

A photograph of three young adults, two women and one man, looking at a smartphone together. They are all smiling and appear to be in a casual setting. The image is overlaid with a blue and purple gradient and semi-transparent circles. The text is in white, bold, sans-serif font.

Connected campus: Digital transformation in action

How smart, shared infrastructure
can modernize education

A background image of three students (a man and two women) looking at a smartphone together, overlaid with a purple and blue gradient and semi-transparent circles.

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Connected campus: Digital technology for empowering student success

Schools, colleges and universities around the world are accelerating their digital transformations to build more inclusive, safe, resilient, sustainable and connected campuses.

There are challenges to overcome: Declining enrollment, infrastructure needs and financial sustainability, among others. Smart technologies address these issues and open the door to an array of possibilities based on artificial intelligence, the Internet of Things (IoT), home automation and connected buildings.

However, these developments rely on the implementation of a robust network and optimized data use. This helps administrators communicate with students and faculty, rationalize expenditure, attract more student enrollment and make on-campus travel easier. Schools, colleges and universities need the right support to navigate through this digital revolution.





Technologies for innovation in education

The digitization of administrative services such as student services, human resources and facilities management provide students and faculty with easy access to services and simplified processes.

Digitalization also enables possibilities for smart services to create connected campuses that are more efficient and reduce resource consumption by automating waste management, lighting and other networks. Other areas where smart technology is being used to benefit campuses is in transportation – where it is used for on-

campus road management to assist in the smooth flow of traffic – and student safety, which is undergoing significant transformation with the implementation of video surveillance.

None of these services would be possible without a strong base of underlying technologies, including:

- AI-driven automation and enhanced observability
- Wired networks based on optical fibre and wireless networks using standard protocols (for example: Wi-Fi, Zigbee and Lora)

- A wide variety of applications hosted in a data centre or in the cloud, including business applications and dedicated services
- A growing number of connected objects such as video surveillance cameras, temperature sensors, air sensors and vehicle counters
- Digital public signage, display systems and smart parking lots
- Multi-device and multimedia communications

Campus app: Communication between students and services

Campuses are adopting mobile apps to bring together academic services and administrative communication in a single, easy-to-use platform. For example: Students and faculty can schedule meetings, access course materials and receive real-time alerts. AI-powered chatbots support 24/7 inquiries, resolving common requests and routing others to appropriate staff. Notifications can include updates on safety, campus events or changes in class schedules, all accessible from mobile devices.

What is CPaaS?

Communications Platform as a Service (CPaaS) is transforming the way education institutions communicate, how they deliver student services and how they interact with campus communities. From notifications about academic or administrative requests, to student satisfaction surveys and chatbot integration, a fundamental CPaaS strength is that it connects everything. Contextual information can be seamlessly synchronized during a call or web interaction, enabling campus staff or automated bots to provide a personalized service. This can be based on the e-service requested, the specific web page visited – such as course registration or a financial aid page – or the history of previous interactions.

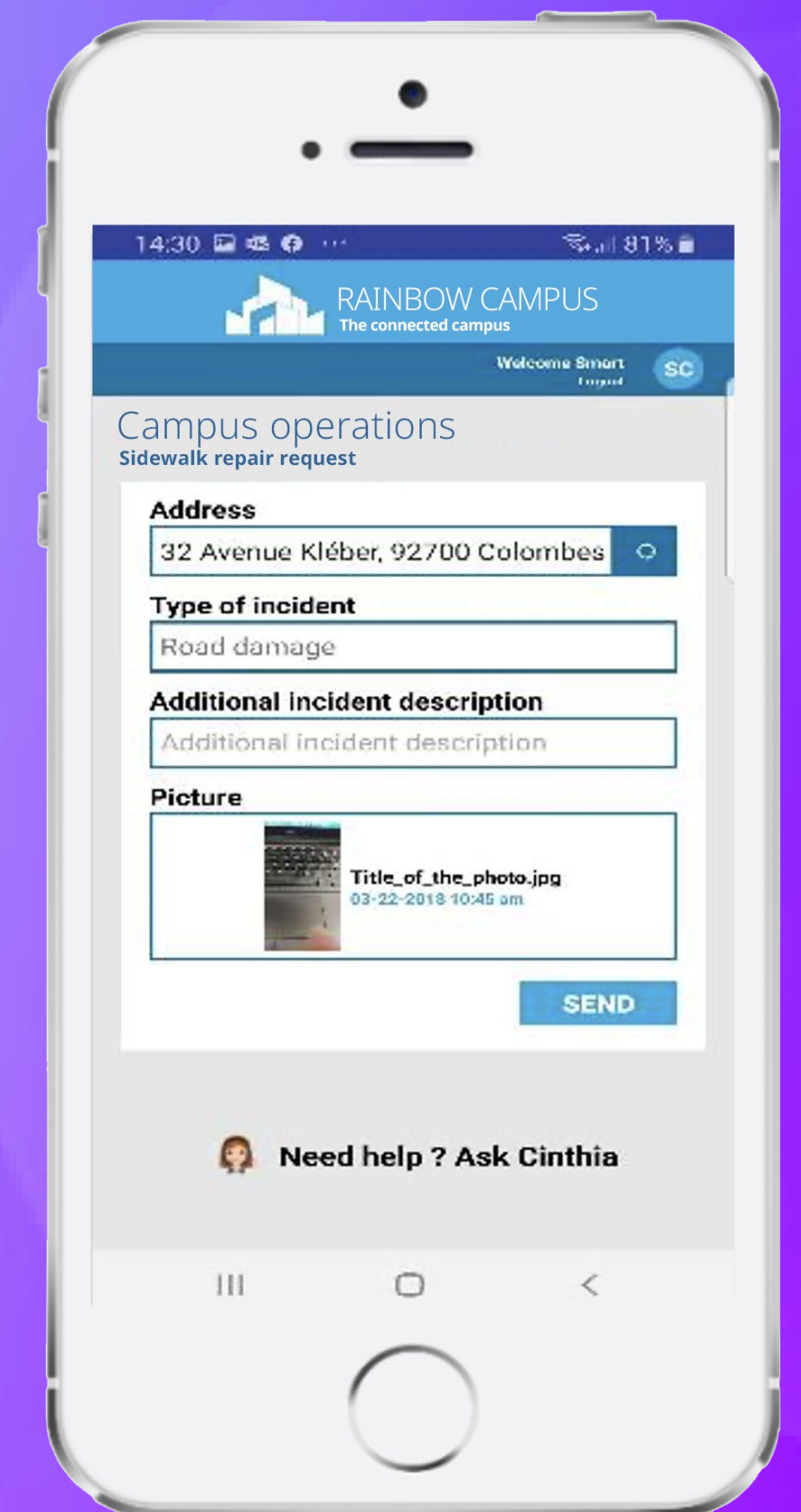


The student's role in a smart campus

A connected campus puts students at the center

With direct feedback mechanisms and community engagement tools, universities can anticipate needs, evaluate new policies and co-create services.

CPaaS empowers users to report incidents, suggest improvements and engage with campus development projects. Dialogue becomes ongoing, and the campus becomes more responsive to its community.



CPaaS and IoT integration

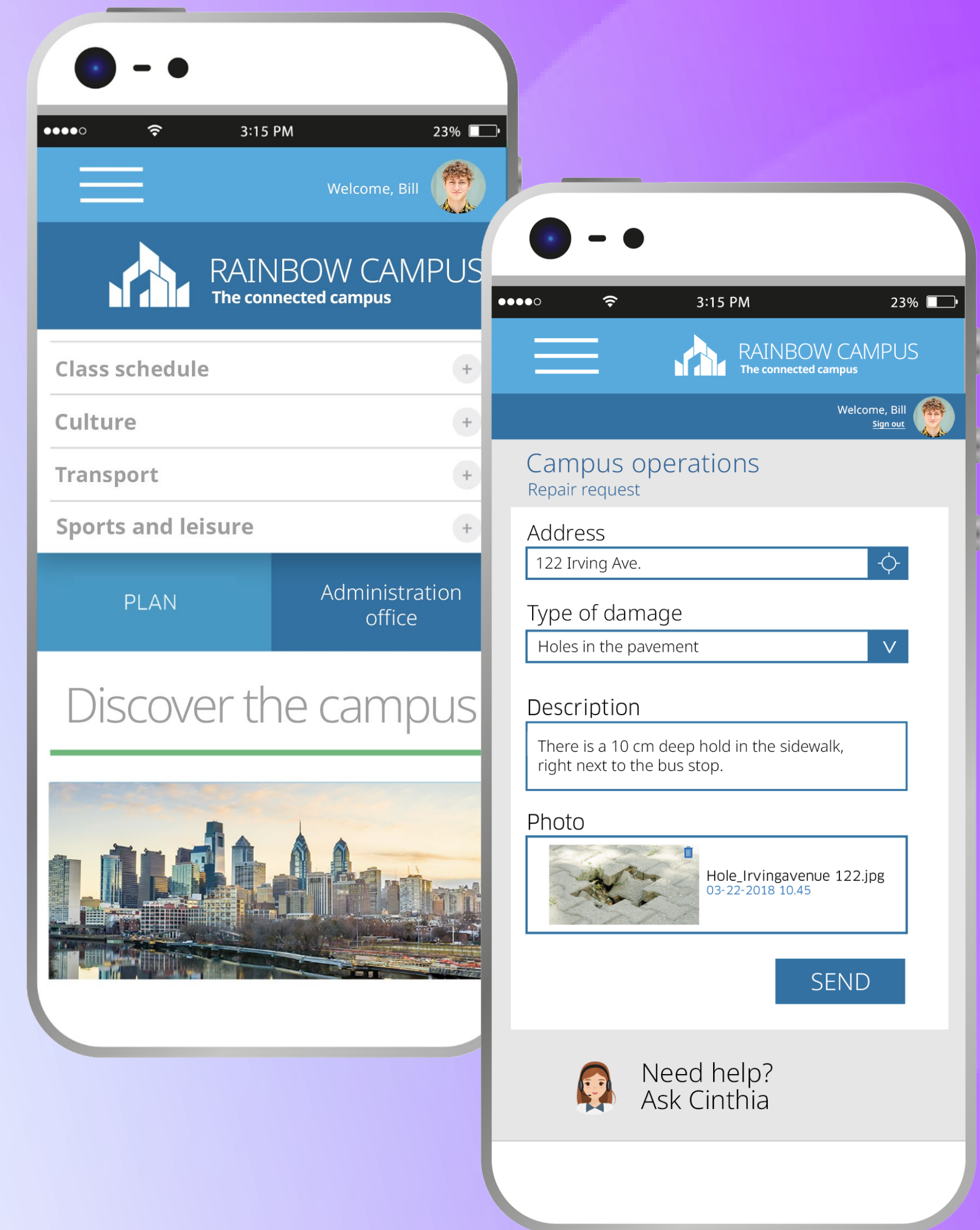
Smart campus infrastructure allows seamless interaction between people and devices

Lab safety incident

- A gas leak sensor in a chemistry lab detects abnormal levels
- The system immediately alerts lab supervisors, safety officers and campus security through voice, text and push notifications
- Automated evacuation messages are sent to students and staff in the building with clear exit instructions
- Cameras in the lab stream live video so safety teams can assess the situation before entering
- A conference call between the lab director, emergency services and campus facilities is automatically initiated to coordinate next steps
- Digital locks restrict access to the lab until it's declared safe

Smart classroom scheduling

- A professor cancels a class at the last minute via the university app
- The system automatically frees up the classroom in the scheduling system
- Students receive a real-time notification of the cancellation and a suggestion for study spaces available nearby
- IoT occupancy sensors detect that the room is empty and update availability for ad-hoc study or group work
- If another professor needs a classroom, the system offers this room as an option and coordinates logistics automatically



Modernization of student services

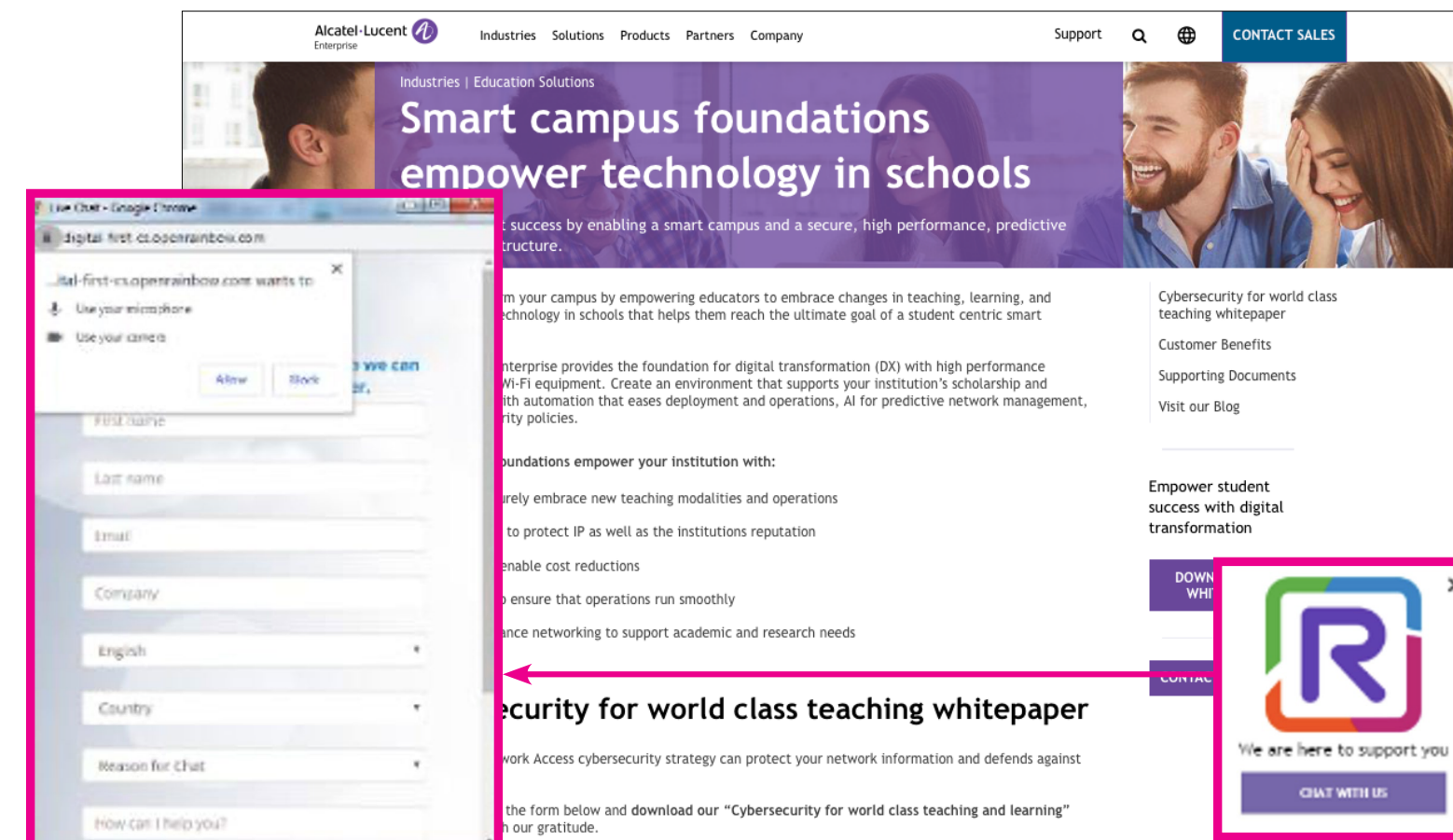
One-click connection through your website

Enable students and staff to connect to the right person or service, selected by language or availability. Once connected, advisers or staff can engage using voice, video or screen/document sharing. Scheduled appointments include reminders about required documents or meeting formats, reducing no-shows and improving preparation. Simple tools like embedded calendars or URL links streamline the process and ensure easy access to the right resource.

Digital services and resources

- A click-to-calendar service enables students and faculty to reserve services or resources such as laboratories, auditoriums, study rooms or specialized equipment

- Students and staff can schedule academic advice or career counseling appointments and connect virtually through voice, video and chat, with the ability to share and review documents in real-time
- Event organizers and student associations can request campus spaces through a simple website link, with automated conflict checks, approvals and confirmations sent via calendar invites
- Requests for services automatically route to the appropriate department, ensuring efficiency and transparency



Connected buildings: Smarter spaces for learning and living

Smart campus buildings offer new ways to interact and access services

Control and monitoring of space automation

- Integration with a third-party automation system for centralized control of lighting, heating, cooling and door opening systems
- Smart control of lights, air conditioning and curtains from a smartphone, smart desk phone and chatbot, among others
- Provide analysis to monitor and improve energy consumption and operating costs

Real-time room reservations and availability

- Find and book the nearest available classroom, lab or auditorium
- Real-time programming
- Automated reservation upon entry or exit

Real-time location of security guards and equipment in case of emergency

- Geolocation of staff and directions to reach them in real-time in a building
- Location of emergency exits, fire extinguishers and defibrillators
- Man-down detection function
- Analysis data

Monitoring of sensitive areas and contact tracing

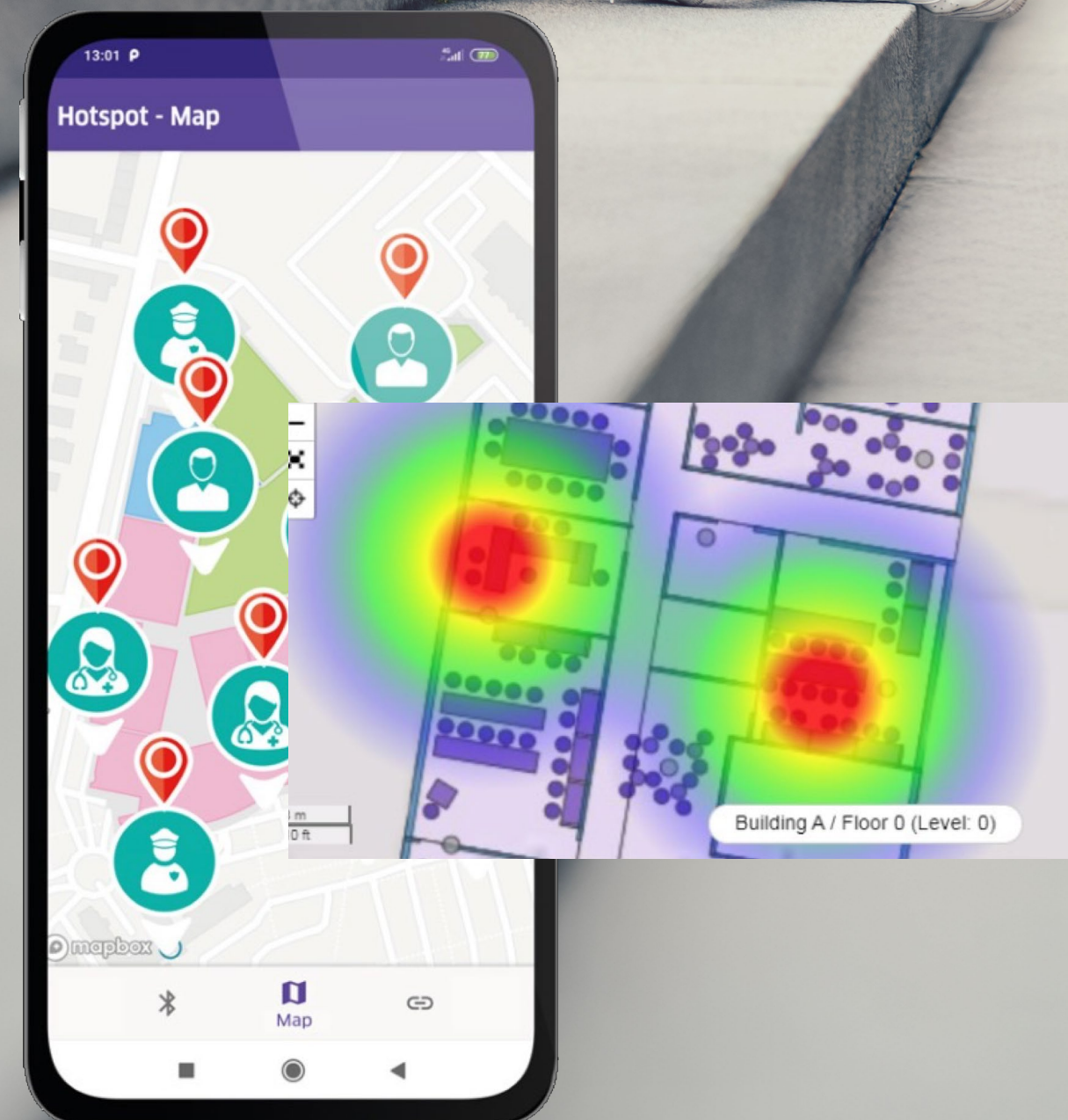
Smart buildings used by students, faculty or staff can manage the number of people in a specific area and help enforce social distancing through real-time density monitoring.

The solution allows you to:

- Define an area to monitor
- Identify the number of people in the area
- Identify, in real-time, when people are too close, as well as when there is prolonged contact (logged timestamp)
- Notify affected staff based on specific criteria (for example: people moving across a boundary, or the number of people entering or leaving an area)
- Use analytics to trace contact flow history, if necessary

Safety and security in campus buildings

- Audio notifications/alerts through phones and loudspeakers
- Emergency call points
- IoT notifications/alerts through different media
- Predefined workflows to quickly involve first responders



Multi-service and secure infrastructure: The smart campus foundation

A single network

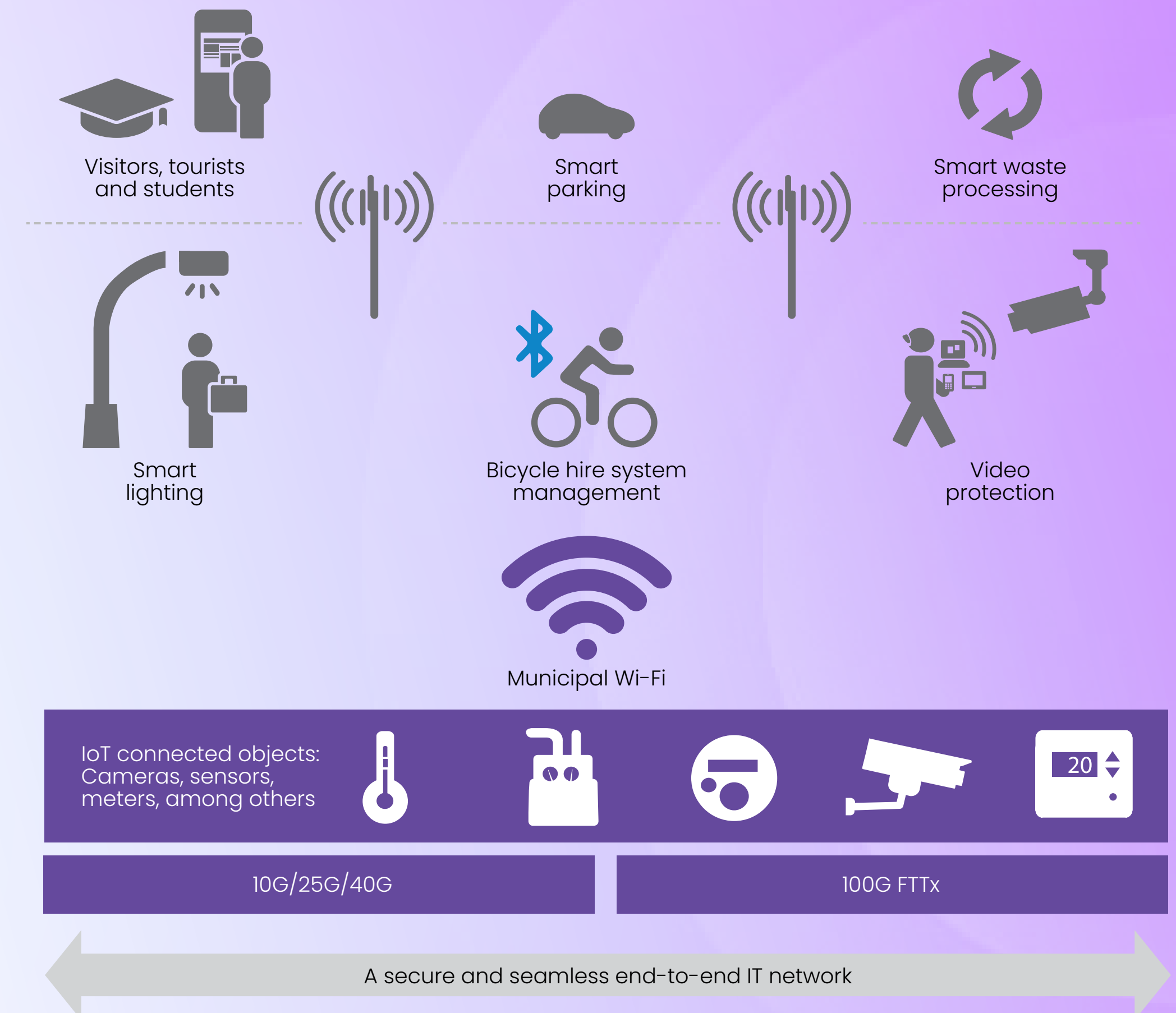
To connect all services and connected objects to a single network, the campus should rely on a secure multi-service infrastructure. Faculty buildings, day care cents, administrative offices, campus police, libraries and other services all gain dedicated applications with high-speed connectivity. This communications base can be extended to local public sector partners and campus signage, while collecting information from a multitude of connected IoT objects (such as video surveillance cameras, sensors or detectors).

Unified and simplified administration

End-to-end consistency is guaranteed by a single administrative platform. A single networked system environment simplifies the

integration, deployment and administration of a digital system and secures the exchange of data.

- AI-powered network operations adapt dynamically to business needs, allowing your campus to be faster, smarter and more responsive
- Digital traffic between connected objects is confined within dedicated virtual networks
- Whether you connect to the information system using a wired or a wireless network, the user experience remains the same
- IT administrators can fine-tune accessible resources to match a user profile, making it possible to offer different services depending on the role or authorizations attached to each person



Wi-Fi 7: Wi-Fi for the modern campus

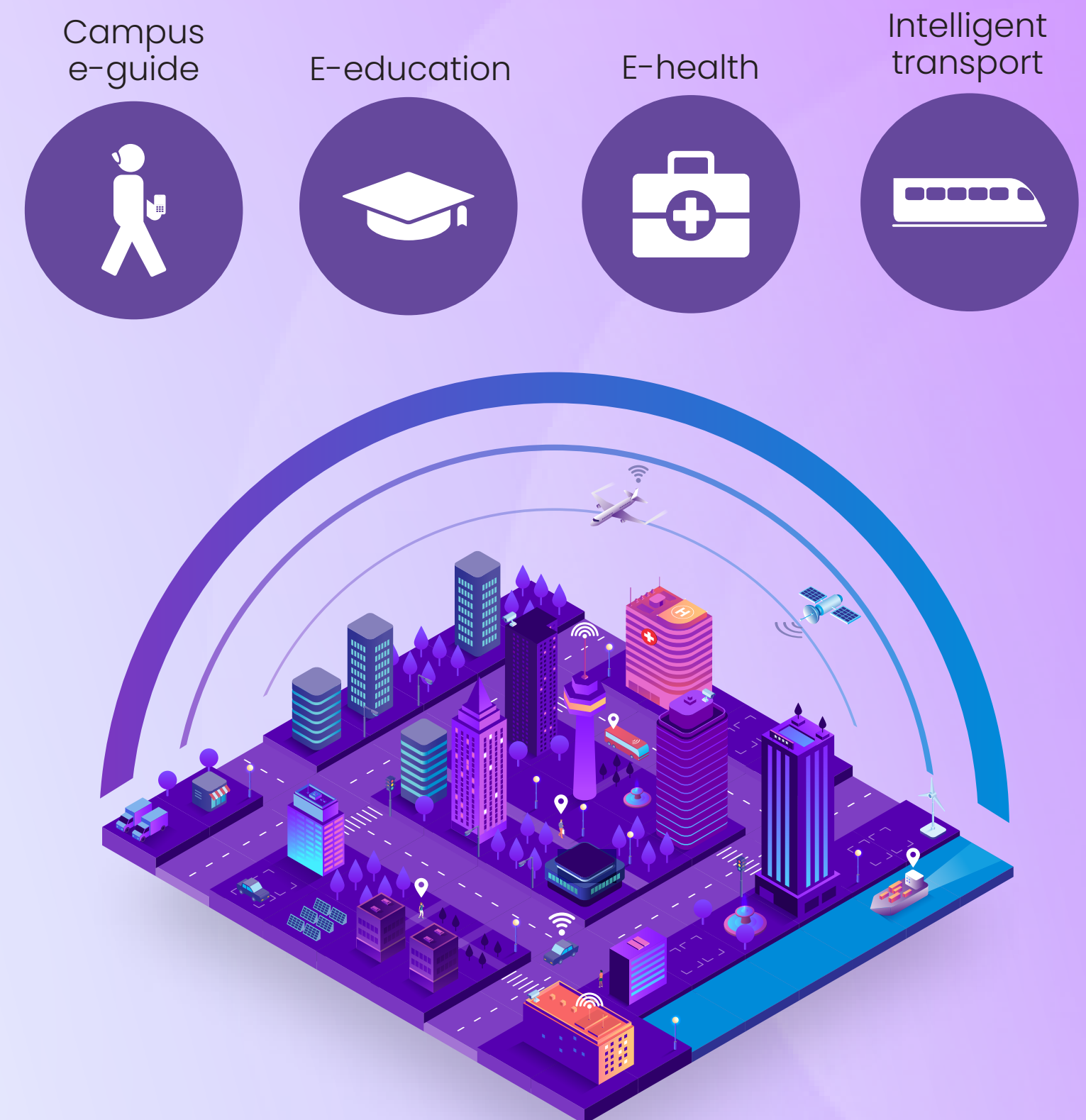
Next-generation connectivity for education

Educational institutions are deploying new, more interactive wireless services to support their academic communities. Wi-Fi 7 enables high-speed, low-latency connections that enhance learning experiences and streamline campus operations. Publicly accessible forums, multimedia content, videos, surveys, games and virtual tours are easily available across mobile and smart devices, ensuring seamless engagement anywhere on campus.

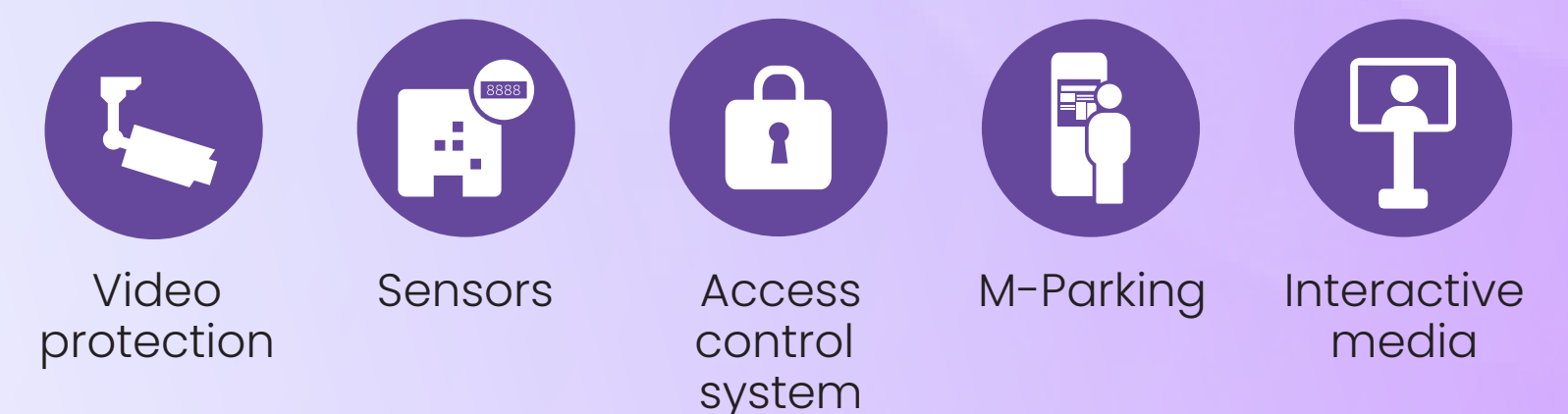
Endless real-world examples

- Enhanced learning through smooth access to interactive content, immersive simulations and collaborative platforms
- Improved campus mobility with optimized traffic flow, smart parking management and internal transport updates delivered directly to devices
- Operational efficiency with reduced operating costs enabled by IoT-driven energy management and smart building systems
- Student experience elevated through digital wayfinding, campus engagement apps and real-time notifications for events or services

The rise of wireless devices is exponentially increasing mobile user expectations



Public Wi-Fi for smart campuses





Secure technology: The cornerstone of digital education

How IT teams can approach IoT with confidence

Objects connected to a smart campus network can expose shared resources or be leveraged to extract private data passing through the network.

Network segmentation prevents the entire network from being compromised in the event of an attack on a vulnerable object or machine. It also provides the automatic and secure integration of IoT devices while simultaneously protecting the network.

The IoT containerization strategy ensures the efficient and secure integration and support of multiple sensors and connected devices. It consists of three elements:

1. Detection and classification: Each object connected to the network must be detected and classified. The [Digital Age Networking](#) solution provides access to a database of more than 29 million objects to instantly identify an object connected to the network and automatically set up a configuration associated with a particular device.

2. Virtual segmentation: Segmenting a single physical network infrastructure into separate virtual networks or containers is essential to ensure that each service or application has its own dedicated segment, enabling suitable operation and security

3. Continuous monitoring: The network monitors the behavior of [IoT](#) devices and applications to ensure they are functioning properly. Each authorized object is stored in an inventory. This allows the IT department to know exactly how many devices are connected to the network in real time. It is important to constantly monitor a connected object on the network to take immediate action in the event of any deviation from its usual behavior. In the event of abnormal activity, the network can react and disconnect the faulty device, send a notification to the network administrator or change the destination of the dedicated IoT container for further checks.

An expert's perspective on security, automation and visibility into a multi-service network

How is infrastructure key to the development of smart campuses?

Digital transformation in education demands a solid, adaptive foundation. A service-oriented network supports the digital experience expected by students and faculty, while enabling the secure deployment of applications and devices. Digital age networking empowers universities to move forward with confidence, offering automation, secure IoT onboarding and process innovation.

What about IT teams' workload?

Automation allows us to save a significant amount of time. [Autonomous Networks](#) are automatically configured and made available, ensuring critical and secure network operations while optimizing the user experience.

This architecture combines high availability, ease-of-use, low total cost of ownership (TCO) and a very high level of security.

As a result, teams on the ground work faster. Administrative tasks that used to be done manually, such as configuring network access for terminals, are now automated. Network maintenance is simplified and the infrastructure's TCO is reduced. All of this allows even a small operations team to manage a secure network covering the entire community.

Can we accurately control all connected devices across the campus?

While essential for the development of new services within the framework of smart campus, the connection of a large number of connected objects is a challenge both in terms of deployment and security. Configuring and managing each of these objects and their network connectivity can be a time-consuming process that carries considerable security risks.

The Alcatel-Lucent IoT containerization strategy is designed to provide an automated solution to integrate IoT devices securely and efficiently, while simultaneously protecting educational institution networks.

In the future, this technology will automatically adapt and systematically enable a secure connection from a user or an object to an authorized application.



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About Alcatel-Lucent

Alcatel-Lucent solutions for education deliver a new [connected student experience](#), sustainable and secure campuses and the future of digital learning. Our solutions help you comply with stringent requirements and deliver a secure experience.

Our solutions connect everything using efficient and customized technologies designed to meet the needs of our customers. Our mission is to connect all your devices with

[Digital Age Networking](#), [Digital Age Communications](#) and [CPaaS Solutions](#) and services to ensure your business success. In the cloud. On premises. Hybrid.

Alcatel-Lucent is committed to developing effective technology solutions for our customers, connecting people, machines, objects and processes, while creating a more sustainable future for all.

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