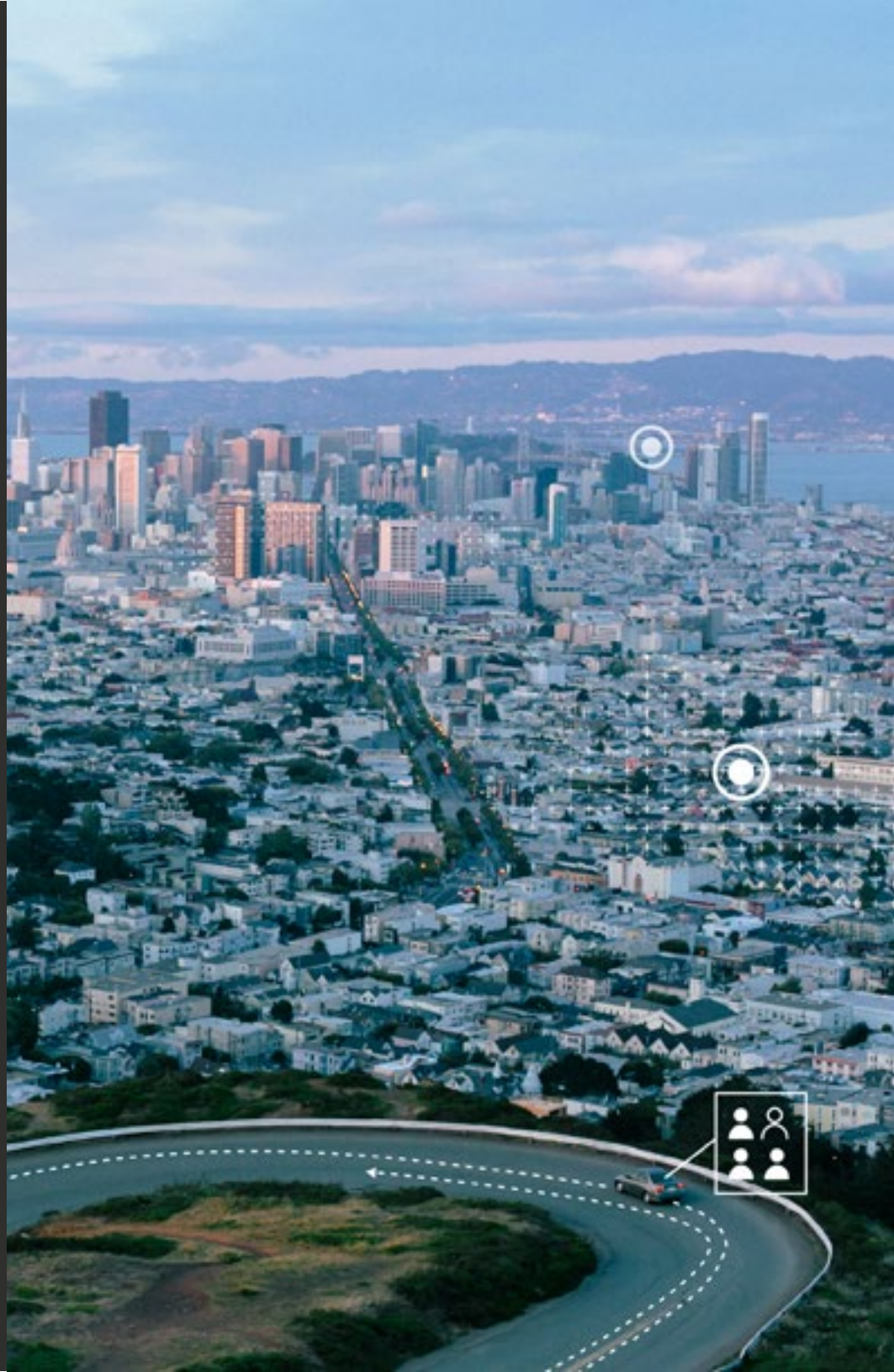
Microsoft Azure Government Series

2030 smart communities

Envisioning new possibilities for state and local governments

Microsoft



2030 smart communities

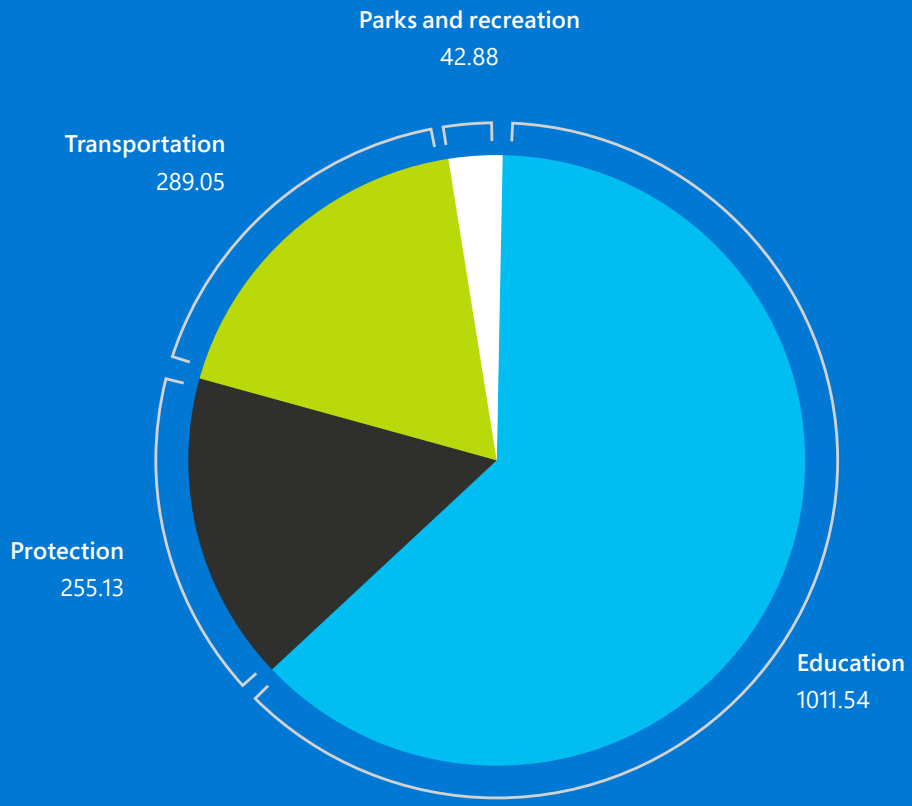
Envisioning new possibilities for state and local governments

How did we get here...

and where are we going next?

State and local government investments (2017)

$ in billions | source: usgovernmentspending.com[1]



It's easy to imagine where we're going when we remember where we've been. Just think back 10–15 years, and about the technology that has become part of our daily lives. We've moved from mainframes to datacenters, then to the cloud. This digital transition has given us innovations such as smart cars, wearable devices, and more. But what are the next big advances—and how will they determine the services state and local governments are able to provide to their communities?

[1] Accessed from usgovernmentspending.com/spending_chart_2008_2023 and usgovernmentspending.com/federal_budget_estimate_vs_actual_2017_XXbs2n_7071#usgs302.

One thing governments need to prepare themselves for is the increasing density of these communities. For example, cities around the world are expected to grow exponentially, with projections showing that urbanization, combined with the overall growth of the world's population, will add approximately 2 billion people to cities by 2030. You don't have to be great at math to visualize how this might add time to your morning commute, to the number of students in classrooms, or to the stacks of public records.

On the flip side, with urban areas bursting at the seams, state and local governments will also want to keep in mind citizens in more isolated areas, so no population goes underserved.

These are concerns that call for creative solutions. Investments are already being made, as seen in the chart on the previous page. As state and local leaders, you don't need to stop there, however. There are opportunities to go beyond improving the citizen services you already have. By using digital technologies, you can completely reimagine those services while creating new job opportunities.

In this book, we'll explore how state and local governments like yours can go further, connecting services through the cloud, mobile and wearable devices, Internet of Things (IoT), and more. Uniting these services will generate more data, which will be key to creating smarter communities.

Once siloed and underutilized, data now has become essential to the way things work—including big data, metadata (data about data), and artificial intelligence (AI). By using data, governments will be able to manage urban congestion, maximize energy efficiency, enhance public security and resilience, uplift current education systems, allocate resources based on real-time evidence, and turn operational data into information, knowledge, and insights.

But what will the future look like for citizens themselves? For that, we'll peer through the lens of one such individual.

[2] United Nations. "The World's Cities in 2016." Accessed from un.org/en/development/desa/population/publications/pdf/urbanization/the_worlds_cities_in_2016_data_booklet.pdf.

Meet Maggie...

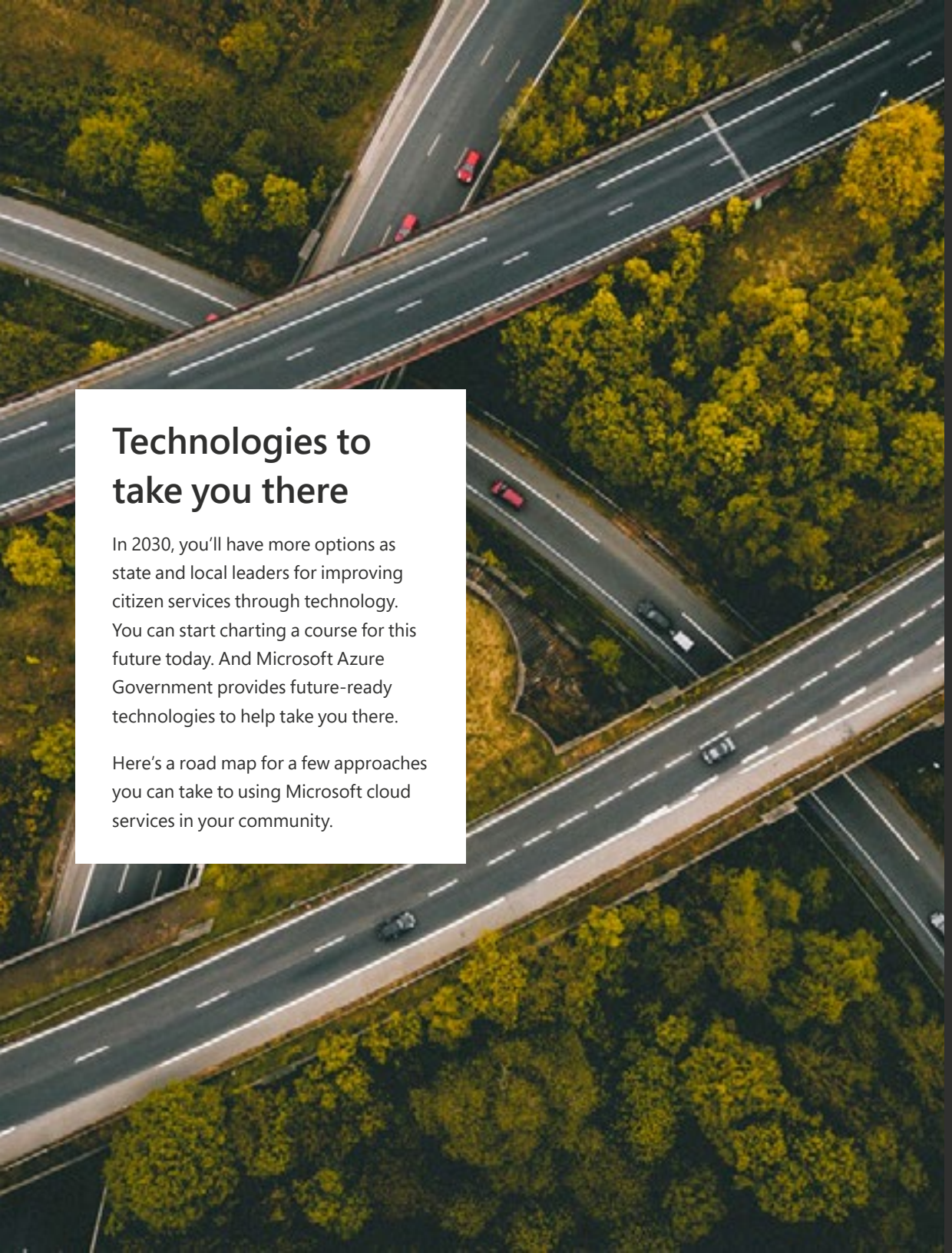
To see how daily citizen life will be different in 2030, let's consider Maggie and her family.

Maggie is a civil engineer for an environmental consulting group, providing oversight for city construction projects. Her husband John is a professor of linguistics for a state university and a volunteer tutor for a local non-profit. Their two kids are Dexter, a sophomore in high school, and Cleo, a third-grader. You should also take note that they have a beagle named Maximus.

Maggie's family lives in a city where the population has ballooned by 20 percent in the last 15 years. They get a lot of time together these days—these days being 2030—but that wasn't always the case.

Part of the problem used to be that Maggie and John shared a single car. This made it difficult when Maggie had to get to job sites on the far reaches of the city, while John had to crisscross town on multiple bus connections to teach his classes and be at the tutoring center. That was on top of getting, in those days, Cleo to day care, and Dexter to school and basketball practice. The time spent going places—and having to be places—all added up.

Flashing forward, it's a different story in 2030. To learn why, let's start with some of the technological advances that get us there.



Technologies to take you there

In 2030, you'll have more options as state and local leaders for improving citizen services through technology. You can start charting a course for this future today. And Microsoft Azure Government provides future-ready technologies to help take you there.

Here's a road map for a few approaches you can take to using Microsoft cloud services in your community.

Education – Graduate from traditional chalkboard sessions to modern classes. With enhanced education mechanisms, you can not only help students but also empower teachers with AI-enabled learning experiences, intuitive holographic study, advanced analytics for better student management, and more.

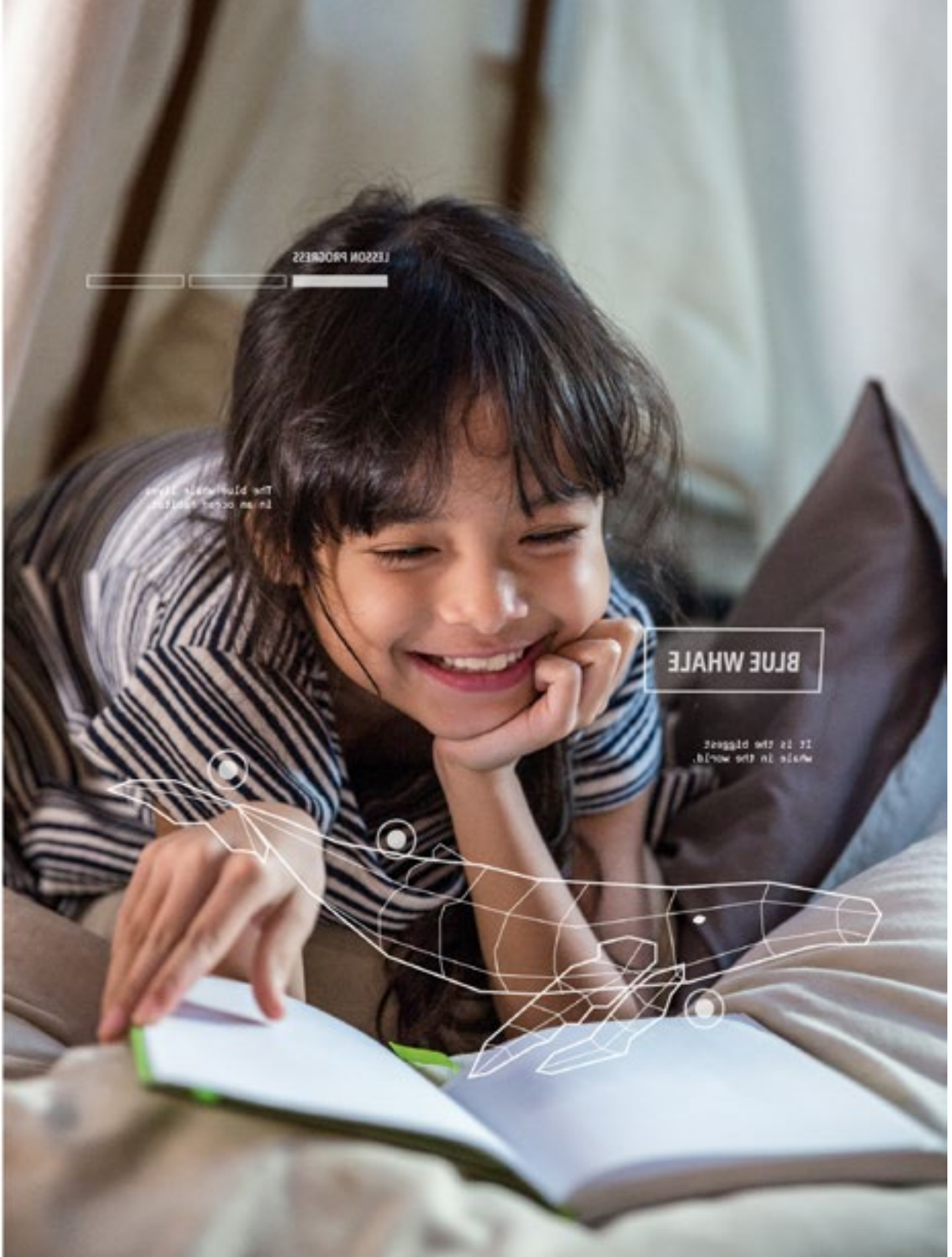
Transport – Reconceive the idea of personal and public transportation in your community. Overcome growing concerns over traffic congestion and carbon footprint through autonomous vehicles enabled by AI, micro-mass transportation, and increased opportunities for telecommuting.

Public records – Modernize your public records systems. By offering centralized and connected records with high availability, advanced analytics, and intuitive chatbot capabilities, you can make it easier for citizens to interact with government agencies, pay bills, and find what they need.

Public safety – Equip your public security and police departments with advanced digital technologies, allowing these departments to further public safety initiatives and deliver more impactful outcomes for the people they serve and protect. AI, holographic modernizations, robotics, and augmented reality (AR) can enable better policing and smarter home security systems.

Parks and recreation – Improve the spaces in your community where people go for relaxation and recreation. AI-enabled security systems and human-less waste management will ensure smart, safe, and healthy public parks for citizens.

So, how will these advances impact our everyday lives in 2030? For that, let's look at a typical morning at Maggie's house.



Education

Some mornings, when Maggie wants her kids to view her as slightly more ancient, she starts a sentence with, “In my day….” This is spoken in the process of getting her daughter Cleo ready for school. “In my day…” goes on to describe halting yellow buses with weakening shock absorbers. In 2030, Maggie can’t help but think back to her own school days because, as she prepares to walk Cleo two blocks to the elementary school, her son Dexter is getting ready for a different kind of classroom experience.

Like Maggie, many of us have had these moments: seeing how school has evolved over generations. (This goes along with moments of feeling old, but that's another story.) In the future, expect more of the same…by expecting something completely different for education.

In fact, education systems are already shifting—from chalk-and-talk teaching to student-centered learning where curriculum and classroom sessions are personalized based on students' adaptability and understanding. Going forward, student assessment mechanisms will no longer rely on written test scores. Instead, educators will assess students based on their overall performance throughout the session. Classrooms are increasingly outfitted with the latest devices as they move to digital technology. Traditional school libraries are turning into digital repositories, housing not just research materials but also valuable educational resources—from a simple tutorial to a webcast of last week's lecture—that can support and encourage independent learning. Plus, better collaboration tools are helping students work together on projects.

By 2030, students will get more opportunities to learn at their own pace and convenience. They'll be able to benefit from technology-enabled curriculum that's about what they need specifically instead of what the class needs. The traditional assessment model will change from paper-based to more practical examinations—so, more dissecting frogs, less writing about it.

It won't be only students who will be profit from this transformation. Teachers will, too. With the help of advanced technologies, teachers will be able to understand more about student behavior and deliver a more personalized learning experience.

Lastly, technology won't just help provide a learning environment for a rapidly growing number of students in densely populated areas. It will also reach further than ever before into underpopulated areas. Students will be able to receive a quality education virtually wherever they are.

Let's look at some future scenarios for education.

Better student analysis and engagement.

Along with the students themselves, student record management will have a chance to be smarter in 2030. Machine learning and other data analytics services will help administrators and parents track students' grades, attendance, performance, health records, and behavioral analysis to correlate their educational growth. This will allow schools to make more informed decisions—which will be predictive and holistic rather than reactive and disconnected—to maximize student engagement.

Azure Government Analysis Services can help schools manage records and help parents track student progress by analyzing massive amounts of student data of in real time.

Digital teaching assistants.

With digital teaching assistants, students can build their own curriculum. Students will be able to personalize their learning experiences, including the pace at which they learn—so they won't affect or compete with the pace of other students. With advanced AI capabilities—such as sentiment analysis, speech recognition, and motion detection—bots can analyze how students are responding to teaching mechanisms and learning material, gathering behavioral information so that educators can adjust their teaching methods.

Azure Government enables these digital teaching assistants through a comprehensive set of AI services, including Azure Cognitive Services, Azure Machine Learning, and Azure Bot Service. Educators also have the flexibility to choose open source tools through the Azure platform.

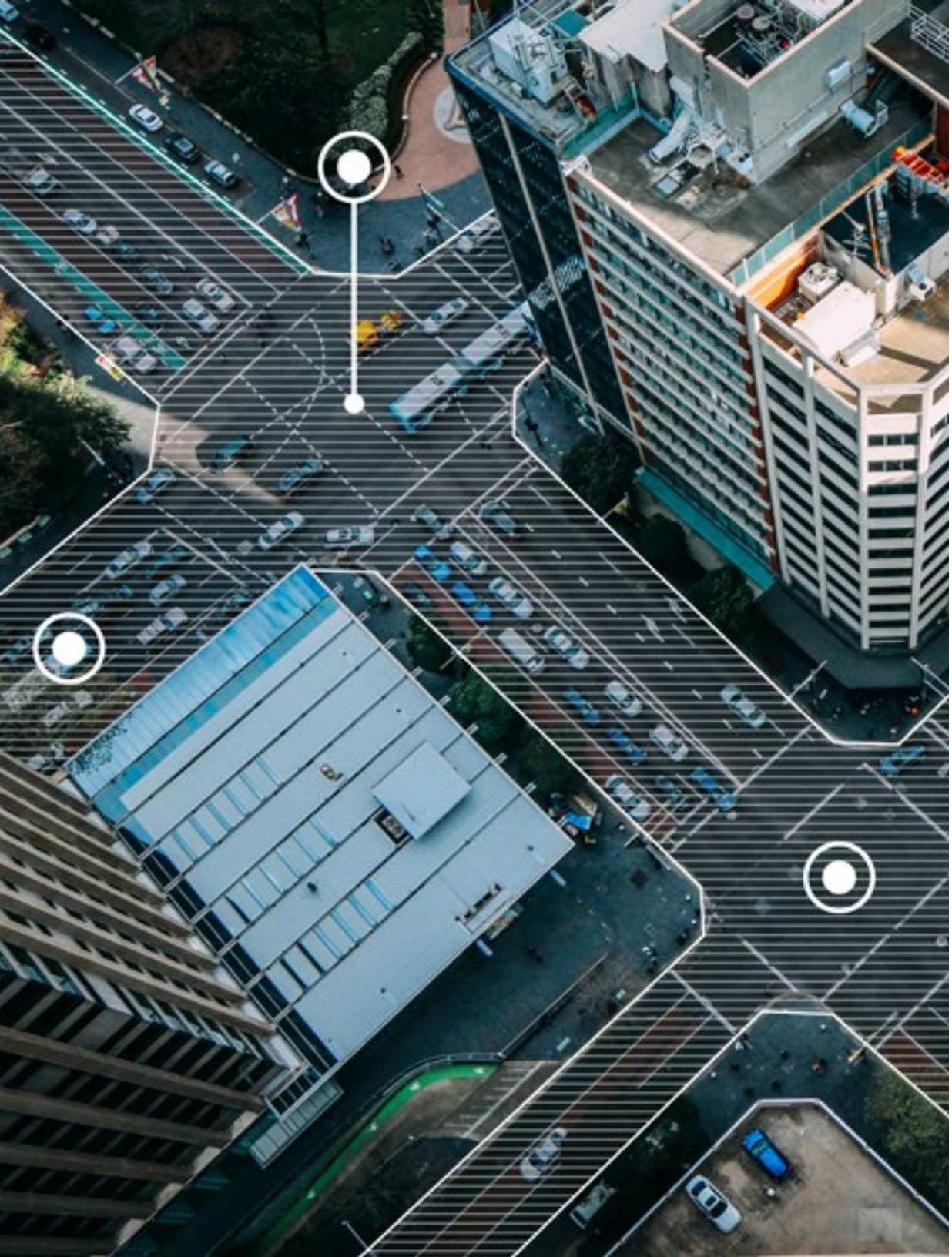
Augmented reality for a better learning experience.

AR is part of the next wave of innovation technology. By 2030, AR applications will be common in classrooms, making lessons more interactive. Instead of studying drawings or images in books, students will be able to deepen their knowledge through realistic, three-dimensional holographic visuals.

Azure Government can help you achieve these AR experiences through high-performing compute, storage, and media capabilities.

Microsoft is continuously investing in technologies for education so that state and local governments can keep improving their education initiatives for the future.

As Maggie steps out the door with Cleo, Dexter starts his school day with a remote learning session conducted by a research fellow at Camp Leakey in Borneo, a facility for the observation of orangutans in their natural habitat. Enhanced by AR visualizations, the session helps Dexter further his independent study. Dexter divides his personalized curriculum between virtual and traditional classroom experiences. His basketball practices, however, are exclusively on-site.



Transportation

As we learned in the previous section, Maggie and her family have more options for remote education experiences. That goes for not only Cleo and Dexter's learning, but for John's teaching, too. Maggie herself is often able to work virtually, but today she has an in-person consultation on a construction site. It's in a part of town that used to be hard to reach—and finding parking wasn't fun. In 2030, however, she has better ways to get there.

Transportation-based initiatives may be among the most visible advancements we see in our communities. That's not just because of the scale of these projects—it's also because of the pressing need for them. Isn't there a faster way to get there? A better route? (And will it take forever to find parking once we're there?)

As more people move to cities, it's going to be critical to elevate transport systems. Technology—particularly cloud adoption—has already been playing a key role in meeting this demand, helping to shape modern transportation systems that are smarter, safer, and more convenient. We've seen pollution-generating vehicles start to give way to electric vehicles; manual tollbooths to automated, electronic toll collection; bare security measures to Intelligent Transportation Systems (ITS), including speed sensors, automatic traffic lights, security cameras, and so forth; and paper-based maps to GPS-enabled real-time navigations.

But there's more work to be done. On the horizon are efforts to improve transportation mobility and traffic congestion while reducing the carbon footprint.

Let's look at some future scenarios for transportation.

Autonomous vehicles.

By 2030, fully automated self-driven vehicles will be the norm rather than an anomaly. These types of vehicles will not only increase safety on the road but also help reduce traffic congestion. They'll use computer sensors that identify lane lines and other vehicles, and they'll communicate with other cars to measure distance and velocity. These autonomous cars will also be smart, not just pinpointing current locations of passengers but knowing where they want to go—and the best, least congested route to get there. And when a passenger needs to take control of the vehicle's steering, throttle, and brakes, they can do so with simple mechanisms.

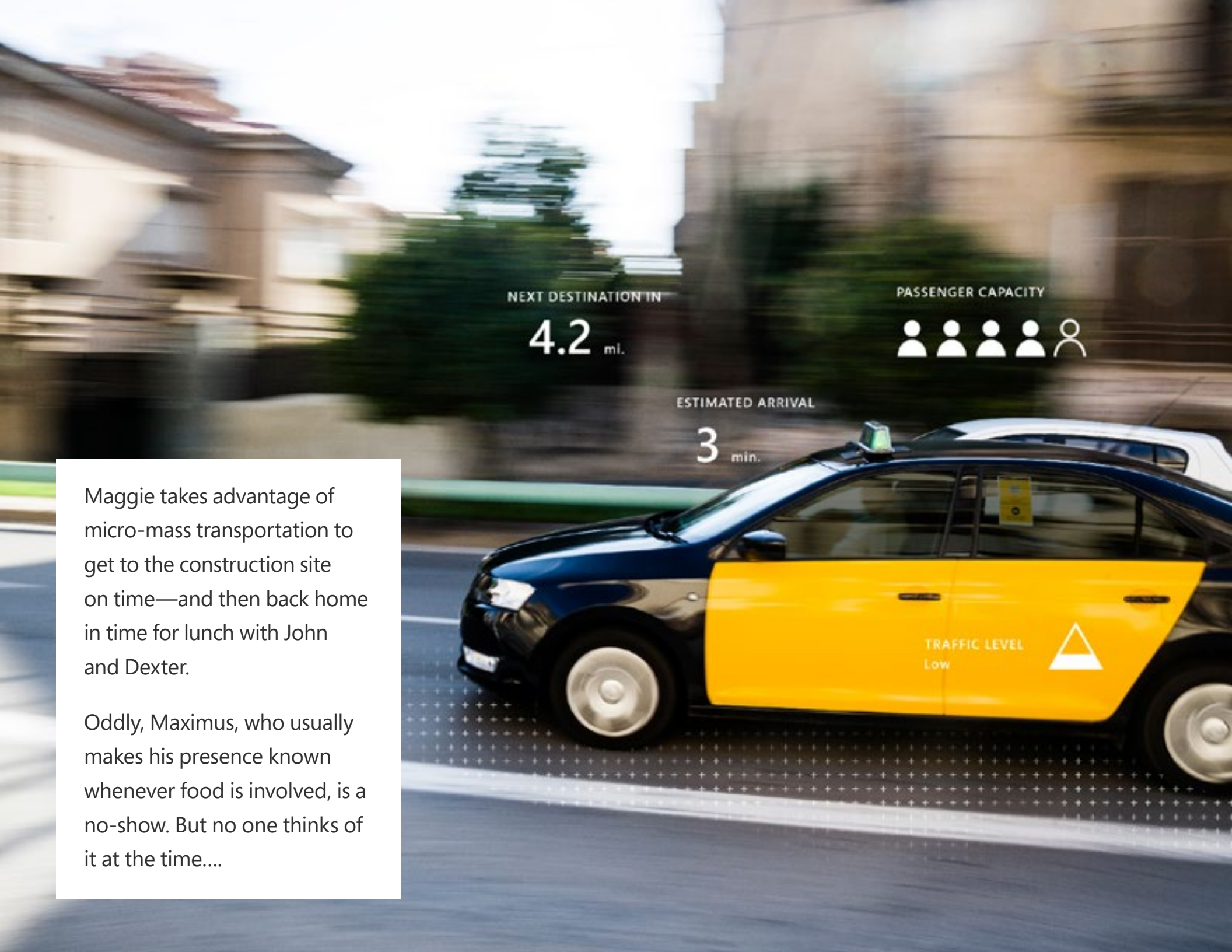
This vision of autonomous vehicles is achievable through Azure Cognitive Services, Azure IoT Suite, Azure Machine Learning, and Microsoft Bing, plus other open-source tools and services.

Micro-mass transportation.

In smarter communities, modular and automated electric buses will be the future of public transit, helping to reduce the carbon footprint, parking problems, and traffic congestion. These buses will be able to connect and disconnect with one another to take passengers on more precise trips to their destinations. Parking solutions for these electronic vehicles will use IoT sensors and GPS-based navigation to identify vacant charging stations, so vehicles are fully charged and ready to hit the road.

Micro-mass transportation will be enabled by Azure Machine Learning, Azure Cognitive Services, and Azure IoT Suite, along with Microsoft Bing. Through these tools and services, you can develop better switching control for modular buses; complete visibility into tracking, routes, and schedules; and better identification of road lanes and objects on the way.

Microsoft Azure is already helping to transform transportation projects, lower carbon footprints, and improve parking management. Hop aboard now and tell us where you want to go.



Maggie takes advantage of micro-mass transportation to get to the construction site on time—and then back home in time for lunch with John and Dexter.

Oddly, Maximus, who usually makes his presence known whenever food is involved, is a no-show. But no one thinks of it at the time….

Public records

Maggie likes having options for getting around the city that involve leaving the car at home. But she also loves taking the car out on the open road with the whole family. She's especially excited about their upcoming trip to visit Mount Rushmore, the Badlands, and anything else they might see along the way. First though, she's going to need to renew her driver's license. However, with meetings taking up most of her afternoon, she doesn't have time to stand in line at the DMV.

As populations grow, it becomes harder for government agencies to store and analyze the increasing amount of information that corresponds to individuals—including birth and death certificates, court records, property reports, and driver's licenses. This can slow processes for citizens trying to access public records or make transactions based on them.

State and local government agencies like yours are continuously working on this issue. And with digital technologies, they've been able to deliver on-demand, omni-channel access to public information for their citizens to provide better transparency to public records. Manual and paper-based record management is being replaced with digital record libraries, helping citizens to reduce the time required to get information.

As discussed earlier, the population in your community will likely be a lot higher by 2030. More automation and innovation will be required to manage citizen data and make that data easily accessible. As a solution, you can connect citizen records across departments to streamline record requests and ensure people have public information at their fingertips.

Let's look at some future scenarios for public records.

Digital assistance.

Many state and local government departments have already started adding chatbot systems to their websites, enhancing access for citizens seeking information. By 2030, this type of digital assistance system will be transformed by AI and machine learning. Digital assistance won't just provide the information requested by a given citizen on a particular day—it will also keep that citizen a step ahead of the information they'll need soon. For example, if your driving license renewal date is near or your residential lease agreement is about to expire, you'll receive useful information from different departments on a single platform. You'll then be able to take the appropriate actions—such as renewing your license—remotely.

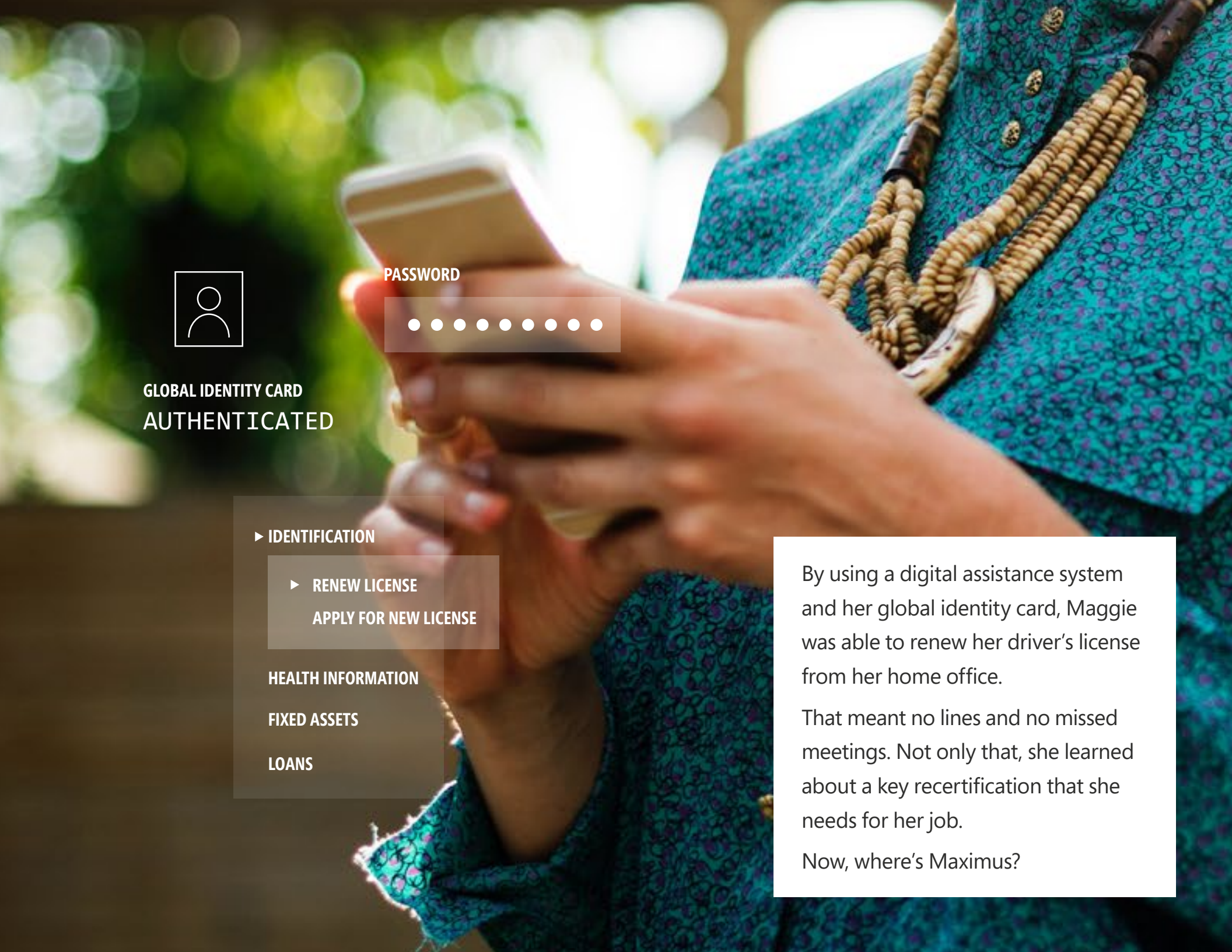
Azure Government can help you meet the requirements for storing and analyzing big data, with services such as Azure Analysis Services, Azure Machine Learning, Azure Data Lake, and Azure HDInsight. These services provide proactive assistance for reimagining customer experience and engagement.

Global identity management.

In the future, identity management will be more efficient and convenient for citizens. Citizens will hold one card with all their assigned identifications—and their associated information such as loans, health information, fixed assets, licenses, and more—in one place. By using a blockchain model, you can create better record identity information and drastically improve the citizen-verification process.

With the blockchain capabilities of Azure and Azure Active Directory, Azure Government can help you better manage citizen identity and provide seamless verification systems like never before.

Azure Government can help agencies like yours streamline large amounts of citizen data and make it accessible on demand for citizens that need it, while making it more straightforward for citizens to establish and manage their own identities.



By using a digital assistance system and her global identity card, Maggie was able to renew her driver's license from her home office.

That meant no lines and no missed meetings. Not only that, she learned about a key recertification that she needs for her job.

Now, where's Maximus?

Public safety

The safety of her family is of paramount concern to Maggie. And with their house's smart security system, she certainly sleeps a little easier at night. But when something unthinkable happens, modern safety and security mechanisms can help them beyond their property line. Take for instance that day when someone left the back door open. And their dog Maximus went missing.

Public safety is among the most critical tasks for any community, no matter how large or developed it is. It has been observed that rising crime rates can hold back the growth essential for economic development. Plus, with data an increasing factor in everyday lives, people are understandingly concerned about the security of their sensitive personal data.

With the help of evolving technology, security and police departments are drastically changing the way they ensure public safety. Older patrolling systems have given way to computerized crime mapping and easy and instant communication over wireless networks. And there have been advancements in digital home security, fingerprinting databases, and records management systems, and more robust security for sensitive data in the cloud.

Such types of transformation will continue. That's why it's expected that by 2030 over 90 percent of all crimes will be solved through AI, data collection, and other forms of advanced surveillance technologies.[1]

Our homes will see improved protection in the future, too. Home and neighborhood security will be redefined and intertwined in ways you may not have ever imagined—in ways that will improve peace of mind for citizens and their families.

Let's look at some future scenarios for public safety.

Augmented reality with mobility.

With augmented reality, uniformed law enforcement personnel and command staff can discover information, patterns, and trends to drive more informed decisions and effective planning for the safety and security of citizens and communities. Personnel can quickly and accurately analyze and visualize data, including video. They can then match this information in real time with BOLO (be on the lookout) systems—which keep records of citizens and vehicles—so they always know whether a person or vehicle is suspected of a criminal offense.

Microsoft ensures the confidentiality, integrity, and availability of citizen and criminal information stored in Azure Government services through advanced security capabilities like Role-Based Access Control (RBAC), data encryption at rest or in transit, shared access signatures, and more. And Azure Government is equipped with industry-standard compliance for the United States Government.

Azure Government can be used with Microsoft HoloLens to implement face and object detection, enabled by Azure Cognitive Services, Azure Storage, Azure HDInsight, and Azure Analysis Services. These services can provide almost limitless storage to manage large amounts of citizen and criminal data, advanced machine learning, and data analytics capabilities.

[1] Thomas Frey. "33 Dramatic Predictions for 2030." Futurist Speaker, December 18, 2013. Accessed from futuristspeaker.com/business-trends/33-dramatic-predictions-for-2030/

Smart home security systems.

Home security has evolved from human security guards to digital surveillance systems that include CCTVs, smart or biometric-enabled door locks, and burglar alarms. However, these systems are still isolated. By connecting disparate devices, we can define a better security posture for citizens. State and local governments like yours can take initiatives to bring these devices together with government security and surveillance systems. The result is that, in case of any suspicious activity, IoT devices can send real-time warnings over lightning-fast networks to help reduce the response time needed to take action.

Azure Government can help all members of state and local governments focus on prevention to deliver more impactful outcomes for the people they serve and protect. Azure provides a comprehensive set of capabilities to meet the security and compliance standards for these governments. With Azure Government, you get the flexibility to choose from among trusted cloud solutions and services and open source technologies, and you get the support of a vast global partner network.

Azure IoT Suite, the Microsoft artificial intelligence platform, Azure Cognitive Services, and Cortana Analytics Suite can help you implement these security systems.

Through a network of home security systems, Maggie was able to track down Maximus a few neighborhoods over. It's not important, Maggie tells her kids, who left the door open in the first place. (It was Dexter.) What matters is that their family is whole again—and their home, personal property, and data are more secure.

Parks and recreation

With the work and school day over—and hours of precious sunshine left—Maggie and her family head to their favorite local park, Maximus in tow.

Public parks are a place where we can relax, play, and spend time with the people we care about. They're also, in the best cases, places where we can feel out of harm's way.

State and local governments like yours are working to ensure secure and healthy public spaces for citizens—and increasingly they're using technological innovations to make it happen. Currently, public parks are modernizing operations with smart irrigation controls, automatic lighting solutions, connectivity to the internet, and CCTV cameras for safety.

By 2030, smart parks will be using technology to reflect better cultural and environmental conditions while promoting the safety and health of communities. These future parks will offer digital, interactive learning spaces for children, high-tech waste management, real-time parking updates, and improved surveillance for public safety.

Let's look at some future scenarios for parks and recreation.

High-tech waste management.

Effective waste management has always depended on how garbage has been classified, processed, and disposed of. In public parks, garbage collection and classification still rely on manual processes. In the future parks, AI-enabled robots will provide help to sanitation crews. These intelligent and automated robots will roam parks to assist crews with garbage collection. Then, by using machine learning, they'll identify the type of garbage—whether general household waste, recyclable, or green organics—and classify it accordingly. With high-tech waste management like this, parks will be both cleaner and smarter.

Azure Government services such as the Microsoft AI platform, Azure IoT Suite, Azure Cognitive Services, and Azure Machine Learning can help you build solutions for intelligent waste management.

Intelligent security systems.

In the future, citizens using parks will be protected by more advanced security than CCTV cameras or alarm systems currently provide. Intelligent security systems won't just record what's happening—they'll also be able to spontaneously react if something is unusual. These systems will be equipped with sensors that will simultaneously performs tasks such as facial recognition, voice analysis, motion detection, and sentiment analysis to understand situations. And in the event of anything suspicious, these devices will send real-time updates to the appropriate authorities.

Azure Government can help you build intelligent security systems through services like Azure IoT Suite, the Microsoft AI platform, Azure Cognitive Services, and Azure Analysis Services.

Azure Government helps state and local governments maintain safer and cleaner public spaces for their citizens. With innovations like high-tech waste management and intelligent security systems, families like Maggie's will be able to enjoy an improved parks and recreation experience in 2030.

Conclusion

Today, state and local governments are aggressively working to further numerous smart city initiatives to ensure a better citizen experience tomorrow.

With Microsoft Azure Government, state and local governments like yours will be able to reimagine existing education, transportation, public safety, parks and recreation, and public record systems. And you can do this with an Azure Government cloud platform built upon the foundational principles of security, privacy and control, compliance, and transparency. Azure Government services offer future-ready innovation technologies, including AI, IoT device management, automatic bot systems, cognitive services, big data, analytics services, and many more capabilities.

Through the power of data, the future of innovation in our daily lives is virtually limitless. Start making your future initiatives a reality today.

Next steps

Get started with a free Azure Government trial:
azure.microsoft.com/global-infrastructure/government/get-started/

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info.microsoft.com/en-us-resources-TheBenefitsofMovingtotheCloudforStateandLocalGovernments-OnDemandRegistration.html

Learn more how Azure Government can help you innovate citizen services:
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