



Laptop Limitations Bringing you Down? *Eliminating the Sacrifices Users Make for Portability*

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INTRODUCTION

All too often in today's demanding high-tech industries, power users are forced to utilize laptops for their portability, even when the system capabilities do not fulfill all of their needs. Many are forced to sacrifice performance and functionality, thereby dumbing down critical applications, just for the sake of portability. The fact is large computer manufacturers offer a wide variety of laptops that are primarily consumer level machines.

Even if they are categorized as "workstations," they often fall short of the needs of a segment of users that truly need to bring their desktop workstation, with all its bells and whistles, with them when they leave the office for home, abroad, or to a client site. The desire to have a portable workforce crosses a number of industries, as executives look for ways to increase productivity, expand the reach of sales and marketing personnel, and reduce the total cost of ownership of all essential computer equipment. The need to mobilize critical staff with fully functional computers in hand must be addressed by computer manufacturers. This paper addresses common sacrifices executives and end-users must make when deciding between a laptop and a desktop, and offers a tangible solution to this growing problem.

THE SACRIFICES WE MAKE

Applications which require portability continue to increase as users demand the freedom to work anywhere. Some common applications include:

- remote or onsite design projects
- network management
- onsite production
- demonstration such as at a tradeshow or client meeting
- utilizing one computer for multiple purposes or locations within an office
- the ability to work from home

When most companies look to acquire computers for critical staff, they have a list of feature requirements. When portability is at the top of that list, laptops are the first option to come to mind. Limitations are inevitable when laptops are used to run applications written for use on higher performing, stationary



systems. Inadequate system performance, high cost of ownership, and feature limitations are the sacrifices routinely made when selecting a computer.

System Performance

Processors incorporated into laptops are not as high-performing as most desktop system processors. This is perhaps the biggest reason for the gap in performance between the two. A typical, high-end laptop includes a processor like the Intel® Core™ 2 Duo Processor¹. These processors may work fine for the average user; however they are often overkill for many. However, if you routinely run complex, multi-threaded applications, render loads of 3D data, or streams massive data in real time, the applications can quickly bog down the processor if it does not have the capability to keep up with the load. In contrast, high-end engineering workstations often house one or more quad-core processors, like Intel® Xeon®². A clear performance deficit exists when complex applications are transferred from a system with high-performance processors to a laptop, no matter how high-end it may be.

Adding to the performance problem is the limited feature set available on laptops. Memory, storage, and I/O options cap out at a point often below what is required for the intended application. RAM for workstation class laptops is generally around two to four gigabytes. Even the highest end HP notebooks on the market max out at eight gigabytes³. Hard drive capacity on workstation class notebooks averages at 250GB⁴ and are not available above 500GB. I/O includes perhaps one Ethernet connection, one PCI slot (PCI Express if you go very high end), a DVD Rom, and two to three USB ports. The chassis itself does not allow for any further options.

These limitations slow down data streaming applications, do not allow for the use of PCI/PCIe cards, and do not allow for storage of large data sets. These capabilities are needed to optimally run a growing number of applications. High-end desktop workstations offer more functionality (i.e. more memory, 16GB or higher; two or more Ethernet connections; two to five PCIe slots and with a couple of additional PCI slots; and storage capacity surpassing one terabyte).

Upgradeability is also limited with laptops. Typically, only the memory, hard disk drive, and the CD/DVD drive can be modestly upgraded. The ExpressCard or PC Card slots provide limited expansion capabilities, and there are no PCI or PCI Express slots at all⁵. For the long term, you are stuck with what you originally bought. Most desktop workstations are based on an open architecture and can easily be altered with more powerful components. If you need to add a better graphics card, a faster processor, or multiple internal hard drives, you can do so. This lack of upgradeability is a substantial trade-off which shortens the life of the average laptop to around two years, much sooner than an upgradeable stationary workstation.

Prohibitive Costs

¹ Hewlett Packard website. Pavilion Series processor selector page.

<http://www.shopping.hp.com/webapp/shopping/cto.do>

² Dell website. Precision workstation specifications page.

<http://www.dell.com/content/products/compare.aspx/precndt?c=us&cs=555&l=en&s=biz>

³ Hewlett Packard website. Performance Notebooks specifications page. <http://h10010.www1.hp.com/wwpc/us/en/en/WF04a/321957-321957-64295-321838-3329741.html>

⁴ Hewlett Packard website. Laptop Finder specifications page.

http://www.hp.com/sbso/buyguides/pg_notebooks/notebook-finder.html

⁵ Tao Security Blog. <http://taosecurity.blogspot.com/2007/09/tactical-network-security-monitoring.html>

If the functional needs of the system outweigh the need for portability, other sacrifices must be made. One of these sacrifices includes the costs inherent to shipping a desktop system for an application that should be portable. Stationary systems are routinely shipped for remote projects and demonstration. The cost in dollars and man hours is prohibitive. The average cost to ship a desktop workstation across the country is about \$100, using standard Ground methods, and \$200 - \$300 if expedited⁶. The additional cost to a company that will not be able to utilize the system while in transit can bring the total up substantially if the system is depended on for daily use. This can mean that multiple systems need to be on hand to keep productivity stable. Further, there is the possibility of damage if stationary equipment, not intended to be portable, is shipped. Not only must the computer be fixed or replaced, but the resulting downtime may hinder a company's ability to meet a client's needs within the expected timeline.

The need to acquire multiple stationary systems to perform the same or similar tasks in numerous locations increases company costs. In the following circumstances, the need for multiple systems would apply:

- when a home computer and an office computer are needed for employees who work in both locations
- when an onsite computer is needed to perform client service functions
- when multiple computers are set up within a single office to perform the same function in different areas

The use of laptops in these scenarios would certainly lower the acquisition cost, as fewer computers could be used for the same number of applications. However for some companies, the loss in performance is often too much of a sacrifice.

BRIDGING THE PERFORMANCE GAP

A computer that provides the features and functionality needed for the applications mentioned above, while maintaining ease of portability, would reduce associated costs, performance issues, and risks of downtime. The computer would need to incorporate high-performance processors, comparable to those found in desktop workstations. To combat any decrease in application performance, the latest in multi-core technology, like Intel's Xeon® Quad Core processors or AMD's Third Generation Quad Core Opteron™ processors would need to be incorporated. RAM would need to be eight gigabytes or higher with the option to increase. Additionally, storage capacity would need to rival that of a desktop system at one terabyte or higher. These three features alone eliminate much of the performance loss associated with choosing a laptop.



For many industry-specific applications to run optimally, the system must also be able to support high-performance accessories. Ultra high-end

⁶ UPS website. Calculate cost and time page. https://wwwapps.ups.com/ctc/request?loc=en_US

graphics cards, data acquisition, and sound cards are not useable on laptops, as the form factor does not allow manufacturers to incorporate slots to accommodate them. To truly bridge the performance gap between laptops and desktop workstations, multiple I/O options are necessary, such as multiple PCIe and PCI slots, more than one Ethernet port, multiple SATA/SAS options, RAID, firewire, and audio ports.

Ideally, the architecture of the system would be open, ensuring compatibility with desktop workstation applications and simplifying transference of data and software. This would also allow for multiple configuration options to customize and change the system as necessary to fit a company's requirements. The system would need to be upgradeable, allowing for easy component swapping, processor upgrades, and memory increases.

So how does a system that packs all of those features into one box maintain the convenience of a laptop? The form factor would need to be slightly larger than a typical laptop to accommodate the processors, add-on cards, and hard drives, and still small and light enough to be hand carried easily. A workstation-class laptop without the added weight of additional components is typically around 7-11 lbs, with dimensions of about 15" x 11" x 1.5". A compromise of a few more pounds and inches could be the crucial difference between applications running optimally anywhere or bogging down repeatedly on a laptop. Would a system, weighing as little as 13.5 lbs and measuring only 16.8" in width, be worth the enormous increase in performance and flexibility? If housed in an all in one briefcase-like chassis that can fit into the overhead bin of a commercial airliner, the tradeoff is minimal.

Additionally, the system would also need to incorporate an integrated, high-resolution display to enable both optimal graphics performance and laptop convenience. It should be durable enough to withstand frequent location changes and travel. It should accommodate any standard keyboard and mouse and include a case that can house both the system and keyboard, allowing for easy portability. A computer like this would be neither a desktop workstation, nor a laptop, but something more flexible than either. This "flextop" system would create a new niche category of computing for users that just can not get by with the performance limitations of laptops, but still require portability.

FLEXTOP COMPUTING EMERGES AS THE SOLUTION

At the end of 2005, NextComputing, a high-performance portable computer manufacturer, branched out from its history of providing ruggedized mobile computers for the military to launch the first flextop computer, called NextDimension. The company defines the flextop category as a portable, all-in-one workstation and server, characterized by upgradeability and open standards architecture, which is distinctively flexible. Flextops are designed to fulfill the need for portability within the power-user community. This is the same necessity that launched laptops into the mainstream consumer market.



The popularity of the company's ruggedized solutions lead to a sector of companies and end-users requesting the same capabilities in a commercialized chassis that was both sleeker and smaller than its rugged counterpart. Professionals routinely using demanding

applications in fields like digital content creation, broadcasting, medical imaging, energy, and test and measurement are searching for portable solutions that would expand the possibilities of when and where they could work.

NextComputing answered the call with the first NextDimension computer, which has now grown into an entire line of flextops that offer configurations to optimize numerous industry specific applications with desktop performance in a portable form factor. As an open standards solution, flextops can be configured with hundreds of combinations of memory, storage, and application specific I/O. The system is entirely modular and upgradeable, and the processor-agnostic nature of the NextDimension series allows the system's processor module to be upgraded at any point without affecting the existing configuration.

The NextDimension Pro HD, measuring at 16.8" x 11.44" x 4.4" and weighing as little as 13.5 lbs, is the smallest available flextop. Offering high-performance, flexible feature options like dual and quad-core Intel® Xeon® processors, 24GB of RAM, two PCIe slots, two GB Ethernet ports, two "hot swappable" hard drives, over one terabyte of SATA storage, RAID controller, and audio and firewire ports in top-of-the-line configurations, the system easily rivals mid-range to high-end desktop workstations. The integrated 17" display with resolutions up to 1920 x 1200, provides the graphics of a desktop and the all-in-one convenience of a laptop. Standard keyboard and mouse are compatible and fit neatly into the carrying case.

The NextDimension Evo HD is the most capable of the flextop family. Still impressively small at 16.8" x 11.44" x 5.69", it is only about one inch thicker than its cousin, the NextDimension Pro HD, and weighs within the same range depending on the configuration. The Evo HD expands on the Pro HD's I/O capabilities to allow for even more flexibility. For example, some configurations can provide up to three terabytes of internal storage, or three PCIe slots and an additional PCI slot to handle even the highest-end graphics cards that no laptop can accommodate. The Evo HD is specifically suited for the most demanding applications requiring portability, such as video production and editing, 3D imaging, and data streaming. The design of the NextDimension Evo HD reflects NextComputing's original intent to provide a portable computing powerhouse.

"The support of NVIDIA Quadro FX SDI boards in NextComputing's small footprint chassis means our customers are not compromised when quality of output is required within the constraints of highly mobile solutions. We are delighted to be shipping this solution." Mike Fredriksen, Commercial Director, RT Software.

BUSINESS BENEFITS OF CHOOSING A NEXTDIMENSION FOR PORTABLE APPLICATIONS

Performance

Choosing a NextDimension flextop eliminates the sacrifices that normally accompany portable computing. There is no sacrifice of performance for the sake of portability, no sacrifice of features, expandability, or upgradeability. The system is fully equipped to complement or even replace most stationary workstations. This allows for a whole range of portable possibilities for the high-tech workforce that laptops just can not provide.

- Designers can bring work home and utilize all of their applications fully optimized, just as on a desktop workstation.
- Engineers can bring work to client locations.

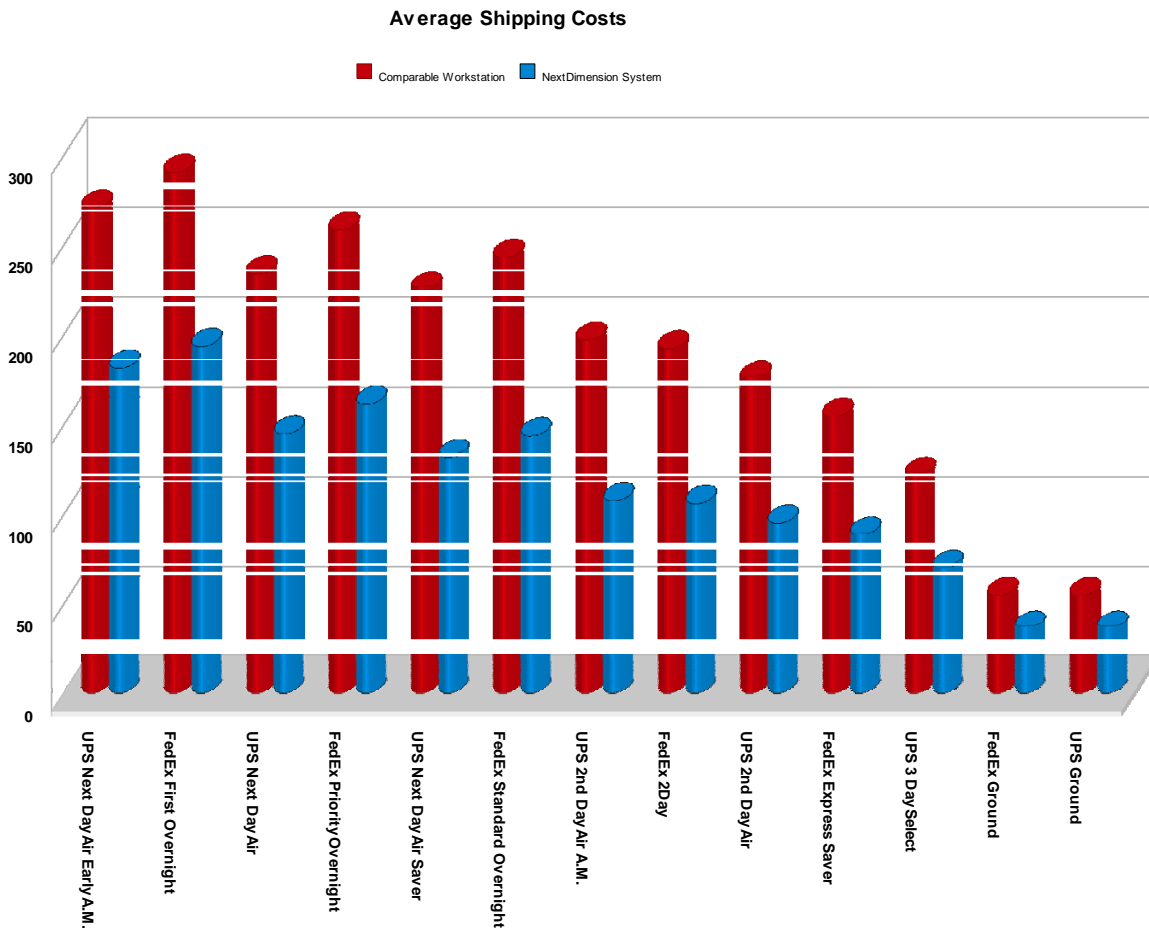
- Producers can edit on location, or off, without sacrificing the tools they need to optimize their applications.
- Independent Software Vendors (ISVs) can demonstrate their complex applications anywhere with all features intact, not just a mock up, which is often presented due solely to the limitation of the laptop being used for demonstration.

"NextComputing's small and powerful NextDimension systems round out the package by offering a complete turnkey workstation solution that artists and designers can take anywhere, and which showcases both of AMD's CPU and graphics technologies," Jeff Rainwater, Manager of North American Channel Sales for Workstation Graphics, AMD.

Cost Benefits

The NextDimension family also enables companies to purchase fewer machines by utilizing one portable system for multiple tasks, where more than one system is needed. Network administrators, for example, can test equipment and monitor data anywhere with the same machine. ISVs and components manufacturers can mobilize their sales forces and increase the quality of client demonstrations. Service companies can increase support offerings and on-site services. Overall productivity increases when workers have the ability to work in any location.

The choice of a NextDimension can eliminate shipping costs as well. As a hand carried system, there is no need to take the risks of system damage and downtime that can result from shipping. Take the average cost of shipping, \$100 per system, and multiply that for each time a system is shipped across country. Tack on the downtime as the system is in transit, and in a year, most companies will benefit exponentially from choosing to use a NextDimension. On the flip side, the durable design of the chassis is intended for travel, so if it needs to be shipped, risk of damage is minimized.



NextComputing is continually evolving the computing standards for the flextop category by offering faster processors, more I/O options, higher-performing graphics, and more storage.

CONCLUSION

When faced with the critical decision of which computers to utilize for high-performance applications requiring portability, sacrifices are typically made. High cost, inadequate performance, and feature limitations are daunting realities that must be considered. With the increase of mobile workers across all industries, these sacrifices are being made at a growing rate. A laptop is an obvious solution to the need for portability, but with that comes a set of limitations, i.e. processor performance, feature limitations, and limited upgradeability. If the limitations are too great in order to utilize a laptop, a stationary system will be chosen. This too, comes with sacrifices, i.e. prohibitive costs of shipping, acquiring multiple systems for similar tasks in different locations, the need to transfer work and applications from one system to another, and the risk of damage when shipping a system not intended to be used as a portable computer.

NextComputing's NextDimension family of flextops eliminates the all too common set of sacrifices made by companies deciding on the best computers to use for maximum productivity and cost effectiveness. With performance and feature sets of high-end desktop workstations, along with ease of portability, these sacrifices are no longer necessary. The high-tech workforce needs to be as mobilize as the consumer market, perhaps more so. Flextop computers can bridge the performance gap that exists between laptops and stationary workstations, enabling this end user group and the companies they work for to be more productive, flexible, and mobile. Contact NextComputing to receive an online demonstration of flextop features and capabilities.

About NextComputing: One of the first in a unique breed of technology companies to specialize in high-performance, small form factor, portable computing solutions in both ruggedized and sleek commercialized form factors. www.nextcomputing.com.

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