors, compared with only around half of students with low- to mid-range technology inclination scores.⁶



Cloud Computing—The New Campus on Cloud

Students and faculty are adopting on-demand cloud solutions as a means to access coursework anywhere, anytime. With the continued focus on collaboration, sharing content is as simple as granting someone access, no need to transfer or email data or being concerned about version compatibility.



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6. <https://library.educause.edu/resources/2015/8/~media/24ddc1aa35a5490389baf28b6ddb3693.ashx>



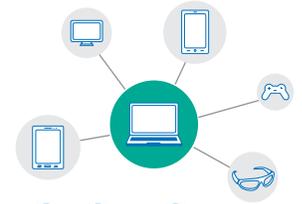
Education-as-a-Service—Encouraging Student Engagement

Emerging on-demand education models, enabled by online learning, are delivering education as a service. Learning is becoming a process rather than a mere qualification. Advancement in online learning has enabled post-traditional students to acquire skills required in the workplace, facilitating institutes to retain students longer.



Internet of Things (IoT)—Mashing Student Interactions for Simple, Seamless and Streamlined Experience

According to Gartner, the total number of connected devices in use globally is projected to grow to 20.8 billion by 2020.⁷ Connected devices yield a continuous stream of data based on users' interactions with those devices. In higher education, a few institutes have already started to mine this data in order to improve engagement with students.



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Unlocking the Potential of IoT in Higher Education—Evolving from Reactive to Proactive, and Now Predictive

Gaining Operational Efficiency with Connected Beacons

- Energy savings through controlled use of lighting and HVAC
- Auto-shutdown of networked devices that are idle
- Tracking campus shuttles
- Tracking campus inventory
- Tracking facility and equipment usage
- Enabling smart doors, locks and security cameras
- Auto-lock access points in case of emergency
- Tracking student attendance

Enhancing Academic Experience with Connected Wearables

- Learning pattern based automated performance feedback
- Personal notifications, reminders, alerts, and recommendations
- Monitoring fitness indicators of sports teams and students
- Simplified access to campus facilities – fitness center, library, labs, academic buildings, residential halls, events
- One tap payment in cafeteria, bookstore, copiers, and library

7. <http://www.gartner.com/newsroom/id/3165317>

Wi-Fi is the Backbone for Digital Higher Education



Image Credit: Rawpixel.com/Shutterstock.com

A robust Wi-Fi infrastructure is the backbone of digital transformation. According to an EDUCAUSE survey of 1,900 students, wireless access is at the top of the list of things students want the most, followed by emergency alerts and access to coursework.⁸ With unprecedented device proliferation, cloud adoption and changing expectations of students, institutes are preparing ahead for the bring-your-own-everything (BYOE) environment, further fueling demand for Wi-Fi.

Addressing the “Triple Threat” — Accessibility, Affordability and Achievement

Accessibility—Putting Higher Education at Fingertips of Students

Connected devices are becoming the de-facto mediums for delivering learning. The mobile platform's unique capabilities make higher education accessible anywhere, anytime. Opportunities for enhanced learning are made available—on and off campus—via emerging delivery models. While access was limited traditionally to the geographical boundaries of classrooms and campus libraries, digitization of content and e-learning initiatives has enabled greater access to higher education.

Affordability—Making Higher Education “Cost” an Addressable Challenge

One of the greatest boons of technology in higher education has been to make learning an affordable experience. With this in mind, online courses not only enable greater access, but they also make higher education more affordable.



92%

of students own at least 2 Internet-capable devices.⁹



61%

of students try to connect at least 2 devices to the network at the same time.¹⁰



US\$ 128

Usage of an openly licensed text book could save students an average of US\$128 per course.¹¹

8. <http://www.edtechmagazine.com/higher/article/2014/01/efficiency-motion-how-mobile-apps-are-changing-college-campus>

9. https://library.educause.edu/resources/2015/8/~/_media/24ddc1aa35a5490389baf28b6ddb3693.ashx

10. Ibid.

10. <http://www.studentpirgs.org/sites/student/files/reports/The%20Billion%20Dollar%20Solution.pdf>

11. <http://www.elearn.space.org/blog/2010/08/25/what-are-learning-analytics/>

Achievement—Wiping the Competency Craze

As student expectations are changing, institutes are evolving their engagement strategies. The key objective of these engagement strategies is to narrow the achievement gap by connecting students to real life situations and opening up a world for them beyond traditional textbooks. Learning analytics enable a more personalized and integrated learning experience, empowering faculty and students to get a better picture, respectively, of the students' and their own performance.

The adaptive learning model creates a more personalized learning experience. It challenges the "Efficient Learner Hypothesis" (ELF) that asserts that all learners are at the same stage when they start a course and progress at roughly the same pace.¹²

Students' beliefs about having access to data analytics on their academic performance:¹³



87%

believe adaptive learning has a positive impact on their learning

75%

believe adaptive learning technology is very helpful or extremely helpful in aiding their ability to retain new concepts

68%

believe adaptive learning is most helpful at making them better aware of new concepts

Fostering Creativity and Entrepreneurship

Makerspace—“STEAM”ing Ahead with Wi-Fi

Makerspaces are increasingly being created by campuses to foster collaborative effort between various disciplines. Designed to foster inquiry-based learning, the Maker movement is about creating using technology. It supports an emphasis on STEAM or integrating arts in overall STEM learning. A typical makerspace on a campus includes many digital tools, virtual reality equipment, IoT devices and 3D printers. A robust Wi-Fi network that enables connectivity among all devices is essential for makerspaces to succeed.

Business Incubators—Drawing Intellectual Capital Back to the Campus

University-supported incubators allow students to engage with entrepreneurs, mentors and investors. They get the advantage of shared location, technologically advanced labs, cafes, faculty and business support services. Likewise, universities benefit from the creation of job opportunities, sponsorships, donations and industry-academic collaborations. According to the International Business Innovation Association, about 32% of North American business incubators are run by academic institutions.¹⁴ Free Wi-Fi and Voice-over-Internet-Protocol (VoIP) are critical requirements for these incubators.



32%

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12. <http://www.elearnspace.org/blog/2010/08/25/what-are-learning-analytics>

13. <https://www.mheducation.com/news-media/press-releases/learning-analytics-new-likes-college-better-access-personalized-data-new-research.html>

14. <http://blog.marketresearch.com/the-rise-of-start-up-incubators-at-universities>

Empowering Administrators through Mobile Unified Communications and Collaboration (UC&C) Solutions

A mobile UC&C solution greatly enhances an institute's efficiency and security. When this is converged with the advantages IoT offers, the capabilities are enhanced multifold. UC&C introduces flexibility and productivity by allowing institutes to reach out to faculty and staff anytime, anywhere. Applications related to presence, instant messaging, video-based real-time collaboration, mobile voice access and single number reach streamline and optimize operation processes.

Furthermore, UC&C delivers a flexible learning environment in which faculty members create VoIP- and video-based interactive course material that students can access from anywhere. With students demanding flexibility, mobility and interactivity in a real-world environment, UC&C brings capabilities that make distance learning a richer and fuller experience. As institutes discover the benefits of UC&C and modernize their communications and collaboration systems, they need to conduct due diligence on their network infrastructure. A real time voice- and video-optimized Wi-Fi network is critical to ensure an excellent collaborative learning experience.



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Image Credit: Rawpixel.com/Shutterstock.com

Delivering Wi-Fi Analytics for Meaningful Insights and Troubleshooting

Wi-Fi analytics deliver meaningful insights that enhance operational excellence and improve learning campus-wide. IT administrators are able to measure network performance and troubleshoot better based on detailed network usage statistics. Similarly, faculty members are able to modify lesson plans based on applications that are used more often.

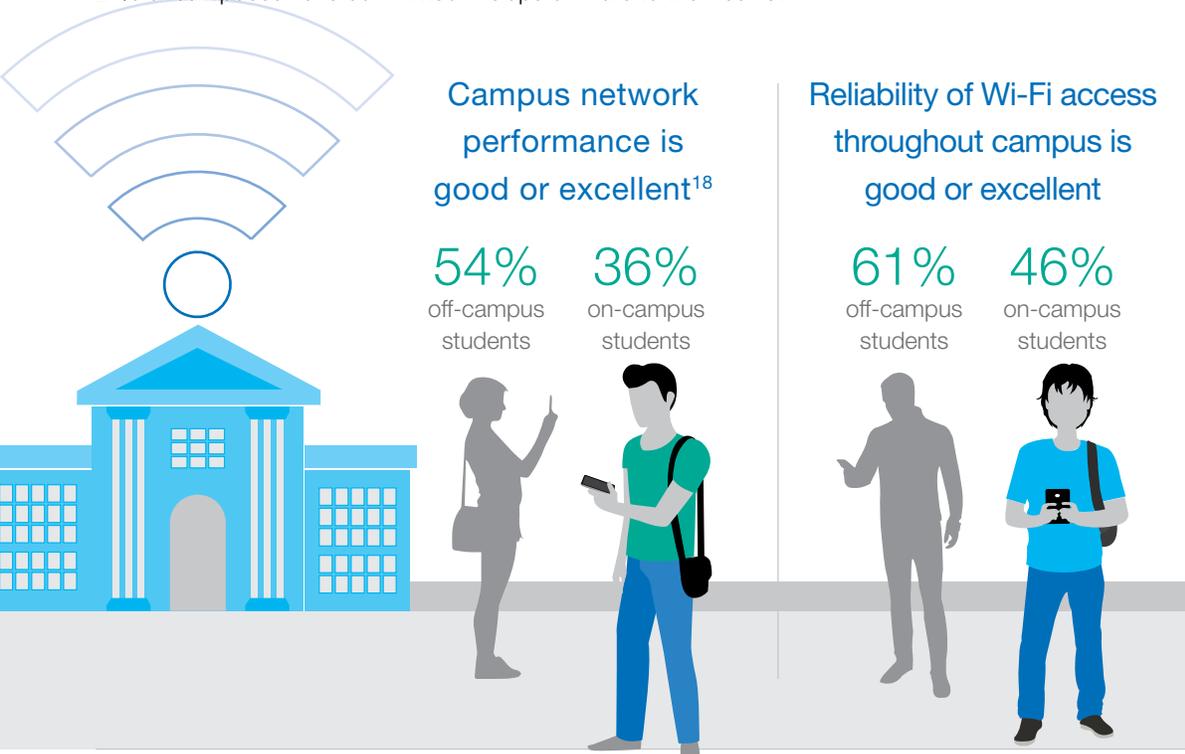
Capacity, Coverage, Density and Security are the Key Challenges with Campus Wi-Fi

Higher education institutes face many challenges when deploying their Wi-Fi infrastructure. Key among these are capacity, coverage, density and security. As mobility becomes an essential part of the daily lives of students, faculty and administrators, institutes need to plan for adequate bandwidth and peak usage situations. Similarly, coverage beyond classrooms—inside and outside—is essential to ensure seamless campus-wide connectivity. This extends to high density areas including libraries, campus hallways, college stadiums, residence halls, dining areas and other outdoor spaces.

Network administrators need to design the wireless infrastructure, keeping in mind the number of users, the number and type of mobile and other connected devices, applications including heavy use of media and video collaboration and back-end applications used by administrators. The network design, while being flexible to meet high-density needs, should also take into account the possibility of interference from neighboring access points and security breaches that may occur.

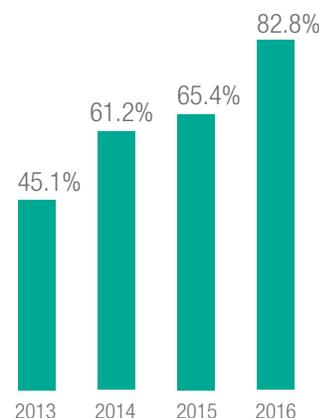
ResNet—Focus Remains Strong

Building adequate bandwidth and meeting capacity requirements in high density areas of the campus such as resident halls and dormitory buildings has improved significantly. According to the ACUTA/ACUHO-I 2016 State of ResNet Report, nearly two-thirds of campuses have dedicated one gigabyte per second (Gbps) or more to the ResNet, which is more than double since 2012.¹⁶ Nearly 21% of campuses have committed 7 Gbps or more to the ResNet.¹⁷



80%

Percentage of campuses offering robust wireless coverage (four or more bars) in more than 80% of the campus:¹⁵



15. <https://www.acuta.org/acuta/pdf/041516a.pdf>

16. Ibid.

17. Ibid.

18. <http://net.educause.edu/ir/library/pdf/ss15/ers1510ss.pdf>

Due to these advances, coverage in campus residence halls has increased in 2016 as compared with the previous years. A survey of campuses offering robust wireless coverage in more than 80% of the campus showed that of these campuses, 87.8% provided adequate coverage in residential rooms, as compared with only 58.7% in 2015. However, open areas outside of residence halls continue to have a lower priority, with only 19.3% of such campuses providing coverage in these areas in 2016.¹⁹ Furthermore, network performance and Wi-Fi reliability were much lower for on-campus students compared to students living off-campus.



Security

With cyberattacks becoming increasingly complicated, network administrators need to ensure that campus Wi-Fi networks are secure.

Prevent Exposure to Data on Air with Authorized Access and Network Encryption

Weak network access security makes it easy for unauthorized users to gain access to the campus network and to the intercepting Wi-Fi network in order to view sensitive information transmitted over the air. While the use of strong passwords and a secure browser connection (HTTPS) is an important security measure, IT administrators must ensure the implementation of a WPA2-based encryption and authentication framework that ensures complete Wi-Fi network privacy.

Proactive Defense against Security Attacks with Wireless Intrusion Detection and Prevention

Devices and networks that are not embedded with intrusion-prevention capabilities are likely to be at a greater disadvantage. IT managers should implement Wi-Fi access-point solutions with integrated wireless intrusion prevention systems (WIPS) to detect rogue access points and protect confidential data from a wide variety of security threats, such as denial-of-service attacks and man-in-the-middle attacks.

Establish Secure BYOD and Public Access Policy with Proper Network Segregation

Network segregation—which refers to separate internal-network access for different departments based on user profiles and campus-managed devices versus student and faculty-owned devices—is essential.

Institutes should be equally concerned about securing real-time data that traverse their network, i.e., blocking known malicious sites, and internal segmentation. This allows them to break or delay the infection chain if a data breach occurs.



“Schools have seen the competitive advantage that comes from the expansion and growth of ResNet bandwidth and Wi-Fi access on their campuses, but with this growth comes an even wider set of challenges. Schools must continue to examine new ways to enhance network performance and limit risk while stretching value.”

- Dee Childs, Chair of the ACUTA Environmental Scanning Committee and Chief Information Officer at the University of Alabama-Huntsville.

¹⁹. Ibid.

How Can Help

As digital initiatives gain priority across higher education, the need to collaborate with experienced partners who understand the complexity of needs and who can provide suitable turnkey solutions becomes imperative. Solution for higher education is just such a turnkey solution that combines plug-and-play simplicity with the advantages of best-in-class technology. offers a total digital higher education solution including Wi-Fi access points, GALAXY tablets and interactive software that is compatible with a variety of hardware including e-boards, projectors, LCDs, printers, smart signage displays and videowall displays.

Wi-Fi Elevates the Learning Experience

Keeping in mind the media-heavy and high-density needs of higher learning, wide variety of 802.11 n/ac/wave2/IOT Wi-Fi access points enable the next generation of wireless networking and unified communication solutions that are required for all modern digital learning and IoT initiatives, such as personalized administering of courseware, 1:1 student-faculty interaction and rich communication in collaborative project work. It also provides improved user experience with noticeably higher performance, while providing easy and reliable management that unburdens faculty and IT administrators of unnecessary complexities.

Built with smart antenna solution, patented traffic scheduling technology and built-in IoT sensors, and featuring wireless intrusion detection and prevention modules, Wi-Fi is geared to enable the best higher education experience under any circumstances—indoor or outdoor.



Expressly tuned to provide uninterrupted full-scale mobile coverage across the entire campus and into areas other solutions struggle to reach.

Seamless Wireless Campus Environment



Inspiring Students

Enabling new learning experiences through technology, student-centric resources and education programs



Empowering Faculty

Creating meaningful courses through smart solutions and improving faculty-student interactions



Simplifying IT Administration

Simplifying deployment, installation and management of Wi-Fi to reduce costs and to promote productive collaboration and participation in the classroom



Securing Wi-Fi Access

Implementing proper authentication access levels, avoiding unwanted access to the campus' intranet and protecting the networks from internal and external dangers