Doing IoT Right:
Top Practices for Multi-Dwelling Units

MDUs Embrace IoT

The future of housing is connected. Consumers increasingly expect their homes to have smart solutions that are convenient, green, and secure and built upon a reliable and high-performing home network. Multi-dwelling unit (MDU) property owners and managers, made up of smart apartments and smart condominiums, senior living, and student housing, are evaluating and investing in technology that opens a new generation of property management and resident experience.

The American Community Survey[1] finds that there were approximately 120M occupied housing units in 2020, with over 31M occupied apartment units and 7.5M condominium or townhome units. Property technology, including bulk broadband, platforms and connected devices, is an emerging market with huge opportunities within these areas.

This whitepaper discusses emerging smart apartment and condominium trends across the United States and lays out a roadmap for MDUs to evaluate these solutions. It highlights areas of consumer demand and key benefits, top smart technology deployment strategies, and the business case for using Internet of Things (IoT) technology for property management.

96% of recent smart home device deployments in MDUs were made fewer than five years ago.

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Smart Apartments are Gaining Popularity

Parks Associates defines "smart apartments" as MDUs that include IoT technology in residential units and across the property. They include a variety of smart amenities and features aimed at residents, staff, and owners. Smart apartments serve an assortment of use cases, ranging from access control and energy management to safety, security, and testing and maintaining environmental quality. IoT and building automation tech can benefit staff by enabling self-guided apartment tours or rapid and proactive maintenance.
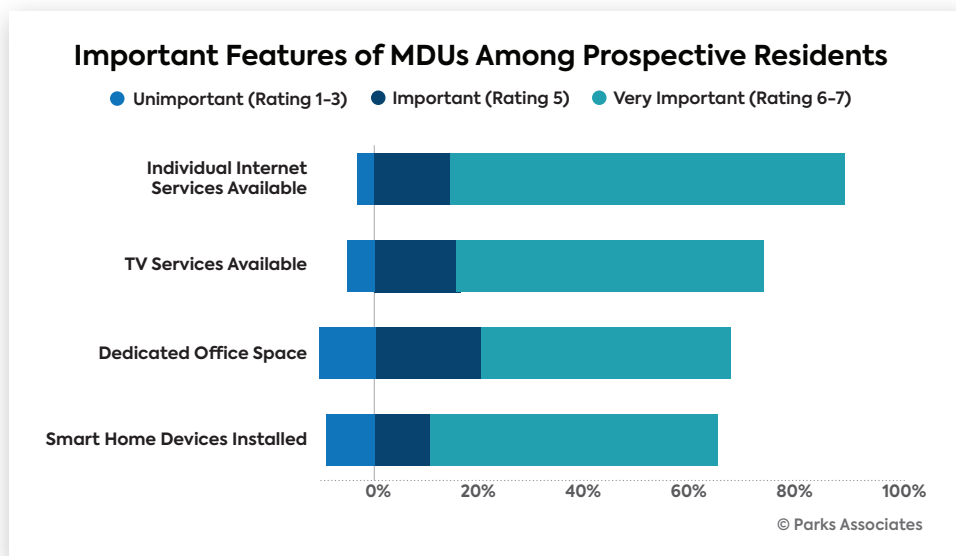
Parks Associates research of MDU owners and property managers reveals smart MDUs are growing in popularity:

- 34% of MDU property managers report offering internet-connected or smart home devices to residents in at least one property that they manage.

- 57% of MDU managers report having a lighting control system in their largest property; 26% have an energy management/monitoring system, and 13% have a smart home device or IoT platform/hub.

- 44% of properties with energy management systems incorporate internet-connected devices such as smart thermostats and smart lighting into the system for remote monitoring and control.
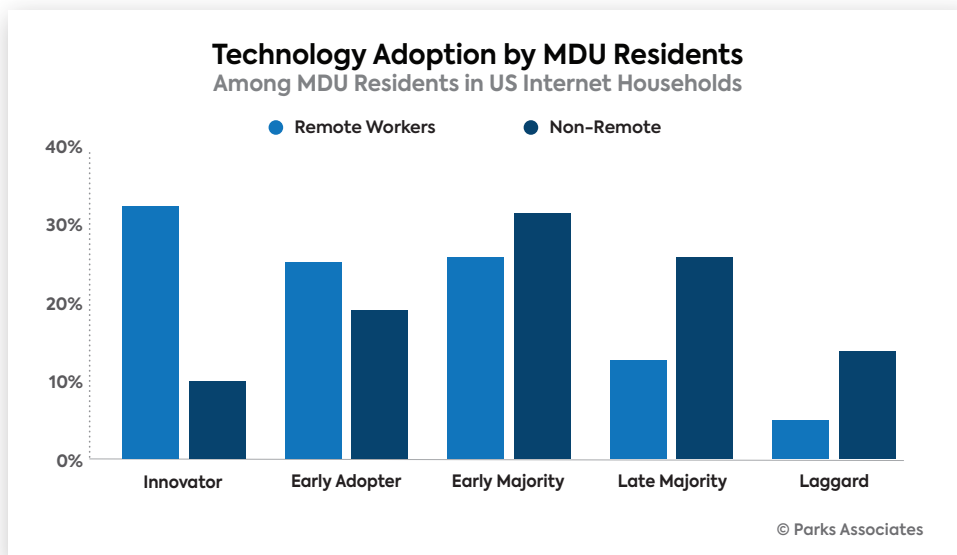
Smart apartment device offerings are emerging as a key differentiator for properties in attracting and retaining residents. An increasing percentage of properties—both new construction and existing properties—are looking to deploy new smart apartment and automation solutions, frequently paired with high-speed internet solutions, largely in response to consumer expectations.

Currently, greenfield properties are more likely to deploy as it is easier to add in new construction than to retrofit. However, proptech advancements make it easier for brownfields to deploy, and so this trend is increasing among brownfields, especially in more competitive markets, where tenants have a choice of MDUs at various price points.

Important Features of MDUs Among Prospective Residents

● Unimportant (Rating 1–3) ● Important (Rating 5) ● Very Important (Rating 6–7)

Feature	
Individual Internet Services Available	
TV Services Available	
Dedicated Office Space	
Smart Home Devices Installed	

0%   20%   40%   60%   80%   100%

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Smart Apartment Opportunity and Demand

Demographically speaking, MDU residents are younger than those in single-family households and oftentimes more technologically adept. MDUs appealing to higher income residents in particular, such as professionals working remotely, can expect their residents to index particularly high on the technology adoption scale and be more interested in amenities such as smart apartment devices, high-speed internet services, and dedicated office spaces as a result. Smart apartment residents are keenly interested in use cases related to safety, security, and energy management.

Technology Adoption by MDU Residents
Among MDU Residents in US Internet Households

Legend: ● Remote Workers ● Non-Remote

Category	Remote Workers	Non-Remote
Innovator	32%	10%
Early Adopter	25%	19%
Early Majority	26%	31%
Late Majority	13%	26%
Laggard	5%	14%

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Parks Associates' definition of MDU residents includes both consumers owning and living in their own units as well as those renting a unit from a building owner. Both groups of residents are interested in tested amenities, however, unit owners over-index in their adoption of property-provided smart home devices. Over 42% of people who own their MDU unit report that their property pre-installed at least one smart home device in their home. Only 10% of renters claimed the same.

The rental market is ripe for introduction of smart apartment solutions.

- Almost two-thirds of prospective MDU tenants report that pre-installation of smart home devices is an important factor when selecting a new home.
- Over half of MDU renters are willing to pay higher rates for apartments with smart capabilities and amenities.
- One-third of MDU renters report they are willing to pay an additional 15% per month, a rate consistent with property manager expectations.

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Property Management Technology: Intelligence and Automation

In addition to raising rental rates and increasing unit attractiveness, property technology and building management solutions can reduce costs, automate certain staff tasks, and enable new use cases. Access control mechanisms allow for self-guided tours for prospective tenants. Security cameras with AI monitoring may increase residents' feelings of safety, as well as reduce crime on properties. In addition to new use cases, IoT solutions may offer improvements in comparison to legacy systems. For example, a video intercom solution with app support could replace the old dialing systems for visitors and events, allow residents to offer virtual keys to friends or service providers, simplifying access to the property and unit to verified visitors.

A top use case for properties is that of rapid and proactive maintenance. One prominent example is the use of smart water leak detectors to allow properties to detect water leakage issues before they cause major damage to the property, potentially saving thousands of dollars in maintenance costs and property damage.

Consumers see clear benefits in technology in MDU units:

- 88% of non-MDU residents planning to move into MDUs in the next 12 months report that the availability of internet services is important in their decision.

- 64% of MDU residents with property-provided smart home devices rank receiving notifications about safety issues valuable, while 62% find the ability to monitor activity outside their door highly valuable.

- MDU residents are also willing to pay for smart home device capabilities. 34% are willing to pay 15% more per month for smart home device capabilities.

While the benefits are clear, proper implementation of these solutions is key for them to be fully realized and to get full buy-in from property management staff. Many factors determine the success or failure of these projects.
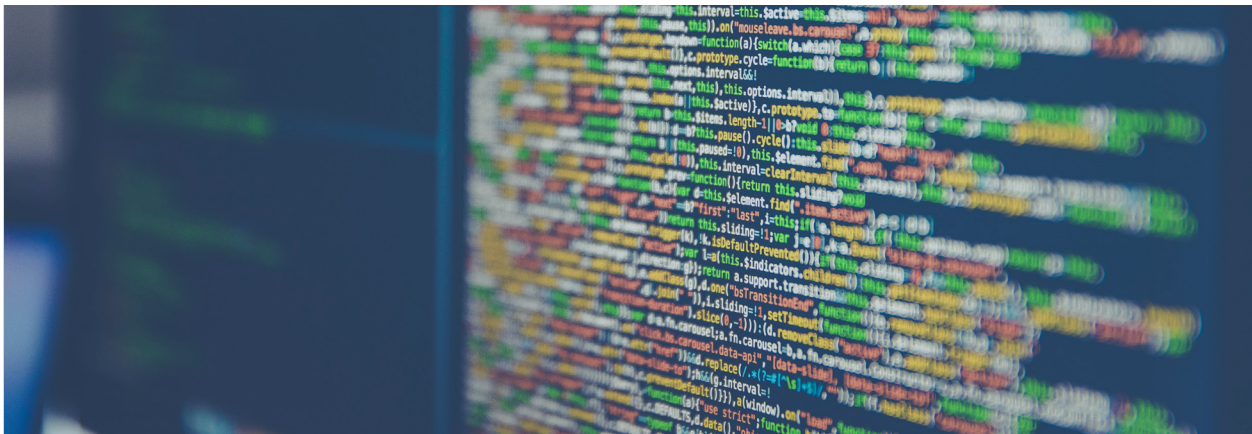
# Doing IoT Right: Common Pain Points and Lessons Learned

Before implementing IoT, MDUs must carefully evaluate business cases, identify important specifics about their properties and property management systems, and evaluate if the solutions they intend to deploy are compatible with their existing systems. A key component of this process is determining the role and responsibilities of each vendor and member of the team—a complex task for MDUs and one fraught with complications.

The best vendors are able to take a trusted advisor role, illustrating and explaining best practices and providing implementation advice. Top vendors will coordinate contributions, manage other vendors as sub-contractors, and ensure that for each project there is only one hand to shake.
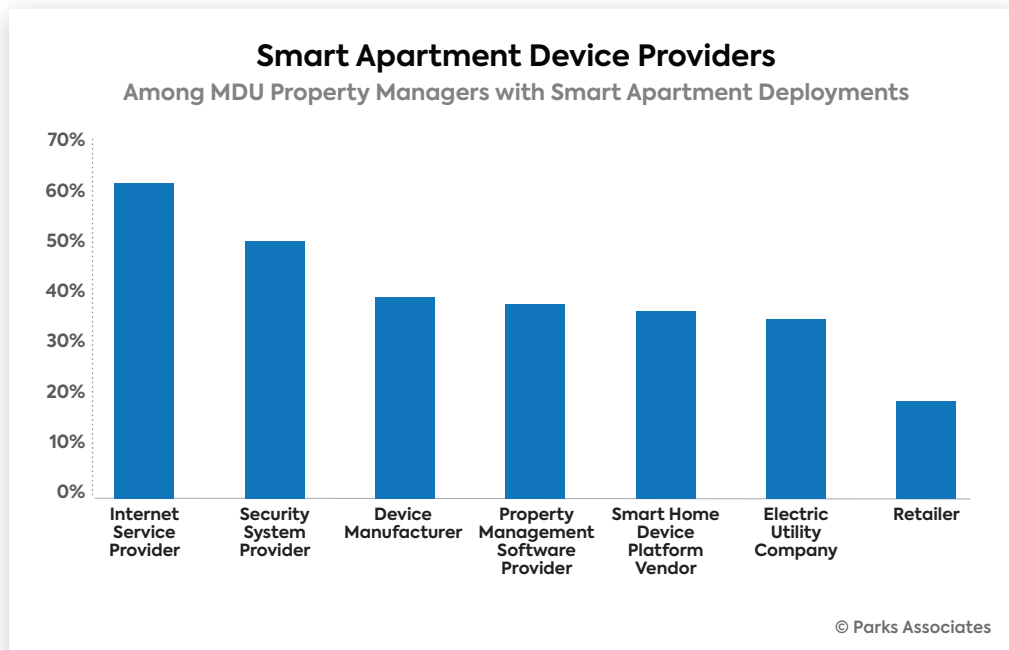
Integration

MDU owners and managers note it is particularly important for smart home systems to integrate into existing property management systems. Such integration would minimize disruption, allow a single point of control, and synch existing resident data automatically.

Important Factors for Smart Home Vendor Selection

% Rating 6-7 on a 7 pt Scale

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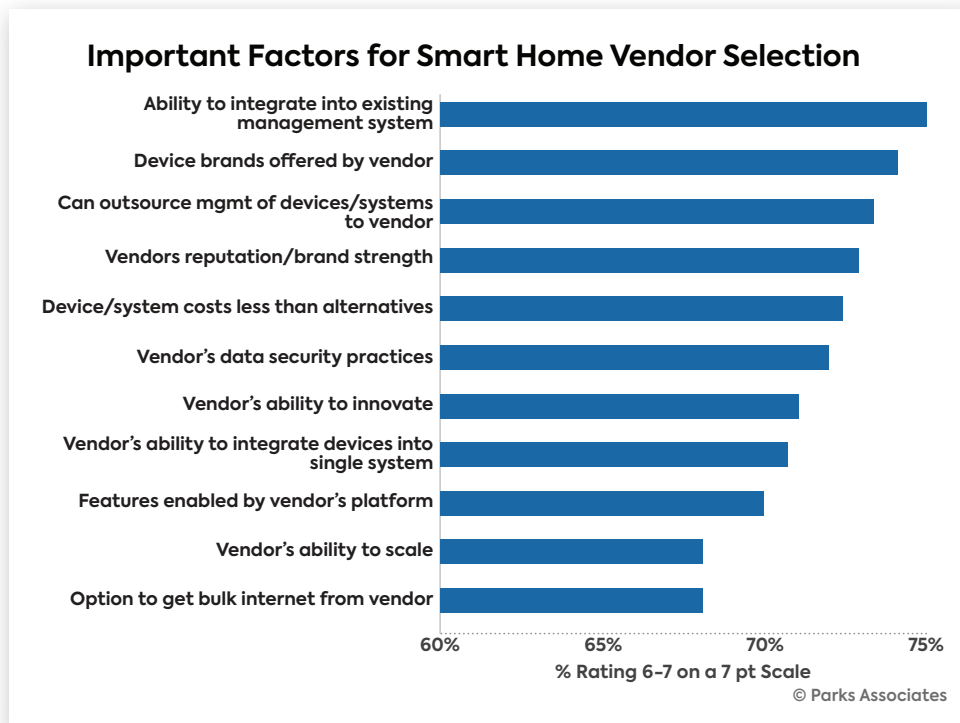
In most early cases, MDUs have bought their smart home devices from an ISP.

Service providers have an inherent advantage in that they have an existing relationship with the MDU, particularly if they already supply bulk internet services. The majority of MDUs who do not already offer bulk internet services plan to offer it in the next 12 months. With the new FCC ruling to prohibit exclusive revenue sharing agreements between ISPs and MDUs, bulk internet agreements allow MDUs to re-capture this lost revenue stream while improving the resident experience. Since bulk internet deployments, including managed Wi-Fi networks, facilitate MDU adoption of smart home devices, ISPs that offers these services have market advantage.

Smart Apartment Device Providers
Among MDU Property Managers with Smart Apartment Deployments

Category	Value
Internet Service Provider	~61%
Security System Provider	~50%
Device Manufacturer	~39%
Property Management Software Provider	~37%
Smart Home Device Platform Vendor	~36%
Electric Utility Company	~34%
Retailer	~18%

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Regardless of the vendor, MDUs must be prepared to treat their IoT deployments as critical technology. They need to ensure a vendor has disaster and redundancy plans for adverse conditions such as power or internet outages, or for interruptions in DNS or cloud services. Critical mechanisms such as access control needs manual backups, and devices should be tested so that they do not behave adversely without internet access.

Ensuring that devices and systems are protected against cyberthreats is also crucial, as device firmware may be vulnerable to ransomware or hacking. New software solutions allow companies to monitor IoT behavior and internet traffic, identifying misbehaving devices and isolating them on networks. None of these requirements are the specialty of MDU management, so the vendor relationship is critical to cover these important areas.

The majority—63%—of property managers with smart home devices installed at their largest properties purchased the devices from an internet service provider.

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Challenges in Connectivity

Connectivity is an important factor in planning IoT deployments. Different built environments support different deployment approaches. Building materials, building layouts, and the presence and location of existing wiring all impact connectivity. MDUs and solutions providers must carefully determine the best deployment model for each location—there is no one-size-fits all approach.

Considerations for IoT devices located in resident units may additionally be different than devices intended to serve property management use cases. Devices in resident units may potentially be able to use with the same infrastructure and wiring used for residential internet access, and depending on the partnerships involved and whether they include the internet service provider, these devices could use the same access points installed on the property. Smart home devices outside of units, across the property, may require a new wired network or the use of wireless technology.

Navigating the Built Environment

More than one-half of MDU renters live in low-rise buildings, composed of four stories or less. Low-rise MDU properties are often spread over larger areas of land than high-rises, are frequently composed of multiple buildings, and physical access point for residential units are commonly located on the outside of buildings. This increases resident demand for access and security solutions such as smart video doorbells, security cameras, and smart locks. However, this layout may also increase the CAPEX for deploying new networking infrastructure.

High-rise buildings, by contrast, commonly incorporate a larger number of units occupying a smaller surface area. Depending on the method by which the building was constructed, and the materials used, it may be more or less costly to deploy new networking infrastructure. One particular challenge for deploying in high-rise buildings is that of building material type, as some materials hinder the ability for radiofrequencies to penetrate through walls. Higher frequencies, including 5GHz Wi-Fi, or even 2.4Ghz, may have challenges operating beyond line-of-sight. Companies may need to choose networking technologies making use of lower frequencies with better penetration and propagation characteristics, or densify their access point deployments.
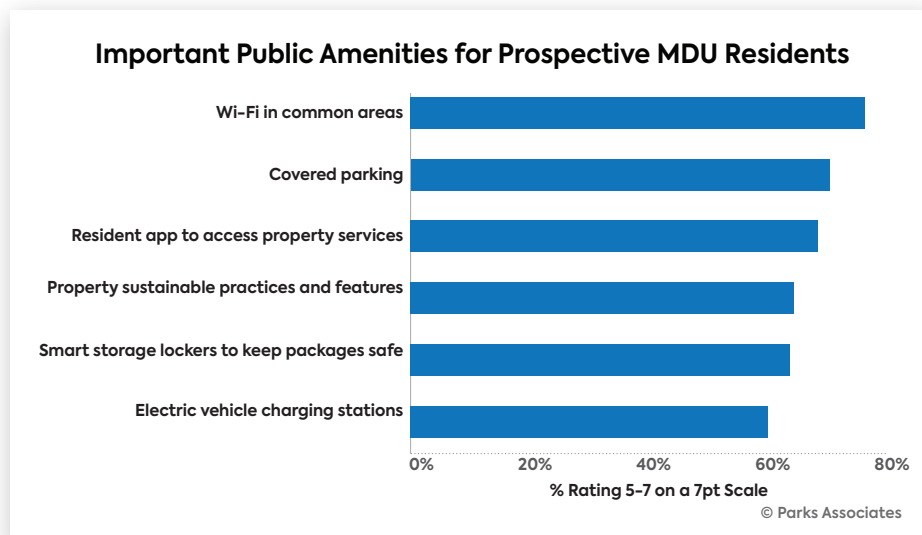
A common strategy for both types of MDUs is that of supporting a mix of radio frequencies through the deployment of specific IoT gateways, which make use of a traditional IP network for backhaul. This may include a wired connection, Wi-Fi, or cellular. Next-generation gateways may support Wi-Fi, Bluetooth, Zigbee, Matter, or other IoT protocols. Some bandwidth-intensive use cases, such as those incorporating streaming video, also require a direct connection.

Technology	Frequency	Power Usage	Range	Penetration/Propagation
Wi-Fi 5GHz	5.15 GHz – 5.85 GHz	High	200ft (400ft if amplified)	Can pass through drywall, plywood. Cannot pass through metal, wire mesh, concrete, brick, masonry block. Difficulties with plaster, ceramic tile, windows, tinted glass
Wi-Fi 2.4GHz	2.412GHz – 2.484GHz	High	~400ft	Can pass through drywall, plywood. Higher penetration through cement blocks and red bricks than 5GHz Wi-Fi. High interference from residential Wi-Fi router/gateways
4G LTE	600MHz – 2500MHz, depending on carrier	High	3.5 – 5Kft	Varies based on frequency – low frequency offers better penetration than Wi-Fi 2.4Ghz
Bluetooth, Bluetooth Low Energy	2400 – 2483.5 MHz	Low	150 –1000ft	Similar to 2.4GHz Wi-Fi; standard (non-amplified) deployments will typically have a much more limited range
Zigbee	2.4GHz (US)	Low	10-100m	Designed for line-of-sight transmission, however, includes mesh networking capabilities
Sub-1 GHz (ex: Z-Wave)	<1K MHz, varies	Very Low	225m – 100km	Highest penetration abilities, but lowest throughput

Working with Different Network Structures

Within the MDU space, many different networking structures are used for backhaul for IoT gateways. These include use of Wi-Fi access points, use of cellular hubs, and directly connecting the IoT gateway to wired infrastructure. A majority of MDUs are already wired for internet connectivity within residential units, with wiring including fiber optic cable, coaxial cable, or copper lines. Additionally, a growing number of communities offer community Wi-Fi, where access points are established throughout the property to allow residents and staff internet access outside of individual units. Wi-Fi is the most important common area amenity for non-MDU residents looking to move into MDUs.

Important Public Amenities for Prospective MDU Residents

Amenity	
Wi-Fi in common areas	
Covered parking	
Resident app to access property services	
Property sustainable practices and features	
Smart storage lockers to keep packages safe	
Electric vehicle charging stations	

% Rating 5-7 on a 7pt Scale

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Generally, there are multiple connection points within residential units, capable of supporting multiple access points. Although intended for connecting residential router/gateways, these access points may also serve to connect IoT gateways. Community Wi-Fi deployments may be supported by a mix of networks, including both wired connections and wireless, that IoT gateways may be able to tap into.

Considering the Wi-Fi network in resident units—using residents' own access points and internet subscriptions may seem like the simplest deployment method for communities.

However, this method has complications that increase staff workload and may cause resident dissatisfaction. Onboarding and disconnecting devices during resident changeover may be time-consuming for MDU staff and additionally may be beyond many staff members' technical abilities. Residents may also change their access point's SSID and password, interrupting connections to smart apartment devices. Technical issues with resident access points, as well as Wi-Fi coverage and propagation issues, may additionally cause problems—and residents may be quick to assign responsibility to their MDU, rather than their internet service provider or router/gateway. MDUs may avoid many of these issues by pre-installing access points and requiring that residents make use of these but would be advised to ensure that residential units are inspected—either by themselves or by a trusted partner—and determine if they offer sufficient network coverage for use cases. However, as a result, MDU owners may not see operational cost savings.

Considering community Wi-Fi deployments, existing deployments may not be capable of providing coverage to the areas where IoT devices are to be installed.

Legacy implementations of community Wi-Fi may feature captive portals that are not designed for use with IoT devices. Even new deployments that use network slicing and VLANs to support security and seamless roaming across properties may not be designed for large-scale IoT deployments and may not offer adequate bandwidth or reliability for new use cases.

Rather than use Wi-Fi for backhaul, some communities are looking to cellular hubs. These hubs allow MDUs to deploy access points in many different locations, without worrying about Wi-Fi coverage or installing new wiring. Cellular hubs may however have limited in-building penetration depending on building structure, performing well in garden-style communities than in high-rises. Some hubs may rely on battery power, requiring regular maintenance. Cost is also a factor, with MDUs paying a monthly fee for cellular connectivity.

Communities are also directly connecting IoT gateways to wired infrastructure. This type of deployment offers higher reliability and better performance and is not likely to impact the quality of resident or staff Wi-Fi networks. There is also no need for battery power. The availability of internal wiring may vary wildly, according to the age of the community and whether the community has decided to upgrade its internet service. With wired infrastructure, property managers and service providers need to plan out precise locations when connecting IoT hubs to ensure coverage. The benefit of using hubs this way is the ability to set it and forget it; there is no need to worry about password changes.

Working with Vendors

Working with vendors is necessary for MDU owners/managers when it comes to deploying IoT. In addition to bringing needed products and services, vendors are also invaluable in offering MDUs their expertise and customer support.

MDUs must ensure that IoT ecosystems are not fragmented. This includes on both the backend and front-end. MDUs must verify that devices and solutions can integrate with backend systems, either locally, through API connections, or via a cloud-to-cloud connection. With the many types of IoT products on the market today, easy integration is not a guarantee; however, the best vendors will offer suites of products and services that are pre-integrated with popular platforms and easy to fully deploy. Without this pre-work, writing new integrations may be as costly—and take as much time and effort—as deploying the physical hardware itself.

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On the front-end, there are multiple IoT standards to contend with. They comprise a mix of radiofrequencies as well as protocols for handling information.

Each IoT standard being used requires a different radio in the gateway device. Historically, these gateways only supported one or two standards—more recently, new gateways have been introduced to the market supporting multiple radios and standards.

These include gateways based on the Matter protocol, formerly known as Connected Home over IP (CHIP), which effectively unite Wi-Fi, BLE, and Zigbee into one IoT gateway product thereby reducing the degree of complexity MDUs and deployers must face.

When it comes to working with vendors, MDUs also have the choice of working with multiple vendors or a single vendor that acts to coordinate subcontractors. Coordinating deployments with multiple vendors may add considerable extra time to deployment schedules, introducing complexities around communication and project management, and may additionally be beyond the wheelhouse of many MDUs. Working with a single vendor may appear more costly up-front, in contrast to MDUs attempting to piece together low-cost solutions from multiple sources, but it offers several critical benefits:

Checklist for IoT Deployments
✓ cost
✓ timeline
✓ product offering
✓ capabilities
✓ IoT integration challenges
✓ coordinating software and hardware ecosystems
✓ support services

- Streamlines the deployment process

- Avoids communication and coordination issues

- Ensures expert project managers are in control and that MDUs have access to a cohort of experts to questions, advice, and troubleshooting

- Provides MDUs with a single point of contact if there are any issues

Top vendors are able to work with multiple subcontractors and partners, offering a variety of suitable lines of services, products, and platforms.

Once solutions are deployed, these solutions must continue to be maintained. Unlike traditional offerings, maintenance for smart apartment solutions includes not just hardware but also software and firmware. Part of the evaluation process for vendors must include their ability to offer long-term customer support, for the lifecycle of the installed solution. The degree of training available for MDU staff, the ability to quickly respond to outages and technical issues, and included cybersecurity features and offerings are also vital.

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Investing in the Future

MDUs have many opportunities in deploying smart apartment technology, but they may underestimate the benefits of these solutions. The use of smart apartment solutions in residential units is a worthwhile investment—it helps to attract desirable tenants and allows MDUs to raise rates and increase ARPU. Beyond solutions designed for tenants living in residential units, MDUs may also use IoT technology to enable new use cases and automate staff tasks, upgrade legacy systems, and gain valuable insights with regards to maintenance needs including potential water leakage and the operational status of appliances.

While IoT deployments are a worthwhile consideration, they are also oftentimes complicated, and beyond the experience of many MDUs. Things may go wrong during the process of planning, deploying, or supporting new IoT solutions. To avoid missteps, MDUs must perform careful planning and execution, aligning stakeholders, running pilot projects, and designing solutions appropriately for the built environment, as well as taking care in the vendor selection process.

MDUs must ensure that solutions are failure-resistant and that vendors are willing and able to quickly help and resolve issues. Customer service must be a top selection criterion when working with vendors. Cybersecurity must be included in the selection process, to avoid costly incidents such as ransomware attacks. Having one vendor to manage the entire process coordinating activities and providing expert guidance, may significantly ease the workload on MDUs and provide a more seamless deployment rollout.

Keeping these best practices in mind, MDUs stand to reap the advantages of new smart apartment technologies while avoiding potential pitfalls.

Endnotes

[1] US Census Bureau, 2020: ACS 5-Year Estimates Subject Tables. S2504 — Physical Housing Characteristics for Occupied Housing Units.

About Parks Associates

Parks Associates, a woman-founded and certified business, is an internationally recognized market research and consulting company specializing in emerging consumer technology products and services. Founded in 1986, Parks Associates creates research capital for companies ranging from Fortune 500 to small start-ups through market reports, primary studies, consumer research, custom research, workshops, executive conferences, and annual service subscriptions.

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About Cox

Cox Communities is the division of Cox that delivers solutions, value, and trust for MDU owners, managers and developers, SFU developers, and the residents and owners within their communities. The Cox Communities team acts as their client's trusted advisor by supporting them in reaching their business goals of optimizing rents, occupancy, and making their properties future ready.

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About the Author

Kristen Hanich
Director of Research, Parks Associates

Kristen Hanich heads Parks Associates' consumer electronics and mobility research, with expertise in other verticals including connected cars, mobile networking, healthcare, wellness, and independent living. She leads a mix of custom and syndicated research projects throughout the year, with a focus on major players and emerging trends. Kristen specializes in bridging the gap between data-driven and narrative approaches to understanding the consumer markets via a mix of qualitative and quantitative research approaches.

Kristen has dual master's degrees in applied anthropology and public health from the Universities of North Texas in Denton and Fort Worth. She earned her BSc in health at the University of Texas at San Antonio and has a graduate certificate in Geographic Information Systems.

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