

Windows Interoperability with Linux Systems

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Agenda

- Capabilities built into Linux today
- The Wine Project
- Virtual Network Computing (VNC)
- VMware
- Q&A



Linux

built in interoperability

- File System types that can be mounted by Linux
 - The *mount* man page has a complete list of file systems supported for Linux and the options associated with each file system type.
 - All Windows file systems are directly mountable under Linux.
 - ntfs, vfat (msdos, umsdos, fat32, fat16)
 - CDs - iso9660 format with Rockridge and Joliet extensions
 - Smbfs
 - You can mount NT shares under Linux as well!
 - and many more!



Linux Automounter

capabilities

- The Linux Automounter can mount file systems of any of the types we just discussed including CDs!



Linux Automounter

setup

- `/etc/auto.master`
 - one automount daemon process per entry
 - format - */directory /etc/auto.directorymap [-options]*

- `/etc/auto.directorymap`
 - format - *key [-options] location*
 - examples:

```
kernel                -ro,soft,intr
ftp.kernel.org:/pub/linux
boot                  -fstype=ext2           :/dev/hda1
windoze               -fstype=smbfs          ://windoze/c
removable             -fstype=ext2           :/dev/hdd
cd                    -fstype=iso9660,ro     :/dev/hdc
floppy                -fstype=auto           :/dev/fd0
```

- `/etc/rc.d/init.d/autofs start|stop|restart|reload|status`



Running DOS Executables Under Linux

- DOS executables can be run directly under Linux using the DOS emulator *dosemu*.
- The *dosemu* is invoked via the *dos* command
- There is support for:
 - Execution, debugging, printing, logging via syslog, floppy disk access, booting from floppy disks and hard disks
- The *dosemu* can be run in an X window or on the console directly
- Requires kernel version 2.0.28 or above
- Will NOT run Windows 3.1



Running Windows Executables Under Linux

- The Wine Project
- Virtual Network Computing (VNC)
- VMware



The Wine Project

overview

- Open source implementation of Microsoft® Windows® 95/NT® API running on X windows and Linux
- Also supported on FreeBSD, OpenBSD NetBSD and Solaris
- Some work has been done for SCO® UNIX OpenServer, SCO UNIXware and IBM® OS/2®



The Wine Project

approach

- Two part approach
 - Program loader
 - Runs existing Windows applications on x86-based Linux systems without recompilation
 - Wine libraries
 - Provides developers the libraries they need to recompile their Windows applications into native Linux applications easily



The Wine Project

status

- Wine is being developed under GNU Public License (GPL) by both volunteer and paid developers
- Corel is making significant investments in developing Wine



The Wine Project

myths and rumors

- “It will be slow like all other emulators are.”
 - Not true! Wine is an alternate implementation of the Windows API that can provide comparable performance to applications running natively
- “Wine will never be able to run all Windows applications”
 - True and not true. There will always be exceptions to the rule, but the vast majority of modern, commercial applications that follow the standard Windows programming techniques will work under Wine



Virtual Network Computing

- Virtual network computing (VNC) is an open-source project from AT&T research in the U.K.
- Information and downloads are available at <http://WWW.uk.research.att.com/vnc>
- VNC is a low-cost, widely-available method of allowing display “projection” from one system to another
- VNC can solve several nagging problems in your computing environment, and is very useful for providing different desktops to a single user.
- This is a unique, very useful tool!





VNC Components

- VNC is a client-server application, comprising a simple viewer client and a display server.
- The viewer software runs on Unix, Windows NT/9X/CE, and many other operating systems. There is also a Java version of the viewer.
- On a Unix system, the server component is the Xfree86 X-server with no hardware interface.
- On a Windows system, the server hooks into the display manager and traps window update events.
- The server sends display updates to the viewer in the form of “remote frame buffer” (RFB) protocol, which is designed to be bandwidth efficient.
- There are several different compression methods available for the RFB protocol.





Unique Features of VNC

- Platform independence: the viewer can display desktops from any system type: Windows, Unix, Macintosh, or others
- The VNC server desktop maintains state -- if the client disconnects for some reason, the desktop retains its client connections
- The desktop may be shared between multiple client viewers
- The viewer software is extremely simple: the Windows version is about 150 KB in size
- The RFB protocol can operate efficiently over low-speed links



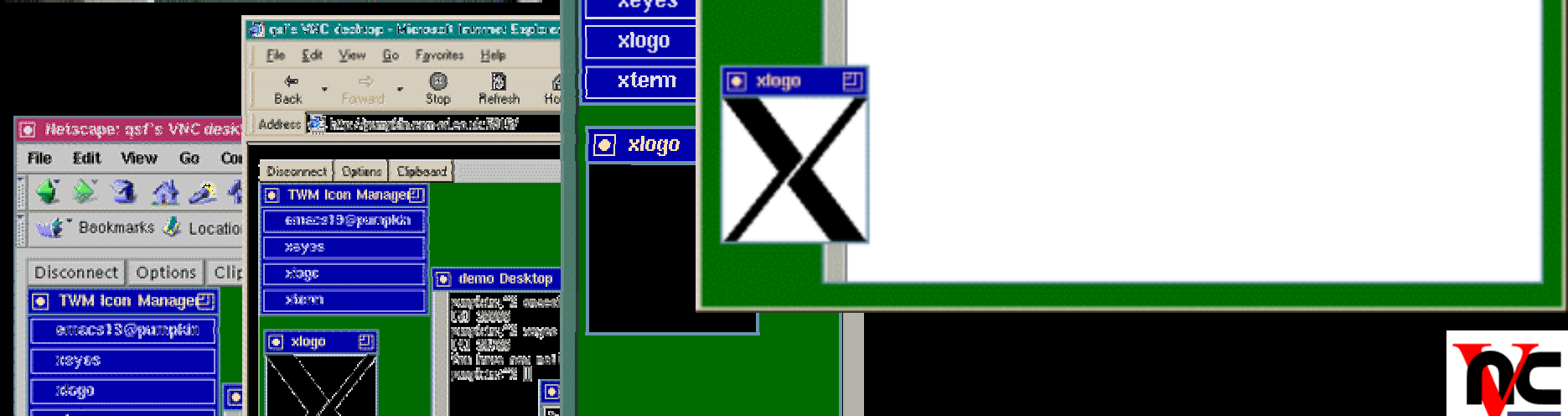
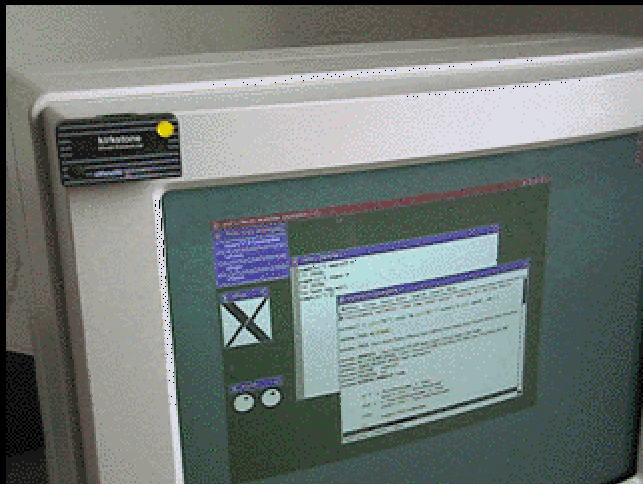


The VNC Client Viewer

- Running the viewer causes you to be prompted for the VNC server hostname and display, followed by a password for authentication
- For convenience, the display identifier resembles the X-windows format: “mysystem:1”
- On a Windows system, the default display is “mysystem:1”
- The viewer supports full-screen mode and several other operations like sending Ctrl-Alt-Del and operating on the clipboard contents via standard function keys



An Example of the VNC Viewer in Action



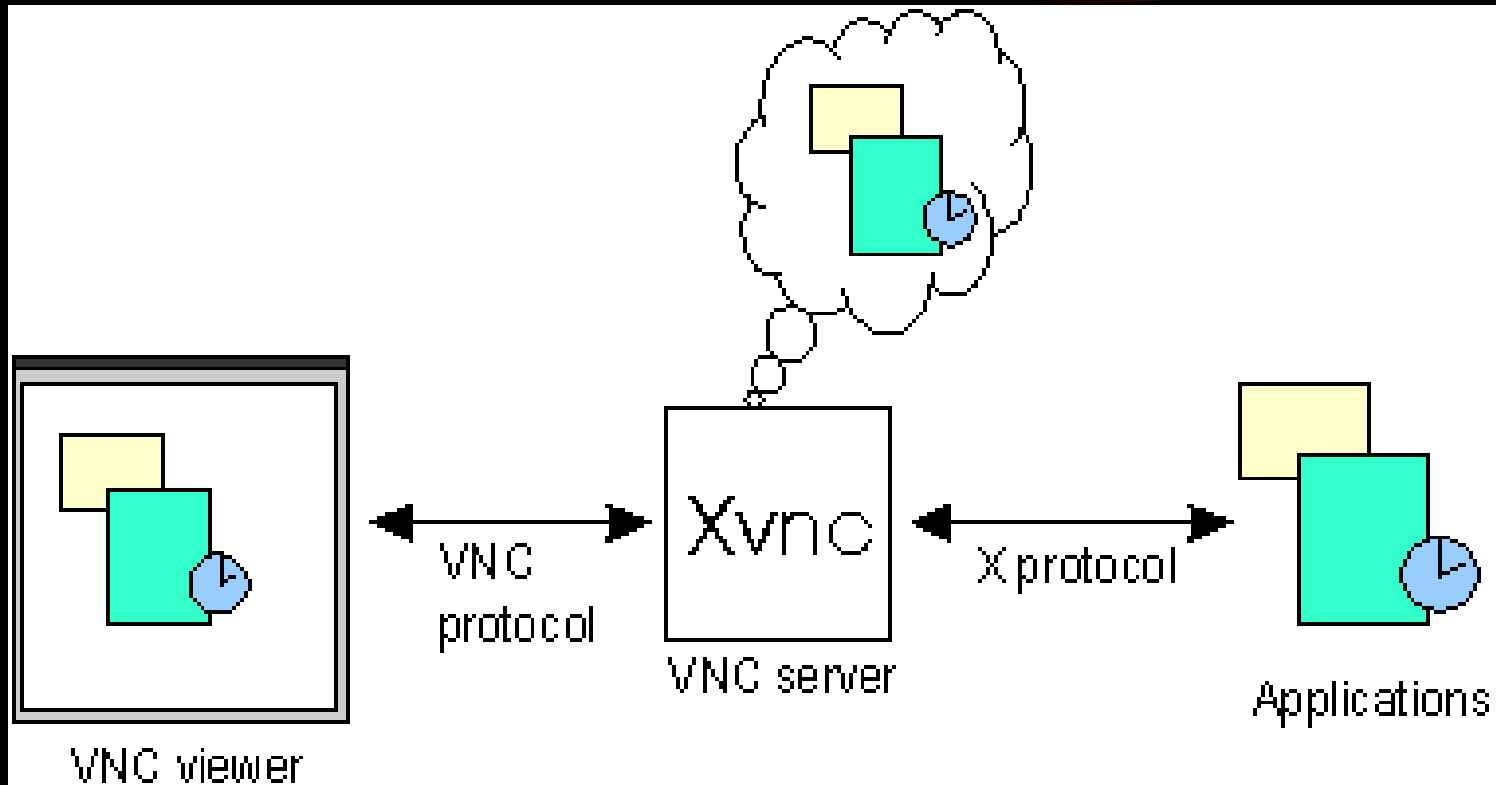


An Example of the VNC Viewer in Action





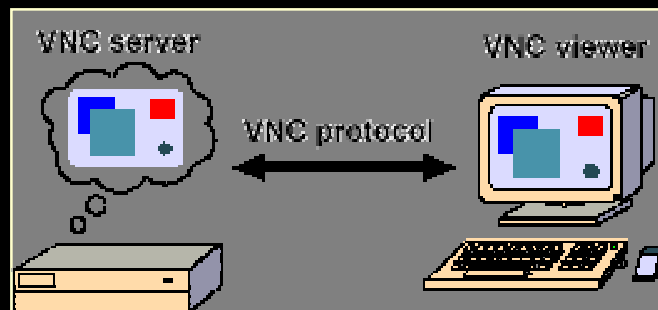
The VNC Server





The RFB Protocol

- Work done by Tristan Richardson and Kenneth R. Wood at AT&T Research in the U.K. and others on the VNC team (see the web site)
- “Put a rectangle of pixel data at location (X,Y)”
- Multiple encoding schemes possible
 - Raw Encoding (NxN identical pixels)
 - Copy Rectangle (duplicate existing rectangle)
 - Run-Rise Encoding: RRE (two-dimensional RLE)
 - CoRRE (no rectangle larger than 255x255 pixels)
 - HexTile (rectangles split into 16x16 sub-tiles)
 - Other? (MPEG, ...)





VMware

overview

- Commercially available product from VMware, Inc.
- IA32 Virtual machines
- Ideas came from scalable OS research at Stanford
- Supported on Linux and Windows NT/Windows 2000
- Hosts any IA32 “guest” OS including:
 - Windows 3.1,95,98,NT,DOS
 - Solaris (IA32 version), Netware
 - Linux, FreeBSD
 - WILL NOT RUN SCO UNIX, UNIXware, or OS/2
- Provides simultaneous boot of multiple OSs
- Cost - \$299, \$99 for non-commercial users, volume discounts available



VMware features

- VM disks can operate in any of 3 modes:
 - persistent - changes are permanent
 - nonpersistent - changes go away
 - undoable - decide at close time
- VM disks are portable and independent of the host file system
- VM networking
 - None
 - Host-only (requires DHCP)
 - Bridged
- VMware provides virtually native performance levels (~3-5% performance loss on local system with full screen window) when using XFree86 v3.3.6 or the VMware XFree86 DGA extensions



VMware features

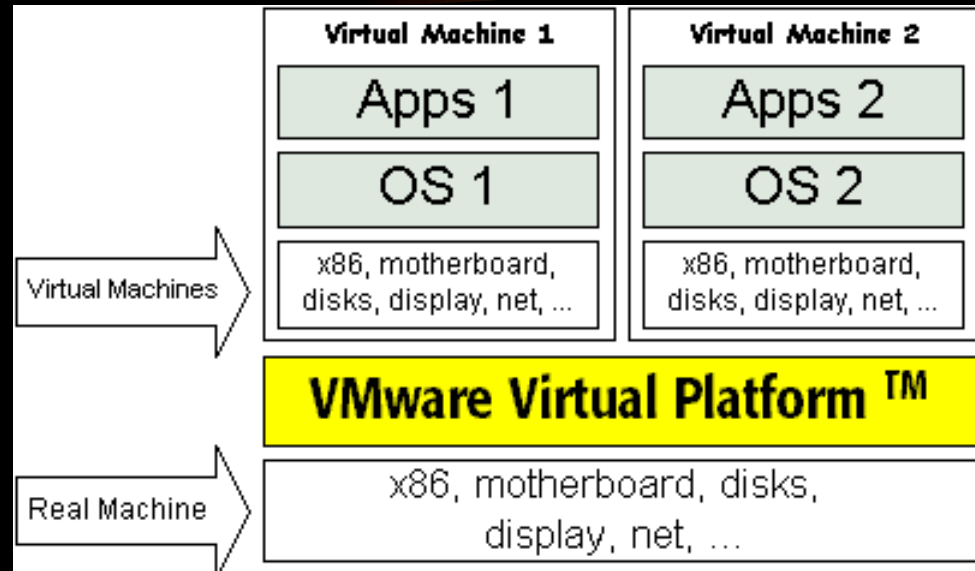
- VMware virtual disks can be mounted onto Linux the file system using `vmware-mount.pl` utility from VMware
 - Very useful for transferring large files between the host and guest
- Usage modes:
 - On individual clients
 - On remote clients using X protocol
 - Reasonable performance
 - Cheaper than putting a second PC on every user's desk
 - “Nonpersistent” mode ensures stable configuration



VMware

Virtual Platform Architecture

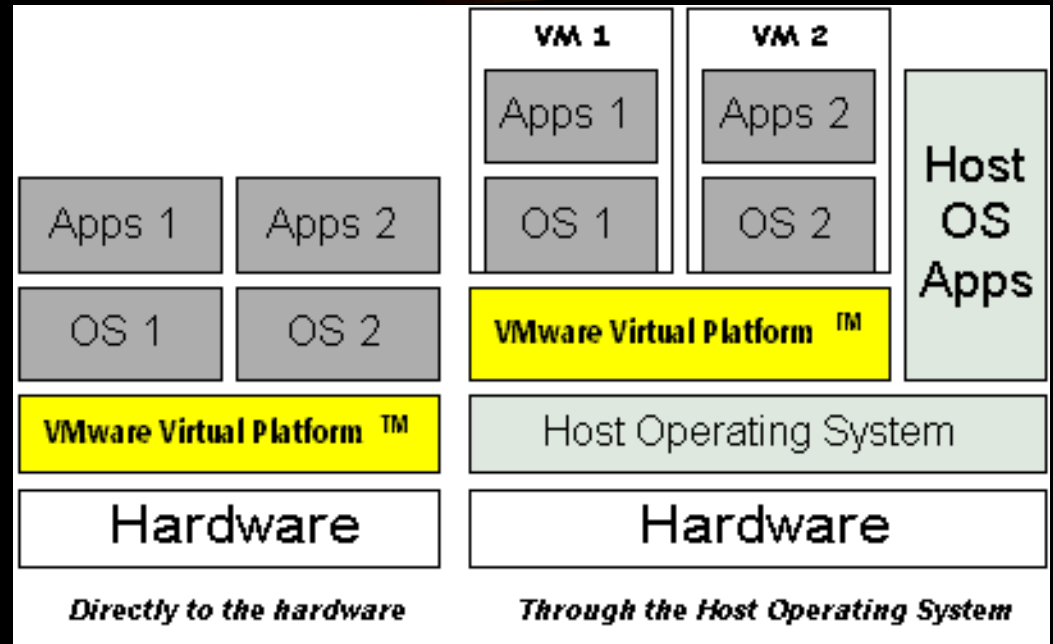
- VMware provides a thin software layer to allow multiple VMs to share the same hardware





VMware Virtual Platform Architecture

- Dual mode personality
 - VM monitor running directly on the hardware
 - Normal application running on host OS

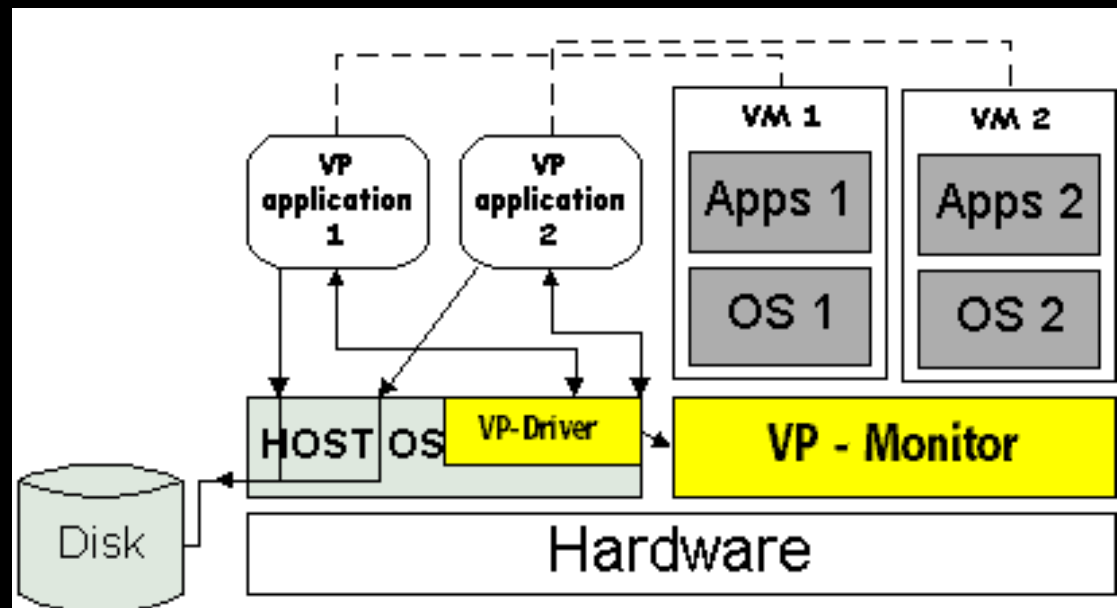




VMware

software components to enable dual personality

- VP application
 - Used to configure, launch and administer VMs
- VP monitor
 - Runs in privileged mode on the hardware
- VP driver
 - Communication gateway between host OS and VP monitor






VMware

screen shot in Linux host environment

VMware: /home/goff/vmware/m4/m4.cfg (VMware for Linux User)

File Power Settings View Help

Power On Restart Full Screen Settings Gosh Help

 vmware

www.vmware.com

Copyright © 1998,1999 VMware, Inc. All rights reserved. Patents pending.
This program is protected by U.S. and international copyright laws.

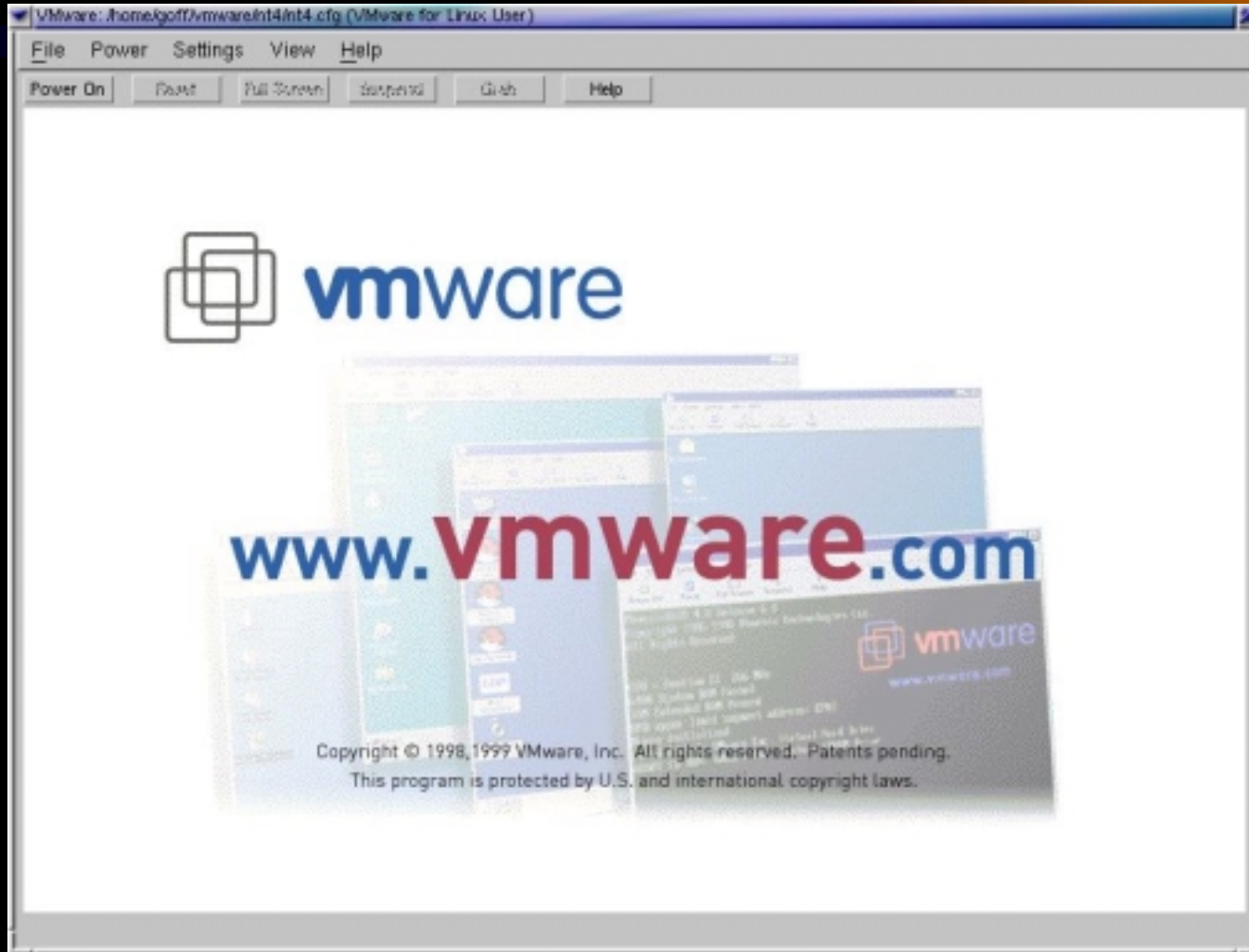
```
usage: vm [-display host:display] [-debug] [-help] [-root|-id <id>|-name <name>] [-
nohdrs] [-out <file>] [-vgl] [-add value] [-frame]
[goFF@psail: vmware-capture]$ vm -root -out screen
[goFF@psail: vmware-capture]$ vm -in screen
[goFF@psail: vmware-capture]$ vm -root -out screen
```

Terminal Thu Jan 13 11:31 AM

VMware: /home/goff/vmware/m4/m4.cfg (VMware for Linux User)

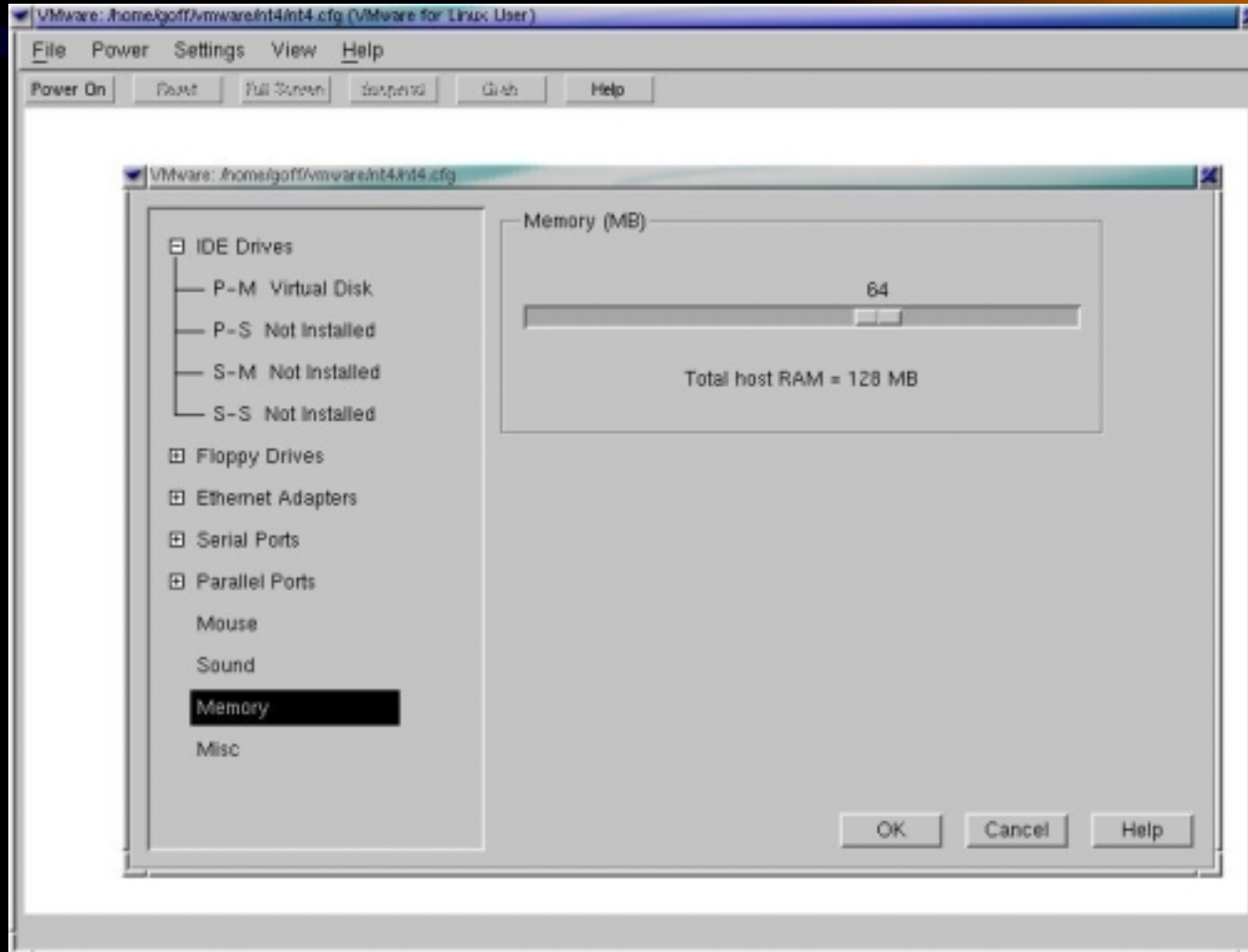


VMware startup screen



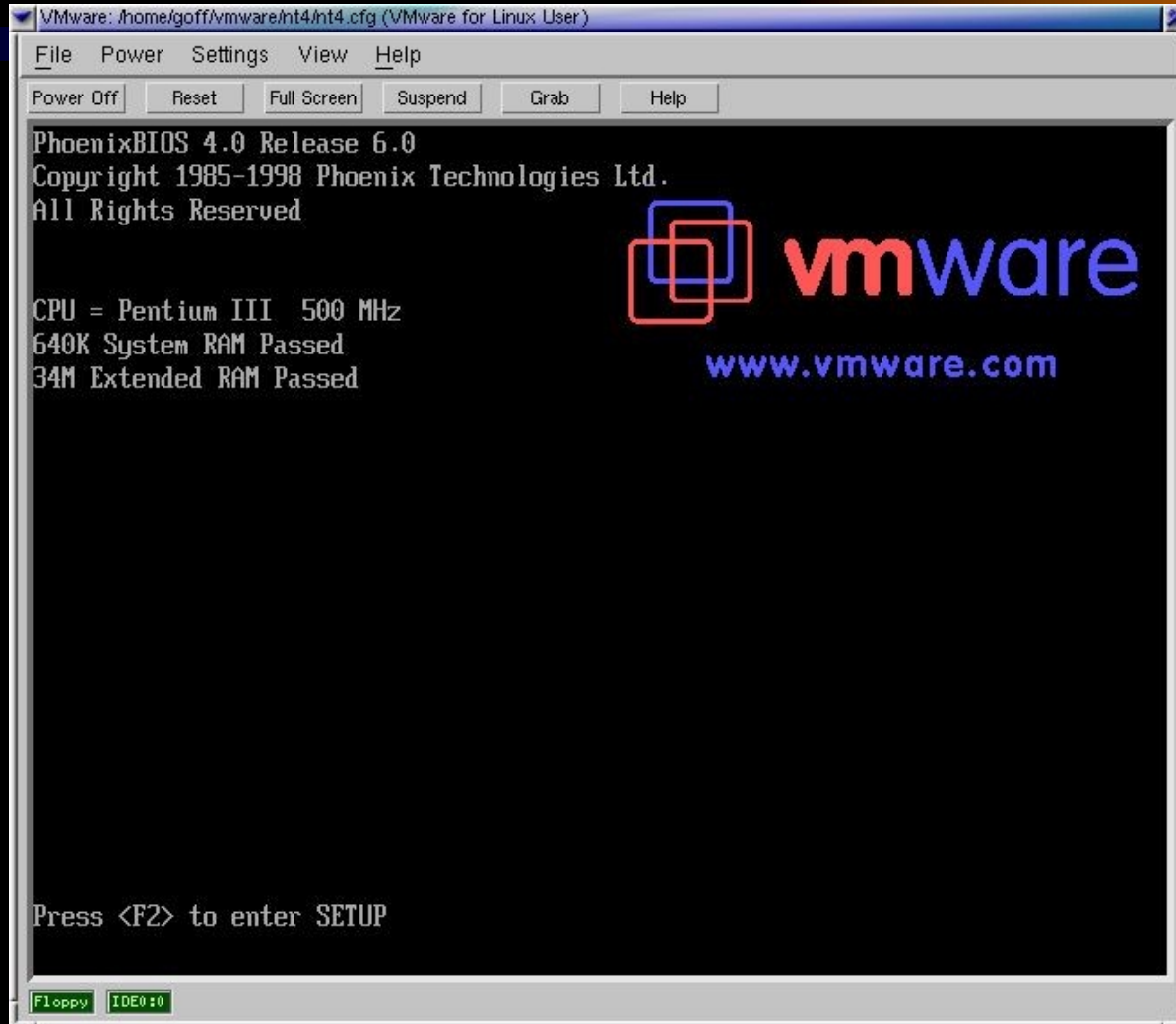


VMware VM Configuration Screen



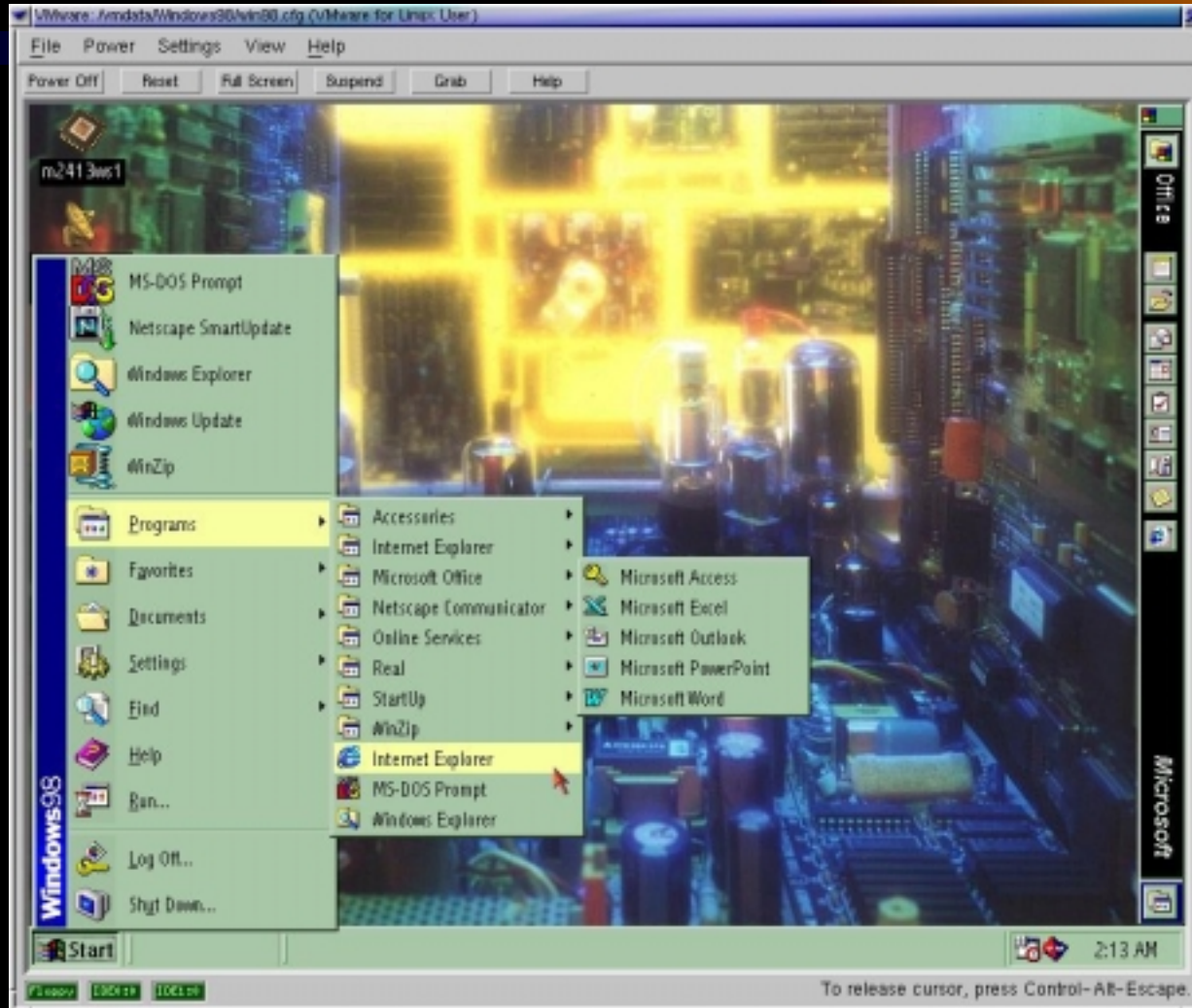


VMware VM Boot Screen





VMware VM Logged In





VMware

- For more information:
 - <http://www.vmware.com>
 - Dave Eaton's presentation, "One Box, Two OSs at the same time"



Questions?