There are many exciting trends driving the storage market today, and some of the most significant are flash-optimized architectures, software-defined storage, and cloud storage for applications such as big data analytics. Some of the keys to successful deployment of such architectures include complying with the service level obligations and having the technical expertise to deliver innovative solutions that provide the flexibility to adapt to changing requirements. From a storage standpoint, this includes addressing customers’ current storage requirements, and also providing sufficient flexibility to scale their storage infrastructures.

Toshiba leverages over 40 years of storage innovation and experience to drive next-generation storage device technologies. This experience also provides greater insight and understanding of customer requirements as well as identifying emergence of new market demands. Simply put, Toshiba knows storage and can help customers deliver storage solutions that address current needs, while also providing offerings that can help improve system level scalability.

Let’s take a look at how some storage technologies relate to both providing cloud-based and flash optimized architectures for traditional storage and big data analytics.

### Meeting End-User Expectations

#### Cloud Based Storage

Organizations are considering cloud-based storage solutions for various reasons. Customers’ requirements can range from data archiving to always-available access to critical data. Some of the key concerns are lowering storage related CAPEX, OPEX and achieving acceptable performance levels to meet service level agreement (SLA) obligations. With the implementation of a cloud based storage architecture, organizations can not only realize cost savings through improved scalability and more efficient utilization of storage resources, but also better SLA compliance.

TechTarget¹ notes that the number one requirement for cloud storage solutions is unbounded scalability and elasticity, but it’s often easier noted than actually built. Where do you start, and who can help?

For organizations that are looking at cloud-based storage, solutions architects and vendors need to understand critical needs and operational expectations, and how systems and solutions will meet those needs while delivering the key benefits that are the most meaningful to customers.

When designing storage solutions for the cloud, you need to work with a storage vendor that can help you deliver effective solutions. Toshiba should be your provider of choice because we deliver a broad portfolio of hard disk drive (HDD) and solid state drive (SSD) offerings for configuring cloud-based solutions optimized for customers’ environments.

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In particular, Toshiba’s MG04ACA family of Enterprise Capacity SATA HDDs is a winning choice when designing storage solutions for the cloud. Not only does this family offer an optimized balance of capacity and workload that can lower your total cost of ownership (TCO), but its range of capacity options makes it effective for scale-out enterprise cloud storage.

**Big data - It’s All the Buzz**

**Leveraging big data will deliver multiple business benefits**

“Big data” is about accessing, analyzing, and monetizing huge amounts of information. The hardware behind this architecture includes ultra-high-performance SSDs, and equally critical, capacious Enterprise Capacity HDDs.

When customers are considering storage for big data, a main concern may revolve around data temperature, which is a term used in describing the importance of data. It is for this reason storage infrastructure is segmented into “tiers,” with each tier designed to deliver different levels of performance. Depending on the “temperature” of the data, it is moved to different storage tiers. For example, data that is less used is often considered cold and moved to slower-access data archiving solutions. However, with big data—data’s temperature can quickly change and storage solutions must be able to quickly move large amounts between the tiers. Big data environments require solutions that combine massive yet agile storage infrastructure to quickly retrieve and transfer data in and out of their computing environment.

Big data storage must be able to handle extremely large amounts of data, scale to keep up with growth, and provide the input/output operations per second (IOPS) required to deliver data to analytics tools.

When architecting a big data storage solution, you need to work with a vendor knowledgeable about various storage architectures and their respective performance requirements. Toshiba is such a company, specializing in both high-performance flash-based storage for compute intensive environments and fast, scalable HDD solutions for cloud storage environments.

Toshiba’s HK4 family of enterprise SSDs would be a key building block for storage solutions intended for big data applications. The SAS and PCIe®2/NVMe variants are optimized for high transaction, high availability, and low latency workloads which makes it effective for storage of critical or “high temperature” data. As data temperature cools, moving it to HK4’s SATA variant may make sense because it still offers relatively high performance, but with more cost efficiency than higher performance SAS and PCIe/NVMe solutions.3

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2. PCIe is a registered trademark of PCI-SIG.
3. Read and write speed may vary depending on the host device, read and write conditions, and file size.
4. Toshiba defines a megabyte (MB) as 1,000,000 bytes, a gigabyte (GB) as 1,000,000,000 bytes and a terabyte (TB) as 1,000,000,000,000 bytes. A computer operating system, however, reports storage capacity using powers of 2 for the definition of 1GB = 2^30 = 1,073,741,824 bytes and therefore shows less storage capacity. Available storage capacity (including examples of various media files) will vary based on file size, formatting, settings, software and operating system, such as Microsoft Operating System and/or pre-installed software applications, or media content. Actual formatted capacity may vary.
For the backend of the big data infrastructure, Toshiba’s MG04ACA family of SATA enterprise capacity HDDs is a good choice. Its massive capacity enables the cost-effective retention of data keeping the hungry big data analytics machines well fed. Customers have come to rely on the Toshiba MG04ACA family of drives because they are economical, scalable, and highly reliable, thereby making them a workhorse for big data.

Driving Storage Innovation

Technological innovation never rests, and Toshiba has continued for the past 40 years to drive storage innovation. Below are just some areas where Toshiba is actively investing in and working with the industry groups to standardize:

- **NVMe:**
  Toshiba is actively involved in NVMe technical and marketing groups, and is looking into innovative designs and protocols like NVMe over fabric (NVMe oF) as ways to improve performance of flash memory for HPC and SDS applications needed for both big data and cloud-based storage solutions.

- **Storage intelligence:**
  Storage intelligence is a set of SSD APIs being standardized in the NVMe and SCSI/T10 committees for allowing the system host to manage some functions of the SSD for better/consistent system performance and management of the life of SSDs.

- **Rack Aware Device (RAD):**
  RAD is a Toshiba effort to have large amounts of flash in a compute rack, where the NAND is virtualized into various pools of fast storage with different attributes, such as Read Intensive, Write Intensive, Read-Only, performance oriented. RAD allows tailoring of workloads and maximizing the use and life of NAND.

- **Storage Class Memory (SCM):**
  SCM is a non-volatile memory technology that provides an intermediate step between high-performance DRAM and cost-effective HDDs, providing performance similar to DRAM, and write performance that is significantly faster than HDD technology. Toshiba is exploring higher performance non-volatile memory, such as Resistive RAM to deliver both cost-effective RAM and faster storage.
When it comes to delivering innovative storage solutions for big data and cloud, Toshiba is helping define the future of storage itself.

Conclusion

Without a doubt, storage requirements for the cloud and big data need to be considered carefully. With over four decades of storage experience, Toshiba continues to lead the way into the future with innovative storage technologies. Our offerings deliver the scalability, elasticity, and performance needed for cloud storage and big data solutions. Not only do we understand what customers are expecting of their big data and cloud-based storage solutions, we help them design and deliver these solutions while providing world-class support.

Toshiba’s proven commitment to innovation and service speaks for itself. We have been rated #1 by Tier 1 OEMs in multiple categories, leading us to consistent growth rates when it comes to SSD and HDD storage technologies.

Don’t be afraid of diving in to deliver successful big data and cloud solutions! Toshiba is here to help you succeed.

For questions or additional information on Toshiba storage please contact us at StorageMarketing@taec.toshiba.com or visit us at toshiba.semicon-storage.com.