



# SSDs: The changing face of data storage

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## Foreword and contents

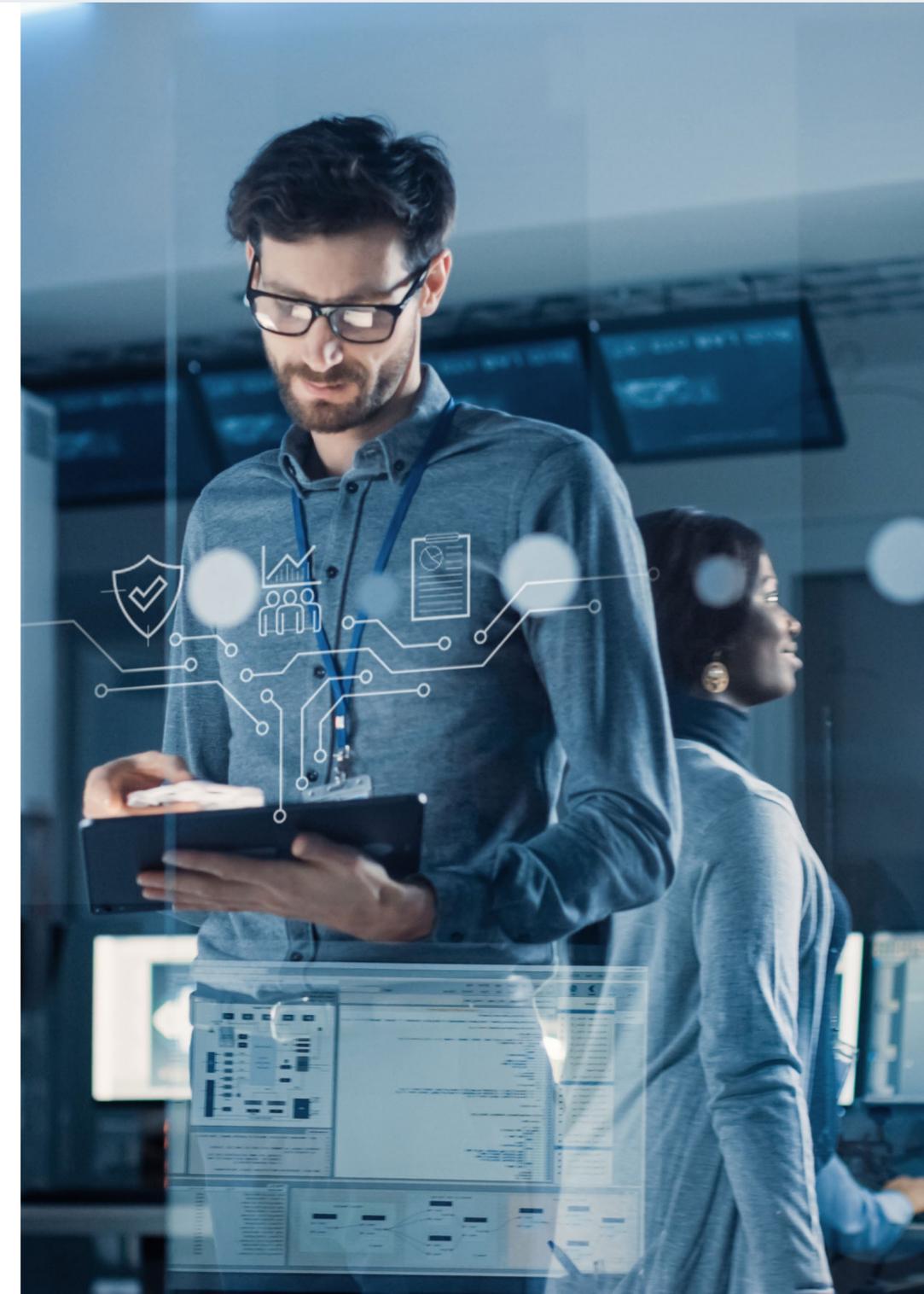
By 2025 the total amount of data being consumed globally is projected to exceed 180 zettabytes. With it, the installed base of storage capacity is set to increase at a CAGR of 19.2%\*. This is driven in part by rapidly advancing digital transformation initiatives that mean data storage will, by necessity, remain a top concern for IT teams in the coming months.

As a result, today's IT leaders are focussed on optimising the value of their data as well as designing and implementing storage solutions that meet their data storage goals. Despite this, 95% of IT leaders cite the need to manage unstructured data as a problem for their business\*\*. Adding to this pressure are increasingly demanding regulations that require data to be stored for years - even decades. At the same time, sustainability agendas are a top priority, with many organisations looking to reduce energy consumption and meet customer demand.

Within this eBook we'll discuss the development of storage technology and how these global and market drivers are affecting the data storage industry,

according to the experts. We'll explore the impact of cultural attitude shifts and emerging technology, highlight some real-world examples solved by contemporary storage solutions, and provide guidance on where next for those looking to increase storage capabilities.

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## Contributors

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



### Simon Besteman

Simon is the Managing Director of the Dutch Cloud Community, 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.



### 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.



### 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.

Over the last decade the pace of change in storage has continued to accelerate, with key technologies such as flash storage, SSDs, and cloud driving major advancements. Ten years ago, storage consisted mostly of hard disks spinning on single devices, kept on-premises. Today, storage is moving away from on-prem hard disks and towards the cloud, with Non-Volatile Memory Express (NVMe) fast becoming the standard.

Solutions are becoming more decentralised, with deduplication tools vastly improving the efficiency of storage management. While at the same time, the partnership between hardware and software is enabling us to get the most out of size and compression, resulting in huge increases in storage availability size.

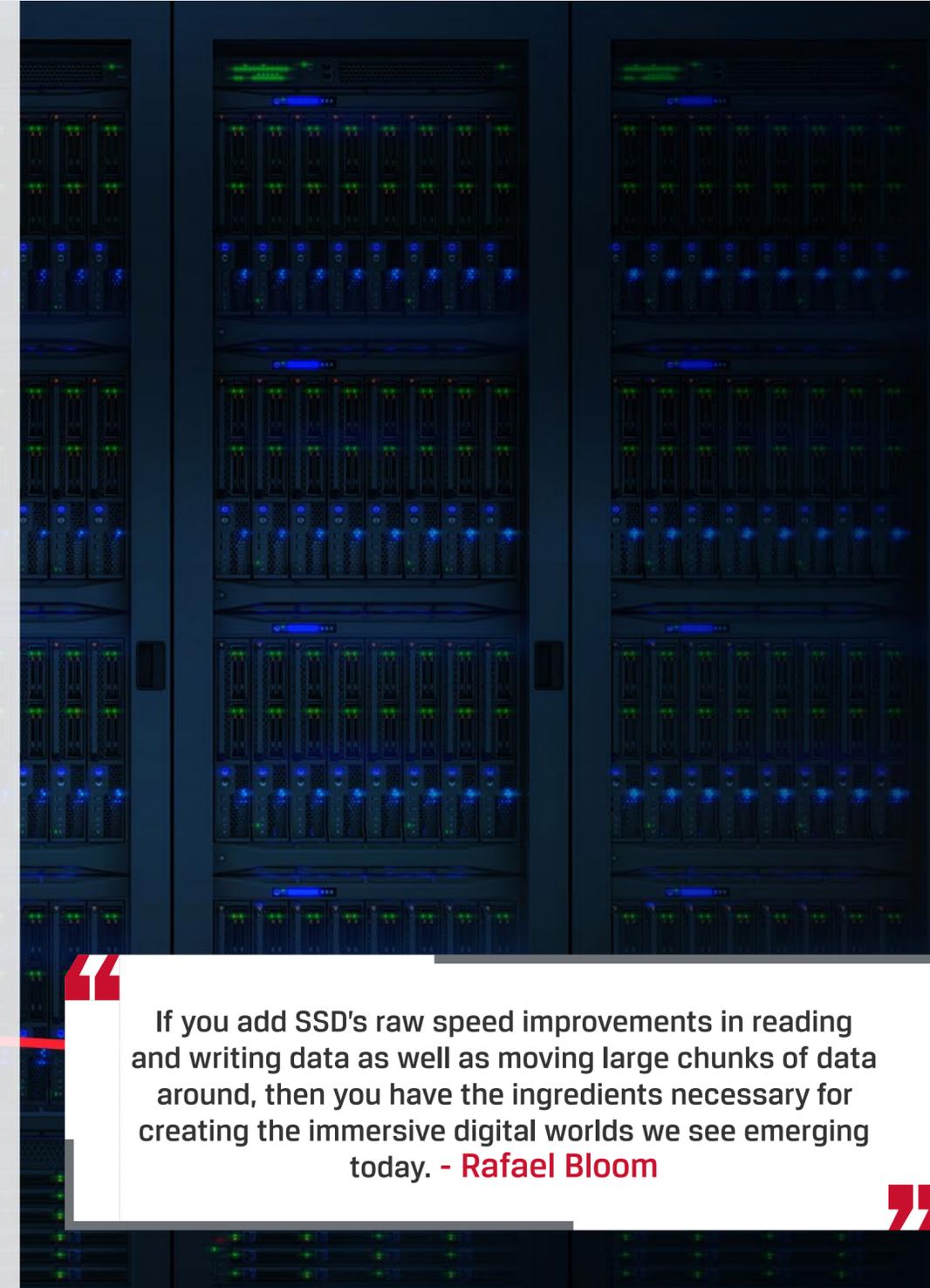
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10 years ago we were scratching around for a maximum of 64GB of storage capabilities (USB drives). Kingston now has a 1TB USB 3.2 Gen 2 drive, amazing advances made in this area! - **Neil Cattermull**

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Data centres have also undergone serious changes with the emergence of true public cloud storage for object storage, file storage, and block storage. The market has seen a myriad of new options become available, paving the way for a true hybrid cloud approach to native cloud working principles. Some organisations may not be ready to move all of their data to the cloud at this time. A multicloud strategy provides the flexibility to collect, segregate, and store data, whether on or off-premises, without compromising data integrity.

While the past ten years have seen a true revolution across the storage industry, perhaps the most impressive aspect has been the massive uplift in the speed and reliability of affordable Solid State storage technology. The absence of moving parts compared to hard drives has been a game changer in terms of power consumption, long-term reliability, and quietness. All of which notably improve the performance of any device that features a Solid State Drive (SSD) instead of a spinning disk.



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If you add SSD's raw speed improvements in reading and writing data as well as moving large chunks of data around, then you have the ingredients necessary for creating the immersive digital worlds we see emerging today. - **Rafael Bloom**

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Along with technological advancements, we are also experiencing a shift in cultural attitudes around storage. Here, the key driver has been and still is the sheer growth of data - and how we want to use it.

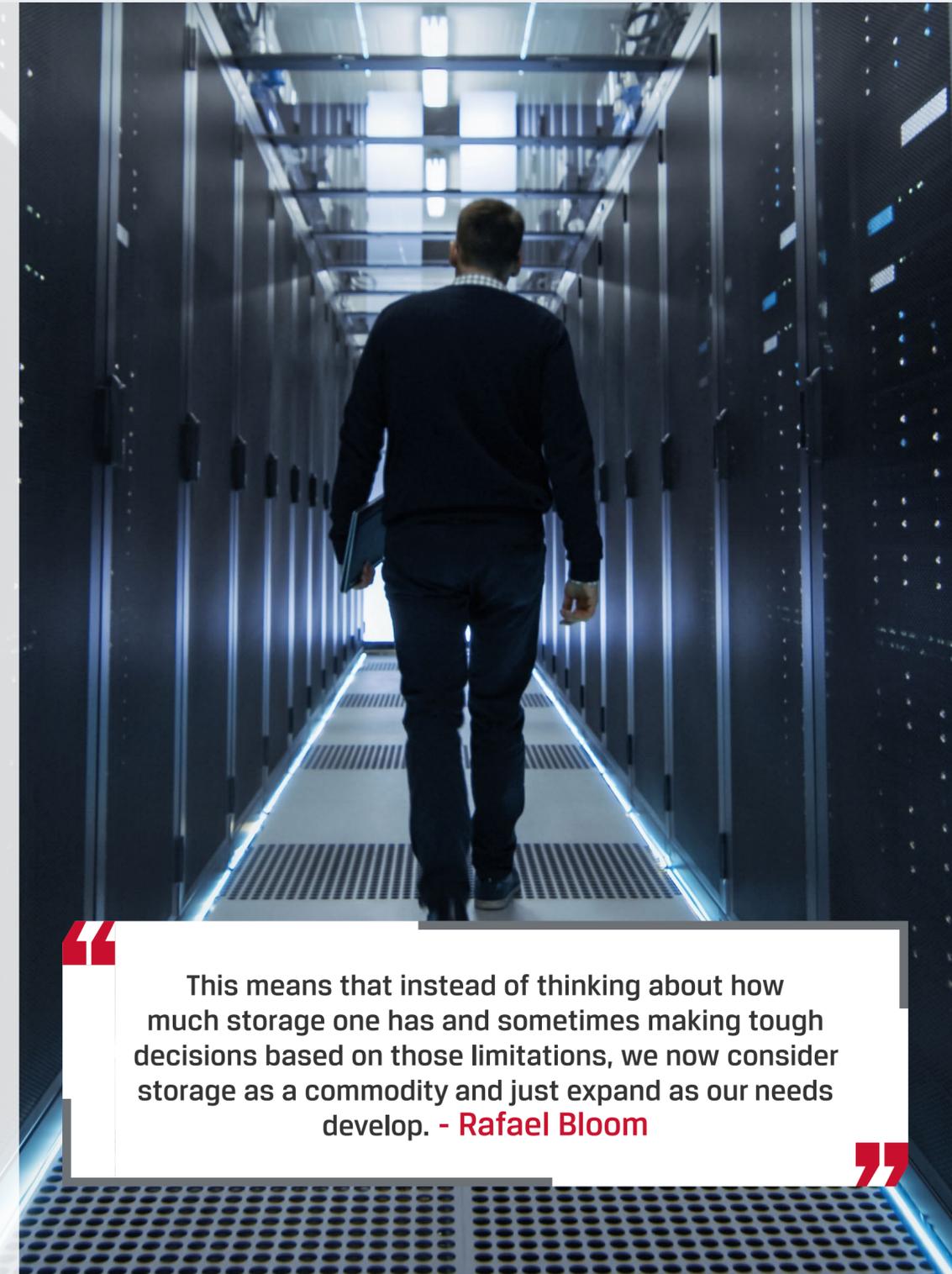
The amount of data we create, use, and exchange is growing exponentially, along with our need to access it in a more granular way. As a collective, we exist in a tech-driven era and are generating more than 2.5 Qn (quintillion) bytes of real-time data\* due to factors such as globalisation and digital transformation. The internet of things (IoT) is also generating vast volumes of data through sensors, smart devices, search engines, and social media. Combined, this serves as a powerful catalyst for rapid advances in data storage solutions.

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We want the data, the metadata, the unstructured data, we want the data from various sources to be addressed simultaneously as if it were one single source. This is the basis that has been pushing innovation at breakneck speed. - **Simon Besteman**

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Because of the shift to the distributed cloud model, storage is now expected to be flexibly expandable depending on user's needs. Our hybrid world of work demands greater flexibility and mobility. A virtual storage space accessible from anywhere is imperative, along with the ability to scale capacity as and when needed. Open-source infrastructure allows companies to use more complex solutions such as multi-cloud and hybrid cloud solutions, which can work seamlessly together. Companies then have the ability to invest in the space, and security required to meet their unique needs.



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This means that instead of thinking about how much storage one has and sometimes making tough decisions based on those limitations, we now consider storage as a commodity and just expand as our needs develop. - **Rafael Bloom**

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Storage is a word that we have chosen to use relating to data. But let's not forget its connotations of being a passive item in the technology stack. In this case, if we separate archive-type data from this and consider the vital role that fast memory has in operationalising new technologies - particularly in cultural media and gaming - then the impact is huge.

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Again, it is not just the quantity of storage available, but the speed with which we can now move large amounts of data around that enable tech like 4K streaming video, virtual reality (VR) and augmented reality (AR).

- Rafael Bloom

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Inevitably, we're becoming a data-driven society. The first big data users were of course video and other data created "for human consumption". But now data is web-generated; compiled from purchases, supply chains, and increasingly more machine data. AI technology and the emergence of "smart" devices streaming data to the cloud in real time has had an enormous impact, despite still being in its infancy. For example, cars continuously send data about their functioning. Industrial machinery communication connects the manufacturing chain, but also reaches other manufacturers and maintenance providers. All of this contributes to the explosion of data we're witnessing, and greatly impacts on the development of storage solutions - together with how we use that data.

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It's interesting to see that we are creating more data than ever with no chance of this slowing any time soon. While we have multiple concepts in place now (artificial intelligence (AI) / machine learning (ML)/ deep learning (DP), Digital Twins etc) to utilise the best out of said data, we are still creating huge data silos. The more data we analyse the better the predicted outcome and this will not change. - Neil Cattermull

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There's no doubt that contemporary technology is having a huge impact on the evolution of data storage. That said, we're coming across several key applications that stand out when it comes to data use and storage.

For example, we now have access to chipsets coupled with software defined networks (SDN) that control a flash-based storage platform, which can provide double the capacity while halving energy consumption. This is a win-win for the consumer and the planet, as well as IT leaders looking for a more sustainable approach to technology and data.

When it comes to AI, companies can control data storage across multiple platforms to achieve efficiencies, whilst reducing costs and risk by minimising human intervention. Organisations can also reduce the time it takes to process data and determine its value. The fundamental challenge of AI however, is that in order to train it to become useful, we need to base its assessments on large volumes of reference data. This requirement is likely to require private companies to increase their storage capacity to quantities measured in exabytes. Capacities such as this will become commonplace within the next decade.

5G is another example of emerging technology that's not only enabling much faster average speeds than 4G, but it's also adding a tremendous amount of new capacity. In six leading 5G countries, recent research has found that 5G smartphone users on average consumed between 2.7 and 1.7 times more mobile data than 4G users\*\*\*.

While 5G will undoubtedly empower users and the enterprise with faster network speeds, mobile data consumption is expected to rocket as a result. For IT leaders and their teams, this requires the need to start making provisions for data growth and planning for how this data can be better managed in the future. At Kingston, we specialise in helping our customers optimise their infrastructure, to meet the needs of today and tomorrow. Whether you're looking to roll out 5G, deliver new AI capabilities, or move more applications to the cloud. From high-performance NVMe storage that keeps pace with demanding workloads such as 3D rendering, to enterprise-grade SSDs that deliver the longevity and performance you need; we offer the skills, technical expertise, and direct support to ensure a successful outcome for the long run.

“ The roll out of 5G is already beginning to have a considerable impact. With up to one million connected devices per square km this is turbo charging the development of smart cities, smart agriculture, and a myriad of new exciting innovations we don't even suspect yet. - **Simon Besteman** ”

If we translate these examples of storage technology use into real world use cases, the impact spans far and wide. However, perhaps one of the most significant applications of our time has been the development of several safe and effective vaccines for Covid-19, within the space of a few months. This is the first time that massive data collection, data modelling, and analysis have been used to develop a vaccine.

In fact, it can be said that digital medicine is one of the best examples of how storage technology advancements have enabled radical shifts in approach, and improvements in outcomes. Let's take a blood sample test as an example. The digitisation of this process means that a scan carried out in location A can be evaluated instantly in location B. The results can be obtained much quicker, at lower cost, and with improved auditability after the fact.

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It was an impressive success. Colossal amounts of data from research institutes all over the planet were shared and used collectively. The same models are now already applied to develop vaccines for Malaria and HIV, which is wonderful. - **Simon Besteman**

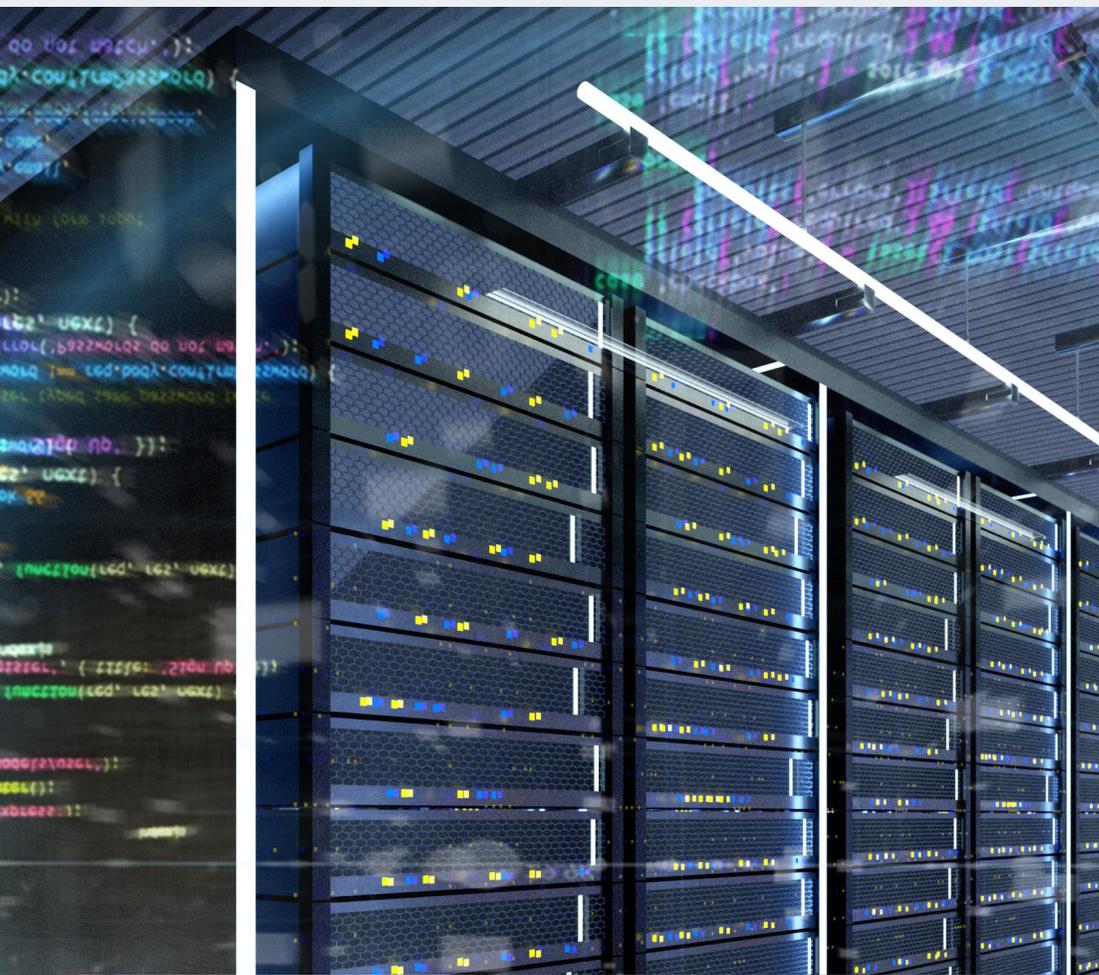
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Once again, given the challenges of the pandemic, this ability to execute key tasks remotely has been extremely timely and seems to be leading us towards a decentralised model for the next phase of technological development. - **Rafael Bloom**

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So, looking ahead, what does the future hold for data storage?

Along with driving efficiencies and outcomes in the world of medicine, from a hybrid working perspective, secure remote access to shared data via the cloud is expected to continue as a top industry priority. We expect more organisations will look to replace network attached storage / storage area network (NAS/ SAN) systems with cloud solutions, to enable greater collaboration and secure remote file sharing.

For the foreseeable future we expect growth. More data, more decentralised data, and smarter, faster ways to access and use data from different sources. However, the longer term may call for the need to rethink our approach to data. The sheer volumes we're predicted to generate through new technologies such as autonomous vehicles will at some point, become too large and too heavy to remain nimble in their usage. As such, the growth of the data centre industry is also under threat in many countries purely due to a lack of available power.

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In the long term it's likely we'll see innovations towards smarter treatment of data in order to relieve the pressure on the ever-growing storage requirements. The current approach may not scale up in the long term.

- **Simon Besteman**

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While there may not be much development in the use of legacy technologies such as optical media and lower-capacity hard drives, we expect growth in numerous other areas. 45% of businesses worldwide are running at least one of their Big Data workloads in the cloud\*\*, with usage expected to increase significantly over the coming years.

For storage within PCs and laptops, we've seen huge developments in read/write speeds. So much so, that we are seeing huge shifts in adoption of the latest generation of Gen4 NVMe SSDs, that are up to 14x faster than their SATA counterparts. This latest generation is indicative of the need for faster and more reliable storage, to not only exceed the expectations of today but meet the demands of tomorrow.

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Given the operational and organisational challenges of the global pandemic, I think it is truly impressive that we have, to a very large extent, moved from the on-site server model to the Cloud, via technologies such as Microsoft Office 365 / SharePoint. When executed with a proper strategy, this transformation can be a massive driver of collaboration and efficiency across an entire organisation. - **Rafael Bloom**

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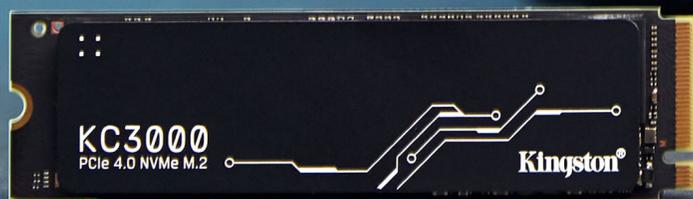
# What's next for storage?



At Kingston, we've been developing solutions that keep pace with the demand for new technologies, such as the Kingston [KC3000 PCIe 4.0 NVMe M.2 SSD](#). Taking speed, capacity, and reliability even further, the KC3000 achieves formidable speeds of up to 7,000MB/s (read/write).

Whether you're creating 3D renders, 4K+ content, or working with large data sets, the Kingston KC3000 PCIe 4.0 NVMe M.2 SSD seamlessly bridges style and performance where it's needed most.

Another trend we're anticipating is a future world of storage that looks a lot more decentralised. Web v1.0 can be remembered for its ability to deliver digital services for the first time via web UX/UI, and web v2.0 for its ability to connect and embed those different services via APIs and SDKs. Web v3.0 signals the rise of the decentralised digital platform, governed by distributed ledger technology (DLT), where users themselves are joint stakeholders in the platform.



We see this emerging particularly in the area of 'decentralised finance'. Tokenisation, having famously emerged with the rise of cryptocurrency, is now being used to provide security and auditability. At the same time, it reduces certain risks because of the absence of silos in a decentralised model and connecting stakeholders equitably via that decentralised structure.

- Rafael Bloom



For those organisations looking to increase their storage estate in the future, our recommendation is to consider sustainable options that give you more for less. Many of our customers are no longer focusing on typical considerations alone, like speed and storage capacity, but are also looking closely at the environmental impact of their storage solutions. The data centre industry as a whole is making efforts to go greener in response to both customer demand and increasingly stringent industry standards. We fully expect a continued focus from organisations on energy use management, such as the use of tiered storage approaches to optimise costs and energy expenditure.

Data storage systems have become a mission-critical component of enterprise IT infrastructure. While many believe the future of storage is decidedly multi-cloud, others may continue to use local storage systems to accommodate many file-handling, backup, and archive strategies. What we do know is that organisations will need to be prepared for the next wave of the data boom by adopting storage solutions that are agile, scalable, secure and flexible. Expect to hear fewer conversations about how and where to store data, and more about the value that data brings to your business.

In addition, the value of data has changed. It now dictates what data is captured and stored, and where it resides. This determines how much protection you need, and how much access you give to each individual. Every one of these additional steps has multiple storage options that can result in greater complexity.

At Kingston, we understand that rapidly advancing technology along with changing cultural attitudes towards storage are a top challenge for IT teams. We get that one size does not fit all, and that it takes an experienced, established partner to meet your unique needs. That's why we're committed to helping you choose the right storage solution with a highly personalised service that's trusted by many. Our broad portfolio of technical experts, consultants, and architects are here to help you decide what will work best for your organisation, allowing you to free up time and resources to drive your business forward.

Whether you're looking to lower power consumption, increase performance and scalability, or better handle mission-critical workloads, our team of experts are on hand to help and with you every step of the way.

1. Analytics Insight - <https://www.analyticsinsight.net/top-10-big-data-statistics-you-must-know-in-2021/>
2. Tech Jury - <https://techjury.net/blog/big-data-statistics/#gref>
3. IS Preview - <https://www.ispreview.co.uk/index.php/2021/06/5g-mobile-users-gobble-up-to-2-7-times-more-data-than-4g.html>

A dark, atmospheric photograph of a server room with rows of server racks and glowing blue lights.

## About Kingston

With over 35 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.