



High Performance SSDs Enable  
Teradata IntelliFlex® to Meet New Workload Demands

Organizations now have more data from more sources than ever before, placing new requirements on storage. At the same time, new types of analytics place a greater demand on data centers and data warehouses for faster, more powerful performance. Hard disk drives (HDDs) traditionally offered a low cost solution for data storage, but with the drawback of slow performance, are no longer the optimal solution for the workload requirements of today's fast-paced businesses.

As a result, the data storage industry is moving toward solid-state drives (SSDs) that offer the speed, high performance, and storage capacity companies need to meet current and evolving workloads. SSDs have been available since 1980. The technology has been used for years in consumer devices such as mobile phones, tablets, and thumb drives.

Until recently, the higher price and shorter lifespan for SSDs compared to HDDs were pain points for business. The cost of SSDs has come down significantly, making them almost as cost effective as HDDs, and new architectures have been developed that push the effective lifetime to match HDD. Now that these pain points have been eliminated, SSDs are increasingly appealing to businesses.

## Lower Prices Drive New Innovation

In its "Solid-State Array TCO Realty Check" report from June 2017, Gartner predicted that the price of solid-state arrays (SSAs) will decline nearly 70 percent on a raw-dollar-per-gigabyte basis by 2020. "Tremendous innovation and investment have fueled relentless price declines in flash memory that translate directly to less expensive SSDs and, ultimately, SSA costs," according to the Gartner report.

Teradata first introduced Teradata IntelliFlex® in April 2016 with a mixture of SSDs and HDDs. This revolutionary hardware platform is the next-generation massively parallel processing (MPP) architecture for Teradata Database. IntelliFlex brings the agile and flexible growth benefits of cloud offerings to the on-premises environment.

The fabric-based structure provides multi-dimensional scalability, enabling companies to add processing power and storage capacity independently to meet current and changing business requirements. The memory-rich configuration for powerful, in-memory computing and high-density packaging is also data center friendly.

## Poised for Substantial Growth

In the past, SSDs in data centers and data warehouses were often used in conjunction with HDDs to create a hybrid model. This allowed the business to leverage the faster SSDs for the most frequently used data, and then use lower cost HDDs for less frequently accessed data.

Now the trend is to optimize all SSDs. According to Gartner's "Moving Toward the All Solid-State Storage Data Center" report from November 2016, the percentage

A solid-state drive (SSD) has integrated circuit assemblies for memory with no moving mechanical parts. By contrast, a hard disk drive (HDD) contains spinning disks and moving read and write heads. SSDs run quieter, and have faster and more consistent response times than HDDs.

of data centers that will use only SSAs for primary data, instead of using hybrid arrays, will increase from less than 1 percent in 2015 to 25 percent by 2020.

Teradata is experiencing this trend as it sees an increase in individual SSD capacity (see table). The jump from 0.3TB in SSDs in 2011 to 15.3TB in 2017 has drastically lowered the price per terabyte for data storage while still delivering exceptional query performance.

Capitalizing on the performance and data storage benefits of SSDs and their more favorable pricing, Teradata released the second generation of IntelliFlex in April 2017. This is the first enterprise appliance to use two sizes of SSDs for the fastest performing, most reliable, and most energy and floor space efficient platform Teradata has ever produced. The multiple tiers of SSDs can be added to IntelliFlex independently, further increasing the flexibility and system characteristics—speed and/or capacity.



## Unique Business Benefits Leave HDDs in the Dust

SSDs provide benefits that HDDs can't offer. SSDs enable much higher throughput, consume less electricity and floor space, and generate less heat, making enterprise SSDs much more efficient than HDDs. In addition, because they have no moving parts, SSDs are not susceptible to the mechanical failure modes associated with HDDs and are therefore able to deliver superior reliability and a lower overall failure rate.

The advantages of SSDs over HDDs include:

- Higher performance for faster and more consistent read and write speeds
- Lower latency
- Enhanced reliability
- Better storage density
- Lower energy consumption per terabyte of capacity
- Lower total cost of operation (TCO)

With SSDs, businesses gain fast and consistent query response times. An SSD-based data warehouse can scan and aggregate millions of rows in less than one second. This allows organizations to load and leverage data at the speed demanded by today's ultra-fast business transactions.

Any company that depends on 100 percent hot data applications—ones that require continuous high-speed processing capabilities—can benefit from the extreme analytic performance that SSD technology offers.

## Enabling Fast, High-Value Outcomes

Teradata has long recognized the benefits of SSD in data warehousing platforms. Since introducing the Active

## Gain Performance, Increase Capacity and Save Money

The solid-state drives (SSDs) used in Teradata IntelliFlex® offer quantifiable benefits compared to hard disk drives (HDDs).

**Performance:** More than 50 times greater input/output transactions per second.

**Capacity:** Up to 8.5 times more capacity than 10K enterprise-class HDDs (comparing a 15.3TB SSD to a 1.8TB HDD). A cabinet has 3.5 times the data capacity using 6.4TB SSDs or 7.5 times using 15.3TB drives.

**Reliability:** Order of magnitude more reliable than HDDs with 90 percent fewer failures than an HDD of equivalent capacity.

**Power consumption:** Approximately 80 percent fewer watts per terabyte of data capacity and 1/200 the watts per input/output.

Enterprise Data Warehouse 6680 in 2011, Teradata has used SSDs to provide the fastest performance for the hottest data and most stringent, advanced workloads.

The recently released Teradata IntelliFlex 2.0 uses multiple sizes of SSDs—1.6TB for write-intensive operations, and 6.4TB and 15.3TB for read-intensive operations—to provide a balance of cost and performance. Hybrid storage now means multiple SSD sizes for different workloads. The 2.5-inch SSDs in IntelliFlex enable more than 50 times faster data transactions per second than an HDD and are

Table: Teradata SSD Capacity Trend (TB)

	2011	2012	2103	2014	2015	2016	2017
SSD Capacity (TB)	0.3	0.4	0.4	1.6	1.6	1.6	15.3

comprised of enterprise-class flash memory devices along with robust, high-performance controllers from NetApp®. The NetApp controllers protect against drive failure and provide error checking to protect all data paths.

With IntelliFlex, businesses benefit from a high cabinet density that can reduce a data center footprint by up to 85 percent. A full cabinet in IntelliFlex 2.0 has 7.5 times more data storage than the first release. Using this new storage efficiency, one Teradata customer went from 136 cabinets to only 20. A single cabinet can cost up to \$7,000 per month in power, cooling, and space costs, so the savings from fewer cabinets are significant.

## More Functional, Flexible Data Warehousing

By delivering real-time intelligence to front-line decision makers, Teradata IntelliFlex extends traditional data warehouse functionality into the realm of tactical decision making. The solution operationalizes data value across the business while enabling smarter, faster decisions by accessing any data at any time.

The faster, more consistent query response times, enabled by SSDs, deliver enhanced business value by allowing more real-time users, shorter response times to events, and deeper, more complex analytics. This allows broader applications with the data warehouse.

By providing massive gains in data warehouse computer power, IntelliFlex helps organizations utilize advanced analytics. The transition to all SSDs in different sizes provides an all-memory appliance capable of delivering up to seven times the compute power per cabinet as the previous solution.

SSD-based data warehouses have matured from focusing strictly on speed and data feeds to enabling broader workloads. Tasks like performing analytics on archived

## Take a Tour

Teradata IntelliFlex® is the most powerful and flexible integrated data warehouse available. [Click here to take a virtual tour.](#)

data that were once considered too time consuming to implement are now possible and cost effective. Businesses can meet requirements for high-performance workloads and latency-sensitive applications while taking advantage of the lower SSD cost structure.

## About NetApp

NetApp provides a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. NetApp is proud to have partnered with Teradata to provide enterprise storage for more than 20 years. For more information, visit [netapp.com](http://netapp.com).

## About Teradata

Teradata empowers companies to achieve high-impact business outcomes. With a portfolio of business analytic solutions, architecture consulting, and industry-leading big data and analytic technology, Teradata unleashes the potential of great companies. For more information, visit [teradata.com](http://teradata.com).

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