

Virtualisation Revisited

Building Large Complex Networks in a Teaching Environment

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Background

In a teaching environment there is the continuing problem of sharing the resources of a network lab that is used by many different classes. With each class having specific requirements and needs, many ideas have evolved to meet those challenges. Among the main options have been the use of multi-partitioned drives, exchangeable hard disks (caddies), PXE Servers to save/restore images and the use of virtualization (virtual machines).

Just a few years ago when considering the possible strategies, virtual server products such as VMware were often dismissed for use in the setting up a lab infrastructure. Budget constraints often meant that virtual server software license costs, the need for more RAM and large amounts of disk space to run the virtual machines were often difficult to justify compared to other options.

Introductory and intermediate level networking courses are generally not as demanding on resources as are networking projects for senior third year students. Although the number of senior students in a class may often be less (and even using small groups), their requirements for computers is significantly higher particularly when needing to build large complex networks.

Why Revisit?

There are several reasons to consider revisiting virtualization and using virtual machines in a teaching environment.

- **Free Software** - For those on a tight budget it and with 30-day evaluation software not a viable option, there are now many full featured and free editions of products available on a range of platforms. Microsoft has also entered the ring with their free offerings.
- **Established Technology** - Virtualisation is being increasingly adopted by organizations as part of the infrastructure in creating large reliable networks. Teaching practitioners need to expose students to these technologies.
- **Convenience and Time Saver** - Labs may have a "normal" state in which they usually exist for most classes. Senior student projects often require significant rearrangements which then have to be reconfigured back to normal before leaving; the time taken reduces the productive time in class. Virtual networks may be created. Physical networks and virtual networks can be bridged or connected by NAT.

- **Affordable Hardware** - It is now becoming far easier to plan for the next upgrade of equipment in labs for a class of computers that are based on dual core, 64bit processors and without the limitations of motherboards "maxing" out at 4GB of RAM. There exists greater potential for using virtualization.

Main Free Products

- **VMware Server** - Windows or Linux hosts with Windows, Netware, Linux, Solaris guests.
- **VMware Converter** - convert physical machines to virtual machines.
- **VMware Virtual Appliances** - pre-installed and pre-configured applications that run in virtual machines.
- **Microsoft Virtual PC 2007** - Windows host with Windows and OS/2 guests.
- **Microsoft Virtual Server 2005 R2** - Windows host with Windows and Linux guests.

There are many other proprietary and GPL virtual machine products available, eg. Xen.

Building Large Complex Networks

There is considerable scope in investigating the use of the various virtualization products.

The networks that are planned are based on the following:

- Four servers per computer - the host and three guests.
- Network Load Balanced Clusters of Web Servers and Network Load Balanced Clusters of Terminal Servers.
- High availability arrangements of MS SQL Servers using database mirroring that requires the use of a principle, mirror and witness servers.

Links

<http://www.vmware.com/products/>
<http://www.microsoft.com/windowsserversystem/virtuals/erver>
<http://www.xensource.com/products/>