Creating a smarter world

How M2M and the Internet of Things are driving the next industrial revolution

m2m.vodafone.com

The future is exciting.

Ready?

vodafone

The world's nervous system

Whether it's messaging a friend abroad, picking up work emails, or streaming the latest blockbuster to your phone, we all rely on networks to connect us to the things we care about.

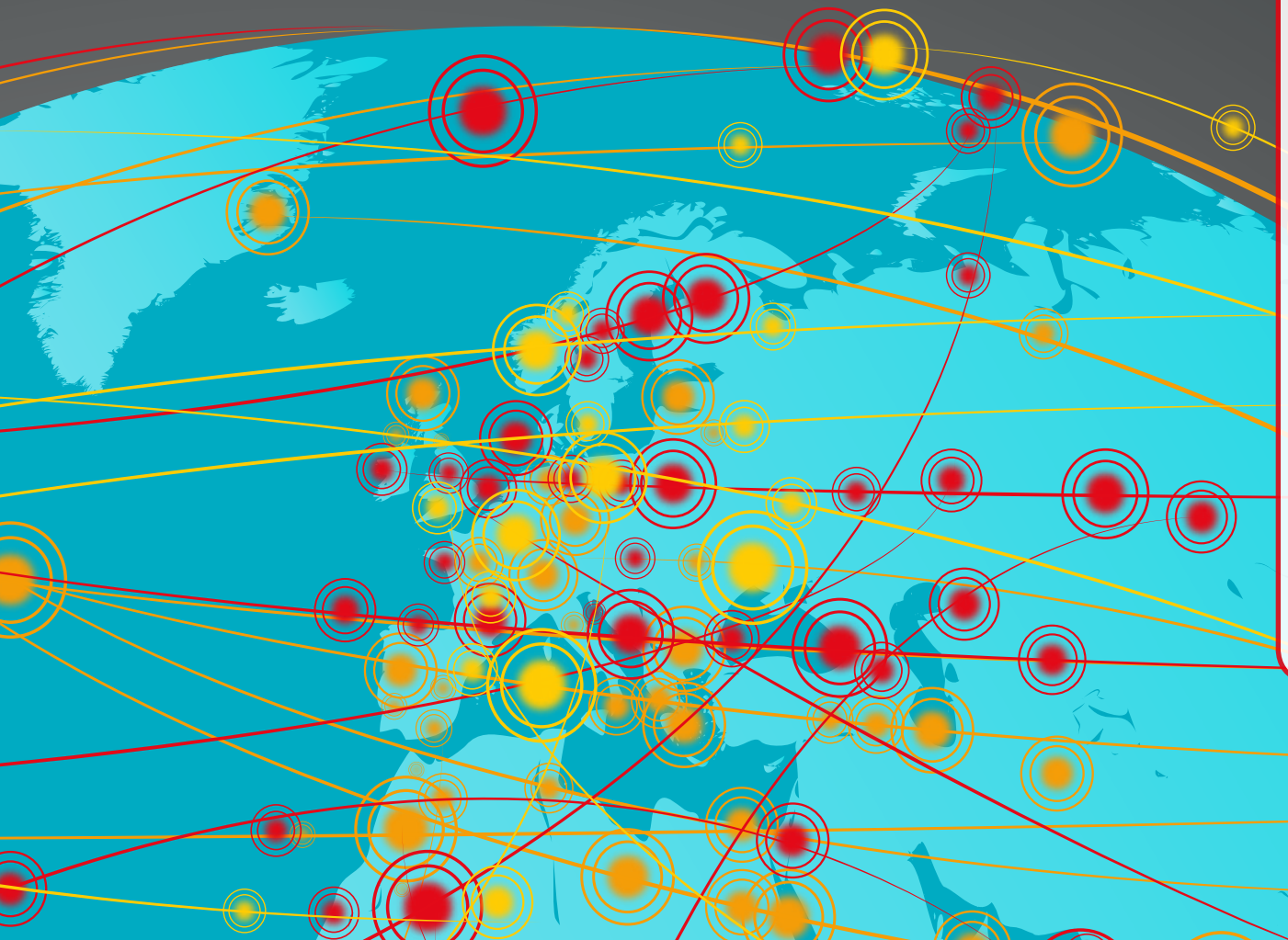
But the world is only just starting to appreciate the huge potential that comes when you can collect data from almost anything.

In our homes, at the office, in industry or in the car, the way we live and work is being transformed in thousands of ways by enabling everyday objects to talk to each other over the network.

This technology behind this is called machine-to-machine (M2M) communications — you might have heard it called telematics, the Internet of Things, or referred to by a specific term like smart grid. The name doesn't matter: it's what you do with it that counts.

The potential benefits are far-reaching. Improving energy efficiency. Making equipment failure a thing of the past. Enhancing safety and security. Supporting faster and better decision-making. Even enabling whole new products, services and business models.

That's what we'll show you over the following pages. Join us as we take a tour of the smarter world.



What is M2M?

In essence, M2M communication is what happens when things such as white goods, shipping containers, TVs, industrial machinery, drinks coolers, cars — in fact, nearly any fixed or mobile assets — are connected to the network. That's why M2M is seen as the driver behind the Internet of Things (IoT).

Using M2M, these assets can send and receive data — about temperature, weight, location or any number of other factors — as well as requests to each other and to central management systems, autonomously. Often this can happen in real time. It opens up a whole new world of opportunities for business agility and efficiency.

The biggest transformation in a generation?

Analysts are unanimous: M2M is going to reshape the way we do business. Gartner has forecast a 30-fold increase in internet-connected physical devices by 2020, up to 26 billion devices. Governments are backing it, too. In March 2014, UK Prime Minister David Cameron said:

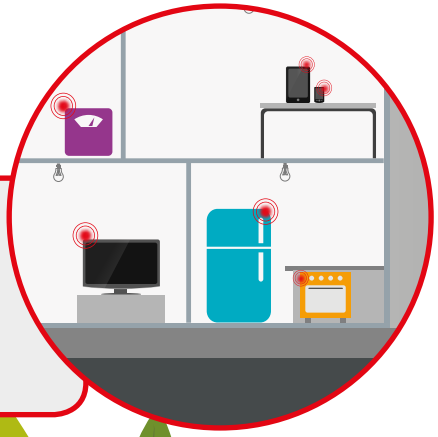
"I see the Internet of Things as a huge transformative development. We are on the brink of a new industrial revolution"

A priority for all kinds of businesses

Our own in-depth research into business adoption of M2M shows that it's a top executive priority. In our 2014 M2M Barometer study, 86% of respondents said M2M is relevant to their business today. 79% agreed that within 10 years, **everything** will be connected. 65% say they've gained competitive advantage from M2M.

A day in the life

Consumers may not realise it, but M2M is all around — providing valuable services that make life easier, safer and greener, every day.



Building smarter homes

Vodafone is at the forefront of the connected home, enabling appliance manufacturers to connect their products and develop innovative new services.

Making advertising more personalised

Amscreen uses Vodafone M2M connectivity for its advertising signage displays that can update with fresh content every day — based on location, weather, or even specific events.

Keeping the traffic flowing

Vodafone M2M connectivity can help traffic flow smoothly through a city, changing traffic light patterns to ease congestion. One Dutch transport group cut the fuel consumption of its buses by €3 million in one year using smart routing technology.

Calling time on estimated readings

We're helping utility companies deploy smart metering across the globe. CESC in India achieved over 99% meter reading accuracy.

A smarter way to save energy

In the connected home, the services we all rely on — heating, lighting, and home security — are smart. They automatically ensure the house is comfortable when you're in, and energy efficient and secure when you're out. Your heating automatically adapts to both changing weather and your schedule — for instance, if you're away on business. This is good news for consumers' wallets, and good for providers looking to manage demand, too.

Informed and in control

Thanks to the M2M smart meter installed in the cupboard, both the homeowner and their utility provider know exactly how much energy the house is using. The meter also knows how much electricity is being generated through the solar panel on the roof.

Customers get accurate bills without reporting a meter reading. The utility company gets more data than it ever dreamed possible, helping it forecast demand and manage its business.

A helping hand in the home

A whole wave of home automation applications are within reach, thanks to M2M. Imagine getting home from work and having the alarm disable, door unlock and lights turn on as you walk up to the door. For the companies that offer these services, M2M provides regular subscription revenue, as well as valuable data on consumer behaviour that feeds into product development and marketing.

Intelligence all around

Outside your front door, the street is connected too. The bus stop features a digital display that reports when the next bus will arrive, and also detects the age and gender of passers-by, displaying appropriate advertising.

The traffic lights at the end of the street are part of a smart traffic management system: they detect traffic volumes and adapt their timings in real time to keep congestion to a minimum. They even turn green automatically when they detect an approaching emergency vehicle.

A new level of business efficiency

M2M can help you save money right across your business — from your facilities to your fleets.

Optimising stock management

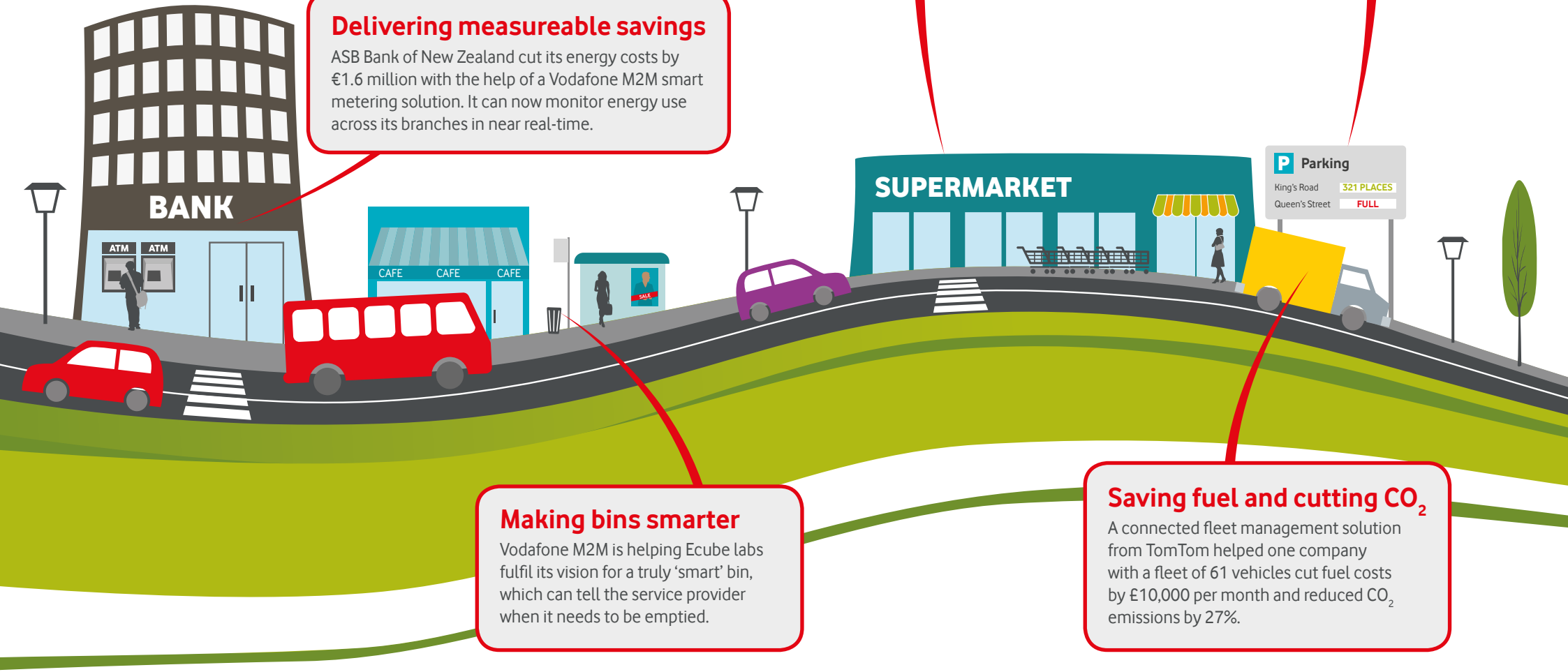
Vodafone's Connected Cabinets solution is a complete, end-to-end solution that transforms retail cabinets into intelligent assets that can monitor usage, keeping the right quantities of stock, in the right condition.

Taking the hassle out of parking

Drivers can forget about the annoyance of hunting for parking spaces. Connected parking systems can route drivers efficiently to any free spaces and automatically collect payments.

Delivering measureable savings

ASB Bank of New Zealand cut its energy costs by €1.6 million with the help of a Vodafone M2M smart metering solution. It can now monitor energy use across its branches in near real-time.



Making bins smarter

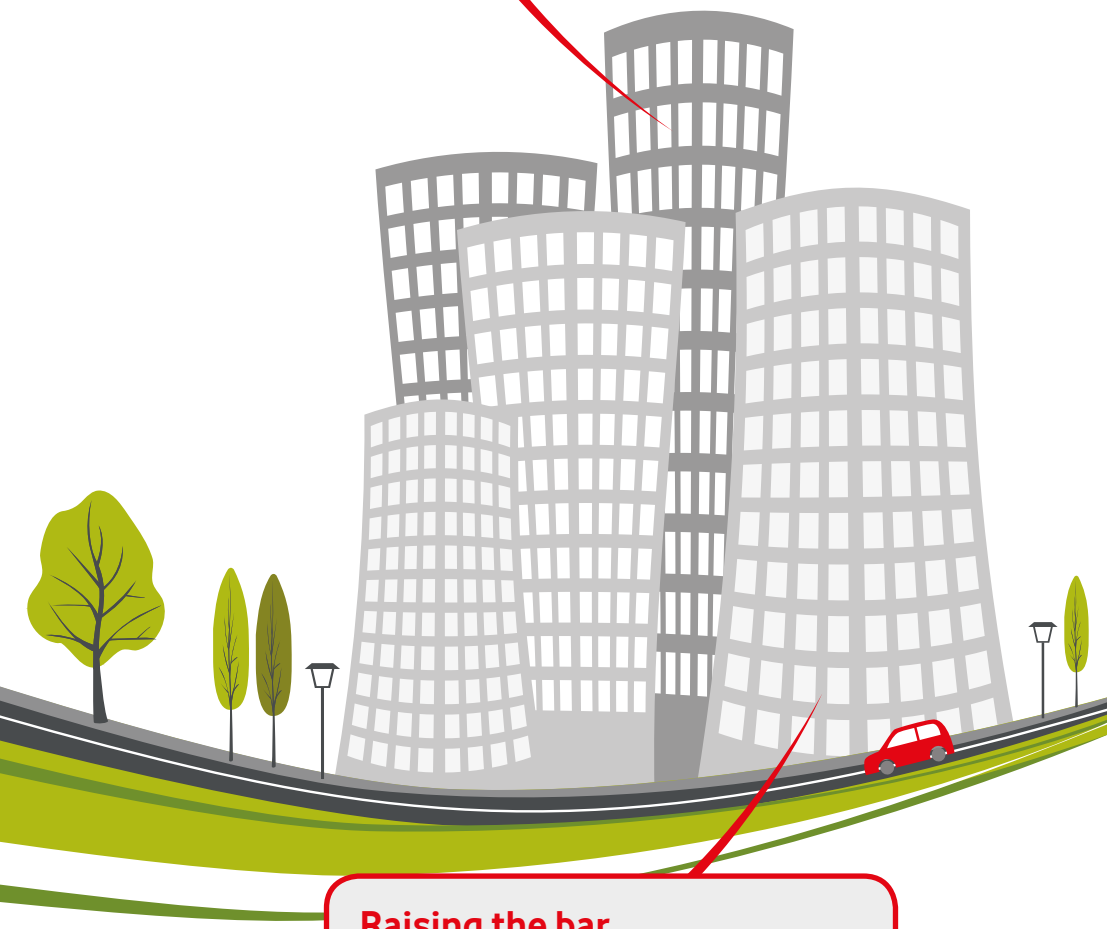
Vodafone M2M is helping Ecube labs fulfil its vision for a truly 'smart' bin, which can tell the service provider when it needs to be emptied.

Saving fuel and cutting CO_2

A connected fleet management solution from TomTom helped one company with a fleet of 61 vehicles cut fuel costs by £10,000 per month and reduced CO_2 emissions by 27%.

Saying goodbye to big energy bills

At Vodafone, we've seen the benefits of energy data management ourselves. We deployed it to 200 sites and achieved an average energy saving of 29%.



Raising the bar

Kone has installed Vodafone's M2M technology in its elevators and escalators to issue proactive maintenance alerts, improving service reliability.

Connecting the supply chain

Organisations that depend on their supply chain, such as retailers, can use M2M to great effect. In the grocery store, Connected Cabinets can sense temperature, the weight of stock, and even when their doors open. Each cabinet can report back to the distributor about its sales and stock levels and its maintenance condition. The distributor knows exactly when to schedule in a restocking delivery or maintenance visit. And the food or drink manufacturer also knows exactly what's selling, where and when — helping target new product development and marketing strategies.

The living building

Offices too can benefit from M2M. Just like in your home, the heating, air conditioning, and other electrical systems are all connected and being monitored for their performance and efficiency — helping employers cut utility bills, while ensuring a comfortable and productive environment for staff.

Even the lifts, escalators and other machinery are connected, giving their manufacturers an insight into performance hour by hour, and early warning about any problems. The building owner gets the convenience of moving to a "pay as you go" model — instead of paying up-front fixed fees for amenities such as lifts, they can pay a simple flat fee each time a lift is used, which includes all servicing and repairs. It's simple — and would have been impossible without M2M precisely and invisibly reporting usage over the air.

Real-time fleet management

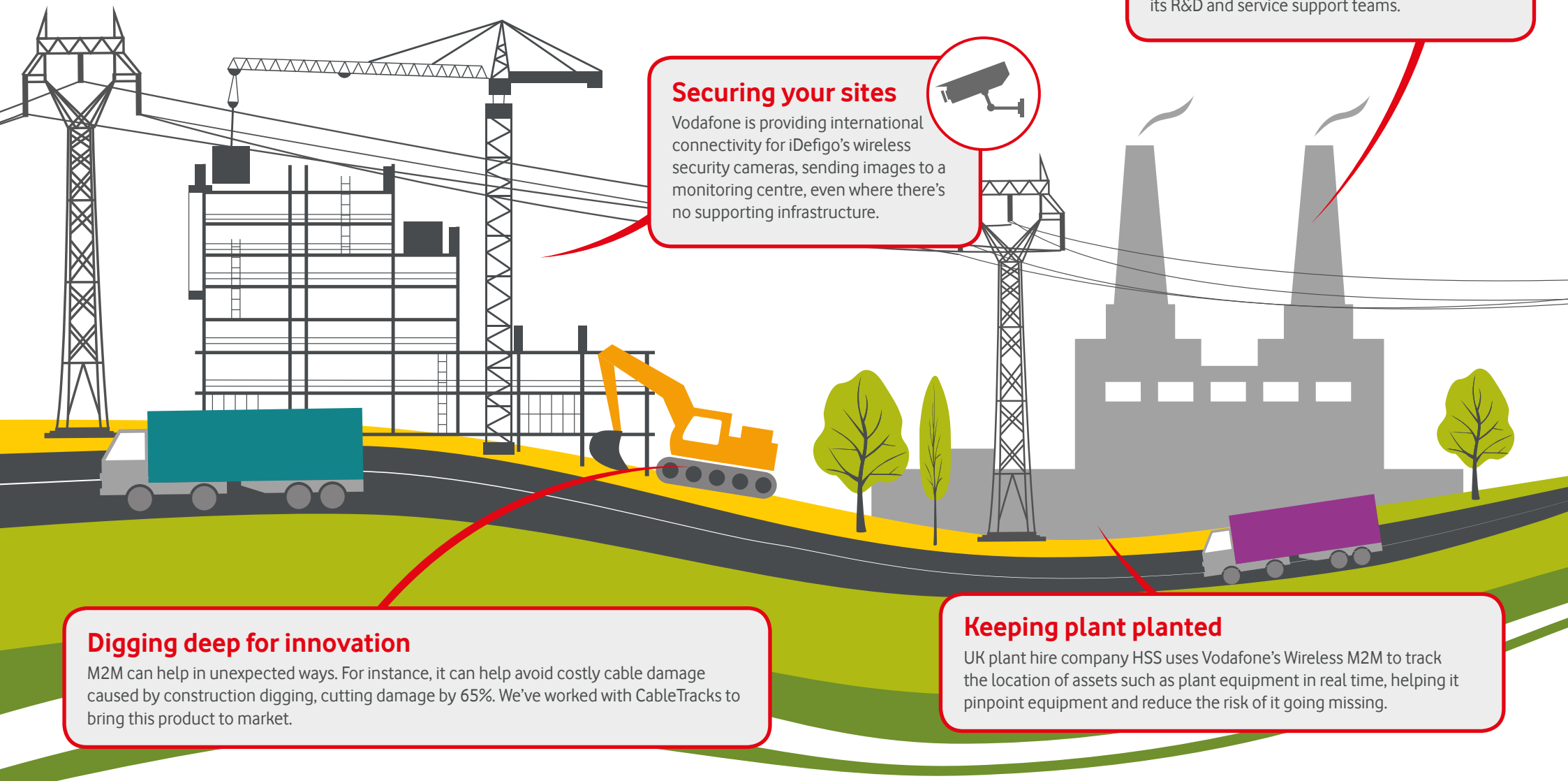
For all the advances that the internet has created, businesses still depend on the flow of physical goods in vans and trucks — whether it's a single parcel delivered to the office mail room or a pallet of stock to the local supermarket.

M2M-enabled fleet management systems ensure that vehicles and their shipments reach their destination on time, routing the driver around traffic blackspots and monitoring the vehicle's engine condition to pre-empt potential breakdowns that could disrupt service.

Fleet management is one of the most well-established M2M applications — it's been tried and tested for years. But in fact, M2M adds value right back along the supply chain: automating delivery and collection booking, optimising warehouse management, and keeping production machinery in the far-off factory running smoothly.

Safer, more productive industry

With M2M, factories, farms and other sites can benefit from greater security, reduced downtime, and better output.



Giving new insights into usage

Atlas Copco is using Vodafone M2M to monitor the performance and health of its products that use compressed air on customer sites around the world — delivering vital new intelligence for both its R&D and service support teams.

Securing your sites

Vodafone is providing international connectivity for iDefigo's wireless security cameras, sending images to a monitoring centre, even where there's no supporting infrastructure.

Digging deep for innovation

M2M can help in unexpected ways. For instance, it can help avoid costly cable damage caused by construction digging, cutting damage by 65%. We've worked with CableTracks to bring this product to market.

Keeping plant planted

UK plant hire company HSS uses Vodafone's Wireless M2M to track the location of assets such as plant equipment in real time, helping it pinpoint equipment and reduce the risk of it going missing.

Building a smarter grid

M2M sensors around the electricity grid can report in real time, helping prevent power outages, increase capacity and defer costly investment. It's proof that M2M is ready for the most mission-critical applications.

Making farms more productive

From smarter crop planting to optimised animal feeding, M2M can drive productivity gains. Vodafone M2M technology has helped livestock feeding machine manufacturer Keenan maximise milk and beef production yields for farmers.

Making sites safer

M2M has a major role to play in ensuring safety and security in all kinds of industrial sites.

Take, for example, a construction company. On building sites, assets like forklift trucks, other plant, and containers of stock can be big business for thieves; M2M lets the company track them down to the metre.

In the past, monitoring remote sites was difficult. Wireless M2M security cameras are easy to install even on sites where power and cabling haven't yet been rolled out.

Agricultural revolution

With global populations continuing to rise, there's a pressing need to find more effective ways to produce food. M2M promises to introduce a new era of productivity in farming. The applications range from fuel-efficient routing for harvesters and tractors to optimised feeding systems for crops, livestock, and fish.

The smarter grid

In the utilities sector, M2M sensors and communication devices are helping companies manage their grids — balancing loads, adapting power flow in response to changing environmental conditions, spotting failing components before they cause downtime, and managing the unpredictable power contributed by renewables and micro-generation. As a result, companies can support greater demand while deferring costly network investment, and better utilise their limited spare stocks, vehicles and engineers.

Connected assets from factory to anywhere

Manufacturers are transforming their businesses with M2M, too — in the products they offer and the way they operate.

In the factory, connecting production equipment via M2M gives early warning of potential failures that could cause the assembly line to grind to a halt. In the warehouse and sourcing, real-time sharing of stock levels and production status can minimise cash tied up in parts and raw materials and tighten the global supply chain.

Many manufacturers are also building M2M directly into products such as generators and AC units, eliminating the need to send an engineer to each client site for routine checks. By gathering data about how these products are used in the field, manufacturers can get detailed insight that could prove invaluable for marketing, new product development, and for spotting recurring faults that can be engineered out in later versions.

Smarter homes and neighbourhoods

By connecting everything, from streetlights to blood pressure monitors, M2M creates new opportunities for efficiency, safety and convenience.

Keeping the lights on

Local authorities spend hundreds of thousands on maintaining street lighting — it's a huge drain on budgets. M2M can alert crews automatically to blown bulbs, as well as allowing councils to adapt lighting — even individual street lights — to weather, traffic volumes and other variables.

The connected car

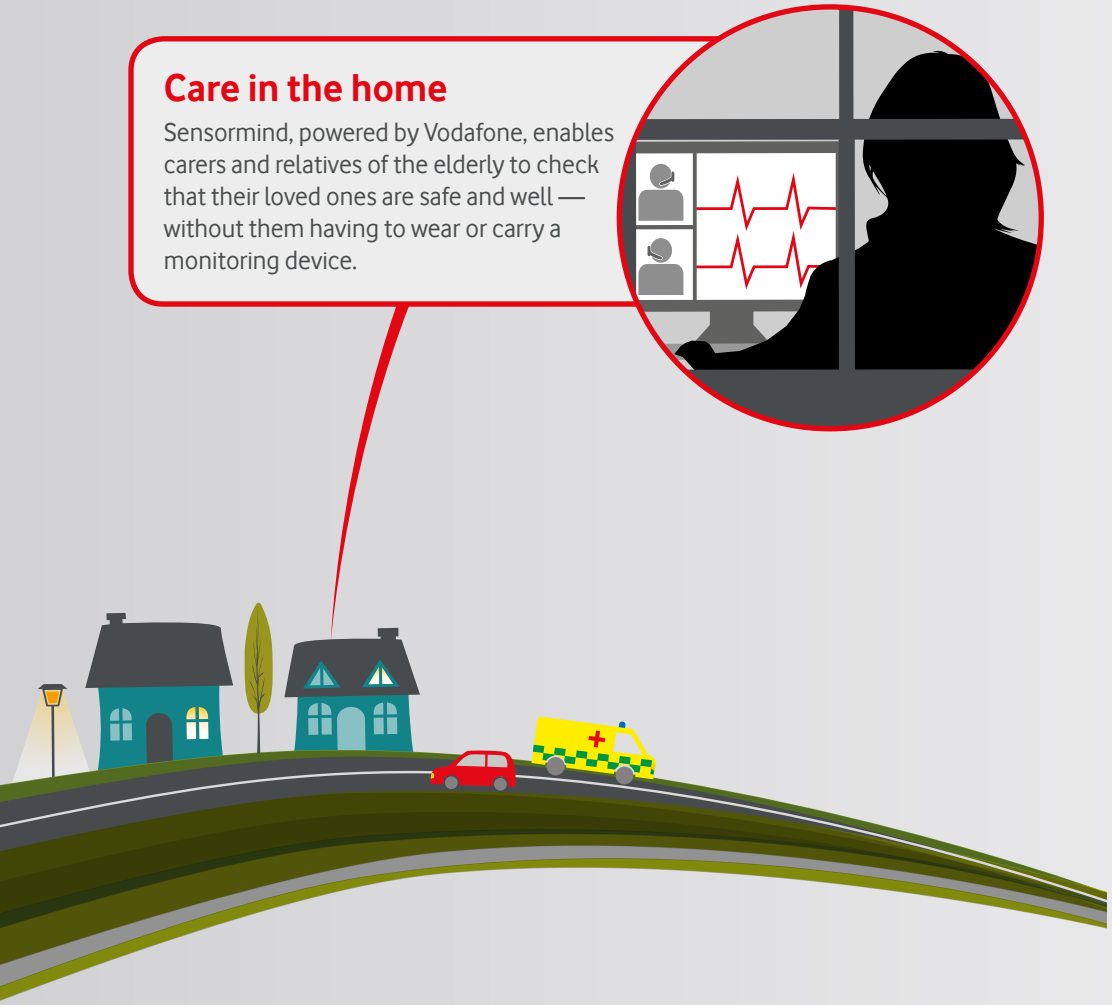
Vodafone M2M connectivity is helping manufacturers such as BMW and Mahindra Reva make the connected car a reality, for safer, more convenient transport.

Safer driving with usage-based insurance

Vodafone is working with CleverMiles to promote safe driving for young people, with an innovative new telematics solution.

Care in the home

Sensormind, powered by Vodafone, enables carers and relatives of the elderly to check that their loved ones are safe and well — without them having to wear or carry a monitoring device.



Keeping the lights on

Even our street lights can look forward to becoming smarter. M2M-enabled lights automatically notify the council when a bulb blows. And they can cut power bills too: intelligent lights can be controlled individually, and adapt their on/off schedule and brightness depending on the time of day, traffic volumes or weather conditions.

From hospital to home

Having people visit the hospital or clinic for a routine checkup is costly for providers and often difficult for patients, particularly the elderly. Using M2M monitoring devices, people can share diagnostic data with their caregivers 24x7, without leaving their homes. The results can be dramatic: better care, and better utilisation of scarce clinician time.

For those vulnerable people that need regular care in the home, M2M-enabled motion-monitoring systems can provide an unobtrusive safety net between carer visits, automatically sending text message alerts in the event of something untoward, like a fall, happening.

The connected car

For many of us, our cars are our second homes — and, like our homes, they too are being transformed by M2M. With a SIM card under the hood, the car's navigation system not only finds the least congested route, it also knows which parking spaces are free. The car can monitor its own health, diagnose problems and communicate with the dealership to book in for a service or repair directly, or in the event of a breakdown, call for assistance automatically.

Onboard trackers can help trim insurance premiums, by monitoring driver behaviour and rewarding those who drive safely or avoid the roads during peak hours. They can also help recover vehicles in the event of theft by notifying authorities about their location.

The big picture

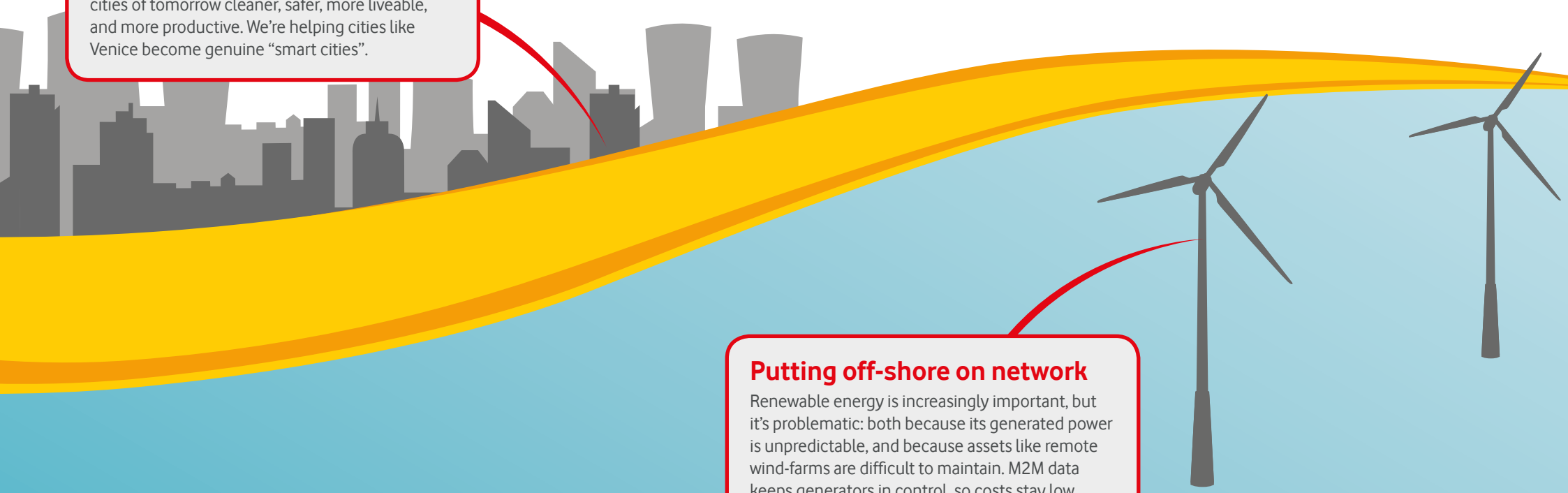
M2M connections can span the city and even the globe, connecting trade, transport and more.

Taking flight

In aviation, M2M can provide point of sale connectivity for in-flight commerce, as well as providing technical diagnostics and management to keep flights running smoothly.

Realising the smart city

The future is urban — and M2M will make the cities of tomorrow cleaner, safer, more liveable, and more productive. We're helping cities like Venice become genuine "smart cities".

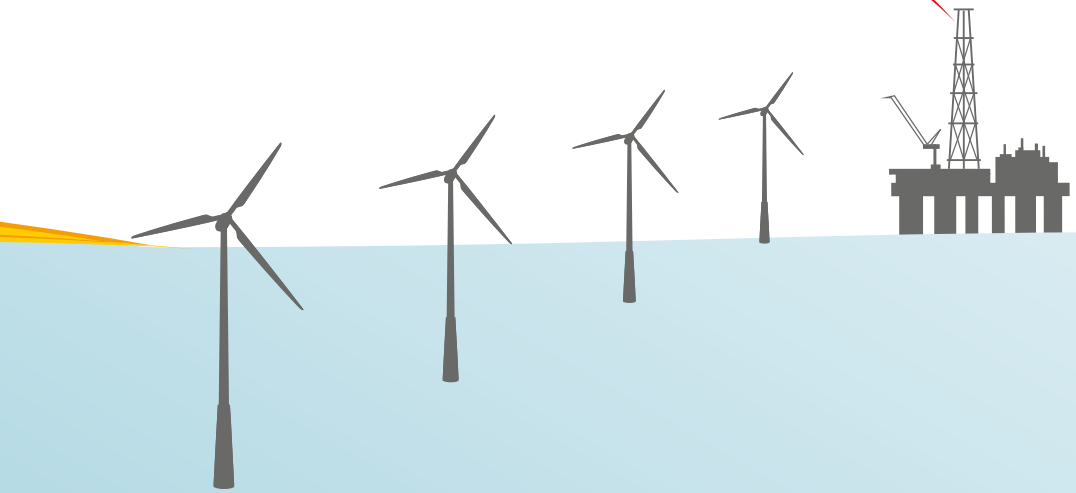


Putting off-shore on network

Renewable energy is increasingly important, but it's problematic: both because its generated power is unpredictable, and because assets like remote wind-farms are difficult to maintain. M2M data keeps generators in control, so costs stay low.

Monitoring even the most remote assets

WIKON is using Vodafone M2M to provide a standardised industrial gas tank monitoring service to customers across the globe.



Greater than the sum of its parts

Put all of these M2M applications together and look at the big picture. What do you see? The smart city: where the whole urban environment reacts and adapts to stimulus in real time — keeping on top of traffic jams, pollution, crime and the other stresses of urban existence. Millions of citizens, plus businesses and public sector organisations, benefit in countless ways every day from M2M and the Internet of Things.

But M2M is not just for cities. It's for the world.

Off-shore, on-network

Remote industrial facilities like oil rigs, wind turbines, tidal power generators, and pipelines are a key part of our global economy. M2M can also reduce the risk workers face when maintaining this critical infrastructure, by avoiding the need entirely for manual inspection visits. M2M can report on the status of an asset without any human intervention.

Keeping the world moving

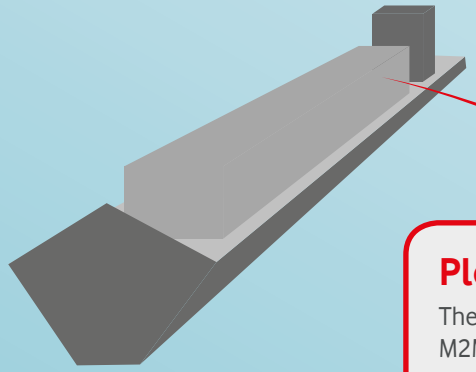
The lines of trade that keep the world moving — cargo vessels and commercial airliners — increasingly run with M2M at their hearts.

M2M tracks tankers and cargo ships, reporting location to company owners and authorities, monitoring the risk posed by storms, and alerting to potential failures of engines and other systems.

The thousands of containers that cargo ships carry are also connected — keeping transit companies informed about the location, status and security of products from end to end. For instance, food producers and their customers can verify that a refrigerated container has stayed at the correct temperature even during a long ocean voyage.

Flying high

For aeroplanes, both cargo and passenger, M2M is having an even greater effect. While here too M2M can track cargo, it can also help manage the vehicles themselves. We're working with one airline on M2M flight monitoring, giving it a package of diagnostic data after each journey, including fuel consumption data, that can help inform business decisions and make engineers' lives easier.



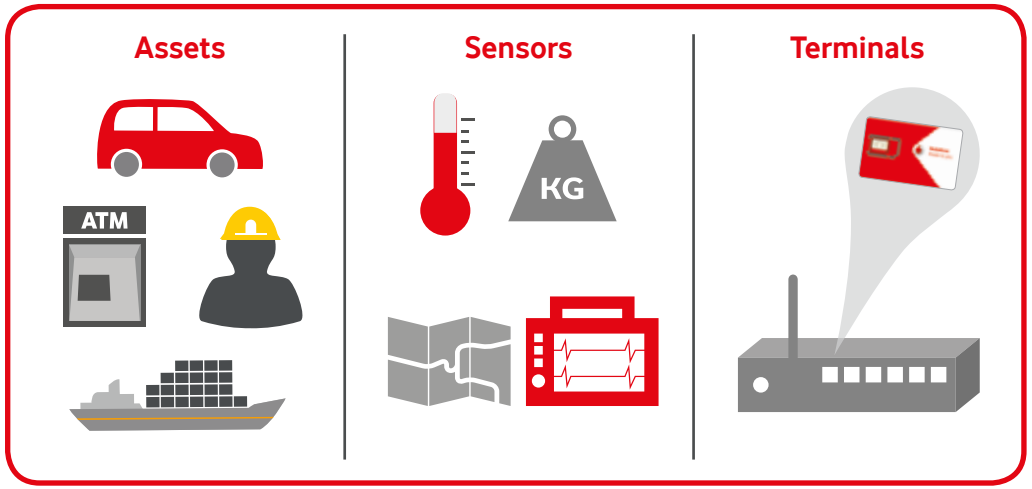
Plotting a better course

There are an estimated 3 million shipping containers in transit at any one time. M2M can help companies track them. Vodafone and Globe Tracker are already transforming global trade with a breakthrough asset tracking solution.

Making it happen

While every M2M solution is different, each is made up of a few key elements.

1 M2M connected devices sense their environment



Assets

It all starts with your assets: the people, vehicles and fixed equipment that you need to connect. No matter whether they're fixed or mobile, large or small, and in hazardous environments or not, there's an M2M solution to suit.

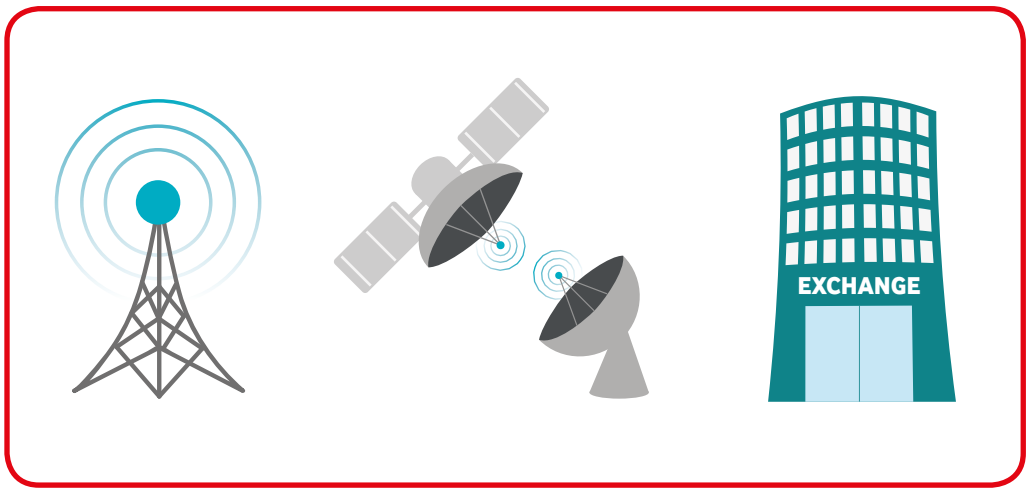
Sensors

Almost all M2M applications depend on sensors: whether that's for temperature, vibration, light, weight, movement, power consumption, or some more esoteric factor.

Terminals

The data from these sensors is gathered in an M2M terminal integrated in, or mounted on, the asset. The terminal may take many different forms depending on whether it's built into a car, fixed to an air conditioner, part of heavy industrial machinery, or even part of a user-carried device.

2 Network connectivity carries M2M data



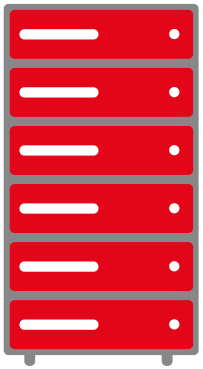
Connecting assets

Each M2M terminal — of which there may be millions in a single deployment — is connected, so that it can communicate the data it's gathered and receive instructions back in turn.

Often this connectivity takes the form of an M2M SIM card, meaning the M2M device is cellular, in some ways just like your smartphone. But M2M terminals may also communicate via fixed line; via Wi-Fi or Bluetooth; via other radio connectivity; or even via satellite.

In some cases, where connectivity absolutely has to be assured, you may want to connect your assets by two different means simultaneously.

3 An M2M platform aggregates data and controls your devices



The M2M data passes over global wireless and wired networks to your M2M provider, where a central M2M platform gathers and processes the data and allows customers like you to manage and monitor all your M2M devices.

You may even be able to do this via the web through your browser window or on a mobile device.

4 Applications use M2M data in business processes

The value of M2M comes from using the data and automating how assets are controlled. So the M2M platform connects, often via APIs, to your business applications — whether those are ERP and CRM systems, fleet management tools, insurance risk engines, building management tools, worker job scheduling systems, or countless others. This is where you use the M2M data and react to it, either automatically or manually.

5 Professional services keep everything running smoothly

M2M solutions can become highly complex, aggregating data from a multitude of sources. You'll need to plan each stage carefully and identify where investments are prioritised. That's where the choice of provider comes in — and the professional services they offer, from design and testing to ongoing support. You'll want an experienced partner that knows how to take the complexity out of M2M deployments.

Further reading

The world of M2M is broad, and you'll find there are many ways to make sense of it. Here's our summary of the most important M2M applications we've talked about, and details on where you can find more information.

A day in the life

Connected home
Connecting heating, lighting, security and other home systems for automation and control.

Smart metering
Monitoring energy use in real time, for more accurate bills without the hassle of manual meter reading.

Enexis: Vodafone M2M provides Enexis with the scalability to meet legislation requirements.

CESC: See how Vodafone's smart meter solution helped improve customer service.

Digital signage
Displays on bus stops, in stores and around the city that display up-to-the-minute content, beamed to them using M2M.

Amscreen: Driving up in-store sales with digital promotions.

Traffic management
A key part of the smart city — intelligent traffic lights, signage and public transport management that reacts to congestion to keep people moving.

Dorset County Council: Traffic management system smoothes journeys for Olympic sailing.

Sycada: Smart monitoring system spurs Dutch bus drivers to deliver better performance.

A new level of business efficiency

Connected Cabinets
Track usage and operational status of chillers and freezers remotely, for marketing insight and better customer experience.

Energy Data Management
Reduce electricity use by identifying power-hungry building systems and automatically responding to demand.

ASB Bank: New Zealand-based bank cuts energy use with smart meter deployment.

Vodafone: We're big believers in our solutions and used M2M to cut our energy bills by 40%.

Smart bins
Enabling urban assets — such as bins — to report on their status remotely, easing the burden on local government.

Ecube Labs: The world's smartest bins coming to a street near you.

Mic-O-Data: Dutch councils track 6,000 refuse collection points at public housing estates.

Remote maintenance and control
All kinds of equipment can be monitored remotely, for potential problems and usage.

Kone: The remote monitoring solution for more reliable elevators.

Carel: Italian refrigeration firm reduces maintenance costs through smart machines.

Fleet Management
M2M can help you utilise your vehicles more effectively, cutting fuel consumption, insurance costs and waste.

TomTom/Zenith: Healthcare group slashes transport costs with connected vehicles.

Transpoco: Irish vehicle tracking group picks Vodafone to drive international expansion.

Safer, more productive industry

Mobile Asset Tracking
Whether it's plant equipment or shipping containers, if you need to know where an asset is, M2M can help.

Custodia Systems: Theft-tracking device maker plots expansion with Vodafone.

Security cameras
Wireless M2M security cameras can be installed anywhere, giving high-quality footage for security and remote monitoring.

iDefigo: Solar-powered cameras use mobile connectivity to secure remote sites.

Smart grid
M2M gives utilities real-time view of the load on electricity grids, enabling more responsive management and greater utilisation, adapting to the effects of micro-generation and renewables.

Remote maintenance and control
In industry and construction, M2M can put you in control of equipment performance, cutting downtime.

Atlas Copco: Industrial tool maker uses M2M to monitor its compressed air devices.

CableTracks: Remote monitoring system reduces damage to underground cables.

Connected products
All kinds of consumer products can be bundled with M2M connectivity out of the box, enabling engaging services and giving manufacturers valuable usage data.

Amazon: Online retailer adds Vodafone connectivity for its Kindle Fire tablets.

Keenan: Milk producer boosted yields by using M2M to optimise its cow-feeding machinery.

Smarter homes and neighbourhoods

Street lighting
Connecting street furniture such as lighting via M2M can simplify maintenance and cut waste.

Connected car
M2M connectivity supports safety applications such as eCall and bCall, plus in-car convenience and entertainment features.

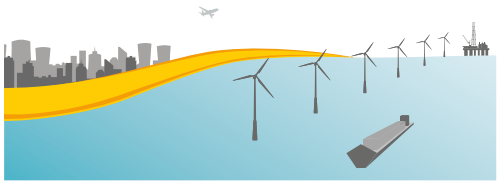
Usage-based insurance
M2M can collect detailed driving data for insurers, enabling fairer premiums for drivers.

CleverMiles: M2M powers safe driving solution for young motorists.

mHealth
M2M lets doctors monitor patients 24x7 from their homes, reducing stress for patients and the strain on caregivers.

Sensormind: Home monitoring devices provide peace of mind for relatives of the infirm.

The big picture



Smart city
Bringing together city systems such as traffic, air quality monitoring and security can multiply the benefits of M2M.

Venis: M2M delivers traffic monitoring and environmental alerts for this iconic city.

Remote maintenance and control
Offshore equipment is particularly hard to maintain. M2M gives remote control.

Mobile asset tracking
International trade is hugely vulnerable to loss, theft and delay. M2M can help track products in transit.

Airline solutions
In the air and on the ground, M2M gathers and transmits operational data that helps airlines run their businesses.

For detailed case studies visit: **m2m.vodafone.com/casestudies**

Why Vodafone?

From the connected home to the smart city and intelligent industry, M2M and the Internet of Things have the potential to transform your business operations, whatever your size. So your choice of M2M provider is critically important. Here are three good reasons why you should choose Vodafone.

Unrivalled experience of M2M

We've got more than 20 years of experience in M2M and have delivered some of the world's leading M2M solutions for companies like Amazon, BMW and Bosch.

For example, we've already partnered with one of the UK's largest utilities companies to deliver a connected home solution incorporating energy management, remote control and home security functions to more than 20,000 homes.

Vodafone has also delivered groundbreaking M2M projects in agriculture, the public sector, retail, banking and many other industries.

Today we have more than 400 dedicated M2M experts ready to put this experience to work for you, with deep experience in helping companies solve operational challenges.

You can put your trust in Vodafone to transform your business.

M2M global networks you can rely on

Vodafone has mobile operations in 27 countries, partners with mobile networks in 48 more, and fixed broadband operations in 17 markets. As of 31 March 2014, Vodafone had 434 million mobile customers and 9 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 competitive contracts and can guarantee the high quality of service you expect.

The solutions to simplify M2M rollouts

We know that building an M2M solution can be complex. We focus on making it simple.

We give you a single point of contact, bringing together the right hardware, application and service providers for you, and ensuring they work together seamlessly with our global network.

We partner with the world's leading connected device manufacturers, offering a full range of equipment from home sensors to industrial devices and fleet management systems, all certified and fully compatible with our network and management tools.

The result? We offer you unrivalled levels of connectivity and service, helping you put M2M to work for your business and delivering a rapid return on your investments.

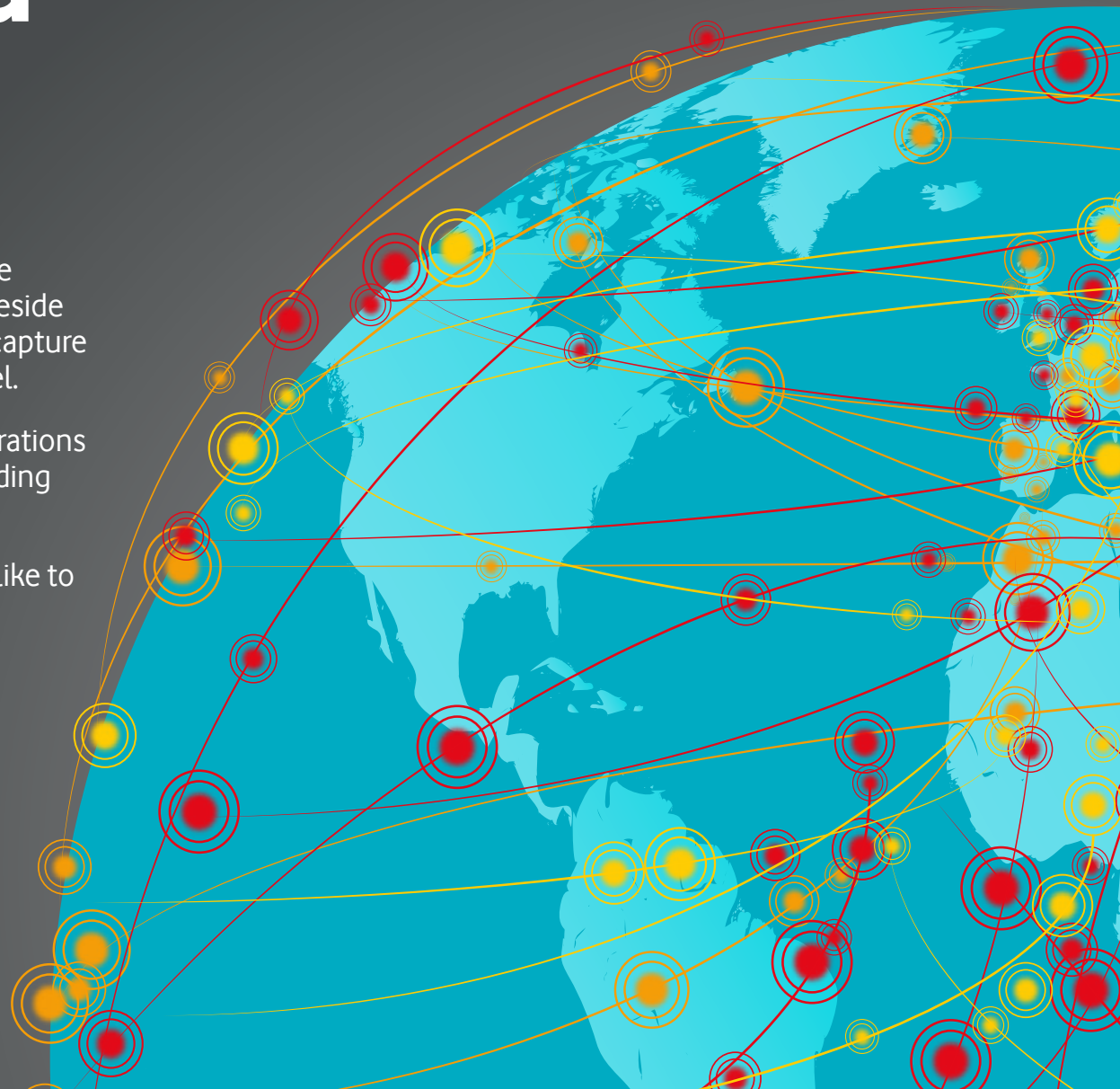
For more information visit: **m2m.vodafone.com**

Create your smarter world with M2M

Although we've discussed dozens of uses of M2M, this is just the beginning. With creativity, commitment and the right partner beside you, M2M can help you solve perennial operational problems, capture opportunities for growth, and even change your business model.

M2M gives you a real-time, granular understanding of your operations that you've never had before: from the energy use in every building you own, to the location and status of every mobile asset.

We're excited by the possibilities. We hope you are too. If you'd like to find out more, contact your Vodafone account manager or visit **m2m.vodafone.com.**



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