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FOR EDUCATION

ADVANCE YOUR UNIVERSITY'S MISSION

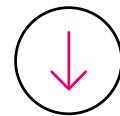## WITH FUTURE-FORWARD NETWORK INFRASTRUCTURE

5G ANS website

Higher education institutions rely on network connectivity now more than ever.

Blame it on economic forces, students' changing views on higher education, or even lower birth rates, but the fact remains—across four-year higher education institutions (HEIs), there were nearly 1.2 million fewer enrolled students in spring of 2023 when compared to 2019.[1]

In an increasingly competitive landscape, HEIs will set themselves apart by implementing new technologies that attract students and researchers, lower costs, and enhance efficiencies. To keep these interconnected technologies working, **HEIs will require fast, flexible, and augmentative network infrastructures that enable tomorrow's adaptions.**

[1] Inside Higher Ed, Leveling Off at the Bottom, May 2023

[2] Edge Research and HCM Strategists, Student perceptions of American higher education, March 2024

[3] Higher Ed Dive, Colleges' expenses rose 5.2% in FY22, the biggest increase since 2001, December 2022

[4] US News and World Report, One Culprit in Rising College Costs: Administrative Expenses, June 2023

[5] Higher Ed Dive, 7 higher education trends to watch in 2024, January 2024

[6] BestColleges, Closed Colleges: List, Statistics, and Major Closures, June 11, 2024

Connectivity will address these higher education challenges:

Fewer students are going to college.

According to a student survey by Edge Research and HCM Strategists, high school students reported feeling less confident that higher education is a wise investment.[2]

To attract the students who do decide to attend college, universities must offer them access to cutting-edge technologies that will set them apart in the working world. Having grown up with technology, this generation of students isn't impressed by a strong Wi-Fi signal or an old-school computer lab. **To support the implementation of technology at a university scale, dependable and high-capacity network connectivity will become more important than ever.**

The cost of operating HEIs is increasing.

Following trends in inflation and ever-rising labor costs, it's getting more expensive to keep your HEI staffed and running. University operating costs jumped 5.2% in 2022—that's the largest operating cost increase since 2001.[3] According to US News and World Report, one of the biggest factors in rising operation costs is administrative expenses.[4]

Universities will increasingly turn to automation to help offset these costs, especially up-and-coming technologies such as generative artificial intelligence (genAI). **As administrative processes become more efficient, HEIs will rely on their network to handle ongoing capacity strains.**

HEIs' budgets are falling.

As expenses grow and cash flow slows, public and private universities are forced to operate with smaller budgets. To survive, many universities have taken dramatic measures to stretch their budgets. Take West Virginia University, where leadership had to cut 28 degrees from its roster to remain financially stable.[5] Not all universities are able to balance the books—since March 2020, at least 49 public and non-profit HEIs have closed, merged, or announced plans to close or merge.[6]

Universities that reduce costs, attract new research funding, and increase enrollment will have the best shot at staying afloat. **Your network must be deployed in a cost-effective manner.**

To provide your professors, researchers, staff, and students with the technology to learn and work on the cutting edge, you need a network provider that provides one-on-one customer support.

Embrace technology solutions with a modern-day 5G network.

To meet these challenges and remain competitive, colleges and universities are embracing technology as a conduit for positive change. Some universities are transforming old buildings into research labs and student centers through a process called adaptive reuse. Many are bringing the classroom right to students' homes with hybrid and remote learning. As your HEIs adapts, your leadership and IT teams need to recognize this as the perfect opportunity to evaluate the strength of their network.

Older network infrastructure will not be able to keep pace. Ethernet networks are fast but extremely inflexible and often cannot reach off-campus buildings or research centers, not to mention slow and costly to install. Wi-Fi can work great inside the classroom, but it lacks the mobility to keep today's students and researchers consistently connected throughout the campus. Unlike these technologies, 5G provides a reliable, flexible, and augmentative solution that can connect campuses virtually all sizes.

T-Mobile provides a competitive edge with 5G Advanced Network Solutions.

T-Mobile offers a system of 5G solutions to create a mobile, flexible, and high-performance network experience at your college or university.

Here's what makes T-Mobile 5G Advanced Network Solutions (5G ANS) a good fit for higher education:

Scalable for tomorrow: If tomorrow's needs can't keep up with today's network, there's no need to rip and replace your entire network. Our solutions are augmentative, meaning we can add to your network experience without the friction or high costs of a rip-and-replace installation.

Financially flexible: At T-Mobile, we use an Operating Expenses (OpEx) model to customize our pricing plans to your network and technology goals. As we design and build your ANS infrastructure, we can bundle related technologies and services to help you realize your technological transformation without breaking the budget.

Purpose-built to customer: We work one-to-one with every customer to design and implement a network infrastructure that suits your exact capacity needs. Our teams include engineers, installation professionals, and sales specialists with a focus on higher education to provide design specifications with your goals and challenges in mind.

T-Mobile features a three-pronged approach to our 5G network, offering a public, hybrid, or private 5G network experience, each with unique benefits.

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Advance your university's mission with future-forward network infrastructure.

3

Higher education use cases.

Here's how HEIs are making the best use of ANS.

Tomorrow's students, professors, and researchers will be implementing new technologies and tools in and around the classroom. Your HEIs likely needs the flexibility and modularity of a 5G network to keep up with new technologies, cost-cutting efficiencies, and ever-growing competition.

To advance your university's mission, your network will need to be designed and built for constant adaptations.

If your university is planning to implement any of the following use cases, now is a great time for a network consultation.

1
Cross-campus connectivity.

Wi-Fi can't support the network alone. It's important that everyone can access seamless connectivity both in and outside campus buildings.

2
Digital transformation.

HEIs need the speed and capacity to implement new technologies such as artificial intelligence and virtual reality inside the classroom and lab.

3
Equitable digital access.

Students need equitable access to information, tools, and resources, regardless of their proximity to campus.

4
Smart Campus strategy.

A solid network infrastructure lays the foundation for a Smart Campus, where Internet of Things devices automate essential tasks.

5
Adaptive renovation and reuse.

Old and under-utilized buildings and spaces can be adapted for sustainability, student utilization of space, and data powered insights.

6
Bandwidth augmentation.

Campuses can host large community, alumni, sporting, and student events that create a need for enhanced network capacities.

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USE CASE 1
When your campus is spread out, one network can merge the experience.

Most universities aren't confined to one single location, creating immediate problems for the on-campus network experience. In major cities such as New York City and Chicago, students take busses or subways to classrooms split across boroughs and neighborhoods. Other HEIs are bisected by rivers or highways, splitting the campus into two distinct locations.

But the separation of the modern campus can spread even further. Many four-year public and private universities feature branch campuses, often located in other towns or cities, potentially hundreds of miles from the primary campus. In fact, the American Association of State Colleges and Universities estimated that of the seven million undergraduates enrolled in the US, 70% attend a regional campus.[1]

Unfortunately, most Wi-Fi infrastructures can't serve the reality of the split campus. With less coverage than 5G, Wi-Fi can't quite cover the outdoor areas where students may prefer to attend off-campus classes. It also lacks mobility, making it difficult for students and staff to travel across campus without losing connection to multiple signal handoffs.

Extending connectivity to research centers.

To support research initiatives, universities have established outposts around the nation, including:

- Agricultural and horticultural research farms
- Forestry and environmental science stations
- Oceanography research laboratories
- Geologic field stations

Many of these field locations are in rural or remote communities, but researchers still need connectivity comparable to what they would use back at the primary campus. With America's largest 5G network, T-Mobile connects big cities, rural towns, and unexpected places in between. Your college's research facilities may be able to leverage our public network. And in situations where researchers' sensors, equipment, and other IoT devices demand speed and capacity beyond what's currently available, 5G ANS can augment the network to match that facility's requirements.

[1] AASCU, Issue Summary: Regional Comprehensive Universities, 2022

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USE CASE 2
The digital transformation of campus life will deepen your network dependence.

Learning is no longer confined to the classroom; in fact, student preference might further push professors to teach in a hybrid environment. According to one survey by Anthology, 37% of students at four-year public universities prefer asynchronous learning, and 30% prefer a hybrid learning environment.[1]

While students learn asynchronously, researchers will implement new technologies to make cutting-edge discoveries. Already, medical researchers are using AI-based computer vision to train cameras to detect patterns and form insights across medical scans and images.[2] Engineering and aviation departments are using VR and AR devices to create digital twins of engines and structures;[3] these one-to-one virtual simulations of tangible systems enable researchers to perform realistic simulations.

At first, hybrid classes, VR headsets, and AI implementations will feel new and exciting, but after just a bit, these ways of learning will become as routine as pencil and paper. **These digital transformations will create hundreds of new data points, sent from student and researcher devices to the school's network and back again, creating a new, ongoing source of network traffic.**

But all of this will happen alongside normal daily operations—students will stream lectures on laptops, maintenance staff will communicate via mobile devices, and professors will access student materials in the cloud. Can your current network support day-to-day operations while taking on the extra demands of up-and-coming technologies?

A scalable network provides the capacity for concurrent needs.

As network traffic expands across your campus, you'll need a network that can grow alongside it.

Whether students are logging in from the quad or researchers are using AI to parse through biomedical information, 5G ANS can provide the scalability to support everyone's needs. The right 5G network can be augmented at any time, helping process the increasing capacity needs of new technologies while helping support day-to-day needs.

[1] Anthology, Nationwide Student Survey: Opportunities to Grow Student Success and Career Preparation, 2022
[2] Mind the Graph, Exploring the Role of AI in Academic Research, June 2023
[3] EdTech, What Are Digital Twins and How Can Higher Ed Use Them?, March 15

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USE CASE 3
5G creates equitable access to digital resources for students.

When some of us envision a traditional student, we picture a recent high school graduate between the ages of 18 and 22 who lives near campus and attends school full time. In reality, 37% of college students are 25 or older.[1] Many undergraduate students fit "non-traditional" criteria—they commute to campus, work full-time, attend school part-time, or have dependents.

Lectures, collaborative projects, and even in-class experiences are moving to the cloud. Resources vital to the student experience—academic counseling information, financial resources, physical and mental health support— have moved from difficult-to-navigate website portals to one-touch mobile applications. In 2022, more than half of university students experienced problems with unreliable connections.[2] Without access to a reliable public network, the digital transformations of the modern university can leave non-traditional students behind, unable to access these vital living and learning materials. **HEIs will need the spread and reliability of a public 5G network to adequately support students who live, work, or study off campus.**

The T-Mobile public network enables digital equity.

The T-Mobile 5G network is the largest in the United States, reaching 98% of Americans by population. The breadth of our three-pronged 5G network provides frictionless handoffs for continual, reliable connectivity. When non-traditional students leave the hybrid or private network at your campus, students can stay continually connected to vital living and learning resources when swapping to the wider coverage of the public network.

The T-Mobile Connected Laptops and Tablets program makes this frictionless hand-off from on-to-off-campus connectivity easier. The program distributes smart devices to students and staff, each with its own unlimited data plan to provide 5G connectivity from almost anywhere.

Read on to see how T-Mobile 5G ANS and the Connected Laptops and Tablets program transformed student learning at Bradley University.

[1] Lumina, Today's Student, 2018
[2] Educase, 2022 Students and Technology Report: Rebalancing the Student Experience, October 2022

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Bradley University provides digital equity with T-Mobile 5G ANS & Connected Tablets.

Bradley University (BU) is a medium-sized, non-profit, private university located in Peoria, Illinois. At first, BU leadership wanted to propel student learning with innovative technologies, such as AI-powered note taking, graphics-intensive video game development software, and real-world telehealth technologies. However, BU had a challenge to tackle—**31% of its undergraduate population lived off campus and did not have a guaranteed network connection.**

BU asked T-Mobile if it was possible to enhance the performance and capabilities of the on-campus network without leaving its online and asynchronous students behind. To promote this kind of digital equity and learning flexibility, Bradley University would need to establish a lightning-fast, far-reaching network.

T-Mobile 5G ANS enhances connectivity both on and off campus.

After working closely with BU leadership and establishing an operating expense model that bundled technologies, T-Mobile engineers recommended two solutions—an on-campus hybrid infrastructure for on-campus networking and Connected Tablets for off-campus connectivity.

At BU, we implemented a 5G hybrid mobile network to balance high-speed performance and wide-reaching coverage. The high speeds and large capacity allowed students to interact with real-world tech advancements

to virtualize complex machinery and better learn how it operates. Additionally, the hybrid network supported BU's adoption of IoT-connected Smart Campus devices such as leak detection and water quality sensors.

To provide students access to digital learning materials whenever and wherever they study, BU will be launching a Connected Tablets program in Fall of 2024. T-Mobile will provide students, full-time faculty, and select staff with 10th Generation iPads, keyboard cases, creative and working apps, and unlimited T-Mobile 5G data, all bundled in with the network build for maximum cost savings.

BU is the first college in the US to implement 5G ANS for digital equity.

With the hybrid mobile network already in place and the Connected Tablets program set to launch in Fall of 2024, Bradley University can expect the following results.

Immersive classroom experiences with the implementation of cutting-edge technologies.

Equitable digital access for students and faculty, regardless of their location.

Customized billing with bundled OpEx model, plus additional savings from Smart Campus device implementations.

USE CASE 4
Smart Campus efficiencies call for an advanced network.

Like a small city or town, universities require the collaborative support of maintenance teams, mail carriers, medical professionals, and local police. But what happens when these vital teams and their systems aren't governed with maximum efficiency? Waste happens. According to Energy. gov, the average commercial building wastes 30% of the energy it consumes.[1] Even worse, poor support of these local professionals can result in negative student experiences, such as the 82% of students who reported personal safety concerns on campus ahead of the fall semester of 2021.[2]

Using IoT as its foundation, campuses can become "Smart" by syncing interconnected digital devices, autonomous technologies, and on-site human professionals to create a more efficient, cost-effective, and safer campus experience. Your Smart Campus may use IoT sensors to control HVAC, lighting, and water systems for maximum cost savings 24/7; AI-powered smart cameras to send proactive notifications of potential threats; or even autonomous vehicles to clean facilities or deliver packages. And this isn't some far-flung science fiction scenario. Autonomous fleets are projected to be 50% more cost-effective than traditional vehicles by 2030–2040.[3]

But the benefits of the Smart Campus often can't be supported by legacy Wi-Fi networks. Most Wi-Fi networks can only handle about 30 devices per access point. When every refrigerator, point of sale (POS) system, employee device, and security camera in your student center accesses the network, you're talking about hundreds of connections in just one building. **Wi-Fi cannot support the massive scale of the interconnected, Smart Campus future, and fiber is simply too expensive.**

T-Mobile 5G ANS is designed for high-capacity connectivity.

5G ANS has the bandwidth needed to make a Smart Campus that is able to support hundreds of devices. T-Mobile 5G uses a network design method called "network slicing" in which similar devices connect to their own "slice" of the overall 5G network, enabling these devices to send and receive signals with few opportunities to experience interruptions. For example, you may have all your temperature and humidity sensors combined on one slice and your AI-powered smart security cameras on another.

And if your connectivity needs increase—say you transfer every camera to an AI-enhanced smart camera—T-Mobile can easily augment your network speeds to meet your new needs.

[1] US Department of Energy, About the Commercial Buildings Integration Program, 2020
[2] ADT, Research Finds 82% of American College Students are Concerned About Their Personal Safety, October 2021
[3] United States Department of Transportation, Autonomous vehicle fleet ownership and operating costs are expected to be half that of traditional vehicles by 2030–2040., August 2018

5G ANS provides flexible networking for any campus layout.

CIOs, CTOs, and other HEI leadership should consider 5G to promote seamless interoperability at the right speeds across multiple campus locations. Only 5G has the bandwidth, coverage, and ease of implementation to connect students' and staff's devices from any corner of the campus.

But what's step one? We'll meet one-on-one with your IT and leadership teams, address your campus' needs, and help create a custom-fit solution that keeps your entire campus connected.

Explore three managed network options for a flexible, right-sized 5G connectivity solution for your university or college.

- **Public Network:** Access our shared T-Mobile spectrum via an existing macro network for secure coverage, seamless handoff, and connectivity virtually anywhere.
- **Hybrid Network:** Access our shared and/or dedicated spectrum and enjoy the flexibility and interoperability of a combination of public and private infrastructure.
- **Private Network:** Access specific, focused coverage with a fully customized network ideal for high-performance applications.

With 5G ANS, you can get the exact performance required for your campus' unique connectivity needs. As your mission and priorities progress, you can easily scale up and adapt the solution to meet your goals.

Build for today, scale for tomorrow.
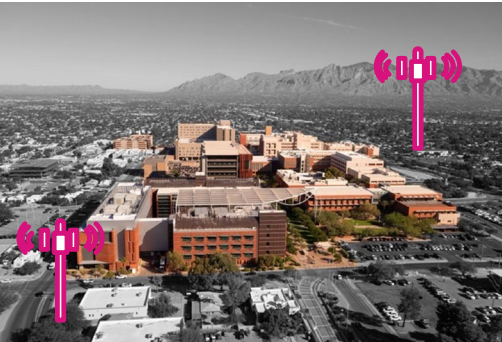
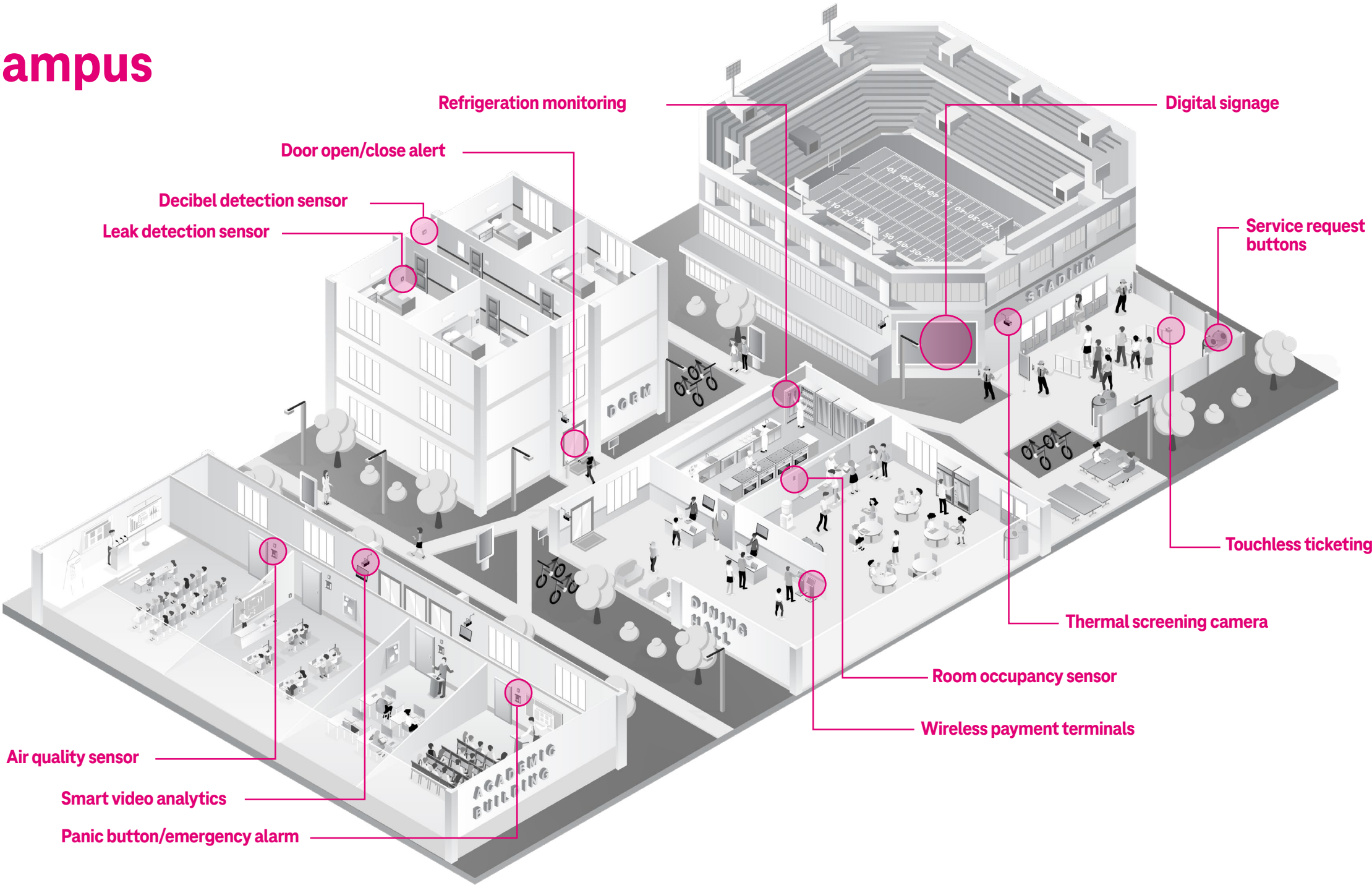**T-Mobile public network.** **Hybrid mobile network.** **Private mobile network.**

Increasing levels of performance

	T-Mobile public network.	Hybrid mobile network.	Private mobile network.
Need	Seamless, secure coverage and handoff for connectivity anywhere	Enhanced, seamless, ubiquitous coverage	Specific, focused coverage for high-performance requirements
Use case	Enable personnel to connect mobile devices, tablets, and computers	Ensure mobile connectivity across all corners of a facility or campus	Support data-intensive virtual reality (VR) and augmented reality (AR) technology and robotics
Spectrum	Shared T-Mobile spectrum via existing macro network	Specifically designed for the customer—shared and/or dedicated T-Mobile spectrum	Customer-dedicated T-Mobile spectrum
Radios	T-Mobile public network radios	Customer-dedicated radios	Customer-dedicated radios
Core	T-Mobile public network core	T-Mobile public network core	Customer-dedicated core

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Create a Smart Campus with 5G ANS.

Unlock new efficiencies, establish a safer environment, and make your campus an all-around better place to live and learn with 5G ANS. Pursue your mission with a digital transformation of your own.

- Refrigeration monitoring
- Door open/close alert
- Decibel detection sensor
- Leak detection sensor
- Digital signage
- Service request buttons
- Touchless ticketing
- Thermal screening camera
- Room occupancy sensor
- Wireless payment terminals
- Air quality sensor
- Smart video analytics
- Panic button/emergency alarm

USE CASE 5
Revitalize old campus infrastructure without subsidizing costly wires.

Aging campus buildings may be a rich part of your university's history, but they also present financial and environmental issues for your school. If your older campus buildings are outfitted with outdated technology such as Plain Old Telephone Service (POTS) lines, your building becomes a financial liability, incurring heavy costs to rip-and-replace connectivity or risk becoming abandoned altogether. However, it's best to make use of old builds because it's 50% less expensive to modernize an existing building rather than build a new one.[1]

Older buildings also worsen your campus' carbon footprint. After an investigation of 103 campus power plants across 93 universities, Reuters found that these plants emitted 5.8 million tons of greenhouse gasses in 2020. That's the same as 1.1 million additional cars on the road.[2] Smart Campus implementations such as automated HVAC, lighting, and water systems controls are necessary to prevent older buildings from consuming more energy and incurring more costs. **5G ANS provides a solution to adapt and reuse these old buildings.**

Easy-install 5G network solutions can repurpose aging infrastructure.

From both a technical and a financial perspective, T-Mobile 5G ANS is the easiest, most cost-effective way to breathe new life into old buildings. One of 5G's biggest strengths is its easy installation. 5G installation connects your campus to nearby 5G towers, with no need to lay underground cable. T-Mobile can simply connect your university to a public, hybrid, or private network that penetrates buildings and reaches throughout the campus, saving you from demolishing beloved older buildings.

We understand that every penny counts in the world of higher education, especially now with reduced revenues and increased costs. When working with T-Mobile, HEIs can opt-in to an OpEx model that sets cost predicability so you aren't forced to make a major up-front capital expenditure.

[1] Progressive Companies, Benefits and Challenges of Adaptive Reuse in Higher Education, January 2021
[1] Reuters, U.S. colleges talk green. But they have a dirty secret, November 2022.

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USE CASE 6
Community events require high-performance network capacity.

The University of Michigan's Michigan Stadium in Ann Arbor has a capacity of 107,601.[1] Imagine the network strain when Michigan takes on its fiercest rival, Ohio State. That's more than 100,000 attendees using their mobile devices to send their friends pictures and videos of the game, as well as countless devices used by coaching staff, camera and production crews, and on-site journalists.

While most universities don't require their network to cover a nationwide spectacle, they do need to provide coverage for peak times and large events. A peak time is any window where a specific part of your campus takes on a short, but intense, network strain, such as lunch time at your student center. Large events encompass popular sporting events, block parties, or fundraisers in which hundreds or thousands of people log onto your network seemingly out of the blue. When peak times and events create network disruptions, prospective students and alumni are likely to see this as a reflection of the university's overall quality, rather than blaming your network provider.

Peak times and large events can quickly degrade the network experience. **Without the scalability of a 5G network, student and staff devices can become sluggish and unresponsive at events when these devices are needed most.**

Prepare your network for one-off or recurring network strains.

To hasten your HEI's growing network traffic, T-Mobile engineers can increase your network capacity through our augmentative and flexible approach to 5G. In high-density areas such as stadiums, we can install a Neutral Host Distributed Antenna System (DAS), a carrier-agnostic network solution that improves wireless access for all mobile users, even if they aren't T-Mobile customers.

Network slicing allows your T-Mobile 5G ANS infrastructure to increase speed and capacity needs on a temporary or permanent basis, allocating slices of the spectrum to specified users or devices. For example, if your HEIs throws an end-of-year block party, food vendors, security, and attendees will need connectivity. Network slicing offers staff and attendees their own slice of the network, providing optimal speeds to prevent slowdowns.

We can do the same on a permanent basis. If your school's rivalry game becomes a big-ticket event, consider contacting us to establish a private 5G network. A private network offers dedicated capacity, meaning you get exactly the network experience you need to service your stadium week after week.

[1] NCAA, The 25 biggest college football stadiums in the country, July 2023

Prepare your university for the future of higher education.

In an increasingly competitive higher education market, HEIs are implementing new methodologies and technologies to adapt. The technology that drives learning and research is evolving. It's reshaping the ways IT teams connect remote and hybrid students, how researchers collect and synthesize data, and ultimately changes the way universities pursue their missions.

Interconnected, advanced technologies will continue to gain importance in higher education's day-to-day operations. If your university wants to use increasingly complex communication, learning, and research technologies—with an affordable OpEx billing model—you'll need a custom-fit, scalable, professionally managed network to support your strategic priorities.

At T-Mobile for Education, we'd love to work one-on-one with you to select a 5G ANS infrastructure that powers your university's digital transformation goals.

Let's talk. Speak with a T-Mobile Representative today at 844−973−0629 or visit <u>our 5G ANS website</u>.

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