

MORE FUNCTIONALITY, LESS INFRASTRUCTURE: MANAGED IT WITH NETBOOT//I™

TECHNICAL WHITEPAPER

Double-Take Software, Inc.

Published: November 2008

Introduction

Building and maintaining computer systems is no easy task and information technology managers are constantly looking for better tools to reduce the total cost of managing their data centers and infrastructure. Advances in computer, networking and storage technology allow us to separate the various parts of our infrastructure to specialized platforms. For example, storage area networks have allowed us to separate the data storage from our servers in much the same way that file servers are used to separate data from desktops and provide more robust management functionality like centralized backup and recoverability.

Storage has been evolving throughout the history of computer systems. Storing both operating system state and data within the computer caused management challenges such as storage over provisioning, data duplication as well as expensive and ineffective backup solutions. Shifting data storage to Storage Area Networks (SAN) provided numerous advantages in both hard and soft dollar cost savings. The final evolution of storage management is to separate the boot disks from systems and turn them into stateless compute devices. The netBoot/i™ technology separates state from compute devices and allows them to run from iSCSI SAN. This provides solutions for:

- Managed Desktop – netBoot/i allows you to share read-only images across large numbers of desktops which keeps processing power closest to the users while centralizing the management of desktop. When software needs patched or upgraded, then only one image needs to be changed and all desktops will instantly receive the new software.
- Managed Servers and Blade Servers - netBoot/i separates system state from hardware which allows you to quickly provision new servers and move them easily to different hardware, placing the right workload at the right place at the right time.

MANAGED DESKTOPS

Whether you're managing desktops in a call center, a campus lab or general purpose business desktops, your challenges remain the same. How do you provide the best possible desktop experience to your end-users while still controlling costs and reducing the amount of management required caring for the environment over time? Implementing netBoot/i solutions for managed desktops will give you all of the management capabilities that you need while providing end-users with the desktop experience that they need to get their work done. You won't have to worry about users competing for shared resources since they have their own dedicated computing resources that provide the most efficient work space possible. What most IT managers would like to have is the centralized management capabilities of thin clients with the power and flexibility of a desktop. netBoot/i provides the ability to completely remove the disk storage from your desktops and centralize it on your SAN. Then you can assign individual computer images or groups of images and a selection menu to your desktops. netBoot/i works with your existing 32-bit or 64-bit operating systems and applications so you don't have to worry about starting over from scratch with a new platform. You can simply transfer the existing images to your SAN and then assign them to the computer that needs them now. For example, if a manager's office is being renovated and they need to work from a spare cubicle you can simply click on their computer's image and reassign it to the computer in the spare cubicle and they won't notice anything different because it is the exact same image.

If a netBoot/i managed desktop becomes infected or corrupt, then you don't have to spend hours trying to diagnose and fix the problem. netBoot/i gives you the option to keep your base images in a read-only state and only update them when you are ready. Simply tell the user to turn off the computer's power and then turn it back on and their desktop is instantly restored to the pristine state that they began the day with. Their data is still stored on file servers and application servers safely behind corporate firewalls.

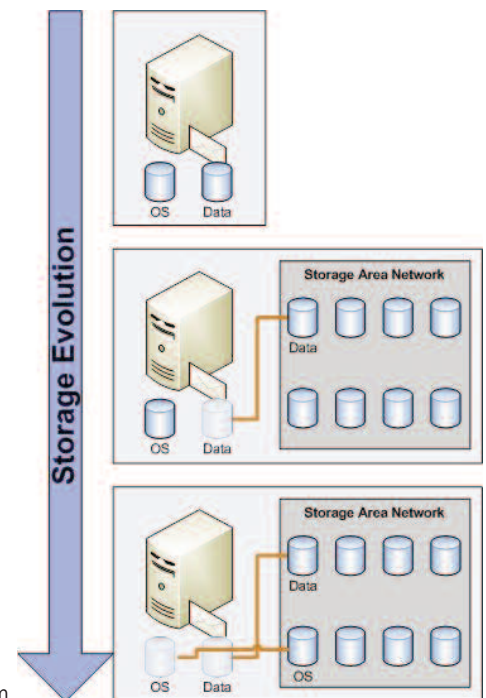


Figure 1: Evolution of Storage

MANAGED SERVERS, BLADES AND VIRTUAL SYSTEMS

netBoot/i also provides the same quick provisioning features on server and Blade platforms. This allows you to unbox and rack new servers and put them in production within seconds. Simply tell netBoot/i which of your pre-configured images that the new systems should boot and turn the power on. Once the machine is running then you can customize that image with its unique configuration and persist any changes to its image.

You can even perform boot from SAN from virtualization platforms which further reduces the time and complexity of managing workloads. Perhaps you've simply run out of compute power on a heavily used virtualization server and need to move that workload to another system. However, the two virtual platforms are not on compatible hardware so you can't use that vendor's tools to quickly move the workload - or maybe you're switching virtualization vendors from VMWare to Microsoft Hyper-V. Both problems are solved with a simple click of the mouse for netBoot/i. Create a new base virtual machine configuration on the new server - you won't even need any disk resources on it - and then have it boot from network. Using netBoot/i, just point the existing running image to its new server home and then shutdown the old VM and start the new VM on the new host server. The guest will boot, find the netBoot/i server and receive its instructions where to find its boot disk on the SAN... then it boots the operating system as normal and starts processing within seconds.

Fast Provisioning

Fast provisioning reduces the amount of time required to deploy a new computing resource. Provisioning tasks traditionally require installing and configuring the operating system, installing and configuring the applications, service packing and patching all of the software.

Disk imaging technologies historically have helped IT departments deploy new desktops and servers by eliminating the need to perform installation on each desktop. However, they still require the time to copy new images to each of the computers making them increasingly unsuitable for the modern enterprise. Disk imaging can take a long time on a moderately sized network because of the contention for network resources between the imaging server and the image clients.

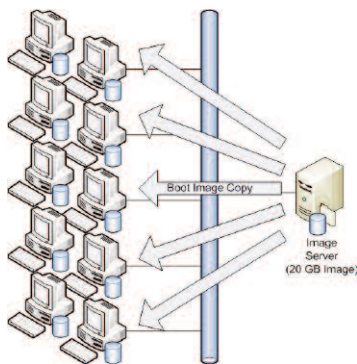


Figure 3: Dynamic Reprovisioning

Worse still is that the clients can't be used while the imaging process is happening, (which can take hours to complete). Thus, many IT organizations have resorted to visiting each computer and replacing hard drives with updated images manually. If a hard drive image becomes infected or corrupt, then the computer becomes unusable until the drive is re-imaged or swapped with a new hard drive.

The netBoot/i technology eliminates image copying and all manual hard drive updates processes by completely eliminating the hard drive from the system and centralizing the management of system images. When a new computer is deployed, an administrator simply chooses which image that system should boot and then it's simply turned on; the image is loaded dynamically and available within seconds. If a computer image becomes infected or corrupt, then the user or administrator can simply reboot to a pristine image and continue working as if nothing had happened.

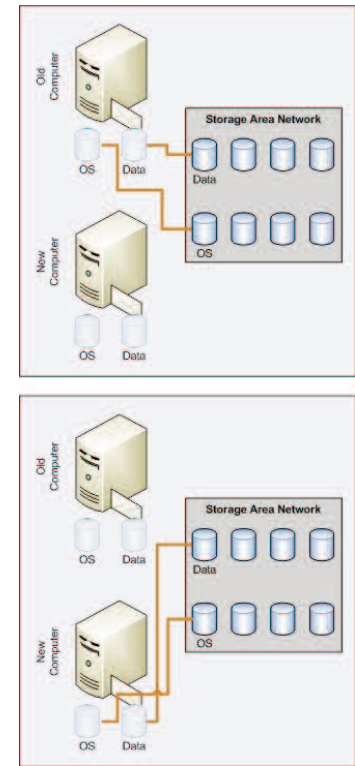


Figure 2: Dynamic Reprovisioning

Centralized Management

Centralized management of computing resources becomes ever more important as the number of desktops and complexity of their applications increase. Many IT organizations have found remote desktop technology useful for centralizing the management of many of their desktop applications. However, most end users have learned to despise these infrastructure technologies because they quickly learn to associate them with terms like “inflexible”, “slow” and “unusable”. Still, their premise is simple enough that most desktop computers have much more computing horsepower than the average user needs. Thus, there are economies of scale to be achieved by centralizing them on shared servers. In practice, we find that these shared platforms don’t provide enough performance when users need it most. Many organizations end up having to revert their thin client infrastructure back to thick desktops over time because the cost savings simply aren’t enough to make up for losses in productivity and user frustration.

netBoot/i combines the best features of centralized management capability while still giving users the full power and usability of a thick client desktop. Updates can be applied to a shared image and made available to all clients without sacrificing application performance and flexibility. netBoot/i also eliminates the tedious nature of traditional desktop support by making thick clients stateless machines that can quickly be replaced or upgraded to different hardware without a significant interruption of service.

SHARED IMAGE DE-DUPLICATION AND PERSISTENCE

netBoot/i also allows computers with similar workload needs to share a common bootable image. This greatly reduces the total amount of storage required to store images by avoiding the duplication inherent in each image’s common operating system and application binaries. User data is stored on database and file servers to keep the images stateless and each computer can maintain a separate writeable cache to store its own unique configuration such as computer name and network settings.

The netBoot/i writeable cache can be non-persistent and stored in RAM; this keeps the computer’s boot image in a read-only state to prevent corruption by accidental misuse or malicious attacks. While most operating systems require less than 75 megabytes of downloaded files to boot, you can also choose to cache boot image data to locally attached hard drives and further reduce network traffic from low to almost immeasurable levels. This can prove beneficial for very large sites with thousands of computers that boot simultaneously on the same ethernet segment.

COMPLETE CENTRALIZED MANAGEMENT

netBoot/i technology centralizes all management of the last remaining storage devices in your enterprise. netBoot/i uses a completely software- driven platform, which means that you don’t have to purchase expensive boot-from-SAN HBAs for your computers like other boot-from-SAN solutions require. These are highly specialized adapters that are much more expensive than their non-bootable counterparts. In addition to those hard dollar total cost of ownership benefits, netBoot/i does not require any hands-on updating process like solutions that require manual firmware flash updates any time that a workload must change. netBoot/i boot from SAN solutions are managed anytime, from anywhere, at the click of a mouse.

Centralizing the physical location of your boot images to SAN allows you to take advantage of technologies like snapshots, cloning and replication that are native to SAN platforms. Thus you can create point-in-time copies of your entire data center at regularly scheduled intervals for fast restoration in cases of logical corruption. You can also clone systems when provisioning new and similar workloads, thus eliminating the need to build the system or to maintain base images. Your existing production systems can be those base images.

In addition, you can develop and test new system and then once the implementation is approved you simply clone and boot them on their production hardware. Storage area networks can also provide replication functionality that can provide off-site recoverability cost effectively for non-critical workloads that can’t justify the budget for more robust recoverability solutions. Storage replication is perfect for disaster recovery of desktops and tier 3 workloads that have low change rates (such as web servers).

NETBOOT/I SYSTEMS ARCHITECTURE

The netBoot/i architecture is composed of three major functions that work in concert to perform client boot from iSCSI SAN.

Clients: Provide the basic compute and memory hardware that run workloads. These can be desktops, servers, blade computers as well as virtual machines, which will boot from an iSCSI SAN rather than direct-attached disks. Clients can be any computer that supports the industry standard Wired for Management PXE protocols.

iSCSI SAN: Stores the bootable workload images outside of the client for manageability and recoverability. The sanFly™ iSCSI Target software can run on any Windows® machine and allow provisioning and sharing of that server's unused disk resources using iSCSI protocol.

Management Server: Matches clients with their iSCSI boot images and any necessary pre-boot functionality.

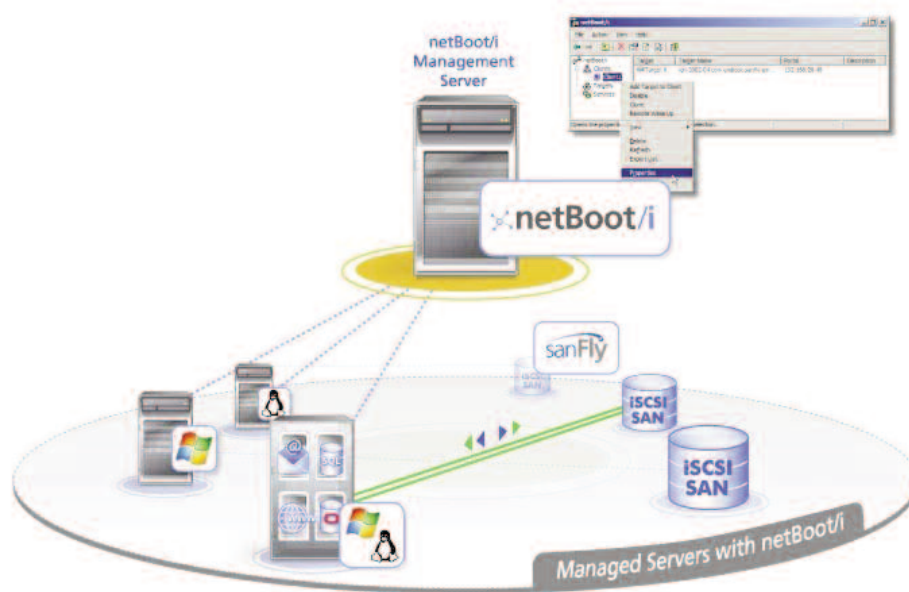


Figure 4: How netBoot/i Works

BOOT PROCESS

1. Client computer begins boot from network process by polling the network for a DHCP server and using the Wired for Management specification.
2. netBoot/i will also respond to the request if the client computer's MAC address is registered as a network bootable computer.
3. The client computer receives a bootable image, which may be preceded by a pre-boot image that provides iSCSI mapping prior operating system boot, for OS's that don't have native bootable iSCSI drivers.
4. Finally the client operating system begins to boot, using the disk image stored in the Target iSCSI LUN. Changes to the image can optionally save to the boot image or be discarded upon reboot.

NETBOOT/I MANAGEMENT SERVER

The netBoot/i Management Server provides the services that map available iSCSI boot images to computers and helps facilitate the communication necessary for them to connect and boot from iSCSI SAN.

You create netBoot/i clients by referencing their ethernet MAC address and then assign one or more bootable iSCSI Target LUNs. There are advanced options that

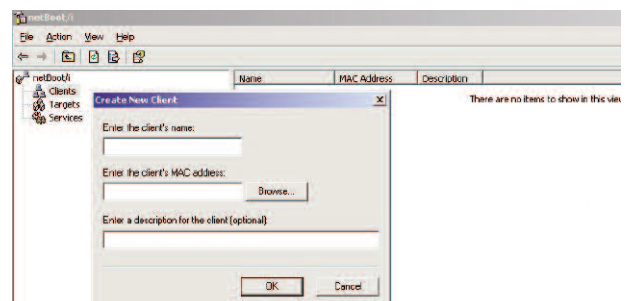


Figure 5: Creating a New Client

provide fail-over functionality to split boot loads between different iSCSI storage devices and provide fail-over for boot redundancy. If a client has more than one image assigned to it, then you can also provide a menu to the computer's user that allows them to select the image that they want to boot at that moment. Later, they can reboot and select a different image when they finish the previous task. This solution works well by providing full CPU power directly to the users while maintaining full centralized management capabilities.

ISCSI SAN AND SANFLY

netBoot/i uses industry standard communication protocols and all of your existing infrastructure. iSCSI storage provides the most cost-effective total cost of ownership because it doesn't require any specialized hardware. Whereas fiber channel-based solutions require very expensive HBA adapters in each computer to provide basic connectivity to fiber channel storage and redundancy against failure. netBoot/i can turn your existing iSCSI storage by simply building out LUNs and then use netBoot/i to point clients to that storage. If you don't have iSCSI storage in your data center or if you would like to continue leveraging your investment in direct-attach or fiber channel storage, then sanFly from Double-Take® Software can help.

sanFly is software that runs on any Microsoft Windows® computer and provides iSCSI Target services to your network. You simply create iSCSI disks with sanFly that reside as file on that server's disks in the Microsoft VHD (Virtual Hard Drive) format. Then sanFly makes those target LUNs available to your boot from SAN clients using cost-effective ethernet and IP protocol.

SUMMARY

netBoot/i software can provide a great deal of functionality easily by using your existing technology infrastructure. This saves you time and money when deploying new computers, protecting workloads and migrating existing workloads to new platforms. You can also combine the netBoot/i technology with the rest of the Double-Take Software product family to create the most complete computer systems recoverability solution at the most cost-effective price point in the industry. Contact Double-Take Software if you would like to learn more about the benefits of netBoot/i and our other solutions.

About Double-Take® Software

Headquartered in Southborough, Massachusetts, Double-Take® Software (Nasdaq: DBTK) is a leading provider of affordable software for recoverability, including continuous data replication, application availability and system state protection. Double-Take Software products and services enable customers to protect and recover business-critical data and applications such as Microsoft Exchange, SQL, and SharePoint in both physical and virtual environments. With its unparalleled partner programs, technical support, and professional services, Double-Take Software is the solution of choice for more than ten thousand customers worldwide, from SMEs to the Fortune 500. Information about Double-Take Software's products and services can be found at www.doubletake.com.

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