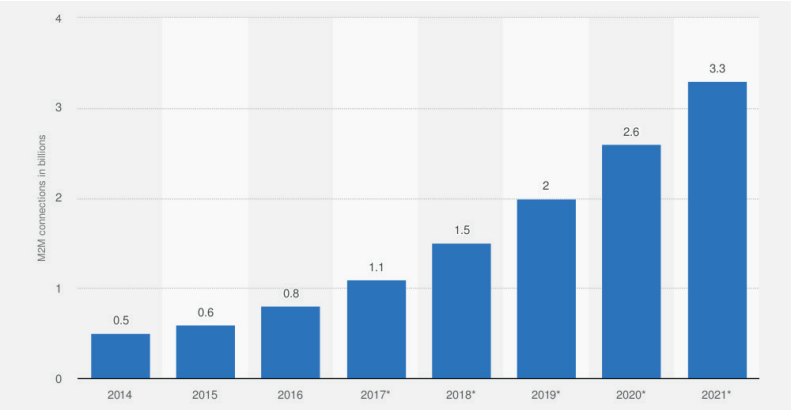
How M2M is streamlining processes and saving businesses time and money

Machine to machine (M2M) technology is transforming many different industries. By enabling machines to communicate directly with each other without the need for human intervention, M2M dramatically slashes operating costs, improves service levels and drives up productivity.

Unsurprisingly, the drive for automation is gathering pace with market predictions showing that by the end of this year the number of live M2M connections will have grown from 0.5 billion in 2014 to almost 3.3 billion. This is because M2M presents opportunities for businesses to automate previously labour-intensive processes, work much smarter and increase efficiency.



Source: https://www.statista.com/statistics/487280/global-m2m-connections/

There are a number of important factors that lie behind the rapid growth in M2M deployments:

- The proliferation of communications networks, in particular high-speed cellular, Wi-Fi and the expansion of the Internet.
- Significant advances in sensor technology have made it relatively cheap and easy to measure conditions such as location, speed, light levels, humidity and temperature using standard, low-cost components.
- Sophisticated software and developments in areas such as Artificial Intelligence (AI) and Machine Learning (ML) that have revolutionised the ability of systems to interpret data, make autonomous decisions and perform actions without the need for human involvement.

Underpinning the growth in M2M is the widespread availability of reliable, secure, cost-effective networks. The entire basis of M2M is connected devices, and networking technology provides the foundation upon which all M2M solutions are built, delivering the widespread coverage and high performance needed to accommodate the vast amounts of data involved.

Clearly, in order to communicate, devices need to be connected to a network so they can exchange data. Around half of M2M connected devices use wireless networks - either local networks such as Wi-Fi, or, for longer range connections, cellular networks such as 4G LTE and 5G.

It should be noted that there are other Low Power Wide Area Network (LPWAN) technologies designed to provide a wireless connection for devices, such as sensors, over longer distances. These have very low bit rates and use unlicensed transmission frequencies meaning high levels of interference, poor security and necessitate data passing over unregulated networks.

The other half of M2M devices connect by wired connections, with industrial Ethernet providing the best combination of high-performance, low-cost and robustness required. Industrial Ethernet switches provide the high-speed connectivity that is ideal for wired M2M applications.

M2M technology is not particularly new. It was first used in manufacturing and industrial applications, where technologies, such as the Supervisory Control and Data Acquisition (SCADA) architecture, had been used to manage equipment remotely. However, the M2M market has grown massively across various sectors, ranging from utilities and healthcare to automotive, retail, and Smart Cities, driven by the combination of inexpensive electronics, the massive growth in IP-based and other ubiquitous high-speed networks, cloud computing, and the development of sophisticated, low-cost devices that can collect, store and analyse data.

Today, M2M technology provides a way to connect almost any peripheral device to a network so that the data gathered from the device can be evaluated, shared and used interactively.

M2M is also the foundation for the Internet of Things (IoT).

The Internet of Things

A large part of M2M is the IoT which, in simple terms, has everyday devices connected to the Internet. While the term "M2M" is used to describe systems that use communication between machines over wired or wireless networks, IoT systems rely specifically on the Internet.

M2M covers a broader area than IoT, encompassing machines that communicate over any type of network rather than specifically connection over the Internet. Having said that and understandably, IoT is a vast area, and the Internet is increasingly used as the communication backbone for M2M solutions.

Like with any devices connected to the Internet, security is a significant focus for the IoT. When it comes to securing IoT networks, the use of Virtual Private Networks (VPNs) ensures all network traffic is encrypted by passing through a VPN server before reaching its final destination. VPNs provide added security by keeping connections private, hiding the IP address of any IoT connected device. So, it is vital that IoT networks are built using routers that support advanced VPN functionality to ensure secure connections to both IoT devices and the servers used to analyse data and run AI and ML applications.

Key drivers of M2M

Critical to the growth of M2M has been the evolution of networking technology in providing flexible, resilient, low-cost, high-speed links. This, coupled with advances in sensor technology, has driven the use of M2M across many different applications where it is used to turn vast amounts of remotely gathered data into automated, meaningful actions.

Unlike other remote monitoring approaches, such as SCADA, M2M systems often use public networks and access methods, such as cellular networks, Wi-Fi and the Internet, giving them wider appeal and making them more cost-effective to deploy, even to remote locations.

Increased network speeds with faster mobile technologies and durable industrial Gigabit Ethernet switches further drive M2M growth. For instance, D-Link's range of 4G LTE M2M routers with built-in redundancy and remote management, are specifically designed for use in M2M systems and have features that ensure reliable, high-speed performance, particularly important when operating in remote or hard to access locations. Similarly, its compact industrial Gigabit Ethernet switches can withstand extreme conditions and have a fanless design for increased durability.

Ultimately, it is the business benefits of M2M that are driving the rapid take up.

On a relatively basic level, the automated monitoring of remote devices and systems improves operational reliability by removing the need for physical human visits and check-ups, saving time and money. A system that can automatically identify problems as they occur enables faster corrective action to be taken. In many instances, M2M systems can also take action before a fault develops, or have automated responses built-in to resolve faults in real-time, again without the need for human intervention.

Beyond reducing system downtime and maintenance costs, M2M can deliver many operational benefits across a huge number of different industries, from automatically monitoring stock levels, controlling traffic lights in real-time (in line with current traffic levels), to providing smart meter readings and usage data to utilities companies and their customers without the need for anyone to visit the premises.

Besides commercial applications, governments are also recognising the benefits of M2M in sectors such as utilities, Smart Cities, automotive, policing and healthcare.

Where is M2M being used

The impact of M2M can be seen in the way it is driving automation across many different sectors.

Asset tracking

M2M is used across a wide range of different areas to track a multitude of different products and keep tabs on stock levels and the exact location and condition of assets.

Asset tracking is vital in areas such as warehouse management, supply chain logistics and inventory management and is also a powerful tool in combating theft by keeping close tabs on assets.

Using asset tracking, vending machines can be remotely monitored so visits to restock them are perfectly timed, refrigerated goods can be monitored to ensure they are being kept at the right temperature and airport baggage handling systems can be streamlined.

M2M technology is also being used in Reverse Vending Machines to encourage recycling through automated deposit returns. Smart lockers with M2M technology are increasingly being used. Recipients are alerted with an e-mail containing a code that can be scanned to unlock a locker when the package is ready for collection at the individual's convenience.

Healthcare

The biggest area of M2M use in the healthcare industry is currently in remote health monitoring outside of medical facilities, such as in the patient's home. Such IoT applications are used to measure vital signs such as heart rate, blood pressure and temperature and to alert a patient if an area is detected that needs addressing. In some instances, they can trigger an automated action to, for example, recommend medication based on AI and historical medical records. This approach can also monitor patient responses to treatment and improve reaction times to medical emergencies.

By using M2M to automate day to day monitoring and even some basic healthcare procedures, the time of medical staff can be more efficiently used, with nurses and doctors only involved when required.

On a broader scale, collecting and analysing vast amounts of data relating to many different patients' treatment and conditions provides insight into wide-scale trends. It can shape and improve future treatment regimes.

There is scope for wider use of M2M and IoT in healthcare, though the critical nature of many applications and the sensitive patient data involved means that progress is slower than in some other sectors.

In the future, IoT, enabled by low latency, high speed 5G, for example, could transform healthcare practices but in such a highly regulated industry, compliance and meeting stringent regulatory requirements will be a necessity.

Mobile payments

Most of us now frequently use our NFC-enabled smartphones to make contactless payments. Contactless credit and debit cards combined with digital wallets (such as Google Wallet and Apple Pay) are driving increased use of M2M in the consumer finance sector. Speed and convenience for the consumer at the point of sale in retail outlets, vending machines, and other payment points. Combined with the security and efficiency savings for retailers that no longer have to handle cash, contribute to this area's continued growth.

Another related area of rapid growth is e-ticketing, again based on NFC in smartphones. E-ticketing is now being widely used across transport, events and leisure industries.

Financial institutions use ML in the fight against fraud, using the huge amounts of gathered transactional data to verify purchases based on predicted customer behaviour.

Smart homes

Smart homes use M2M to monitor and remotely control appliances and other household functions such as thermostats, lighting, home security cameras, TVs and electric shutters. For example, programmable thermostats improve energy efficiency by reducing the temperature when the home is empty, taking control beyond merely working to a pre-programmed schedule and enabling a much more adaptable approach based on real events.

Of course, one of the most prevalent smart home applications is smart meters that provide detailed and accurate information on energy usage levels. The information collected from smart meters can be fed back to the consumer to show actual consumption leading to behavioural changes and reduced energy usage. For utilities providers, smart meters eliminate the need for manual meter readings and provide real-time data that can be used for balancing loads and reducing operating costs.

The smart home of the future will likely have many connected appliances, devices and sensors all linked to a home network that is, in turn, connected to the Internet. This will enable broader monitoring and control of household appliances, security systems, heating and cooling, solar panels and electric vehicle charging points.

Smart Cities

M2M is integral to the growth in Smart Cities. Smart Cities use technology to efficiently deliver public services, stimulate economic growth, improve security and reduce pollution levels.

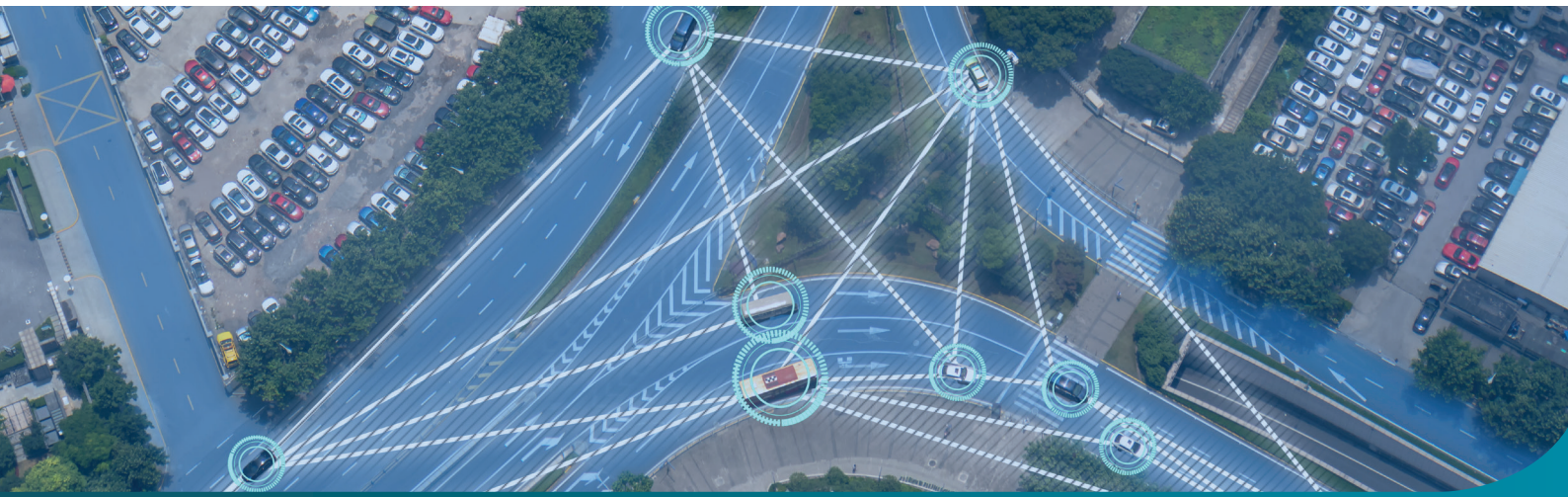
Critical municipal functions ranging from power stations and wind farms to water purification, sewage treatment plants and transport hubs, can be more effectively monitored, managed and controlled using M2M technology.

Similarly, M2M in real-time traffic control can adjust signals to keep traffic flowing and reduce pollution using sensors that measure traffic volume and speed. M2M systems can also adjust street lighting so that, for example, lights are off when a street is empty and automatically switched on when needed. Parking systems can communicate directly with vehicles to notify drivers where spaces are available, saving them from driving around looking for somewhere to park.

Because of M2M, public transport users can be shown accurate times for the arrival of the next bus, tram or train based on information collected from vehicles in transit.

All of these Smart City M2M applications rely heavily on having an intelligent, robust network infrastructure to operate effectively. The critical nature of many Smart City M2M and IoT applications, including the frequent need for real-time operation, dictates the network's characteristics.

Smart City networks need to efficiently transfer data collected from a wide range of different sources to various processing points. This makes the performance and quality of service (QoS) of the network critical.



Automotive

One of the first areas of the automotive sector to adopt M2M technology was fleet management. There are apparent operational benefits in knowing the vehicles' current location in a fleet, whether lorries, vans or taxis, and in learning individual driving styles relating to fuel consumption and vehicle wear and tear. M2M systems can also help pinpoint vacant electric vehicle charging points or more accurately configure routes based on current traffic conditions using data collected from sensors.

Efficient route planning, monitoring driver progress and being able to dispatch vehicles based on current locations, traffic conditions and load status can save considerable amounts and time and money.

Built-in diagnostics, using a vehicle's own sensors, can be used to quickly and easily pinpoint any areas that require attention during routine servicing or, in the event of a breakdown, enable the vehicle to send fault information to the nearest workshop so that appropriate specialists with the right parts can be dispatched.

These applications utilise the broad network coverage that cellular networks provide, with embedded M2M SIM cards transmitting data from vehicles. In these applications, 4G LTE routers are ideal for delivering the flexible, reliable, high-speed connectivity needed.

It is important that automotive M2M networks adopt a standards-based approach to ensure interoperability across such a wide range of different application areas, vehicles and manufacturers.

Given the fast pace of change in-vehicle technology, automotive M2M networks also need to be able to evolve to meet future demands as new, more sophisticated connected car applications, including self-driving cars, emerge. With this in mind, there is strong support for 5G across the automotive sector as a key enabler in delivering the high bandwidth and low latency that future in-vehicle applications will require.

Utilities

The most visible use of M2M in the utilities industry is in smart meters. The advantages of smart meters to utilities suppliers are clear. They remove the need for meter readers to visit each property, saving time, money and ensuring accurate readings with no need to rely on estimated bills if the meter cannot be accessed.

Beyond smart meters, utilities companies often use M2M to monitor pressure, temperature and equipment status across their networks. By collecting data on energy usage patterns, automatic adjustments can be made to the network at periods of peak consumption to spread the load, improve operational efficiency and avoid power outages.

M2M can also encompass vehicle tracking to improve the efficiency of maintenance activities in the utilities sector. For example, an M2M system can quickly generate an alert when there is an outage, automatically dispatch the nearest maintenance team to rectify the fault and, at the same time, provide details of which component has failed so that the maintenance team is equipped to deal with the problem.

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Choosing the right M2M products

Choosing the right equipment is critical for a successful M2M implementation with key factors being range, resilience, durability and performance.

Central to finding the right products is adopting a standards-based approach. Standards are fundamental in ensuring interoperability, open markets and cost-effective solutions. The European Telecommunications Standards Institute (ETSI), a founding partner of oneM2M, a global partnership of eight of the world's leading ICT standards bodies, is focused on industry standards for the M2M and IoT markets. It explains that standardisation is a key enabler to remove technical barriers and ensure interoperable M2M services and networks.

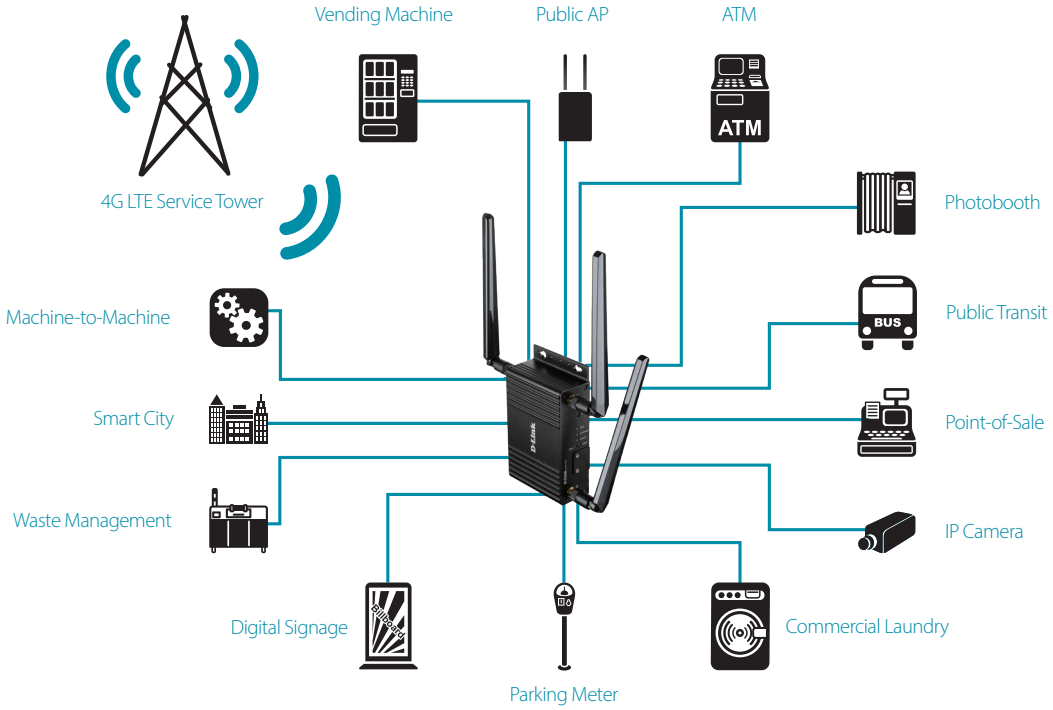
Another very important factor is scalability. M2M systems typical grow over time, and products need to be able to accommodate such expansion.

Security is also an important area in M2M networks. Products that adhere to the latest security standards need to be used to ensure that an M2M infrastructure is secure. Because M2M devices operate remotely, there is an increased security threat from hacking, data breaches, and unauthorised monitoring. For maximum protection, products are needed to incorporate the latest security standards and support remote management and regular firmware updates.

Around three-quarters of all wireless M2M connections are over short-range wireless links, predominantly Wi-Fi, with predictions that M2M wireless network connections will grow to 2.6 billion by 2023. That said, M2M is not just about Wi-Fi connectivity, industrial Ethernet and cellular connections are important technologies in facilitating many M2M rollouts.

Key D-Link M2M networking products

For wireless connectivity, D-Link's 4G LTE M2M routers are standards based, rugged, reliable and easy to deploy in both large-scale and individual set ups. With up to 150Mbps LTE uplinks they have built-in redundancy with dual-SIM fallback for increased reliability. Other important features include remote management and advanced VPN with a hardware engine that can support multiple VPN configurations. Support of the latest security standards and multiple encryption options are designed to ensure secure M2M connectivity. There is also corrosion resistance, industrial grade casing and wide operating temperature and humidity tolerance, essential requirements for M2M deployments.



D-Link's range of compact, smart industrial Ethernet switches are designed to operate in extreme conditions and are certified against vibration, shock and freefall so they can be deployed in a wide variety of places across an M2M network. Their fanless design means no moving parts and less maintenance. They are so robust that they come with a 5-year warranty. Built to support the latest industry standards, they are available in managed or unmanaged versions and have built-in rapid failover to maximise uptime and network reliability.

Find out more
eu.dlink.com/industrial