

# Virtualization on the Desktop

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# Background

- My Background. I've been a computer programmer/software engineer almost continually since 1972. I first worked with virtualization with IBM's VM370 in the mid-1970s. As a computer programmer and not a system administrator, my interest in virtualization stems primarily in using it as a tool to either be able to run an application that can't be run on native Linux or to run several different versions of Linux. For instance, running a Linux C++ compiler and Windows Visual C++.



# Overview

- Virtualization on today's desktop and laptop computers can be a very useful tool, but in a much different context than server virtualization. Users may have a need to run Linux on a Windows PC or run Windows on a Linux or Macintosh system. A user may have a legacy application that does not run on Windows Vista, Linux, or even Windows XP. Today's solution would be to run one of the several virtualization managers that are available either as Free and Open Source software or as commercial packages. Most PCs today have sufficient memory and CPU cores where 2 or more operating systems can run at the same time. Many of these products not only run on Windows XP, Windows Vista, Macintosh, and Linux, but they can host virtually everything from MS-DOS, Windows 3.1 up through Windows Vista and the latest Linux and FreeBSD products.
- **Please feel free to ask questions at any time.**



# Some Useful Terms

- **Virtual Machine**. Essentially this is a container in which can use to run an operating system, Like Windows or Linux.
- **Virtual Machine Manager (VMM) == Hypervisor**: This is essentially the system managing the virtual machines, such as VMWare or Xen.
- **Host OS**. This is the operating system that is running natively on the computer where the virtualization manager runs.
- **Guest OS**. This is the OS that resides inside the virtual machine.



# Why virtualize your desktop

- ◆ I run Windows but I also want to try Linux, but I don't want to set up dual booting.
- ◆ I run Linux, but need to run Windows for some specific applications that won't run on Linux (and Linux with WINE).
- ◆ I have Windows Vista, but some applications don't run properly. So, I install Windows XP in a Virtual Machine.



# Can I use Virtualization

- The short answer is yes, certainly. There are VMMs that run under Windows, Linux, Macintosh, FreeBSD, and even natively on X86 hardware.
- How much does it cost. Many of the desktop level VMMs are available free of cost or at low cost (under \$50). I'll mention this in the upcoming slides.
- Can I run more than 1 guest OS. Yes, you can run several at the same time.



# Performance

- For desktop uses, performance is associated with the amount of memory in the system as well as the number of effective CPUs. Obviously your guest OS is not going to perform as well virtually as it does natively.
  - **Memory:** Essentially, you may assign a certain amount of memory to each virtual machine. Assign too much memory and your entire system can slow down.
  - **CPU:** Some VMMs allow you to allocate a number of CPUs to a virtual machine.



# Snapshots

- One of the features of most of the Virtualization Managers support a snapshot feature where you can save the state of your virtual machine.



# Some Desktop Virtualization Solutions

- VMWare (<http://www.vmware.com/>) is the oldest PC Virtual Machine Manager. They have a number of free desktop clients for x86 based systems. Runs under Windows and Linux. VMWare recently open sourced some products.
- Sun's Virtualbox (<http://www.virtualbox.org/>). supports Windows, Linux, OpenSolaris, and Macintosh. Virtualbox is free and Open Source.



# Some Desktop Virtualization Solutions

- Xen (<http://www.xen.org/>). Xen is an open source virtualization system supporting x86, x86\_64, IA64, PowerPC, and supports Windows, Linux, and other operating systems. It is now part of Citrix.
- KVM/QEMU(<http://kvm.qumranet.com/kvmwik>). This is a Linux based Kernel Virtual Machine that uses the virtualization extensions of the hardware, specifically the Intel VT or AMD-V chip extensions. It also requires QEMU. KVM is integrated into Linux as of the 2.6.20 kernel, and is fully free and Open Source.



# Some Desktop Virtualization Products

- Microsoft Virtual PC is a virtualization solution for both Windows and Macintosh systems. It runs only Windows Guest OSes.
- Win4Lin (<http://win4lin.net/content/>) is a virtual machine manager that runs on Linux and supports Windows 2000 through Windows XP. Because of its design it is very lightweight. One additional feature is that Win4Lin uses the native Linux file system in the user's home directory to store files making interaction with Linux easier.



# A Real World Example

- In my company our products run on Unix and Linux.
  - We standardize our laptops are Lenovo Thinkpad (mostly single CPU) systems running Windows XP as the Host OS.
  - We install VMWare Workstation with 2 Linux Virtual Machines, each running Red Hat Enterprise Linux 5.2.
    - The first guest runs full networking so it can connect to the company's intranet.
    - The second is set up for local only so it can be used as a demo machine at a client site



# A Real World Example

The screenshot shows a VMware Workstation window titled "apd - Red Hat Enterprise Linux 5.2 (32bit) 50g - VMware Workstation". The virtual machine's desktop is visible, featuring a dark red background with icons for "Computer", "algo's Home", "Trash", and "RHEL/5.2 i386 DVD". A terminal window at the bottom of the VM displays the text: "To direct input to this VM, move the mouse pointer inside or press Ctrl+G." The RiskMetrics application window is open, showing a "Web Browser" interface with a menu bar (File, Edit, View, Options, Stress Test, Help) and a toolbar with icons for Instr, Port, Curve, Model, FX, Scenario, Stress, Optim, Template, Recalc, and Graph. The main content area displays "USD 1day MC - Please perform recalculation" and a table of portfolio positions. An error message at the bottom of the application window reads: "ERROR -20002: Invalid pathname to RiskMetrics data. Can't find appropriate data files in ..".

Position	POS/Position Units	THEO/Value	Unrealized Profit	FAIR/Risk
17433	600,000.0000	82.1596 USD	0.0000 USD	
61893	800,000.0000	77.4287 USD	0.0000 USD	
CEG56	10,000.0000	97.3040 USD	0.0000 USD	
EID01	52,500.0000	103.8020 USD	0.0000 USD	
EID03	40,000.0000	100.7503 USD	0.0000 USD	
EID04	120,000.0000	95.0486 USD	0.0000 USD	
EID07	300,000.0000	85.0067 USD	0.0000 USD	
EID08	100,000.0000	93.3485 USD	0.0000 USD	

# A Real World Example

The screenshot shows a VMware Workstation window titled "apd - Red Hat Enterprise Linux 5.2 (32bit) 50g - VMware Workstation". The guest OS is Red Hat Enterprise Linux 5.2. The desktop environment includes a terminal window at the bottom and a RiskMetrics application window in the foreground. The RiskMetrics window displays a table of financial data for various positions and includes a status bar with an error message.

USD 1 day MC - Please perform recalculation

FAIR/RiskMetrics VaR

Previous time	Advance time	Reset time	1999/02/01	Mark time	1999/02/01	Stk
Prev scenario	Next scenario	Reset scenario	N/A	Mark scenario	N/A	En
Position	POS/Position Units	THEO/Value	Unrealized Profit	FAIR/Risk		
17433	600,000.0000	82.1596 USD	0.0000 USD			
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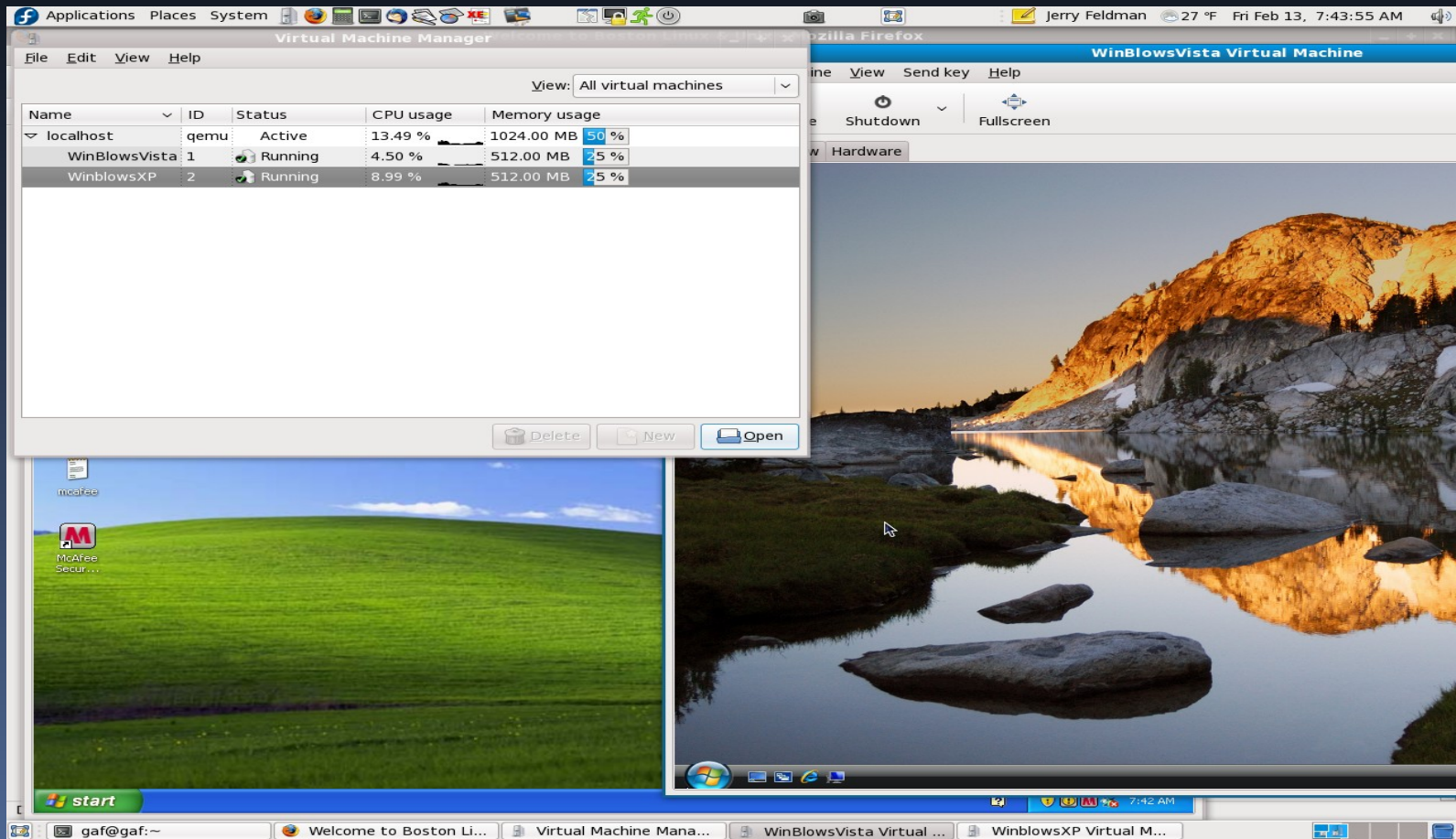
ERROR -20002: Invalid pathname to RiskMetrics data: Can't find appropriate data files in ..

# An Example of KVM/QEMU under Fedora 10 Linux

- In the following screenshot we have both Windows Vista and Windows Xp running in a KVM/QEMU environment under Fedora 10 Linux.



# Windows XP and Vista on Linux



# Summary and Demo

- The bottom line is that there is a desktop virtualization product that can be used on most desktop systems today, and it is a much better solution than dual booting, except possibly for gaming.
- I have VirtualBox 2.1 installed on this system with Windows XP and Fedora 10 Linux installed as guest OSes with Ubuntu 8.10 Intrepid Ibex as the Host OS.
- My system is an HP Compaq NX6125 with a single core AMD Turion (64-bit) chip.



Windows XP and Fedora 10 on an Ubuntu 8.10 Host OS

# DEMO

