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Beyond smart cities: How IoT is changing the world
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Beyond smart cities: How IoT is changing the world

Content

As a society we're on the cusp of experiencing a proliferation of IoT sensors and devices brimming with intelligence, designed to improve our quality of life in every way imaginable. But with all great opportunities comes significant challenges. For IoT this includes: Security and regulation, Data storage and management, and Bandwidth.

In this eBook, we'll discuss the IoT adoption journey so far, current applications and future trends. We'll share insights from some of the leading expert commentators and address the challenges with guidance on how to prepare for a new wave of game changing opportunities.

Contributors

This eBook has been created by four industry experts in IT and emerging technologies.

Giuliano Liguori

Giuliano Liguori is an open-minded and dynamic global Digital & Innovation Leader with successful results, specialising in leveraging Digital Transformation through the adoption of best strategies and managing techniques. He has extensive experience in supporting companies in driving growth and builds reputation and presence on the web. He is currently the CIO of an Italian public sector organisation, Board Member of CIO Club Italia (Italian Association of CIOs and IT Managers), and a Professional Influencer and Brand Ambassador on social media. He collaborates with startups, digital agencies, and enterprises around the globe.

Rafael Bloom

Rafael has spent his career within senior Technology Product, Marketing Communications and Business Development roles. His advisory practice focuses on the new organisational, product and communications challenges of technological and regulatory changes. This highly diverse work involves subject matter expertise on information governance and compliance by design, data privacy and emerging technologies such as AdTech, Mobile & 5G, AI and Machine Learning.

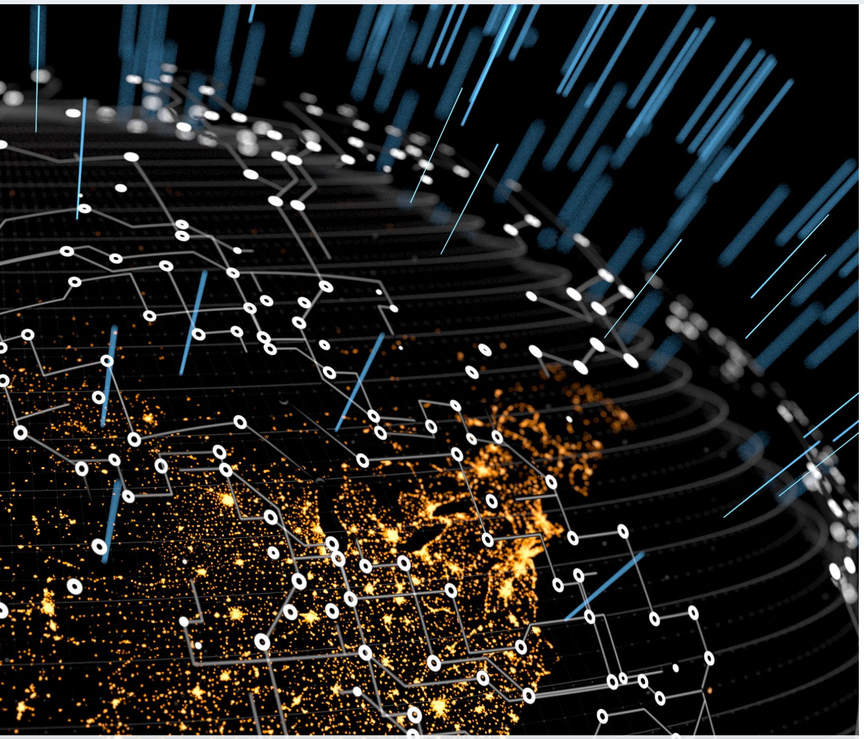
Simon Besteman

Simon is the CEO of ISPConnect, the Dutch coalition of hosting providers. As a leading representative of the industry he is a frequent blogger on industry and policy matters, a keynote speaker at congresses and conferences, and a participant at Dutch government round tables on telecommunication, data center and internet regulatory matters. He sits on the boards of various industry groups, with a focus on education, employment and governance.

Neil Cattermull

Neil has over 35 years of experience working with technology across multiple sectors and brings a unique perspective on technical strategies that are easily understood to technical and non-technical audiences. Technology Analyst and social media influencer across emerging technology sectors. Leading Industry analyst across multiple business sectors, including Cloud, Blockchain, 5G, storage and many others as well as the CEO at the Future as a Service - Enabling consumers of technology to make the right choice, one service at a time.

IoT adoption - the story so far



> For me, the most interesting application of IoT is not about technical boundaries being pushed nor some unprecedented leap of imagination. I am moved by how technology can truly benefit people, so I have to say that home automation for people with disabilities is the IoT application that embodies the real beauty of progress, which is definitely not something you could say of all technologies.
>
> Simon Besteman

Despite the impact of the Covid-19 pandemic, the number, type, and purpose of connected devices is rapidly expanding. During 2020, experts estimated the installation of IoT devices to reach 31 billion, with 127 new IoT devices connected to the web every second[1]. As more organisations prioritise digital transformation, the adoption of IoT technology increases, in order to connect users, systems, and devices to a wider range of networks.

> The recent pandemic highlighted the need for enabling technologies that allow us to overcome space barriers, and thus perform whatever tasks we need remote and regardless of the physical place where we are.
>
> Giuliano Liguori

From voice assistance for the elderly to smart patient monitoring systems, right through to connected smart cities, the ability to expand connectivity without human mediator assistance creates huge potential for IoT. And while the ongoing pandemic has delayed many projects, at the same time it's served as a catalyst for change that's been planned and needed for a long time.

But although we have come a long way in terms of adoption, are we really ready for IoT?

According to Cisco, 75% of IoT projects are not considered successful[2]. It can be said that we are still yet to cross a crucial inflection point where the technology becomes massively transformative at a societal level. Skills shortages, security concerns, and solution complexity can all create challenges when it comes to IoT deployment and adoption success. Equally as impactful is the possibility that we are yet to fully understand the true meaning of the tech.

> Most new cars today are connected devices, but we are not yet ready for fully autonomous driving. Another example might be how new infrastructure heavily leverages the IoT for its construction and maintenance such as London's Crossrail, where we see amazing IoT tech in use, but still experience significant delays and cost overruns despite all the advances made.
>
> Rafael Bloom

IoT drivers: innovation, or necessity?

Despite the many challenges and complexities of IoT development, many businesses have already seized the opportunity fuelled by the prospect of innovation. Globalisation has brought about radical changes to how we do business, creating new market space and therefore favouring the rise of new ventures in multiple sectors. IoT technologies are driving this digital revolution.

> “I think that the term IoT exploded onto the tech scene due to the rapid uptake of wearable technology some years ago, out of a necessity for connectivity…. I believe that, like most tech terms, was spurned out of innovation with little understanding of where the destination truly was.”
>
> **Neil Cattermull**

However, the need to keep pace with the speed of change drives the need to innovate – blurring the lines between necessity and innovation. We need something, so we innovate. But perhaps the bigger debate lies in the examples of IoT development that began as a concept aligned to a trend, and what the real vision behind that idea is. Of course, money is another major player when it comes to IoT drivers. When someone innovates, whatever it is, the economics make a huge difference.

> “A few years ago, a client of mine created a connected sensor tag for perishable goods that constantly reports on temperature, humidity and so-forth. Perhaps the engineers went in that direction with their work because of the need to waste less food, but the technology becomes successfully adopted because there is a business case, a return on investment that means it's worth the time getting that product to market.”
>
> **Rafael Bloom**

Solving real-world problems - and the potential impact

The balancing act between innovation, economics, and necessity is always in play in every field where IoT could make a difference, just as it is with any new technology. When the formula is correct and when the concept is scaled, the potential for IoT to solve real world problems is infinite.

> The future of IoT has the potential to be unlimited. In my experience, I have used IoT technologies to solve specific transversal and vertical needs.
>
> I am pleased to mention a project I followed a few years ago for the public transport sector. IoT devices were used to help transport operators improving system safety and service reliability, enhance the passenger experience, provide higher transit capacity, and reduce operational costs.

Simon Besteman

For example, on an individual level, being able to control one's central heating more efficiently makes sense economically. But the impact of everyone being able to do so might be significant in trying to meet national emissions targets. Similarly, using fully autonomous electric vehicles as a principal mode of transport for just a few people makes them a novelty. Having a top-down view of city traffic that allows for entire blocs of vehicles to be moved according to the most efficient solution changes the way we live.

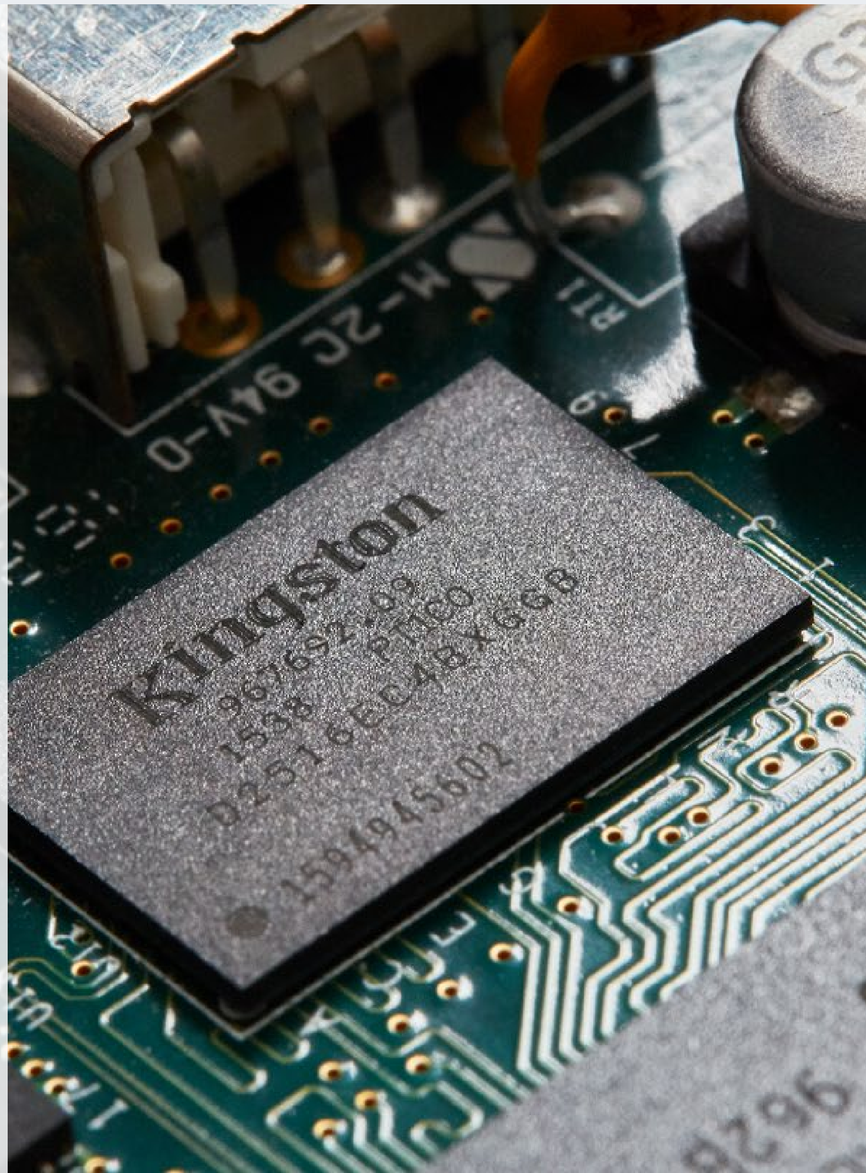
Solving real-world problems - and the potential impact

Then there is the smart city concept. IoT data[3] is the most popular form of smart city data, used to monitor everything from road traffic to energy use in homes and businesses in order meet economic, environmental, and social challenges. In fact, 86% of UK officials expect that IoT sensors and wearables will be the primary technologies used to support smart city initiatives in the next three years[4].

For developers, the use of embedded memory products such as Kingston's eMMC and DRAM components can be used to simplify the interface design and qualification process, speed up time to market, and ultimately help organisations meet their IoT innovation goals faster.

Our ePOP and eMCP components are ideal for space-constrained systems such as smartphones, tablets, wearables, and other IoT devices, while our industrial-grade SDCIT cards are designed for extreme conditions – and able to meet smart city requirements around the world.

Our Design-in SSD range offers system designers and builders consistent storage products underpinned by engineering and PCN support, Locked BOM /firmware, along with a limited three-year warranty, all of which are available globally. So, wherever IoT solutions of the present and the future are being created, **Kingston Is With You.**



IoT potential, beyond smart cities

Beyond smart cities, there are many examples of vertical-specific cases benefitting from IoT solutions from agriculture to manufacturing, retail to logistics.

> IoT will drive a revolution in agriculture by allowing myriads of sensors in the fields to micro-monitor humidity levels of the soil and enabling automated pin-point precise irrigation. This is going to boost productivity while reducing water consumption substantially.
>
> **Simon Besteman**

Within healthcare, powerful devices like connected inhalers and smart insulin pens enable consumers to better manage and address their own health needs.

> What smart devices give us is the ability to deploy solutions widely, but with a fine degree of granular control. That should translate to the ability to deliver highly personalised experiences via our digital services; and within those services, the ability to automate to a degree not seen before and optimise every aspect of the process for maximum efficiency, minimum environmental impact.
>
> **Rafael Bloom**

While wearable devices - like biosensors - enable healthcare professionals to gather data and remotely monitor patients – allowing care to happen beyond the physical walls of a clinic.

> I use a smart watch that monitors my blood pressure, heart rate and exercise with calorie burn. This has been a big leap for health monitoring, together with demonstrative outputs of data that can be shown to your GP that can assist with potential treatments or healthcare strategy for an individual.
>
> **Neil Cattermull**

Addressing an outdated approach to data

As well as on-device applications, IoT provides a huge variety of services to its users and generates masses of data in the process. During 2020, 1.7MB of data was created every second by every person. **And by 2025 it's estimated that as a collective, we will generate 463 exabytes of data each day**[5]. A lot of this information will end up as digital detritus. In other words, it will never get looked at and no insight will be derived from it. Because of this, companies undoubtedly need effective data management techniques at various levels as they collect, manage, and analyse that data to meet the most important part of the chain: customer expectations.

> This data collected by each touchpoint is then stored in different drivers according to the needs and the desired level of contextualisation knowledge. Most large organisations invest in top-notch databases, data management companies, distributed systems, and cloud storage for storing the most important part of their business the digital information.
>
> Giuliano Liguori

As the capabilities of things connected to the Internet continue to advance, they will become more intelligent by combining data into more useful information. Rather than just reporting raw data, connected things will soon send higher-level information back to machines, computers, and people for further evaluation and decision making. This transformation from data to information will allow us to make faster, more intelligent decisions, as well as control our environment more effectively.

> Our approach to data is outdated. IoT devices generate constant large streams of data. Today we simply collect that data, store it and analyse it later. This doesn't scale. Self-driving cars are expected to generate and consume around 40 terabytes of data for every eight hours of driving. We will imperatively need to learn to filter data at the source.
>
> Simon Besteman

To achieve this, data centre technology must evolve and operate with faster servers, widespread use of hardware encryption, optimised storage capacity, and more effective compression. Transitioning from serial attached SCSI (SAS) to solid-state drives (SSD) alone can have a huge impact on power reduction when extended to the entire data centre.

5G and the hyperscale data centre trend

> When managing large surfaces such as energy or water infrastructure, or a complex factory, the IoT coupled with 5G will give instant insight and control of what is going on... For the record, I believe that the completion and general adoption of 5G data networks will be the thing that takes the IoT 'over the top' due to the lack of latency compared to 4G / LTE.

Rafael Bloom

When it comes to making IoT a reality, 5G is predicted to be the change agent and foundation for reaching the technology's full potential. With a unique combination of super-fast connectivity, extensive coverage, and extremely low latency, 5G will allow us to connect with up to one million devices per square kilometre. This creates infinite possibilities to improve the way we live and work. The challenge lies in being able to manage machine generated data from cars, smart city street sensors, agriculture, industrial, and environmental devices.

> With the eventual emergence of 5G, we will see an explosion of virtual concepts becoming the status quo. An always on connected world far more advanced today, coupled with real-time data analysis, to provide near instant results within any business challenge.

Neil Cattermull

With the exponential data volume increase generated by 5G and IoT technology, it's reasonable to expect a continuing trend towards hyperscale data centres. At the same time, we are experiencing a parallel trend towards micro data centres at locations closer to the "edge", where the data is being generated and consumed, and where action can be taken quickly and effectively.

> Pushing data and enterprise applications to the edge network concept requires storage period. Said storage requires rapid access for large (and small) enterprises that process data real-time - manufacturing and the growth of technologies and concepts on the factory floor. Pulling in disparate data sets and analysing in real-time is the normal for this industry now.

Neil Cattermull

5G and the hyperscale data centre trend

> With the rise of 5G and the availability of increasingly sophisticated AI algorithms, this year we will likely see an expansion of Edge Computing use cases. These trends are driven primarily by the development of new business models that of course will facilitate the growth of the offering of edge computing services.
>
> Giuliano Liguori

At Kingston, we've been anticipating these trends and have developed memory and storage solutions built to handle volume, speed, and cope with these extraordinary requirements. More importantly, we've been working with our customers to align their business needs within the relevance of their IT ecosystem.

Our customer relationships are built around solving problems beyond product implementation and providing our customers with the highest quality product solutions, service, and support. At every step of the journey we listen, learn, and engage. That means rather than rushing out to buy the most cost-effective solution, you get support defining your goals and finding the right technology to achieve those objectives.

For example, while you may decide to invest in SSDs, do you know which of the many different types is best for your needs? Or for what purposes they are optimised? Technology should be a business enabler and to know what you're buying meets your requirements, partnering with a trusted expert who is with you, all the way, is critical.

Looking ahead – tackling the security risk

By 2025 it is predicted that there will be over 30 billion IoT connections, that's nearly four IoT devices per person, on average. Across the globe, web-enabled devices are turning our world into a more switched-on place to live and helping us to adapt to changes forced by the pandemic. As we look to the future, these changes may become more permanent fixtures.

> "We're going to a hyper connected world. This is already noticeable in our homes, with home assistants and connected doorbells, cameras and thermostats. But the real impact will be in industrial areas, data centres and agriculture."
>
> **Simon Besteman**

However, as mission critical IoT applications proliferate, there are still many challenges when it comes to creating a secure, functioning global device network. Most recently, COVID has had a multiplier effect on rising IoT exposures, and a lack of regulation can pose a severe security risk that may worsen as the potential attack surface expands to include ever more devices.

> "I worry that the ubiquity of IoT coupled with the ability of technology to make automated decisions about large numbers of people will lead to some very negative outcomes. Preventing this is something that already features in legislation, but these things have a way of happening if we are not careful."
>
> **Rafael Bloom**

Looking ahead – tackling the security risk

When it comes to fixing this problem, most of the work is with IoT device users. Many people fail to see IoT devices as potential security threats that need updating and protecting just as computers and smartphones do. Companies can help employees by providing effective security training while proactively foster a security culture, from the top down, while threat prevention solutions help mitigate risks.

> “My major concern with an always on near instant data analysis is security and control (two go hand in hand). Control of mass device consumption could, in the wrong hands, be weaponised / used against the original initiatives planned and robust security must be in place prior to any mass adoption of IoT principles (which should be addressed today and not just for future planning).”
>
> **Neil Cattermull**

The use of encryption, fast storage, and memory combined with best practices, standards, and policies is a big step and one that Kingston has been working with our customers on.

Our award-winning encrypted storage solutions protect data inside and outside the firewall and cover everything from datacentres to cloud platforms, workstations to mobile data. Outside the firewall, our encrypted SSDs, and USB flash drives provide a critical protection layer against data breaches.

This is essential for businesses with data in transit, field service apps and mobile workforces, for whom we can implement a robust data security strategy at every level.

Summary

A new IoT enabled world is fast developing, and now is the time to prepare. With these great opportunities IOT promises a way to reduce waste, costs and inconvenience, while increasing efficiency. But perhaps the biggest appeal of this technology is for us to lead environmentally cleaner, more productive lives of a higher quality.

However, much research and innovative thinking is required to resolve the security and power consumption challenges posed by unprecedented IoT connectivity, along with the need to question which products are best suited to your business goals.

From advice on what benefits Enterprise SSDs will bring to your storage environment, to guidance on optimising your server for performance, Kingston's configuration experts have the knowledge to help you navigate the increasingly complex IT ecosystem. We will work with you on a personal level to make sure the products you are purchasing align with your objectives, now and for the future too.

About Kingston

With over 30 years of experience, Kingston has the knowledge, agility and longevity to enable both data centers and enterprises to respond to the challenges and opportunities presented by the emergence of 5G, IoT and edge computing.

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