

## WHITE PAPER

### SSDs: The Other Primary Storage Alternative

Sponsored by: Samsung

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## IN THIS WHITE PAPER

This IDC White Paper explores the market opportunities for solid state drives (SSDs) and their potential uses in the digital storage world. The technological benefits are discussed in this context, as are the opportunities where storage requirements align with SSDs. Finally, the market trends that are accelerating the adoption of SSDs in the marketplace are evaluated.

## SITUATION OVERVIEW

Digital content is increasing 50–60% annually, and our interaction with this content is accelerating rapidly over time. Whether it be for work, convenience, entertainment, or personal use, it is important to store and to provide access to this digital information anywhere and at anytime.

This explosion in digital information, coupled with the new ways consumers are using devices to interact with this information, has brought forth a number of new requirements for storage devices. Increasingly, users are interacting with this data in a mobile context, in a harsh environment that is not well-suited for mechanical storage, or in an environment where performance and power conservation take priority. These new requirements present opportunities to leverage the strengths and weaknesses of different storage technologies.

Today, a number of technologies typically are used as storage, such as hard disk drives (HDDs), optical, tape, flash, and SSDs. Each technology offers certain advantages and disadvantages that make it better suited for specific end-market applications. While the storage requirements of each application are different, storage can generally be characterized by its capacity, performance, form factor, reliability, and cost. SSDs seek to offer a better solution along these metrics.

Is the market ready for SSDs? What are the market trends that play to the strengths of SSDs? What are the specific markets where SSDs might have a role? This paper explores the answers to these questions and includes IDC's prediction regarding the future of SSDs.

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## Is the Market Ready for SSDs?

HDD technology is a 50-year-old proven technology and is used as the primary storage device in a number of applications today. However, as computing has become increasingly mobile — in the form of notebooks, portable media players, cell phones, and other devices — alternatives to mechanical HDDs have emerged as potential storage challengers to HDD storage.

SSDs are semiconductor-based storage devices that perform like traditional HDDs and appear to the host system as an HDD-like device. However, SSDs promise to provide numerous key benefits compared with other storage solutions:

- ☑ **Reliability.** Published specifications and testing suggest that SSDs offer reliability improvement over HDDs.
- ☑ **Performance.** With SSDs, access times are significantly reduced, resulting in increased performance.
- ☑ **Lower power consumption.** SSDs typically use less power than HDDs, due to their use of solid state technology.
- ☑ **Durability.** SSDs have increased durability and can be used in harsh conditions.

When combining these benefits, SSDs offer a unique solution and in some cases provide users with a total cost of ownership (TCO) advantage over other storage solutions.

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## Trends Accelerating SSDs in the Market

A number of trends align well over time with the benefits provided when using an SSD:

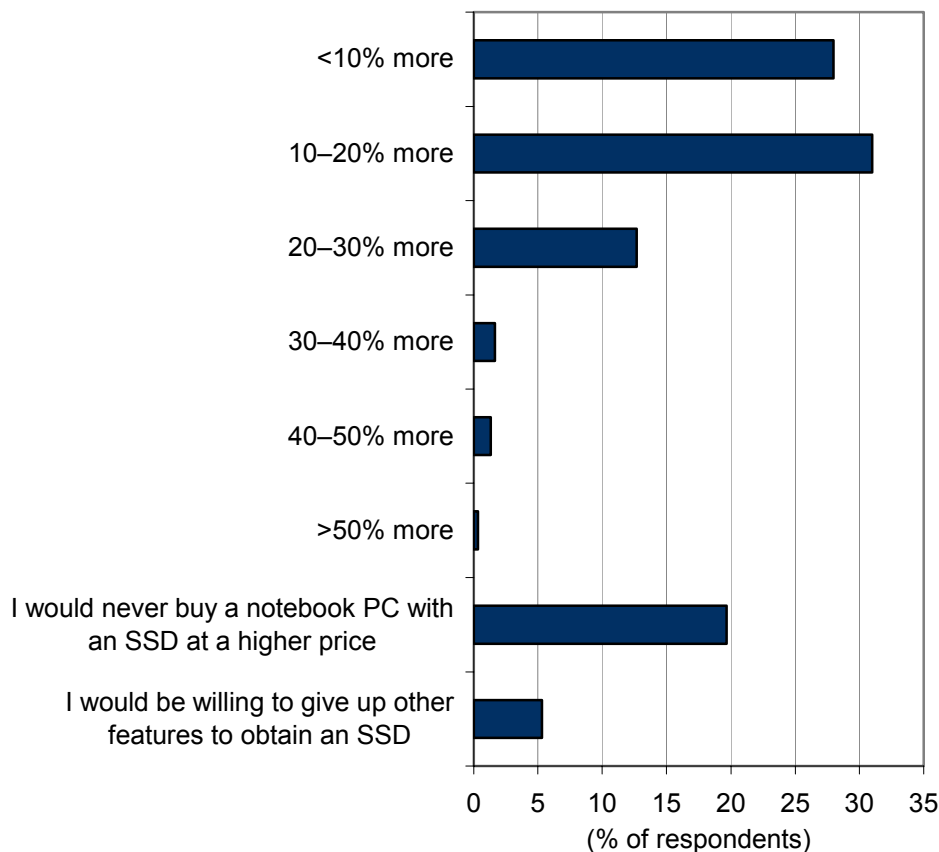
- ☑ **Mobility.** Devices are becoming increasingly mobile. The PC market is transitioning from a market that is dominated by desktop shipments to one that is dominated by notebook shipments. Notebook PCs increase mobility and durability requirements.
- ☑ **Acceptable capacity.** The capacity gains provided by HDDs have been tremendous over the past decade. However, many segments of the market do not require more capacity for their application.
- ☑ **Lower prices.** NAND flash memory is a key component of SSDs, and flash memory has seen an annual decline in price per gigabyte of 40–60% per year. The significant decline can be attributed to advances in semiconductor processing, including smaller geometry devices and larger wafer size. These dynamics enable SSDs to reach more affordable price points and provide them with a road map for future cost reductions.
- ☑ **Green trend.** Power and cooling costs continue to increase. In a storage environment, HDDs consume more energy than SSDs, and any solution that can save power will garner the attention of system OEMs and certainly end users.

- ☒ **Connectivity.** Technologies for increasing the availability and reliability of broadband Internet connections continue to increase. Broadband availability increases the ability to stream content, services, and applications, thereby reducing local storage requirements.

The choice of a storage solution ultimately is determined by matching the best solution to the market requirements. However, cost is an obvious factor to include when considering an SSD. IDC completed a survey of commercial PC buyers to understand the future of PC storage requirements and, more importantly, the industry's willingness to adopt SSDs in laptop and desktop PCs (see *The Future of Storage in Commercial PCs: A Commercial PC Buyer Survey and Study*, IDC #207697, July 2007). The results of this in-depth study indicate the premium associated with SSD adoption in PCs (see Figure 1).

**FIGURE 1**

Acceptable Price Premium for a Notebook PC with an SSD  
Versus HDD: Percentage Respondents Are Willing to Pay



n = 300

Note: Responses assume equivalent capacity for SSD versus HDD.

Source: IDC's 2006 U.S. PC Buyer Storage Survey

## SSD Market Opportunities at a Glance

SSDs are found in a number of applications where other storage technologies have either overserved or underserved market requirements. Other markets where SSDs have yet to be introduced, but could be integrated given SSD aggressive cost and capacity trends, are as follows:

☒ **PC applications.** Today, a number of notebook PCs are shipping with SSD solutions. In segments, such as the ultraportable notebook segment, where form factor, mobility, and battery life are important, SSDs are a good solution. Corporate notebooks offer perhaps the best opportunity given the low capacity requirements. IDC estimates that 56% of today's notebooks are shipped to corporate environments. Gaming PCs are another area that can benefit from the use of SSDs. These systems can take advantage of an SSD's fast access time to accelerate load times and increase performance to create a better end-user experience.

☒ **Consumer electronics (CE).** Flash already is found in a multitude of CE applications. The formula for success is twofold: provide the right combination of capacity and cost for consumers and provide the right performance and reliability for CE OEMs. The iPod Mini to iPod Nano transition is a clear example. In this case, other factors such as smaller form factor, longer battery life, and a more robust or shock-proof design were more important than cost per gigabyte in determining the storage solution, as long as an acceptable amount of capacity was available.

This same equation could be applied to other markets, such as the automotive or GPS market. IDC estimates that HDD shipments into the automotive market surpassed 5 million in 2006 and should exceed 6 million in 2007. Automobile navigation and entertainment is driving the demand for local storage. It is possible that large storage requirements prevent SSDs from gaining a foothold; however, given the harsh operating environment, SSDs might also be compelling.

Finally, gaming consoles will consume over 13 million HDDs in 2007. End users and system OEMs still are struggling to find the right amount of local storage; however, today it seems that more is better. If this trend continues, then SSDs will not be favored. If it relaxes, then the opposite may be true.

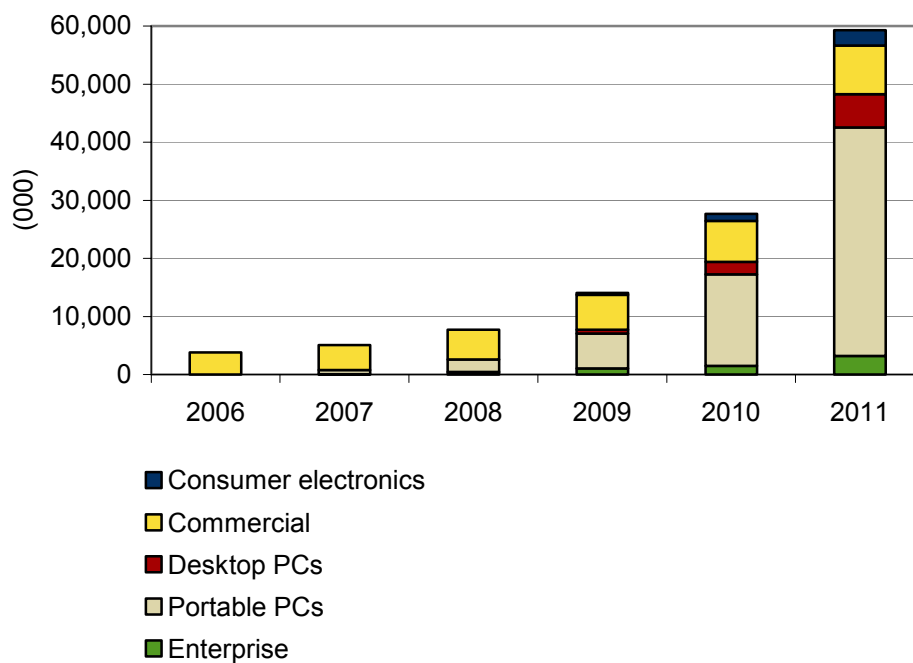
☒ **Commercial.** From industrial equipment and factory automation to military and aerospace, many applications are not well-suited for HDDs and require an alternative. SSDs have been and will continue to be an attractive solution given their high reliability and extreme flexibility in both form factor and capacity. For example, ruggedized applications such as those in the military or aerospace market are designed for mission-critical applications. Industrial equipment that is designed for a long life cycle or kiosks that operate 24 x 7 and have minimal capacity requirements are applications that are well-suited to using SSDs.

## FUTURE OUTLOOK

IDC believes that SSD solutions make sense in applications where the benefits of SSDs match those of the market application. In IDC's study *Worldwide Solid State Drive 2007–2011 Forecast and Analysis: Finding Space in the Expanding Digital Universe* (IDC #207739, July 2007), which examines the market and opportunities for SSDs, we predict that SSDs will see increasing adoption as price points decline and capacities increase (see Figure 2).

**FIGURE 2**

SSD Unit Shipments by Application, 2006–2011



Source: IDC, 2007

## CONCLUSION

Clearly, the highest volume market opportunity for SSDs is the PC market — even a niche win within this growing market can equate to large volumes. Commercial applications already leverage SSDs and will continue to do so in the future, offering attractive revenue and margin potential.

The CE market will ebb and flow with the demands of the finicky consumer. Finding the right balance of capacity, cost, and convenience will determine the success of SSD adoption within any given application. As well, what may seem like an unreachable market for SSDs may turn into a very attractive market quickly, and vice versa. SSD OEMs must be prepared to capitalize when the opportunity presents itself.

Finally, the enterprise segment also provides a rich opportunity for SSDs and is discussed separately in an enterprise-focused white paper.

Today, SSDs are about delivering a premium solution. In the future, SSDs will be about delivering the right solution. SSDs are expanding their presence from niche to mainstream. The declines in the cost of flash and the improvements in capacity and reliability are paramount to the future success of SSDs. We believe the future looks very bright for SSD OEMs.

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