



Selecting the optimal NVMe SSD storage for Datacenter and Cloud service providers

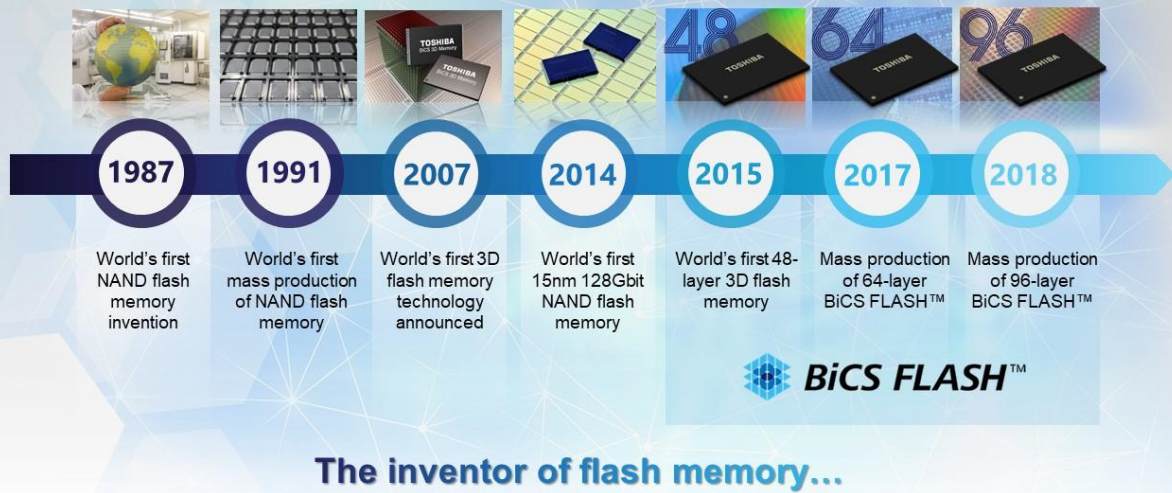
Introduction

In years gone by, bringing a new software service or web-based platform or app to market would have required a huge investment in computing hardware and other infrastructure to make it happen. However, with the advent of Infrastructure as a Service (IaaS), massive compute power and storage is now available to all, enabling disruptor's ideas and concepts to be rolled out and tested, improved, and then launched in ever decreasing timeframes.

With such intense competition between Managed Service Providers (MSP) moving systems partially or in their entirety to the cloud can make a lot of financial sense. The capital expenditure (CAPEX) of sourcing, running and maintaining IT computing and networking resource can be reduced and left to the MSP. Market projections for IaaS seem to confirm this trend with market size estimated to be \$19,319m in 2016 and growth expected to reach \$92,075m by 2023, a compound annual growth rate of around 25%¹. This reflects growing cloud adoption amongst Small and Medium Enterprises (SME), increases in cloud adoption in many vertical industries, and a significant shift to hybrid cloud as a primary deployment model for many businesses.

With so much competition, MSPs will need to differentiate their IaaS offerings in order to avoid simply competing on price. Can the storage medium, implemented with NVMe SSDs, be part of that differentiated offering?

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CAPEX headaches move elsewhere

The CAPEX headache now lies with the MSP, with them having to ensure that their data centers provide the computing resource, networking speed and availability, along with adequate storage to fulfill the needs of their clients. Storage is one key element of the solution where careful investment is required. Uptime, availability and compute performance are all key criteria when selecting an IaaS provider, but there is a basic assumption that the data managed will be stored with integrity and in a manner that ensures it can be quickly recovered should something go wrong.

Transfer speed and capacity of individual drives are two key performance measures that will be compared when reviewing suppliers. Furthermore, power consumption, along with heat generation, are also crucial to operational expenditure that impacts overall costs associated with cooling and dimensioning of uninterrupted power supplies. Beyond these criteria, reliability and the warranty period of the drives must also be reviewed, since these impact service level agreements (SLA) towards customers and how often the hardware will need to be replaced. These are areas where the Toshiba CM5 Series of NVMe SSDs can help.

Comparing SSD options

Solid-state drives (SSD) contribute significantly to the overall performance of data center servers with their speed and response to I/O requests leaving more computing power available for the user's applications. The drive's interface also needs to be considered. With essentially instant access provided by the underlying flash memory of the drive, legacy interfaces such as SATA remain a bottle-neck in accessing data. Here it is worth selecting server hardware that supports NVMe interface drives.

To make the most of the investment it is also necessary to compare drive endurance and reliability. One measure used here is Drive Write Per Day (DWPD), although some suppliers may define this in Terabytes Written (TBW). The reliability of the drive will be given as the number of hours for the mean time to failure (MTTF), while the warranty period can also be used to gauge the manufacturers expected product lifetime.

The last, and perhaps typically overlooked, aspect is the underlying technology used to implement the flash memory of the SSD. It is here that the endurance, speed and capacity is implemented and relies upon continuous advances in silicon chip technology. Toshiba, as the inventor of flash memory, is well positioned to provide innovative storage solutions based upon cutting-edge technologies. Today's flash memories use minute lithography of down to 15nm enabling masses of storage cells to be implemented on a silicon die. Thanks to advanced manufacturing technology, Toshiba Memory has led the way into 96 layer NAND flash storage. This allows customers to take advantage of denser capacity per storage unit while keeping power consumption low.

Differentiating the service offering

The challenge with devolving the hardware choices from the end customer is that they become largely divorced from the underlying technology and the potential value it could offer their business. IaaS providers need to evaluate how the hardware investments they have made can be monetized through differentiated service offerings.

Performance is one obvious value-add, enabling servers utilizing NVMe SSDs to be superior in performance compared to legacy storage solutions. The endurance of the Toshiba Memory NVMe SSD could also be used as a selling point, especially for customers who require flexibility for their application workload. With its power loss protection, the Toshiba Memory CM5 NVMe SSD additionally provides a higher data integrity safeguard.



Finally, the security of the data storage technology is a modern world problem we face. The Toshiba Memory CM5 NVMe enterprise SSDs provide a range of encryption options. Since today's data centers are well protected against both physical and cyber-attacks, the CM5 SSD series provides a further layer of data privacy with their certified encryption algorithm.

Enterprise NVMe SSDs for mixed use

To provide such premium options to IaaS customers, SSD drives need to be sourced that can deliver on the promise of such differentiated services. One potential solution is the CM5 family NVMe SSDs from Toshiba. Featuring 64-layer 3D BiCS FLASH™ TLC memory devices, the drives offer capacities of up to 15.36TB storage ranging from 1 to 3 DWPD. They are available in a 2.5" (15mm Z-height) form factor, supporting an NVMe Rev. 1.3a compliant interface with PCI Express 3.0 Gen3 (4 lanes) and single/dual port support.

The CM5 family NVMe SSDs typically require just 6.0W of power in idle mode, peaking at a maximum of 11 to 18W. Throughput can be sustained at 770,000 IOPS for random read (4KiB, single port mode) and 165,000 IOPS for random write (4KiB),

while sustained 128KiB sequential reads reach 3,350 MB/s, and 3,040 MB/s for writes.

Data integrity is assured with power loss protection along with the inclusion of T10 DIF (Data Integrity Field), while the drive offers 3 DWPD for a random write workload over the 5-year warranty period. The reliability (MTTF) of 2.5M hours, keeps the failure rate low and thus ensures lower maintenance cost for the datacenter.

For those wishing to offer data encryption, models such as the 6.4TB KCM5DVUG6T40 provide a self-encrypting drive (SED) feature based upon TCG Opal technology. This provides encryption within the drive without requiring support from the host server, delivering security without impacting performance. Other models offer FIPS-based encryption, while a Sanitize Instant Erase (SIE) capability using cryptographic erase methods to invalidate user data is also available.

Summary

IaaS providers risk participating in a race to the bottom on pricing as more and more competition enters the market. If instance offerings simply become a comparison of performance, network speed and storage capacity, discussions will inevitably move quickly to focus on the service price. As more SMEs shift to cloud services or hybrid cloud models, and the needs of various vertical market segments are analyzed, NVMe SSDs become more relevant for those MSP's trying to provide differentiated value add services and, ultimately, their market competitiveness.

As the pioneer of NAND flash technology, Toshiba Memory CM5 NVMe enterprise SSDs provide a storage solution that answers the dynamic requirements of the ever expanding and progressing MSP market.

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References:

1. Allied Market Research - <https://www.alliedmarketresearch.com/infrastructure-as-a-service-IAAS-market>

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