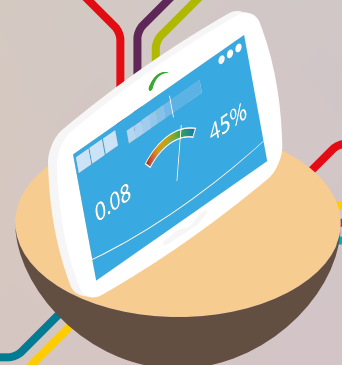
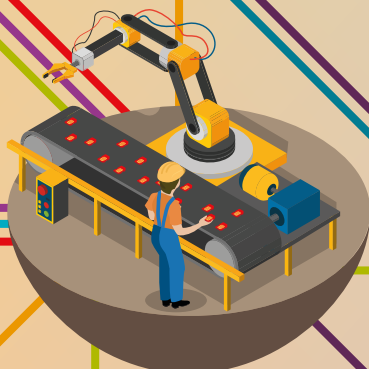
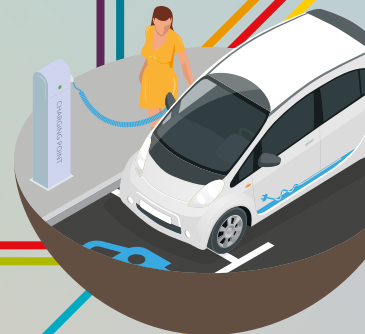


# Creating a smarter, connected world

How the Internet of Things is transforming every industry

[vodafone.com/iot](http://vodafone.com/iot)

**Vodafone**  
Power to you



# Your path to the connected business

The Internet of Things (IoT) is big news, and it's all around us, right now. Whether it's the smart thermostat in your home driving down your utility bills, or the connected car making your journeys more convenient, many of us already benefit from IoT in our daily lives — and we're only just beginning to understand its full potential.

## Welcome to the world of IoT

Whatever sector you're in, your business can benefit too — in all kinds of ways. Connecting your products or the assets around your operations can help you generate new revenue streams, build closer relationships with your customers, cut costs, improve safety, reduce downtime, improve sustainability, and make better decisions every minute of every day.

Businesses around the world are recognising the potential that IoT offers them. In fact, 76% of companies we spoke to said that they considered IoT to be “critical” for the future success of any organisation in their sector.<sup>1</sup>

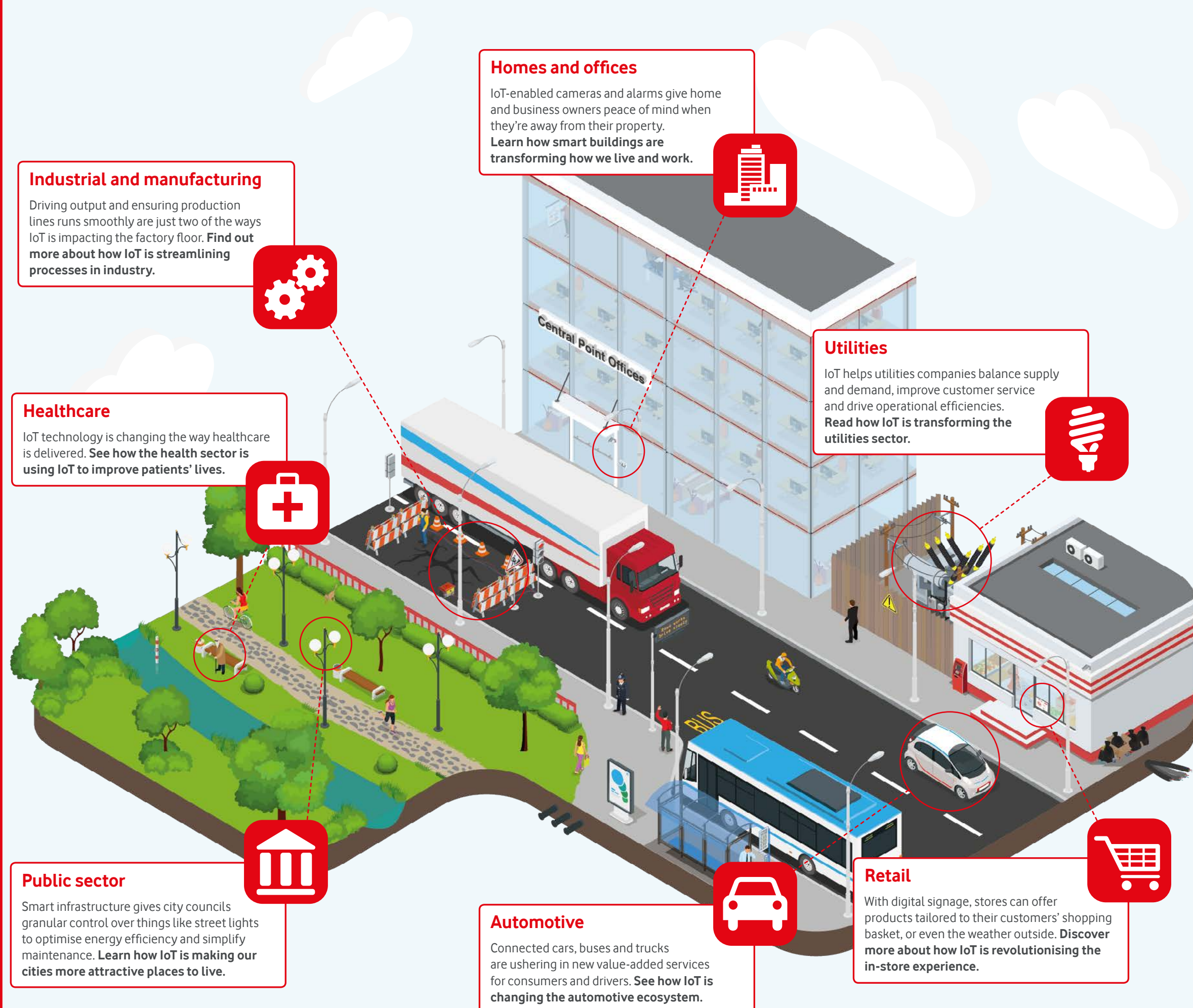
But if you're just beginning to explore the fast-moving world of IoT, what's the first step?

This document gives you a future look at some of the most important IoT applications in seven sectors: automotive, utilities, industrial and manufacturing, home and office, retail, public sector, and healthcare. To help you appreciate what's possible, we've included a range of applications and case studies that are delivering businesses the most impact and the quickest return on investment.

## What is the Internet of Things?

IoT technologies make it possible to connect assets of all kinds — everything from industrial machinery to heart monitors, streetlights to chiller cabinets. These assets are equipped with sensors that monitor their environment, and with a network connection so they can communicate. Businesses can use IoT to gather data about what's happening in their operations in real time, supporting decision making.

1. Vodafone IoT Barometer 2016





# Automotive

The connected vehicle is the most important automotive innovation in a generation. But we're also seeing an overhaul of the entire automotive ecosystem that's changing the way we think about transport.

## Connected cars

For today's drivers, IoT connected vehicle features like navigation and in-car Wi-Fi are at the top of the wishlist. And for manufacturers, connected cars are an unmissable opportunity to create deeper, more profitable relationships with these customers.

The connected vehicle encompasses many different value-added services — for instance, monthly infotainment subscriptions, maintenance alerts that push drivers back to the dealership, and stolen vehicle recovery. Already one in ten cars on the road is connected, and that number is growing every day.<sup>2</sup>

To learn more about how IoT is reshaping the automotive industry, read our white paper "Connected, Automated, Shared"



## Usage-based insurance

Usage-based insurance (UBI) is taking off: in 2015, 12 million drivers took out UBI policies.<sup>3</sup> And it benefits everyone. Insurers gain the opportunity to increase customer engagement, race ahead of the competition and reduce claims costs, while customers — particularly young drivers — get an affordable policy that rewards good driving and puts them in control.

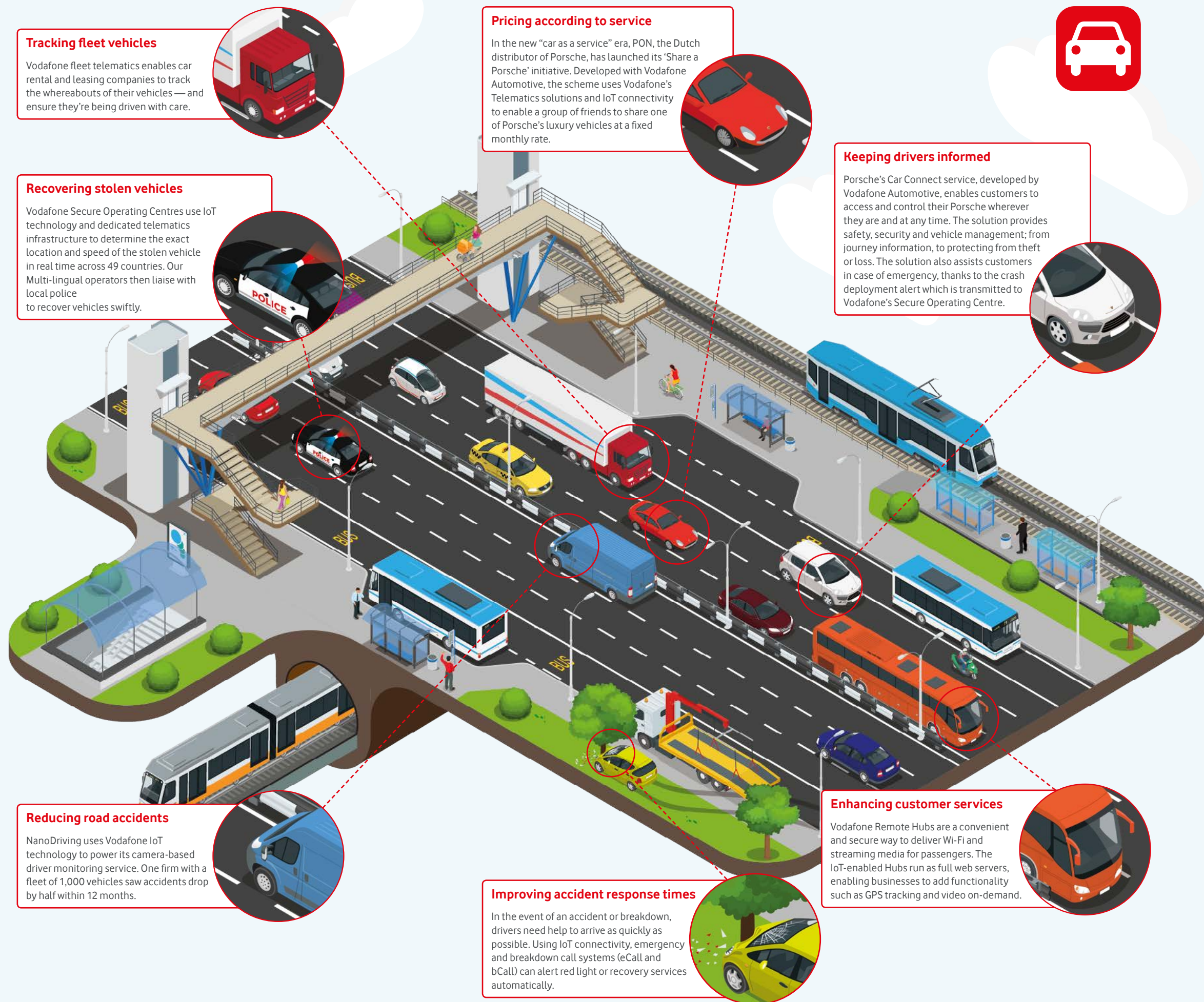
The idea of pricing services based on measured usage is becoming popular right across the automotive sector. Just look at on-demand car sharing or ride-hailing services that are springing up in cities around the world.

## Commercial fleet management

Commercial fleet operators — whether they're running company cars, delivery vans, buses, taxis or trucks — are being squeezed from all sides by driver shortages, high running costs and increased customer expectations.

By adopting an IoT fleet management system that tracks how and where vehicles are being driven, operators can improve vehicle and driver utilisation, prevent breakdowns and theft, reduce accidents and insurance premiums, cut running costs through route optimisation, and even improve customer service by giving the public better access to information.

2. [www.analysismason.com/Research/Content/Reports/M2M-forecast-May2012-RDME0/](http://www.analysismason.com/Research/Content/Reports/M2M-forecast-May2012-RDME0/)  
3. [Press.ihs.com/Press-release/automotive/usage-based-insurance-expected-grow-142-million-subscribers-globally-2023-i](http://Press.ihs.com/Press-release/automotive/usage-based-insurance-expected-grow-142-million-subscribers-globally-2023-i)





# Utilities

Connected devices are pivotal to the future of the utilities sector. IoT is already enabling utilities companies to align supply and demand, secure their infrastructure and enhance customer relationships.

## Smart metering

Millions of smart meters are installed in business and residential properties, giving customers accurate bills and saving utilities providers the cost of manual meter reading. Smart meters enable utilities to offer innovative new pricing models and branch out into smart home services. At a grid-wide scale, utility companies can use smart meter data to better align supply and demand and detect problems. The emergence of LPWA connectivity technologies such as Narrow-Band IoT make it economically viable to deploy large numbers of low-cost, long-life sensors.

## Infrastructure monitoring

But smart meters are just the start. For water and gas utilities, IoT sensors can help detect and isolate leaks from pipelines and tanks, as well as monitor the health of machinery in pumping stations to enable more efficient maintenance scheduling. Monitoring water quality — for pH levels or contamination — can be done remotely, eliminating the need for manual checks.

**93%** of energy and utilities companies that have adopted IoT report that they've increased their number of IoT projects in the past 12 months.<sup>4</sup>

In electricity generation, IoT can monitor the output and condition of wind turbines and solar farms, improving uptime and capacity planning. And in transmission and distribution, smart grid technologies not only provide the kind of real-time monitoring that traditional SCADA systems offer, but also support microgeneration inflows from distributed renewables.

## Site security

Many of the most important assets in the utilities industry are located remotely: substations, gasometers and reservoirs, for instance. They're frequently targets for vandals. Smart cameras and connected alarms offer a cost-effective way to improve security and safety at remote sites, without the expense of manned guards.

### Improving customer service

Energy distributors such as npower and EDP HC ENERGÍA deploy tens of thousands of smart meters each week, which use Vodafone's IoT technology to give the business deeper insight into real-time consumption. This has enabled both providers to optimise their energy networks.

### Enhancing fleet management

One international power company chose us to manage a full IoT fleet management service for 1,500 of its cherry-pickers. Our end-to-end solution enabled the company to reduce downtime, cut costs and optimise routine servicing.

### Bringing power to the unconnected

BBOX is an off-grid smart solar power generator that is delivering electricity to rural and hard-to-reach communities in Africa and Asia. It uses IoT managed connectivity to provide status updates and capture billing data.

### Connecting grid systems

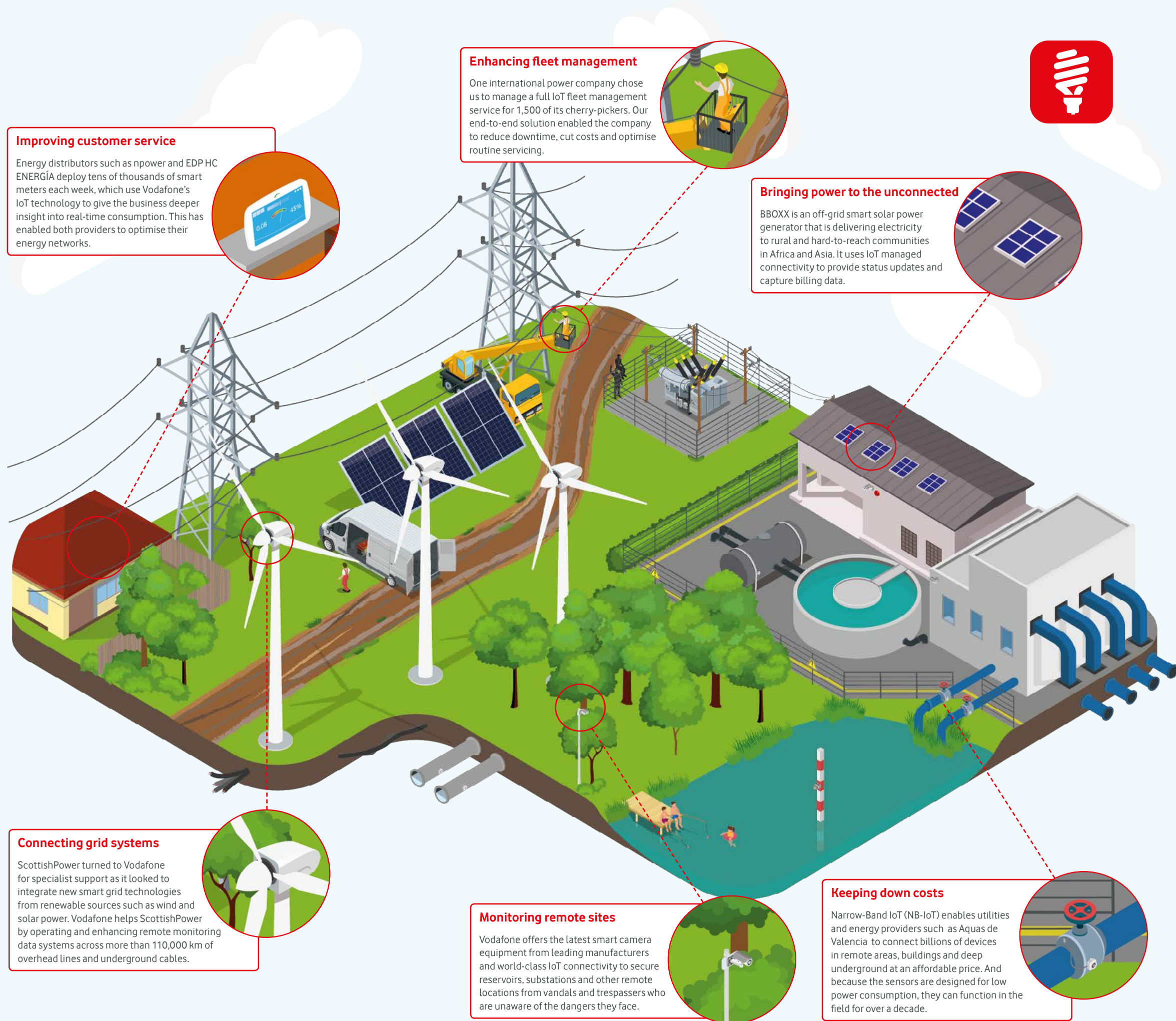
ScottishPower turned to Vodafone for specialist support as it looked to integrate new smart grid technologies from renewable sources such as wind and solar power. Vodafone helps ScottishPower by operating and enhancing remote monitoring data systems across more than 110,000 km of overhead lines and underground cables.

### Monitoring remote sites

Vodafone offers the latest smart camera equipment from leading manufacturers and world-class IoT connectivity to secure reservoirs, substations and other remote locations from vandals and trespassers who are unaware of the dangers they face.

### Keeping down costs

Narrow-Band IoT (NB-IoT) enables utilities and energy providers such as Aguas de Valencia to connect billions of devices in remote areas, buildings and deep underground at an affordable price. And because the sensors are designed for low power consumption, they can function in the field for over a decade.





# Industrial and manufacturing

From the factory to the warehouse, IoT can cut downtime, improve safety and speed up your supply chain.

## Smart factory

On the factory floor, time is money — that's why utilisation is so important. IoT enables manufacturers of all kind to drive output and product quality up. Sensors embedded in production line machinery can identify impending parts failure, enabling maintenance to be scheduled without unplanned downtime. IoT can track stock levels, alert to any delays in inbound parts or materials shipments, and help orchestrate production to minimise delays and waste.

## Supply chain automation

Tracking vehicles, shipping containers and pallets as they move from suppliers through manufacturing to distributors and retailers delivers a host of benefits. It enables manufacturers to tackle loss and theft, give customers more accurate delivery estimates and recover stolen assets. The end result is reduced waste and a better customer experience.

## Site safety and security

Factories and warehouses can be dangerous places. IoT can help manufacturers fulfil their duty of care to keep employees and visitors safe. Connected monitors worn by staff can automatically alert managers to falls or other accidents and guide first responders to precisely the right location. IoT-enabled cameras can be fitted anywhere around a site with the need for a power source and give an instant view of any hazardous area, as well as raising the alarm in the event of a break-in, fire or flood, thereby lowering insurance premiums.

## Connected products

IoT doesn't just help improve operations. Manufacturers can build connectivity into products themselves, enabling new features that improve the customer experience, supporting over-the-air updates to reduce the need for costly recalls, and gathering data about real-world usage that can guide future product development.

More dramatically, IoT enables manufacturers to move beyond selling products at all. Using IoT, manufacturers can shift to offering business outcomes as a service, with the price based on metered usage: a concept called servitisation. For customers looking to shift from capex to opex, as-a-service models are incredibly attractive.

### Introducing servitisation

IoT has the potential to transform the manufacturing business model. Instead of making a one-off sale, manufacturers can offer their products as pay-as-you-use services, delivering long-term, predictable revenue and forging stronger customer relationships.



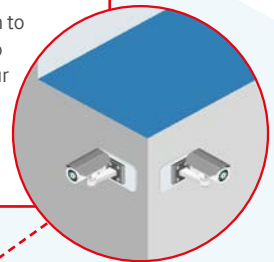
### Minimising equipment downtime

With Vodafone's service, Feintool can measure the condition of equipment deployed on customer sites and give early warning signals about potential failures, so customers can plan for downtime and skip unnecessary servicing.



### Securing business premises

IoT-enabled cameras are a cost-effective solution to manned guards. The wireless cameras are easy to install and provide 24/7 real-time monitoring. Our Secure Operating Centres can review footage to help keep the workforce safe, verbally ward off intruders, and alert the emergency services if a break-in occurs.



### Improving customer engagement

Nearly three quarters of UK manufacturers (74%) say that the principal motivation for offering servitisation is to develop closer relationships with their customers.<sup>5</sup>



### Strengthening supply lines

Vodafone's cloud-based monitoring system lets manufacturers trace the location and storage status of goods while in transit. Shipping containers and delivery trucks are carefully monitored to prevent theft and ensure fragile assets arrive in pristine condition.



5. [www.barclayscorporate.com/content/dam/corppublic/corporate/Documents/research/annual-manufacturing-report-2016.pdf](http://www.barclayscorporate.com/content/dam/corppublic/corporate/Documents/research/annual-manufacturing-report-2016.pdf)



# Homes and offices

The buildings in which we live and work are ripe for transformation. IoT can make them more comfortable, efficient and secure.

## Smart building systems

Commercial buildings are complex, and keeping systems like elevators, boilers, lighting, HVAC, and access control functioning smoothly is a labour-intensive task. IoT can connect these systems and monitor their health in real time, enabling the building owner or service provider to manage them more effectively. Preventative maintenance can be scheduled without causing disruption to occupants.

In the home, the opportunity is around convenience. Smart home features enable the home to adapt to the occupants' needs: turning on lights, ovens and entertainment systems as the owner walks in the door. Delivering these experiences is a great opportunity for providers to delight their customers.

## Energy management

Building systems such as lighting and heating can be incredibly energy intensive, both in the home and in commercial properties. Automating these systems — for instance, turning off lights when a building is empty, or automatically adjusting air-conditioning — can save money and deliver compelling ROI. IoT-enabled energy management tools can sense the environment and follow business rules to govern energy use automatically.

## Safety and security

Security cameras, intruder and fire alarms, motion detectors and access controls are an important part of commercial building infrastructure. But these systems are often proprietary, costly and unintelligent. IoT-based security systems are easier to deploy — even without any power or network cabling — and feature advanced automation features that means they can, in many cases, replace the cost of manned guards.

Safety and security devices are one of the fastest-growing areas of the smart home market, too. These include not only burglar alarms and smoke alarms that alert the homeowner to events even when they're away from the property, but a range of solutions to keep families safe: smart baby monitors, assisted living devices for the infirm, and trackers for pets and children. Creating these products and services is a huge opportunity for manufacturers.

### Maintaining elevators efficiently

Kone partnered with Vodafone to create a remote-monitoring solution that improves maintenance and reduces the disruption of service to users. IoT sensors monitor elevator health in real-time and send regular reports to service technicians so they can pre-empt downtime.

### Helping the elderly live independently

Locate Solutions' My.sens helps the elderly live independently, in their own homes. The system uses a network of sensors to monitor movement, temperature and light, and issues alerts if it detects abnormal events — for instance, a prolonged period of inactivity.

### Making energy management easy

Smart meters enable customers to reduce bills and make their homes more energy efficient. Homeowners can see monthly projections, view energy consumption by asset, and even track how much power their solar panels are generating.

### Monitoring products in the field

Cleaning equipment maker Kärcher has installed IoT connectivity in its office sweepers and driers, so that building services contractors can monitor the equipment's performance and location. This reduces maintenance overheads and losses from theft and damage.

### Securing homes and businesses

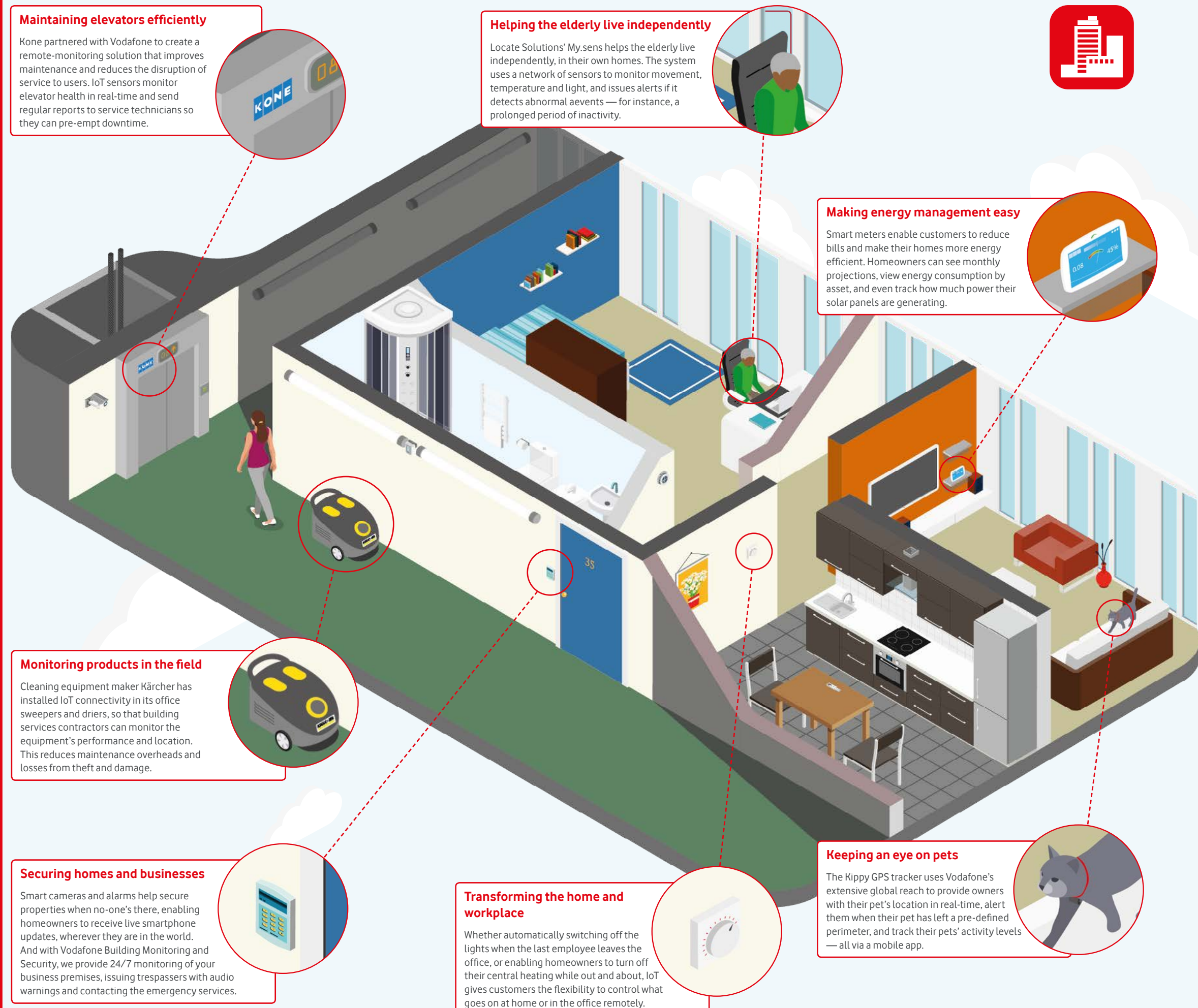
Smart cameras and alarms help secure properties when no-one's there, enabling homeowners to receive live smartphone updates, wherever they are in the world. And with Vodafone Building Monitoring and Security, we provide 24/7 monitoring of your business premises, issuing trespassers with audio warnings and contacting the emergency services.

### Transforming the home and workplace

Whether automatically switching off the lights when the last employee leaves the office, or enabling homeowners to turn off their central heating while out and about, IoT gives customers the flexibility to control what goes on at home or in the office remotely.

### Keeping an eye on pets

The Kippy GPS tracker uses Vodafone's extensive global reach to provide owners with their pet's location in real-time, alert them when their pet has left a pre-defined perimeter, and track their pets' activity levels — all via a mobile app.





# Retail

Retailers are using IoT to revolutionise the shopping experience by building in-store engagement, enhancing their marketing, monitoring footfall and maximising supply chain visibility.

## Digital signage

Retailers are competing to connect with customers, by offering more timely and relevant messages. Digital signage enables retailers to deliver regularly updated and personalised content to shoppers, based on the time of day, the weather outside or even the contents of their trolley. Digital signage is proven to be more effective than traditional alternatives.<sup>6</sup>

## Connected devices for staff

IoT is reshaping the shop floor. By equipping sales staff with IoT-connected tablet devices, retailers can make it easy for staff to serve customers from anywhere in the store, with up-to-the-minute information into product availability, shopper history and upcoming offers, as well as instant payments.

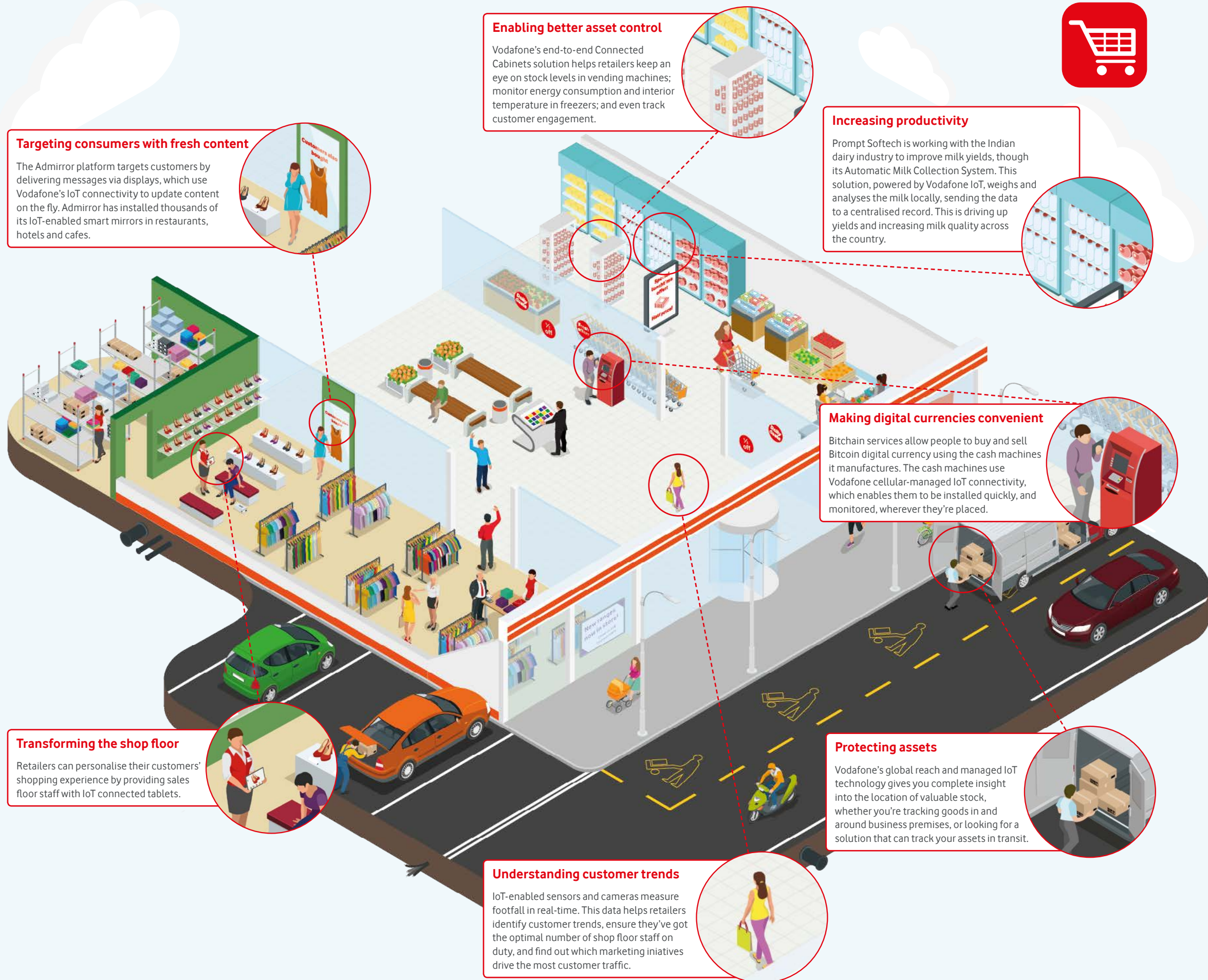
## Supply chain tracking

Retailers can benefit from many of the same IoT supply chain systems as manufacturers, enabling them to track the movement of stock from end to end, reducing shrinkage and damage. Pallet tracking reduces the chances of theft and improves the likelihood of recovery.

IoT has further supply chain benefits for retailers — for example, enabling supermarkets to prove the provenance of goods from field to fork or from factory to clothes hanger.

But retailers can extend this connected and automated supply chain right up to the point of sale. Connected cabinets are a new kind of vending machine that can monitor storage conditions and stock levels, ensuring that products such as beverages are always stocked and always at the optimum temperature.

What's more, in-store IoT gives retailers deeper insight into customer behaviour, enabling them to analyse which displays encourage customers to browse for longer.



6. [www.oaaa.org/NewsEvents/PressReleases/tabid/327/id/4244/Default.aspx](http://www.oaaa.org/NewsEvents/PressReleases/tabid/327/id/4244/Default.aspx)



# Public sector

IoT is the driving force behind the smart cities of the future, but it's also providing the foundation for improving all kinds of public services now.

## Connected street lighting

Lighting and maintenance account for as much as a third of council energy budgets.<sup>7</sup> IoT-enabled street lights, for example, can be set to brighten when cars or pedestrians are nearby and dim when the area is quiet. These intelligent lighting systems also make it easier to identify blown bulbs, reducing the workload for maintenance crews.

## Smart roads and parking

IoT can help solve congestion issues in today's busy urban environments. Using road sensors and digital signage, IoT smart transport systems can route drivers away from congestion; smart parking can help reduce blackspots too, guiding drivers to the nearest available space — the benefits can be huge, given that nearly a third of commuter traffic comes from drivers looking for parking spaces.<sup>8</sup>

## Public safety and crime

IoT can help keep citizens safe from dangers both natural and man-made. IoT connected cameras can be installed easily even in rural or remote areas, helping detect floods and other threats to public safety, as well as crimes such as fly-tipping. With high-quality footage, night vision and automatic number plate recognition, they can increase the chances of a successful prosecution. Connected devices worn by council workers and law enforcement can help not only guide staff to where they're needed, but give them a way of calling for help in an emergency.

The IoT can play a pivotal role in improving public services. Local councils and government agencies can use the data they are collecting to provide automated alerts for extreme weather, flooding or even simply a delay in the timings of refuse collection.

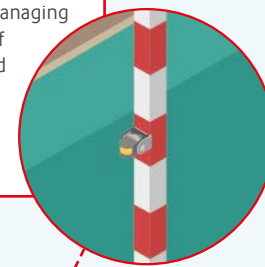
### Tackling waste management

Ecube Labs has partnered with Vodafone to create the world's smartest bin. Using IoT technology, it wirelessly communicates fill levels in real time so councils can plan waste management collections more effectively and keep bins from overflowing.



### Reducing the risk of flooding

The UK's Environment Agency is responsible for managing more than 30,000 bridges, culverts and grids, all of which play a role in preventing flooding. It installed solar-powered smart cameras, powered by Vodafone IoT, at trouble spots to provide remote visual monitoring, and give it early warning of potential blockages.



### Solving inner-city parking

SmartPark's parking technology helps reduce congestion, decrease vehicle emissions and lower driver stress levels. Its SmartEye wireless devices, embedded in parking sensors, use Vodafone's IoT solutions to direct drivers to available parking bays from a central management application.



### Lighting streets more efficiently

Philip's CityTouch smart lighting system — powered by Vodafone IoT connectivity — gives local authorities granular control over their lighting. CityTouch reduces the day-to-day operating and maintenance costs of street lighting.



### Charging solutions for electric cars

Vodafone IoT is at the heart of ubitricity's electric car charging system. It makes deploying charging points more attractive by enabling providers to bill drivers for the power used during charging.



### Safeguarding lone workers

Vodafone IoT trackers can ensure lone workers such as police officers or social workers, stay safe in the field. Users can summon help by pressing a panic button or if the device detects a fall. The notification includes GPS data, making it easier for respondents to locate the user.



7. [www.greeninvestmentbank.com/media/5243/gib-market-report-low-energy-streetlighting-feb-2014-final.pdf](http://www.greeninvestmentbank.com/media/5243/gib-market-report-low-energy-streetlighting-feb-2014-final.pdf)

8. [www.bbc.com/future/story/20140611-can-we-ever-end-traffic-jams](http://www.bbc.com/future/story/20140611-can-we-ever-end-traffic-jams)



# Healthcare

IoT is transforming the healthcare sector, through remote patient care and telecare. It is improving the effectiveness of clinical trials and ensuring cold chain integrity.

## Remote care

Using IoT-powered mHealth solutions, medical staff can remotely monitor, consult with and even treat patients, avoiding the need for the sick and infirm to travel to a hospital or clinic. This not only results in better care through more accurate data collection, but also lower costs and better utilisation of limited clinical resources — vital in a world with an ageing population and more chronic conditions to manage.

## Assisted living

IoT is helping vulnerable people — such as the elderly — live more independently in their own homes for longer, without the need for round-the-clock care. IoT-enabled wearables allow families to keep an eye on their relatives, for instance locating them should they get lost, or raising the alarm if a person suffers a fall. Connected medicine cabinets can even remind patients to take medication.

## Clinical trials

IoT-enabled monitors are already aiding in the research and development of new drugs and treatments, allowing clinicians to remotely collect and continuously monitor trial data, enabling deeper insight and faster reallocation of resources.

## Supply chain

Tracking devices and sensors in containers can naturally help prevent loss and theft, but just as importantly they enable organisations to prove the authenticity of shipments to tackle counterfeiting, and make it easy to verify that the condition of delicate stock has been maintained throughout the cold chain.

### Transforming cold chain management

Any hospital or pharmaceutical company knows the importance of proper drug storage. Using IoT you can track shipments of medication end to end, verifying that drugs are stored at the correct temperature and waste is kept to a minimum.

### Ensuring emergency equipment is in prime condition

Battery-powered defibrillators can save lives in the event of a sudden cardiac arrest. medic assist's IoT-enabled defibrillator constantly monitors the status of the devices, sending alerts in case of failure. This ensures the devices are in prime condition should they be needed.

### Keeping blood sugars under control

Diabetacare's IoT-enabled glucometer is helping thousands of diabetics to manage their condition. The connected meter helps doctors track patient's blood-sugar levels remotely. Controlling blood-sugar levels is key to reducing the long-term health risks associated with diabetes.

### Gathering data round-the-clock

Fitness monitors today count steps, measure heart-rate, track sleep quality and feed that data to your smartphone — all through IoT. But wearables also help families keep an eye on relatives with cognitive degenerative diseases when they're out and about. And for the first time, doctors can continuously collect patient data without having to call them in to the clinic.

### Monitoring patients in transit

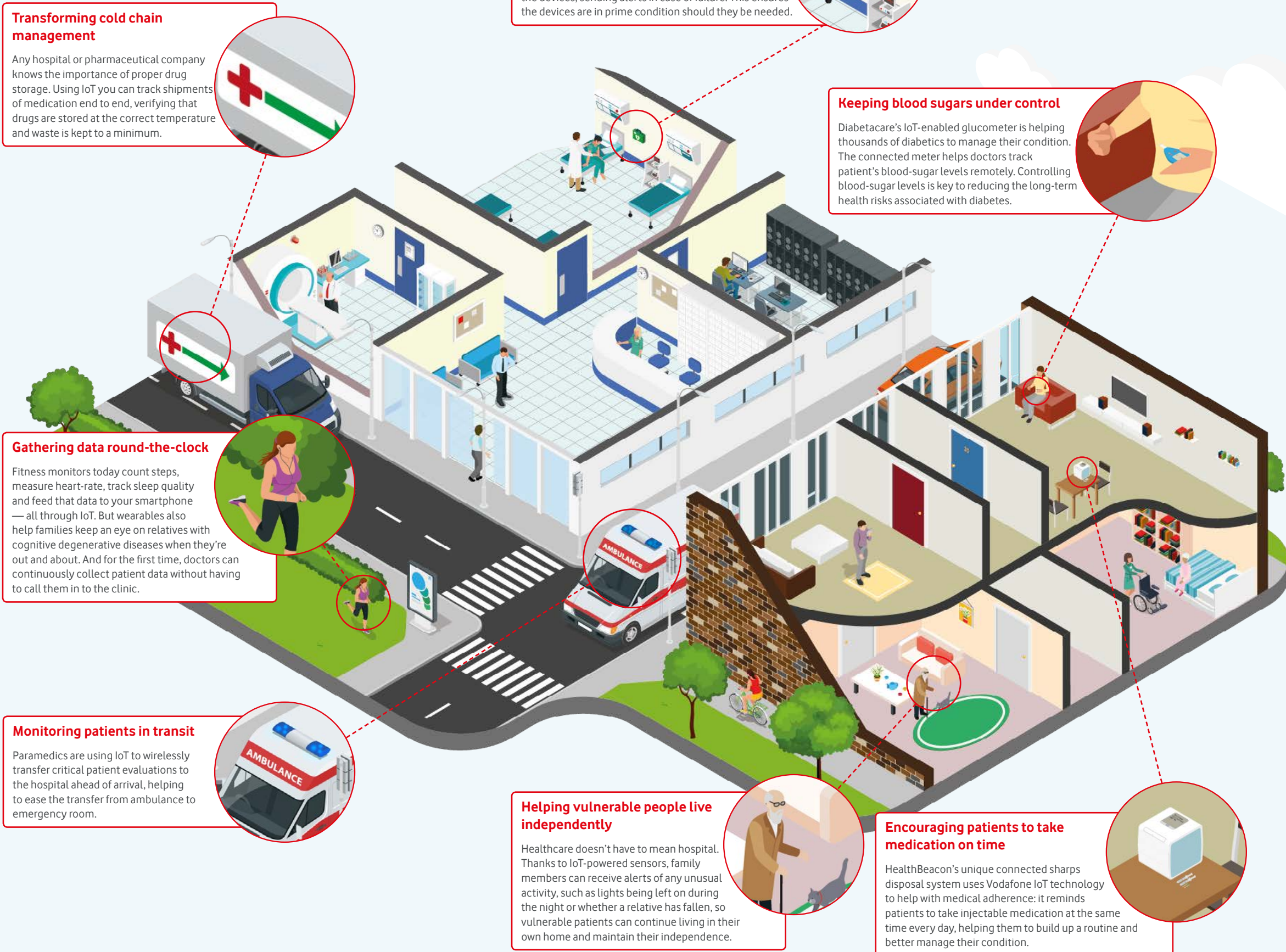
Paramedics are using IoT to wirelessly transfer critical patient evaluations to the hospital ahead of arrival, helping to ease the transfer from ambulance to emergency room.

### Helping vulnerable people live independently

Healthcare doesn't have to mean hospital. Thanks to IoT-powered sensors, family members can receive alerts of any unusual activity, such as lights being left on during the night or whether a relative has fallen, so vulnerable patients can continue living in their own home and maintain their independence.

### Encouraging patients to take medication on time

HealthBeacon's unique connected sharps disposal system uses Vodafone IoT technology to help with medical adherence: it reminds patients to take injectable medication at the same time every day, helping them to build up a routine and better manage their condition.





# Making it happen

The five key elements of any IoT deployment.

## 1 Connected devices sense their environment

It all starts with the assets — the things that you want to monitor and control. Whether they're small or large, mobile or fixed, in their thousands or a one-off, there's an IoT solution that's right.

Equipping these assets with connected sensors gives you the power to monitor their behaviour or environment and communicate any changes you wish to make.

## 2 Network connectivity carries IoT data

The network is at the heart of the IoT. Without connectivity, you cannot get the information you need.

Often, this connectivity takes the form of a SIM card, meaning the IoT device can communicate via high-speed, reliable, cellular networks. But other forms of connectivity, such as satellite, fixed-line or Narrow-Band IoT (NB-IoT), may suit your needs.

## 3 The management platform aggregates data and controls devices

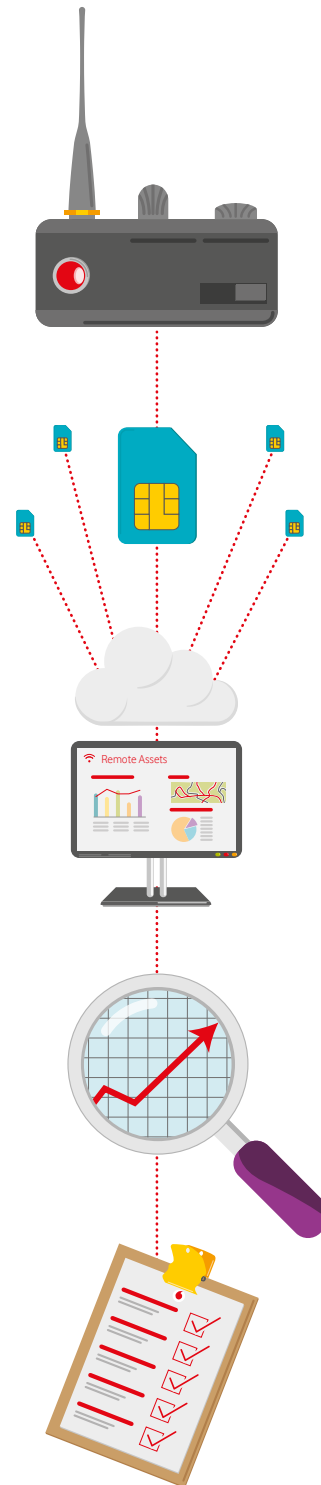
The data generated by your IoT devices is communicated securely to a central platform, often hosted in the cloud, that gathers and processes the data, and allows you to manage and monitor your entire IoT estate.

## 4 Applications use IoT data in business processes

The value of IoT comes from being able to analyse the information you receive and respond automatically and in real time. As a result, your IoT management platform needs to be able to integrate with other business systems — such as ERP, CRM or work scheduling tools.

## 5 Professional services keep everything running smoothly

IoT solutions can quickly become highly complex, given the number of moving parts. You'll need to plan each stage of your deployment carefully and identify where investments are prioritised. That's where the choice of provider — and their professional services capability — is critical. You'll want an experienced partner, that operates where you do business, understands your industry and knows IoT.



# Why Vodafone

IoT projects can be challenging. At Vodafone, we aim to make it easy. Here are three simple reasons why you should partner with us.

## 1 Unrivalled IoT experience

Vodafone has more than 1,300 dedicated IoT experts that you can rely on. We've been delivering IoT solutions to our customers for more than 25 years and have over 40 million IoT connections.

Vodafone has consistently been recognised for our IoT expertise, by our clients and peers. We've been highly rated by leading industry analysts such as Analysys Mason and Machina Research and have been positioned as a Leader in the Gartner Magic Quadrant for Managed Machine-to-Machine Services.

## 2 Global networks you can rely on

Vodafone has mobile operations in 26 countries, partners with mobile networks in 55 more, and fixed broadband operations in 17 markets. As of 30 June 2016, Vodafone had 465 million mobile customers and 13.7 million fixed broadband customers.

Our scale doesn't just give you the confidence that we operate wherever you do business — it means we can offer the exceptional levels of service you need.

## 3 The solutions to simplify IoT projects

We have delivered IoT applications for organisations of all sizes and across all industries, so we know how to make your IoT solution deliver maximum value for you.

We partner with the world's leading connected device makers to offer a wide range of out-of-the-box IoT solutions that take the complexity out of IoT deployment.

But even when you need a customised solution, our team of experts will ensure your business takes advantage of best practices and methodologies for IoT implementation to ensure you achieve maximum ROI.

To find out more about how Vodafone can help you make the most out of IoT, or to book a free innovation session with one of our IoT experts, contact us at [iot@vodafone.com](mailto:iot@vodafone.com), call us on 07444 325793 or visit [www.vodafone.com/iot](http://www.vodafone.com/iot)



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