The Benefits of Blade Servers & Virtualization

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The System Administration Services (SAS) group within ITS' Communications & Computing Services has, in recent years, been faced with the challenge of managing a burgeoning server farm[1] in a finite amount of space, while also striving to meet the explosive growth in demand for new applications and services from the NYU community. That challenge is being addressed in two phases.

Phase I: Blade Servers, Dynamic Storage & Better Backups

In the first phase, which took place over the past year, SAS transitioned the large farm of servers that it manages for various key departments at NYU from a collection of stand-alone and rack-mounted servers to IBM Blade Server technology. Blade Servers are slim units that fit in a single chassis and can be replaced while the computer is operating (known as "hot-swappable"). Each unit is an independent server with its own complement of processors, memory, local storage, network controllers, operating system, and applications. A Blade Server simply slides into a bay within the chassis, like a book in a bookshelf, and plugs into a mid- or backplane,[2] sharing power, fans, floppy drives, switches, and ports with other Blade Servers.

As part of this transition to Blade Servers, the provisioning of disk storage for our managed servers changed significantly. In place of isolated pools of storage allocated to individual servers, ITS put in place a storage area network (or SAN) to which all the Blade Servers are attached. Storage for all ITS Blade-based systems is now provided centrally from a new IBM FastT DS4500 SAN-based shared disk storage array. The move to SAN-based storage not only allows us to more efficiently manage space, but provides our clients with the capability of increasing storage on demand—no further need to worry if your server has enough space to meet your expanding storage needs.

In parallel with the move to Blade Servers and SAN-based storage, SAS has consolidated the backups of all of its managed servers onto the same centralized system that is used to back up all of the ITS-managed "mission critical" systems. Since we adopted this approach, the amount of time it takes to back up the ITS-managed servers has been greatly reduced.

Phase II: Virtualization

As important as this first phase has been, it is in a sense only the groundwork for what is to come. In the second phase, which began this past summer, SAS is beginning the implementation of a suite of products from EMC/VMWare that will enable hardware "virtualization," a process that decouples the physical hardware from the operating system to deliver greater IT resource utilization and flexibility.

Virtualization enables the partitioning of a physical server into one or more "virtual machines." Each of these machines has its own set of virtual hardware (e.g., RAM, CPU, NIC)[3] upon which an operating system and applications are loaded and run. The operating system sees a consistent, normalized set of hardware regardless of the actual physical hardware components. Virtual machines are encapsulated into files, making it possible to rapidly save, copy, and provision them. Full systems (including

1. A server farm is a group of networked computers housed in one location and designed to streamline computing processes by distributing work among the various computers (servers).
2. A "backplane" is a circuit board that links several connectors in parallel with each other, forming a computer bus. It is used as a backbone to connect several printed circuit board cards together to make up a complete computer system. *(*Wikipedia*, http://wikipedia.org/wiki/Backplane)*
3. Random Access Memory, Central Processing Unit, and Network Interface Card, respectively.

fully configured applications, operating systems, Basic Input/Output Systems [BIOS],[4] and virtual hardware) can be moved, within seconds, from one physical server to another for zero-downtime maintenance and continuous workload consolidation.

In the virtualized environment being implemented by ITS, hardware management is completely separated from software management, and hardware equipment can be treated as a single pool of processing, storage, and networking power to be allocated and de-allocated on the fly to various software services. Through all of this, ITS clients who use the new virtual infrastructure will still experience resources as if they were dedicated to them, and will continue to enjoy the same high level of performance and reliability they are accustomed to receiving from ITS (with a few added benefits, as described below). On the ITS side, however, we will have the flexibility of operating services in an expandable pool of resources that can be managed globally across the University.

Most important for our clients, the move to a "virtual infrastructure" will enable ITS to offer services that were not possible before. A virtual server can be tailored precisely to the requirements of an application without the need to over-provision memory in anticipation of possible future needs. Should a virtual server require a memory upgrade, all that needs to be done is to shut the server down, change a setting in the virtual machine definition that governs the amount of memory assigned to the system, and restart the server. Further, the virtual hardware presented by a virtual server remains the same no matter how the underlying physical hardware changes. This will make it possible for a client's "system" to be upgraded to faster, more powerful hardware without the headaches of moving the system to a new hardware platform.

With virtual machines, the testing of new applications destined for production becomes greatly simplified—once licensing issues with the applications are worked out, all that is needed is to shut down the virtual machine and copy the files. Testing new applications can then proceed (with some minimal reconfiguration of the copy), using a fully functional image of the production environment as of the time that the copy was created. This will give SAS the ability to offer either permanent or transient test environments "on demand" to those clients who need it.

The combination of Blade Servers, consolidated storage and backups, and the move to a virtual infrastructure will allow SAS to offer the NYU community a platform for its applications that is flexible, extensible, and as cost effective as possible. For more information about the services provided by ITS Systems Administration Services, contact the ITS Client Services Center at 212-998-3333.

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4. BIOS refers to the software code run by a computer when first powered on. (Wikipedia, *http://en.wikipedia.org/wiki/BIOS)*

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correction of any problem areas in the file, such as overlapping vertices, aligned and unconnected surfaces, and inverted normals.[3]

The Advanced Media Studio

The Advanced Media Studio (AMS), located at 35 West 4th Street on the 2nd floor, provides three dimensional printing services to all faculty, students of the arts, and visiting artists with approved project proposals (see p. 23). The AMS also offers access to a suite of 3D modeling programs, including sophisticated CAD packages such as: Form•Z, SolidWorks, and Cobalt; the NURBS modeling software Rhino; the 3D animation-oriented package Maya; Mathematica and MATLAB; and SketchUp, an easy-to-learn, conceptually-based 3D modeling program. Clients interested in using this service should note that file inspection and correction is their responsibility, and will involve learning ZCorp's ZPrint software.

Figure 4. Sculptural shapes generated by the Z510 printer.

For more information about 3D printing services at the ITS Advanced Media Studio, visit *www.nyu.edu/its/ams/*, or send email to its.rp@nyu.edu.

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3. A "normal" is a 3D vector that is perpendicular to a flat surface. (Wikipedia, *http://en.wikipedia.org/wiki/Surface_normal*)