White Paper

IBM® FlashSystem™: Powering the Future of IT

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The Direction of Business

The direction of technology both follows and influences the direction of business. The tools enterprises need to compete, improve, adapt, solve problems, and succeed are supplied by technology. Sometimes, technology even supplies new opportunities, such as when a technological advance leads to the creation of a new marketplace. The Internet is by far the most powerful example of this in the past 50 years.

According to the World Economic Forum, data has become an economic asset, like currency or gold. Because of the vastly increased value and usefulness of information to enterprises of all types, information technology (IT) has taken a mission-critical place in the operations of commercial and public enterprises, from government, through scientific and medical research, to businesses as large as IBM and as small as the millions of one-person endeavors around the globe.

IT infrastructure is becoming more and more entwined with basic business operations. As this trend continues and accelerates, business questions such as – What is it worth to you to stay ahead of your competition? What is a better online customer experience worth to your bottom line? What advantages do you gain by making faster, more informed business decisions? Can you afford not to have the best possible fraud protection and data security? – are becoming information technology questions.
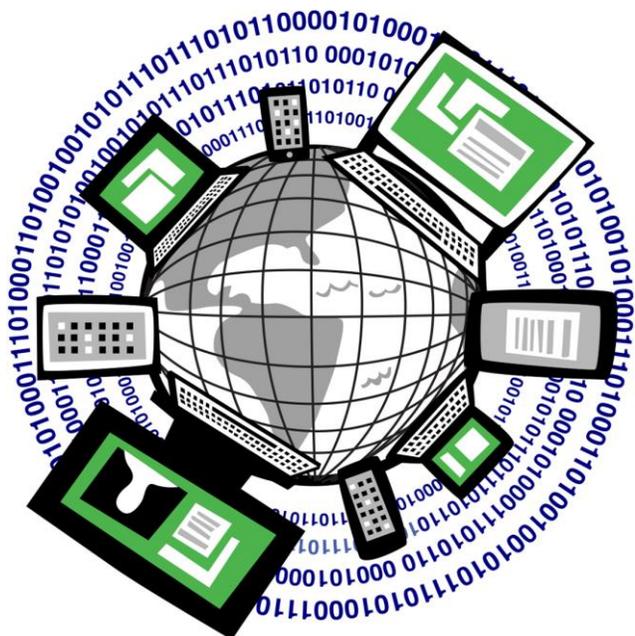
Data storage plays a crucial role in the performance, reliability, efficiency, and cost-effectiveness of IT infrastructure, so to a large extent, these can be questions directly related to your data storage. When you begin to answer them at the storage level, and recognize how crucial a role storage plays in the right answers, then the value of solutions such as IBM® FlashSystem™skyrockets.

The Drivers of Information Technology

Looking into the near-term future, business and IT industry analysts see five basic drivers of information technology, and thus of business itself:

- **Cloud**: More and more of the world's computing will move into the cloud and be delivered over networks and/or the Internet for end users to consume.

- **Data analytics**: Compute tasks for business will focus more and more on data analytics, enabling enterprises to more quickly and accurately measure, understand, and take action powered by real-time insights.

- **Mobile and social engagement**: Some of the largest commercial consumers of compute resources from now into the foreseeable future will involve mobile and social engagement applications, providing powerful business drivers and enormous growth potential.

- **Security**: The linchpin of the future, none of the other driver's flourish without establishing and maintaining the trust of end users and the security of their precious information.

Supporting the compute requirements that underpin these new technological drivers while at the same time exploiting the opportunities they offer demands the power of high performance, agile, and cost efficient data storage.

Storage for the Future

Cloud computing, real-time analytics, mobile e-commerce, and large-scale online social engagement – the IT drivers of the future – all share common characteristics when viewed from a data storage perspective. Add the necessity to keep all of this digital activity secure and the storage requirements become clear. High volume, high velocity, random input/output (I/O) data stream profiles predominate. Other important trends in enterprise data storage emerge as well. For example, operational advantages and costs will gain greater importance within storage system purchase and deployment decision-making.

High performance based on ultra-low latency, cost and operational efficiency, and mission-critical reliability will be the essential attributes required of storage in the future. In fact, these are the value dimensions upon which the IBM FlashSystem family of all-flash storage platforms have been engineered.

IBM FlashSystem: Fast, Efficient, and Secure

Flash technology has transformed storage and given enterprises the ability to extract extraordinary value from complex data sets. IBM FlashSystem arrays provide industry-leading performance, reliability, and operational efficiency plus a full spectrum of enterprise-grade virtualization management and storage services. These all-flash storage solutions offer multiple options for addressing the ultra-low latency, random I/O requirements of cloud, big data analytics, mobile e-commerce, and massive social engagement computing environments.

FlashSystem offers the advantages of software-defined storage at the speed of flash. The systems deliver the full capabilities of IBM FlashCore™technology's hardware accelerated architecture, MicroLatency™ modules, and advanced flash management coupled with a rich set of software-defined storage features, including IBM Real-time Compression™, dynamic tiering, thin provisioning, snapshots, cloning, replication, data copy services, and high-availability configurations.

FlashSystem can virtualize and extend its functionality to all existing storage. Virtualized storage volumes can be non-disruptively moved between external and

internal storage capacity, enabling very agile integration into existing storage environments with seamless data migration between FlashSystem and legacy storage systems.

FlashSystem can take the place of multiple racks of hard disk drives—lowering power, space, and cooling costs. Plus, it can increase server efficiency, which can further cut power and cooling costs and reduce software licensing expenses. Finally, in a future where all customers will require extra layers of protection for adherence to internal or regulatory requirements, FlashSystem supports AES 256 hardware-based data at rest encryption.

How the Future Works

Enabling cloud computing, powering real-time analytics, and supporting secure mobile and social engagement are not tasks for the mechanical at heart. In the past, because the purchase and deployment cost of hard disk drive-based storage – traditionally articulated as dollars per unit of raw storage or $/GB – was so much lower than that for other available storage media such as RAM or flash, and because operational costs were rarely included in enterprise storage cost evaluations, the liabilities of mechanical storage were simply accepted, with numerous technological and architectural work-arounds becoming standard features in both data center hardware and software. Now, that's all changing.

Consumer demand and design innovation are driving down the basic $/GB cost of flash storage. Hardware engineering has made flash more reliable than disk and much more efficient. Finally, with the advent of effective storage virtualization and features such as data deduplication, compression, and dynamic tiering, among many others, the $/GB costs of flash are approaching and in some cases falling below the purchase and deployment costs of higher performance enterprise-grade disk-based storage systems. When all the other benefits of flash are included in cost assessments, the traditional incentives to accept and mitigate the liabilities of mechanical storage begin to evaporate.

But that's just part of the story. Cloud computing, in-depth high velocity analytics, customer expectations for mobile and social engagement and e-commerce, and the compute horsepower needed to detect fraud, deter cyber-crime, and maintain global user trust amplify the performance, efficiency, and reliability advantages flash offers over disk. IBM FlashSystem was purpose-built to bring all of the advantages of flash storage into one cost-effective, easy-to-deploy platform that addresses the storage requirements of cloud, analytics, and mobile compute environments.

Cloud

At the same time that industries and professions are being remade by data, the IT infrastructure of the world is being transformed by the emergence of cloud computing. IBM estimates that by 2016, more than one-fourth of the world's applications will be available in the cloud, and 85% of new software is now being built for cloud compute environments. The delivery of IT as digital services is creating new business models that are generating a market expected to reach $250 billion by 2015.

In all cloud delivery models, including public, private, and hybrid, the IT infrastructure challenges related to data storage are similar. First, because applications and functionality delivered through a cloud model come to end users through networks, either local or Internet or both, system latency is a critical issue. Overall response time includes both network latency and response delays generated at the compute source. For example, one user transaction over the network might generate hundreds or thousands of backend transactions between servers and storage in the data center.Networks are growing ever faster, which shifts much of the focus on reducing latency to the data center itself, and from there directly to the storage systems.


This is where IBM FlashSystem pays the greatest dividends in the cloud. FlashSystem provides response times that can be orders of magnitude faster than traditional storage systems, from many milliseconds down to less than 200 microseconds, depending on the platform and configuration. Deploying FlashSystem in IT infrastructures that support cloud delivery models can make the difference between application responsiveness that gains user acceptance, improves customer experience, and captures competitive advantage, or fails at all of these.

Another cloud-related IT infrastructure challenge stems from the "scale-out" storage architectures employed by many cloud service providers and solutions. Essentially, as cloud service offerings increase and customers multiply, storage must keep pace. Cloud

infrastructures find themselves constantly growing, and the scale-out model where units of storage are simply added on, rather than new storage arrays being configured, proves more cost effective and less complex to deploy in these environments. FlashSystem storage platforms are engineered to the scale-out paradigm from the chip to the rack-full.

Data Analytics

IBM estimates that the market for data analytics will approach $187 billion by 2015, making analytics one of the largest business and technology drivers on the planet. Enterprises can apply a range of analytics – from descriptive to predictive to prescriptive. And importantly, they can capture the time value of data. This matters, because the battle for competitive advantage in this new world can be lost or won in fractions of a second.
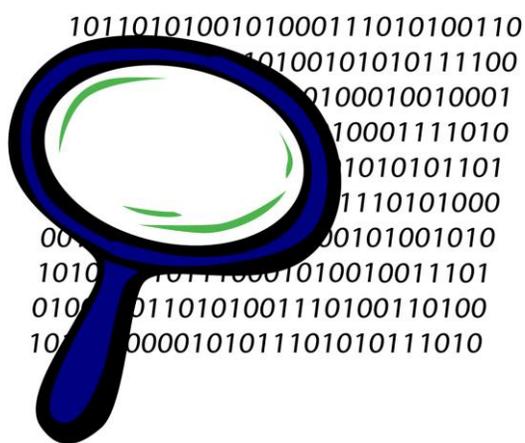
Before the widespread availability of flash, the only solution to the storage performance challenges of complex analytics applications was to array massive quantities of disk drives (disproportionate to the capacity required) in order to derive the tiny bit of incremental I/O available from each additional drive. Instead, all-flash arrays, like IBM FlashSystem, are perfectly suited to the complex workloads created by data analytics. Several key features of FlashSystem are particularly important. First, FlashSystem is exceptionally good at handling small block or large block random I/O operations. This is a fundamental characteristic of most analytics processing. The ability of flash to handle these types of data streams differentiates it from spinning hard disks which struggle with random I/O workloads.

Secondly, FlashSystem offers plenty of performance scalability. For analytics workloads, as data ingest rates increase and as the number of analytic processes proliferate, FlashSystem maintains the exceptional responsiveness enterprise users require to remain competitive or solve complex problems. This performance scalability means that analytics tools can monitor more web sessions simultaneously, ingest data from more sources in real-time, support more concurrent analysts, and interact more frequently with customers. These features enable analytics applications supported by FlashSystem to produce more accurate, more in-depth, faster, and more valuable analytical results.

Mobile and Social

The phenomena of cloud computing and data analytics are changing the arena of global business and society. At the same time, proliferating mobile technology and the spread of social engagement are empowering people with knowledge, enriching them through networks, and changing their expectations for connectivity. Enterprises are now taking a systematic approach to engagement with all of their constituencies – customers, employees, partners, investors, and citizens. For example, 57% of companies now expect to devote more than a quarter of their IT spending to mobile and social systems of engagement by 2016, nearly twice the levels of 2013.

Enterprises are doing so because the way their customers and their own workers expect to engage is undergoing profound change. This means that IT infrastructures supporting mobile and social-based endeavors face specific new challenges. Not only are data volumes and velocities accelerating, but the variety of information is rapidly changing from "structured" data such as the entries in databases to "unstructured" data – documents, images, videos, rich media files, texts, and tweets. Storage management systems are evolving as well, from block storage used for structured data and network attached file systems to "object" storage where each file or object typically includes the data itself, a variable amount of metadata, and a globally unique identifier which enables the file to be located anywhere on the Internet. Object storage systems enable relatively inexpensive, scalable, and self-healing retention of massive amounts of unstructured data, making them attractive for purposes such as storing photos on Facebook, songs on Spotify, or files in online collaboration services such as Dropbox.

The vast majority of cloud storage available in the market leverages an object storage architecture where the actual physical storage is abstracted from applications and can be geographically distributed across an enterprise campus or around the world. IBM has tightly integrated the FlashSystem family of storage platforms with file management systems such as IBM Spectrum Scale software and OpenStack Swift object storage systems, enabling FlashSystem to be used to support geographically distributed,

unstructured/file storageenvironments considered essential requirements to support cloud, analytics, mobile, and social information systems.

Security
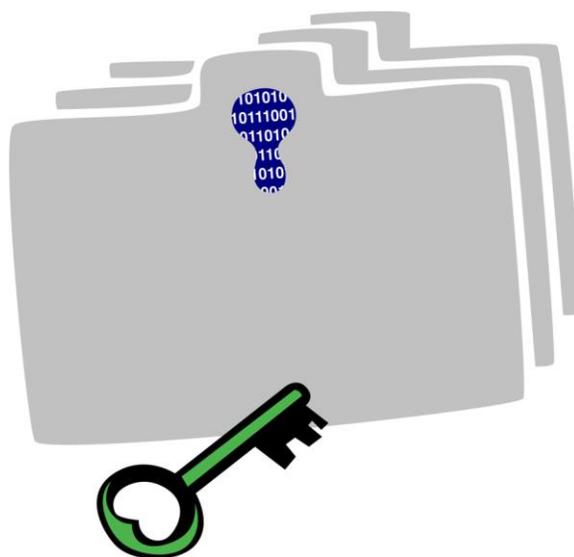
One only needs to follow the news to see rapidly rising concerns about data security and institutional trust. Two-thirds of US adults say they would not return to a business that lost their confidential information. Enterprises benefit in many ways by being increasingly diligent about monitoring for and detecting unusual and potentially fraudulent activity or threats to their data security.

Identity and activity tracking information and data security analytics have the highest value when delivered as quickly as possible. The faster the answers are delivered, the greater the potential benefit in both security and revenue. However, producing results with a high degree of speed and accuracy requires the processing of ever-increasing amounts of data. Although storage systems with large numbers of hard disks can deliver high amounts of IOPS, they cannot deliver the low latency needed to scale data security-related analytic intensive workloads. This will continue to be a problem as data volumes and performance requirements grow.

Enterprises implementing data security measures and software tools are looking to detect and stop data security breaches and fraud before they result in major business, reputation, and customer trust impacts. Using FlashSystem for data security analytics provides business results in a fraction of the time of a performance optimized hard disk array. This translates directly into major business value, because a security risk can be stopped in its tracks.

IBM FlashSystem is not only capable of processing the data at high velocity; it can also handle much larger workloads than traditional storage. But in addition to intense application performance requirements, resiliency of IT systems is critical. The need, for example, in the financial services industry to electronically create legally binding agreements for tremendous monetary sums places unique requirements for redundancy and reliability on infrastructure. To avoid data loss and to lower risks, business-critical

applications not only need to be fast and secure; they must also be resilient. FlashSystem arrays have been deployed for many years in the most business critical environments, from banking and equities trading to global e-commerce processing facilities.FlashSystem is engineered with no-single-point-of-failure integrity and component redundancy, plus it seamlessly integrates with the entire suite of IBM data security detection and management products, such as InfoSphere Identity Insight.

Thriving into the Future

Cloud, analytic, mobile, and social information systems will be the IT drivers for years to come. Massively scalable, globally distributed, ultra-low latency storage capable of supporting high volumes of unstructured data in many varieties at high velocity will be required. IBM FlashSystem offers the performance, efficiency, and reliability needed to help enterprises of all types thrive in the information age.

Deploying FlashSystem-based solutions enables enterprises to become proactive in the rapidly evolving new information system environments, leveraging these powerful new tools to create competitive advantage, make better business decisions, lower operating costs and risks, respond to accelerating customer demands, and innovate for years into the future.

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