

# **COMP 175**

## **System Administration and Security**



## **INSTALLATION AND CONFIGURATION**



# Installation and Configuration

What we have to learn to do we learn by doing.

-Aristotle, Ethica Nicomachea II c. 325 BC

Using a Live CD/DVD/USB only goes so far.

At some point you'll need to install an operating system

**Physical** – easier in a desktop, less so in a laptop

Multiboot - Partitions across one or more drives

**Virtual machine** - under a host OS

Flexible, inexpensive, experience, real-world

Additional layer of complexity



# Virtual Machines

- A virtual machine (VM) is a "completely isolated guest operating system installation within your normal host operating system". Modern virtual machines are implemented with either software emulation or hardware virtualization.
- An essential characteristic of a virtual machine is that the software running inside is limited to the resources and abstractions provided by the virtual machine—it cannot break out of its virtual world.



# Virtual Machines \*

Product	Host OS	Guest OS
KVM	Linux	Linux Solaris Windows
Parallels	OS X	Linux Solaris Windows
VirtualBox	Linux, Solaris Windows	Linux Solaris Windows
Windows VirtualPC	Windows 7	XP Vista 7
VMWare •Workstation •Player •ESXi	Windows Linux	Windows Linux
XEN	Linux Solaris NetBSD	Linux Solaris XP 2003 Server

\* Standard disclaimer applies, not an endorsement, your mileage may vary.



# Pre-Installation

- Disable all Shadow RAM
- Advanced Power Management
  - ◆ Configure APM to control power management
  - ◆ Disable doze, standby, suspend, nap, and sleep modes
  - ◆ Disable hard disk's power-down timer
  - ◆ Linux power-management better than BIOS's
- Read any installation FAQ's
  
- Changing a partition with a file system already on it *can* damage any information there, so
- Backup first, and Read the Documentation



# Partition Sizes

Depends on role of the computer

- /boot partition – contains kernel images and grub configuration and commands
- / (root) partition
- /var partition
- /home partition
- /swap partition (1x or 2x RAM)

Minimum

- /
- /swap (may be done automatically)



# Partition

- /var filesystem log files and email can grow rapidly and fill root filesystem
  - /home partition easy to span upgrades
  - /swap 1 to 2 times memory
- 
- Block size - 1024, 2048 and 4096 bytes
  - dumpe2fs prints the super block and blocks group information for the filesystem present on device
  - # /sbin/dumpe2fs /dev/sda1 | more
  - # /sbin/dumpe2fs /dev/sda1 | grep 'Block size'



# dumpe2fs

10.0.0.2 - PuTTY

```
Filesystem volume name:      <none>
Last mounted on:            /
Filesystem UUID:            d12c0439-fbfa-4f8f-a405-dc67693161b2
Filesystem magic number:    0xEF53
Filesystem revision #:     1 (dynamic)
Filesystem features:        has_journal ext_attr resize_inode dir_index filetype n
eeds_recovery extent flex_bg sparse_super large_file huge_file uninit_bg dir_nli
nk extra_isize
Filesystem flags:           signed_directory_hash
Default mount options:     (none)
Filesystem state:          clean
Errors behavior:           Continue
Filesystem OS type:         Linux
Inode count:                4923392
Block count:                19679617
Reserved block count:      983980
Free blocks:                13284917
Free inodes:                4610445
First block:                 0
Block size:                  4096
Fragment size:              4096
Reserved GDT blocks:       1019
Blocks per group:          32768
--More--
```

Hmmm Not on Ubuntu  
No superblock  
Found a gpt partition



# Workaround

```
$sudo blockdev -getsz /dev/sda3  
4096
```

```
$sudo blockdev -getsz /dev/sda2  
512
```

```
$sudo blockdev -getsz /dev/sda1  
4096
```

```
$sudo blockdev -getsz /dev/sda  
4096
```



# Installation

- Installation and configuration policy
- Requirements?
- Hardware
- Network - address, ports, firewall
- Software
- Staff resources
- Ongoing - licenses?
  
- Take copious notes
- Site log





# Installation

- Installation of Linux
- System Configuration
- Network configuration
- Security configuration
- User configuration
- Printer Configuration
- File Sharing (Windows, etc.)
- Applications needed
- System maintenance
  - ◆ Using package manager





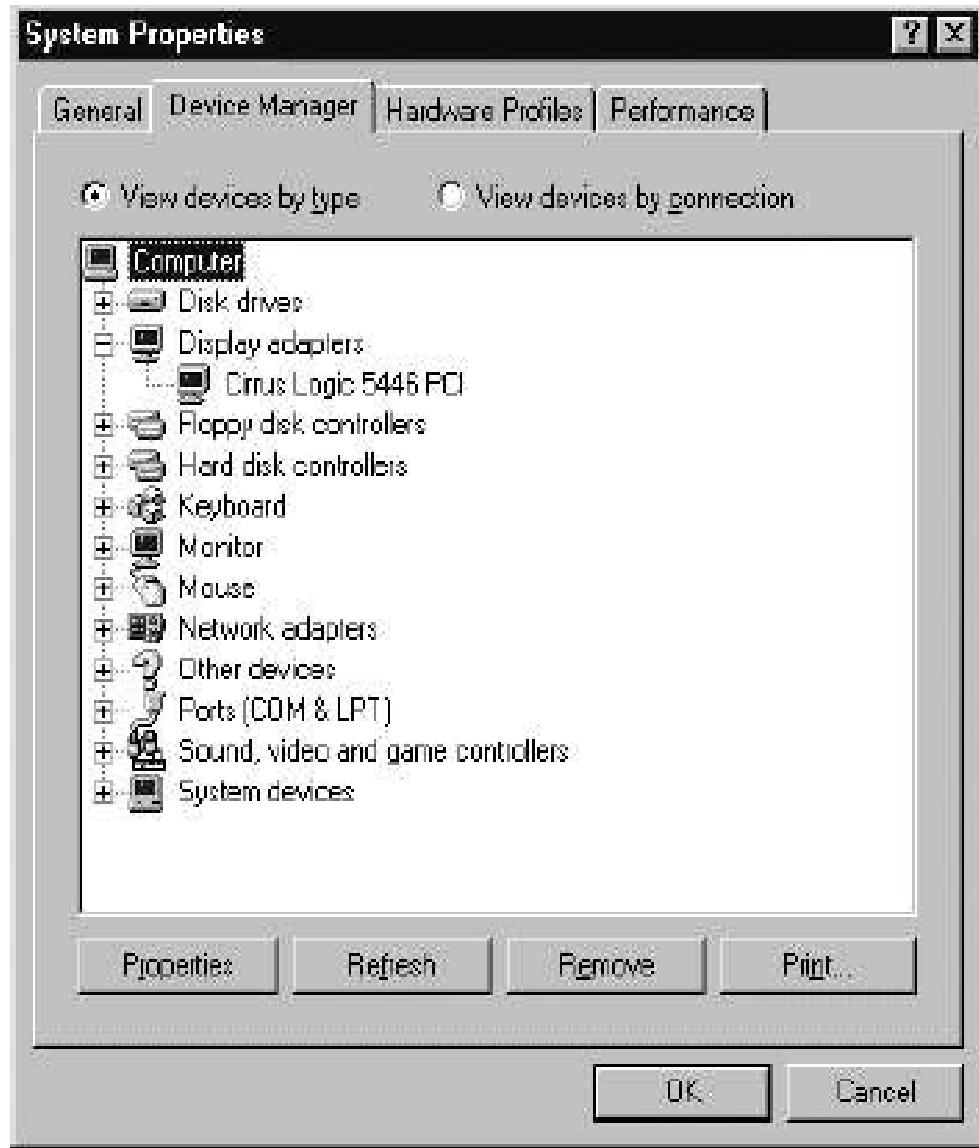
# Pre-Start

- Is Your Hardware Compatible?
  - ◆ example: <http://hardware.redhat.com/hcl/>
- Do You Have Enough Disk Space? 2-4GB
- Remove any antivirus if required
- Can You Install Using the CD-ROM?DVD?USB?
- If needed change BIOS to boot from CD/DVD/USB
- Drivers needed
- Read docs on the process
- Document the steps taken
- Backup before starting



# Gathering Information

- Use 'other' OS to know more
  - ◆ Personal Desktop Installations
    - Learning About Your Hardware with Windows





# Partition and boot info

- Choose the partition
- Configure the partition
- Set the mount point
- Set the swap size
- Enable the filesystem
- Format
- Boot loader – Grub or Lilo
  - ◆ GNU GRand Unified Bootloader
  - ◆ Linux Loader



# Network Configuration

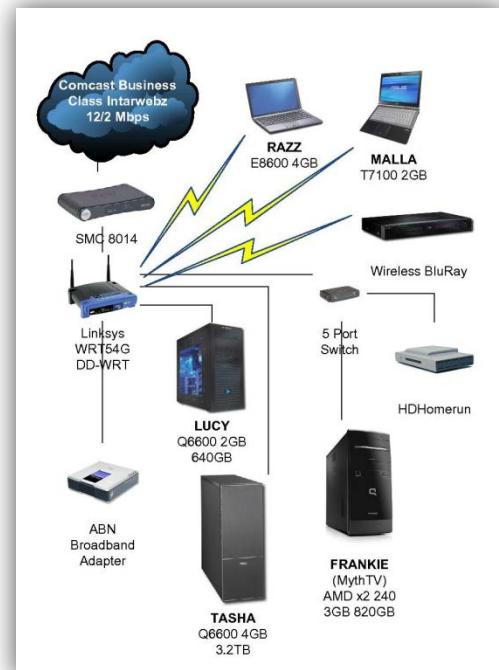
- Host name, domain name
- Static or DHCP
- For each Ethernet card on the system
  - ◆ IP address xxx.xxx.xxx.xxx (Dotted Quad)
  - ◆ Netmask 255.255.255.0
  - ◆ Gateway xxx.xxx.xxx.xxx
  - ◆ Route xxx.xxx.xxx.xxx
  - ◆ DNS xxx.xxx.xxx.xxx
- Generally:
  - ◆ eth0 as the first Ethernet card
  - ◆ eth1 for the second Ethernet card



# Private IP Address Space

- RFC 1918 and RFC 4193
  - Range Addressess  
10.0.0.0 - 10.255.255.255 16,777,216  
172.16.0.0 - 172.31.255.255 1,048,576  
192.168.0.0 - 192.168.255.255 65,536

- Document addresses, network





# Password

- Choose and set root password
- Document what password is
  
- Post installation
- Additional configuration
- Create recovery media
- Update documentation



# Printer Configuration

## Useful Websites

- <http://www.webopedia.com/TERM/p/printer.html>  
*General descriptions of printer types*
- <http://www.linuxprinting.org>  
*Documents about printing, along with a database of nearly 1000 printers compatible with Linux printing facilities*
- <http://www.cups.org/>  
*Documentation, FAQs, and newsgroups about CUPS*
- <http://www.tldp.org/HOWTO/Printing-HOWTO/index.html>  
*Printing HowTo from the Linux Documentation Project*



# Network Security

- Common access control system
  - ◆ /etc/hosts
  - ◆ /etc/hosts.allow
  - ◆ /etc/hosts.deny
  - ◆ /etc/hosts.equiv
- For more info refer to docs on iptables, firewall  
More coming



# Shares

## SMB/CIFS

- You need to start samba server and nmb server  
`/etc/rc.d/init.d/smb start`
- Whatever you want to share is added in  
`/etc/samba/smb.conf`
- Change in conf file requires restarting of server
- Just browse OR find computer from Windows to see these files/folders
- You can share folders, CD, printer

## NFS



# Services

Server = Provide Services



# Services

## Internal

- DHCP
- DNS
- Email (POP)
- Storage
- Calendar
- Multimedia
  - ◆ Music/Video
  - ◆ Photographs

## External

- DNS
- Web
- Email (SMTP)
- Application
- Game



# Services

- Webserver
- Apache server is typically available on Linux
- Can be started via init services
  - ◆ `/etc/rc.d/init.d/httpd start`
- Configuration files are at `/etc/httpd/conf/`
- Typically log files at `/var/log/httpd/`





# **Virtualized**

VMWare Workstation Example  
Creating VM using an .ISO file



# VMWare Resources

Virtual Machine Settings

Hardware Options

Device	Summary
Memory	512 MB
Processors	1
Hard Disk (SCSI)	20 GB
CD/DVD (IDE)	Auto detect
CD/DVD 2 (IDE)	Auto detect
Floppy	Auto detect
Network Adapter	NAT
USB Controller	Present
Sound Card	Auto detect
Printer	Present
Display	Auto detect

Memory

Specify the amount of memory allocated to this virtual machine. The memory size must be a multiple of 4 MB.

Memory for this virtual machine:  MB

32 GB  
16 GB  
8 GB  
4 GB  
2 GB  
1 GB  
**512 MB**  
256 MB  
128 MB  
64 MB  
32 MB  
16 MB  
8 MB  
4 MB

Maximum recommended memory  
(Memory swapping may occur beyond this size.)  
7272 MB

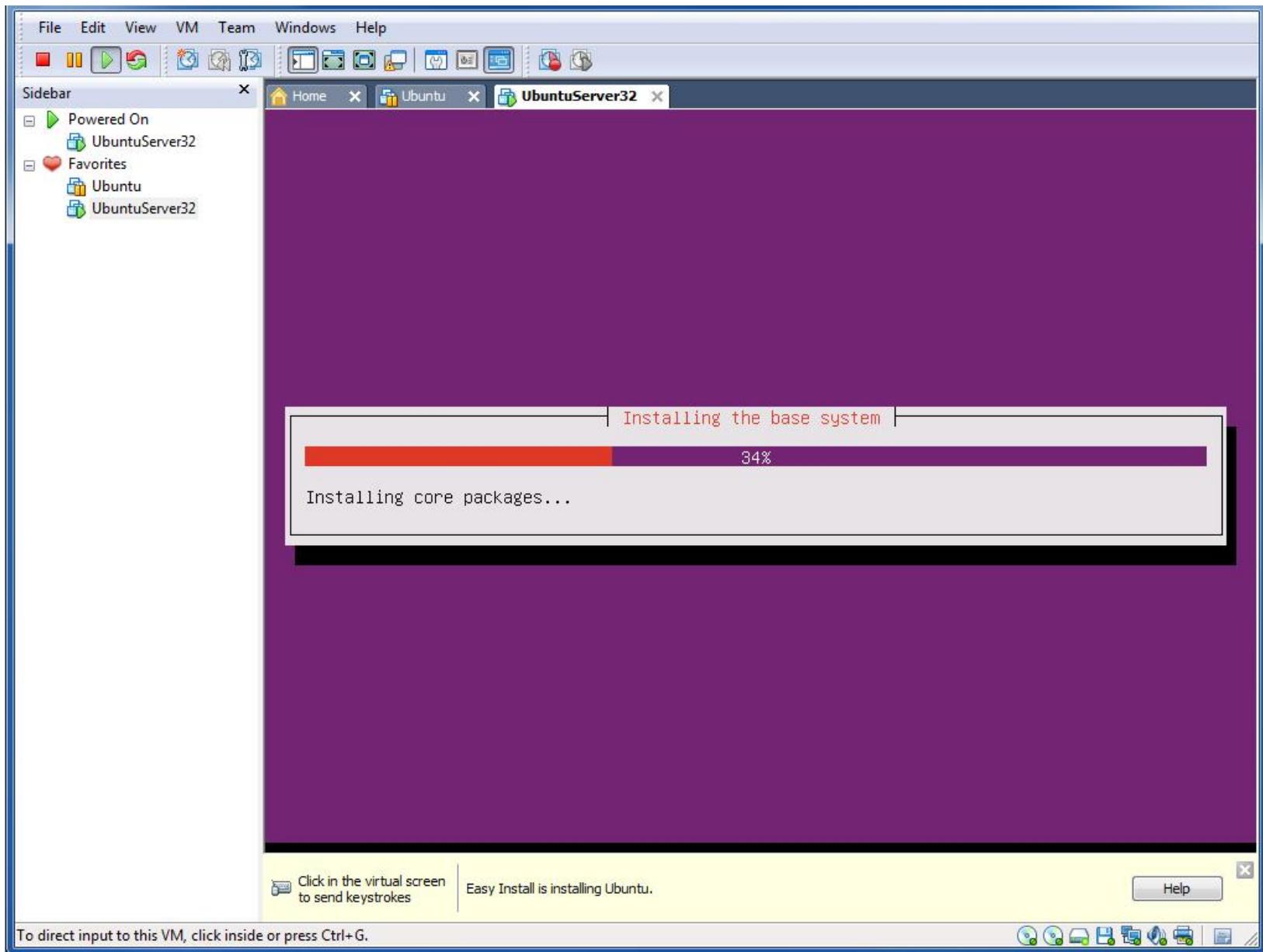
Recommended memory  
512 MB

Guest OS recommended minimum  
256 MB

Add... Remove OK Cancel Help

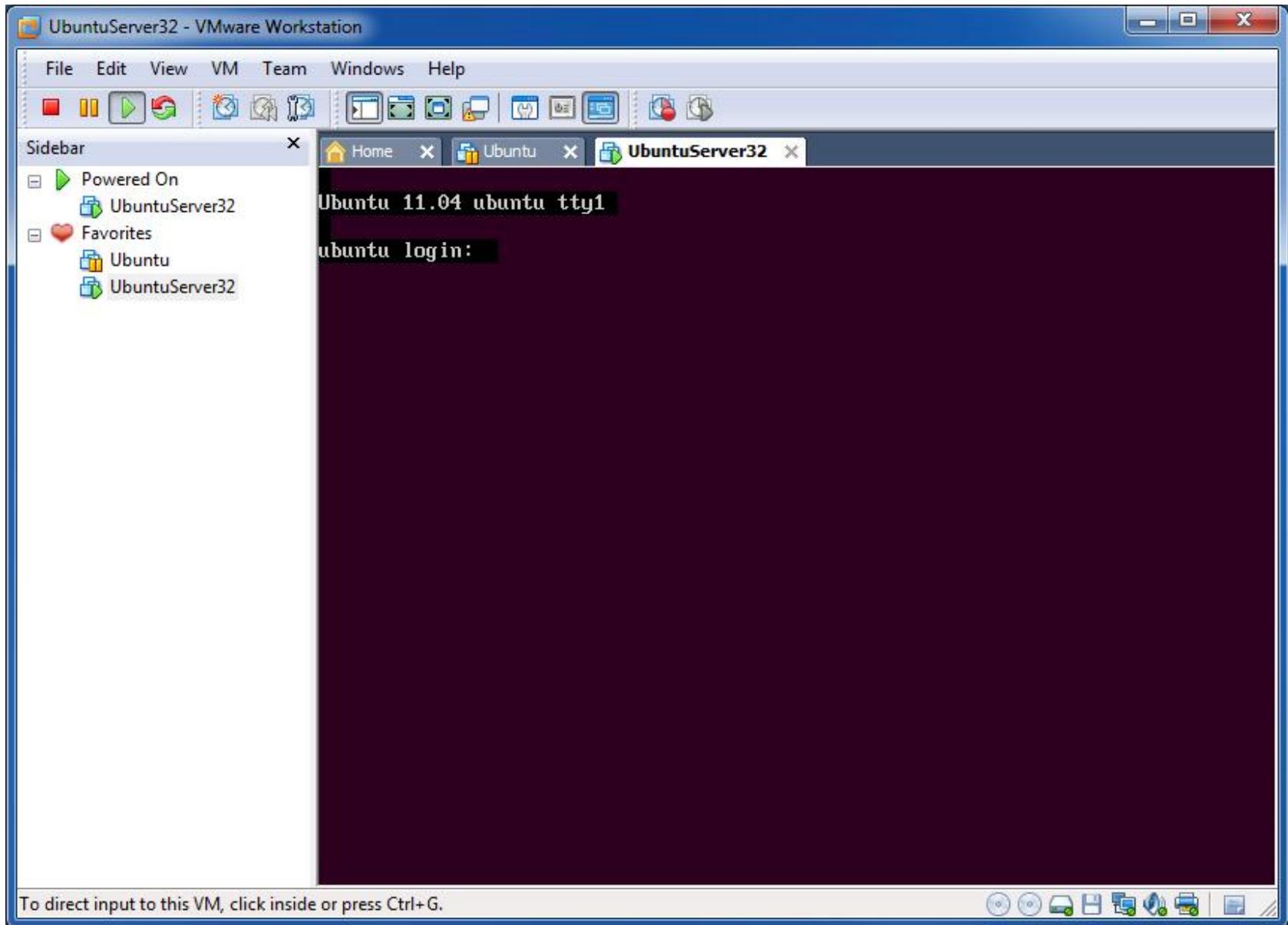


# Installation





# Logon Prompt





# User Shell Logon

UbuntuServer32 - VMware Workstation

File Edit View VM Team Windows Help

Sidebar

- Powered On
  - UbuntuServer32
- Favorites
  - Ubuntu
  - UbuntuServer32

Home Ubuntu UbuntuServer32

```
Ubuntu 11.04 ubuntu tty1
ubuntu login: mmaxwell
Password:
Welcome to Ubuntu 11.04 (GNU/Linux 2.6.38-8-generic i686)

 * Documentation:  https://help.ubuntu.com/

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

mmaxwell@ubuntu:~$ _
```

To direct input to this VM, click inside or press Ctrl+G.

The screenshot shows a VMware Workstation window titled "UbuntuServer32 - VMware Workstation". The main area is a terminal window displaying the Ubuntu 11.04 logon screen. The terminal output includes:  
Ubuntu 11.04 ubuntu tty1  
ubuntu login: mmaxwell  
Password:  
Welcome to Ubuntu 11.04 (GNU/Linux 2.6.38-8-generic i686)  
\* Documentation: <https://help.ubuntu.com/>  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/\*copyright.  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo\_root" for details.  
mmaxwell@ubuntu:~\$ \_



# Processes Running

UbuntuServer32 - VMware Workstation

File Edit View VM Team Windows Help

Home Ubuntu UbuntuServer32

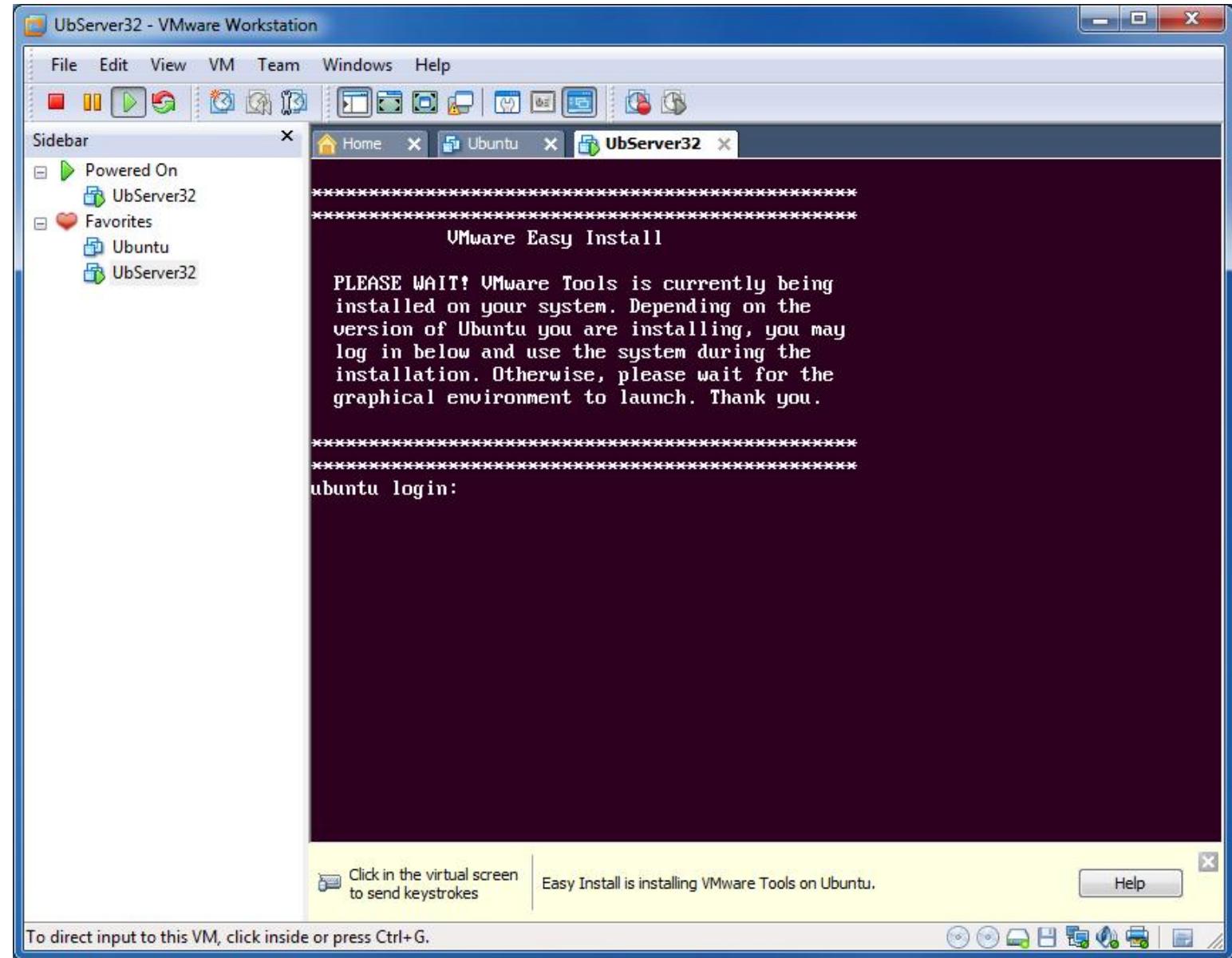
UID	PID	PPID	C	S	TIME	TTY	TIME	CMD
root	1	0	0	20:48	?		00:00:01	/sbin/init
root	2	0	0	20:48	?		00:00:00	[kthreadd]
root	3	2	0	20:48	?		00:00:00	[ksoftirqd/0]
root	4	2	0	20:48	?		00:00:01	[kworker/0:0]
root	6	2	0	20:48	?		00:00:00	[migration/0]
root	7	2	0	20:48	?		00:00:00	[cpuset]
root	8	2	0	20:48	?		00:00:00	[khelper]
root	9	2	0	20:48	?		00:00:00	[netns]
root	10	2	0	20:48	?		00:00:00	[sync_supers]
root	11	2	0	20:48	?		00:00:00	[bdi-default]
root	12	2	0	20:48	?		00:00:00	[kintegrityd]
root	13	2	0	20:48	?		00:00:00	[kblockd]
root	14	2	0	20:48	?		00:00:00	[kacpid]
root	15	2	0	20:48	?		00:00:00	[kacpi_notify]
root	16	2	0	20:48	?		00:00:00	[kacpi_hotplug]
root	17	2	0	20:48	?		00:00:00	[ata_sff]
root	18	2	0	20:48	?		00:00:00	[khubd]
root	19	2	0	20:48	?		00:00:00	[md]
root	23	2	0	20:48	?		00:00:00	[khungtaskd]
root	24	2	0	20:48	?		00:00:00	[kswapd0]
root	25	2	0	20:48	?		00:00:00	[ksmd]
root	26	2	0	20:48	?		00:00:00	[fsnotify_mark]
root	27	2	0	20:48	?		00:00:00	[aio]
root	28	2	0	20:48	?		00:00:00	[ecryptfs-kthrea]
root	29	2	0	20:48	?		00:00:00	[crypto]
root	33	2	0	20:48	?		00:00:00	[kthrotld]
root	34	2	0	20:48	?		00:00:00	[kworker/u:2]
root	35	2	0	20:48	?		00:00:00	[scsi_eh_0]

--More--

To direct input to this VM, click inside or press Ctrl+G.

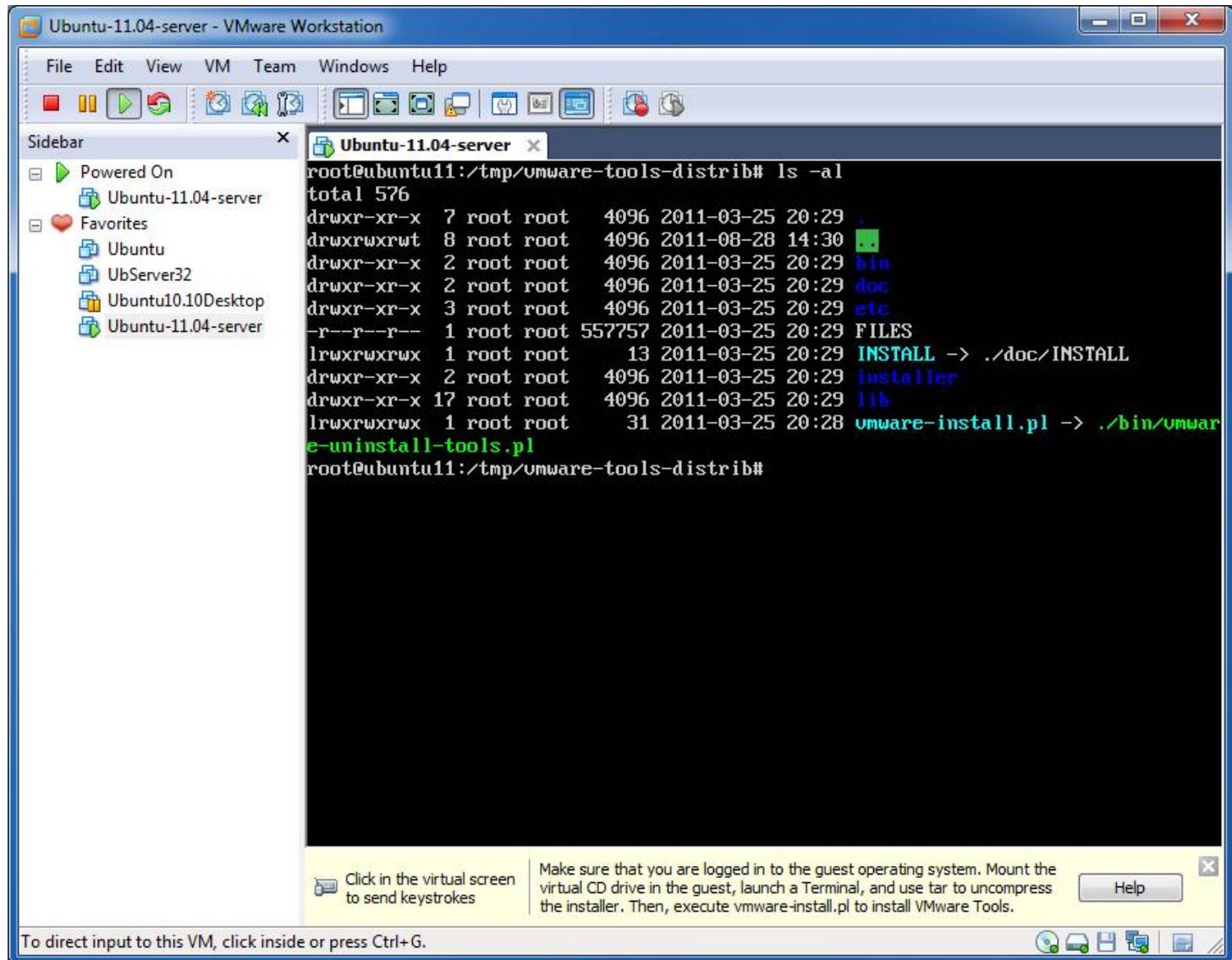


# Adding VMWare Tools





# Tool Install Process





# Tool Install (Yawn)

The screenshot shows a VMware Workstation window titled "Ubuntu-11.04-server - VMware Workstation". The window contains a terminal session with the following output:

```
Ubuntu-11.04-server x
File Edit View VM Team Windows Help
Sidebar x
Powered On
  Ubuntu-11.04-server
Favorites
  Ubuntu
  UbServer32
  Ubuntu10.10Desktop
  Ubuntu-11.04-server

Ubuntu-11.04-server x
CC [M] /tmp/vmware-root/modules/vsock-only/linux/stats.o
CC [M] /tmp/vmware-root/modules/vsock-only/linux/util.o
CC [M] /tmp/vmware-root/modules/vsock-only/linux/vsockAddr.o
CC [M] /tmp/vmware-root/modules/vsock-only/driverLog.o
LD [M] /tmp/vmware-root/modules/vsock-only/vsock.o
Building modules, stage 2.
MODPOST 1 modules
CC      /tmp/vmware-root/modules/vsock-only/vsock.mod.o
LD [M] /tmp/vmware-root/modules/vsock-only/vsock.ko
make[1]: Leaving directory `/usr/src/linux-headers-2.6.38-8-generic-pae'
make -C $PWD SRCROOT=$PWD/ \
      MODULEBUILDDIR= postbuild
make[1]: Entering directory `/tmp/vmware-root/modules/vsock-only'
make[1]: `postbuild' is up to date.
make[1]: Leaving directory `/tmp/vmware-root/modules/vsock-only'
cp -f vsock.ko ../../vsock.o
make: Leaving directory `/tmp/vmware-root/modules/vsock-only'

The module vmxnet3 has already been installed on this system by another
installer or package and will not be modified by this installer. Use the flag
--clobber-kernel-modules=vmxnet3 to override.

The module pscsi has already been installed on this system by another
installer or package and will not be modified by this installer. Use the flag
--clobber-kernel-modules=pscsci to override.

No X install found.

Creating a new initrd boot image for the kernel.
```

To direct input to this VM, click inside or press Ctrl+G.



# man Help System

```
Home X Ubuntu X UbServer32 X Ubuntu10.10Desktop X
MAN(1)                                Manual pager utils                                MAN(1)

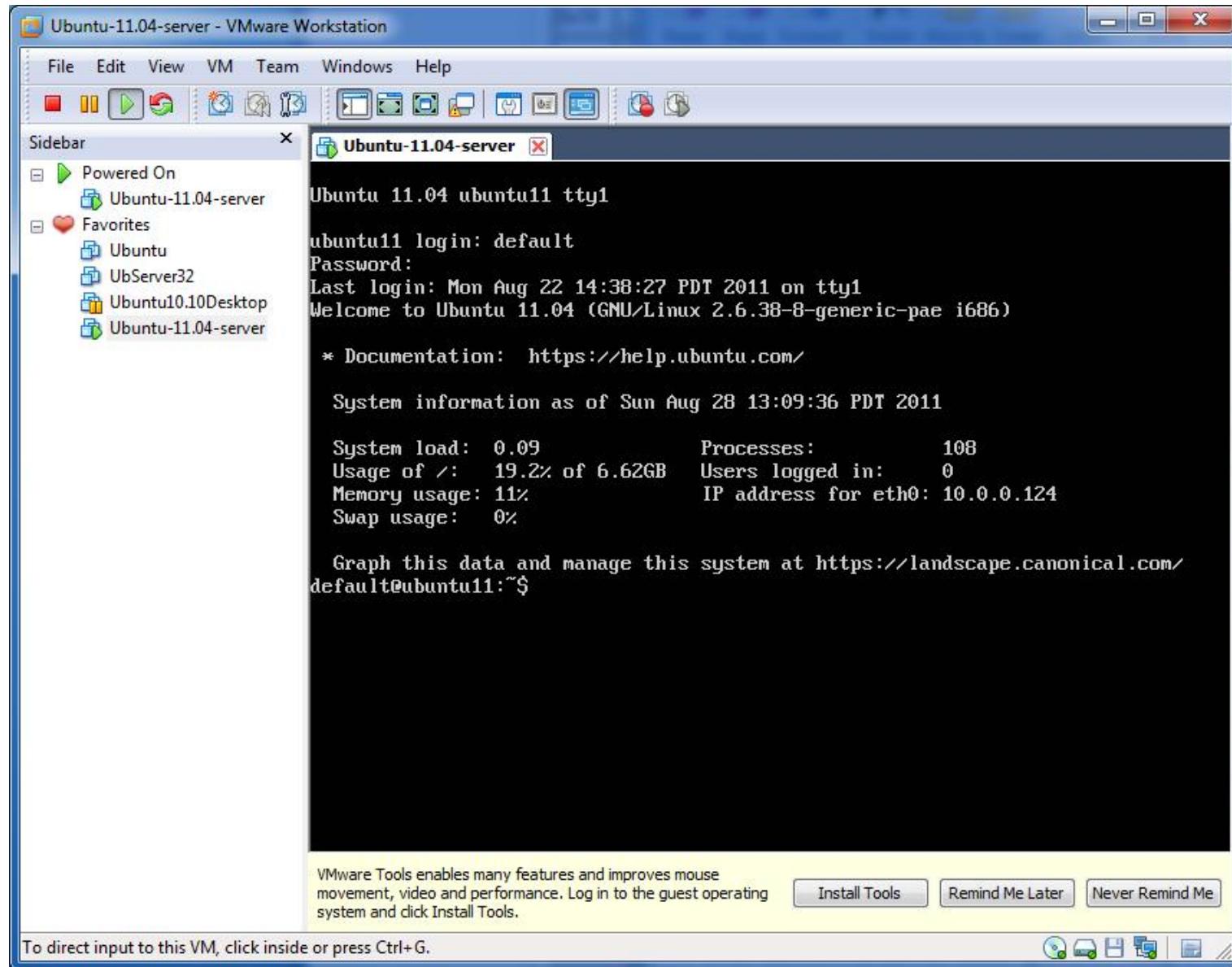
NAME
     man - an interface to the on-line reference manuals

SYNOPSIS
     man [-C file] [-d] [-D] [--warnings[=warnings]] [-R encoding] [-L
     locale] [-m system[,...]] [-M path] [-S list] [-e extension] [-i|-I]
     [--regex|--wildcard] [--names-only] [-a] [-u] [--no-subpages] [-P
     pager] [-r prompt] [-?|] [-E encoding] [--no-hyphenation] [--no-justifi-
     cation] [-p string] [-t] [-T[device]] [-H[browser]] [-X[dpi]] [-Z]
     [[section] page ...] ...
     man -k [apropos options] regexp ...
     man -K [-wl-W] [-S list] [-i|-I] [--regex] [section] term ...
     man -f [whatis options] page ...
     man -l [-C file] [-d] [-D] [--warnings[=warnings]] [-R encoding] [-L
     locale] [-P pager] [-r prompt] [-?|] [-E encoding] [-p string] [-t]
     [-T[device]] [-H[browser]] [-X[dpi]] [-Z] file ...
     man -wl-W [-C file] [-d] [-D] page ...
     man -c [-C file] [-d] [-D] page ...
     man [-hV]

DESCRIPTION
     man is the system's manual pager. Each page argument given to man is
     normally the name of a program, utility or function. The manual page
     associated with each of these arguments is then found and displayed. A
     section, if provided, will direct man to look only in that section of
     the manual. The default action is to search in all of the available
     sections, following a pre-defined order and to show only the first page
Manual page man(1) line 1
```

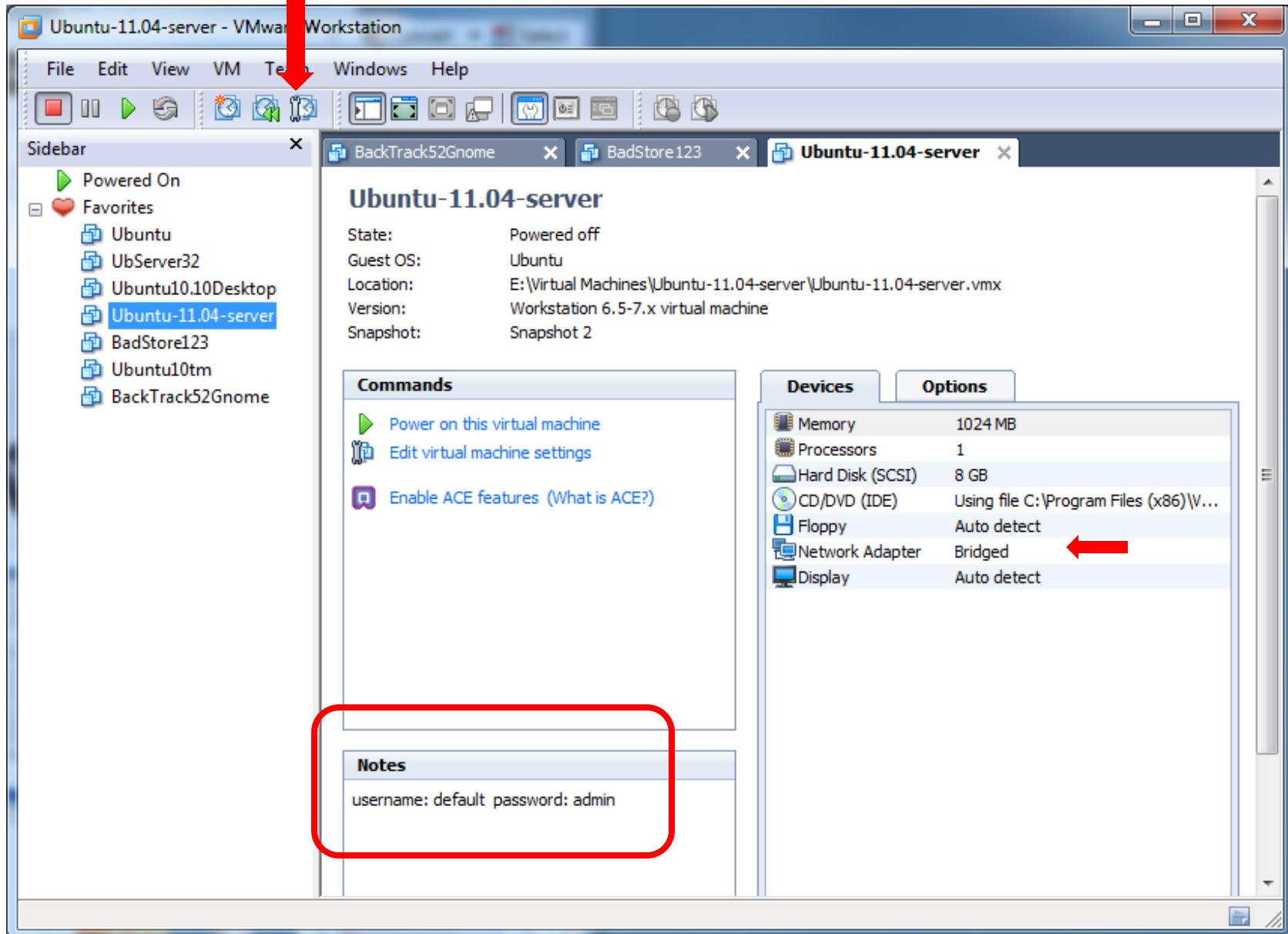


# VMWare Server Resources





# Documentation





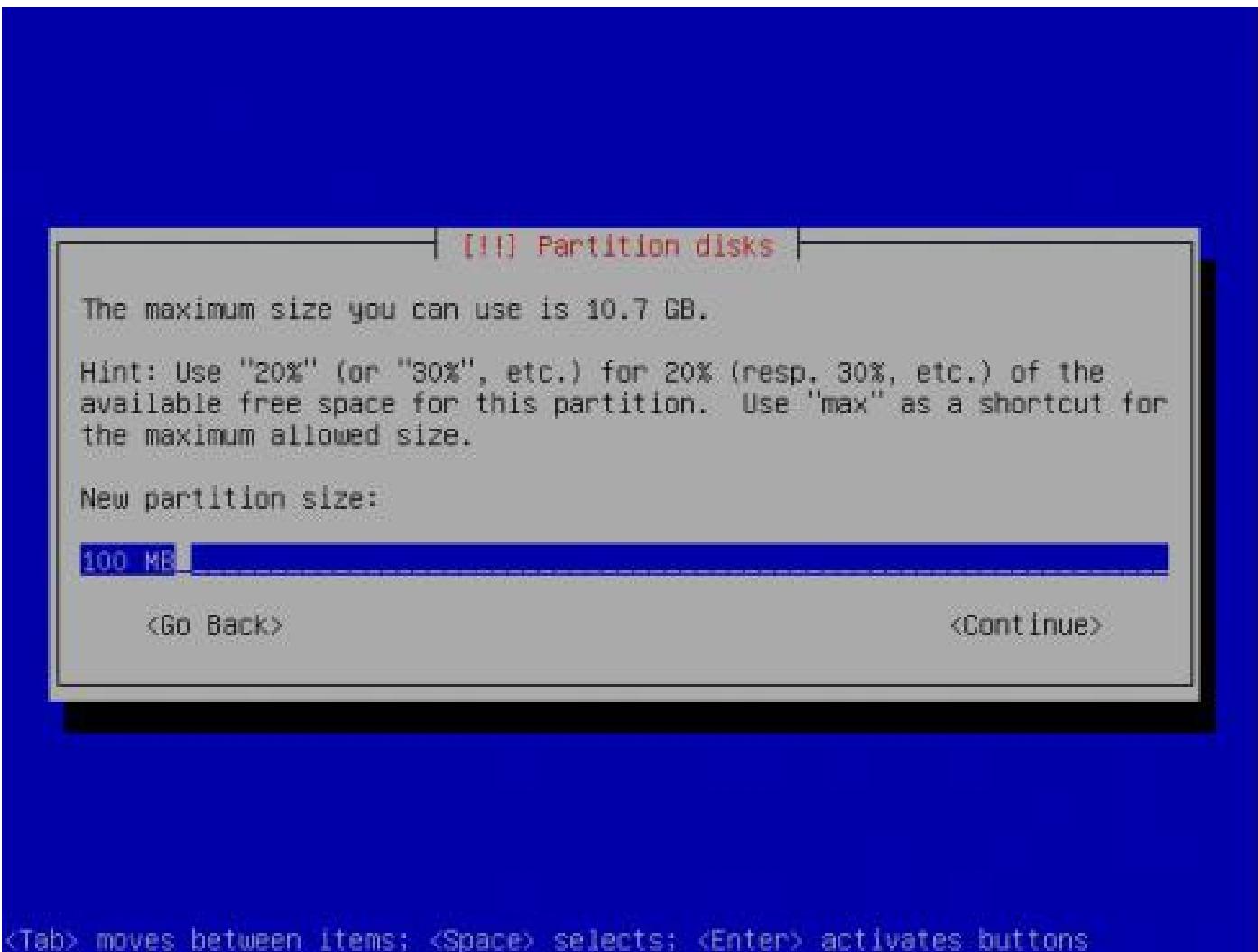
# Partition Editor

Creating a non-virtualized dual boot install may involve using the Partition Editor





# Disk Partition





# Booting Time

Options



Installation



# Network Booting

- No need for disk drive on every host
- Boot from ROM, DOC, USB, SD, etc.
- Send dhcp request for IP number, gets one
- Mounts the root file system over NFS
  - ◆ X-Term
- Use minimal bootloader and load OS over net
- Thin client
- Web client
- Kiosk



# Network Boot Requirements

- Configure LAN infrastructure (broadcasts)
- Need to setup nfs server
- Need to setup dhcp server
- Build a kernel image for network booting
- *Next: Some things to configure*



# /etc

```
# hosts  
127.0.0.1 localhost  
127.0.1.1 ubuntu.localdomain      ubuntu
```

```
# host.conf    resolver configuration file  
# which to check first  
order hosts,bind  
# return multiple names for a host  
multi on
```

```
# resolv.conf  
domain localdomain  
search localdomain  
nameserver 192.168.149.2
```



# mods

- Prelogin message and identification file  
/etc/issue      Ubuntu 11.10 \n \\
- Message issued for telnet sessions  
/etc/issue.net   Ubuntu 11.10
- My issue.net?  
Error - Keyboard not found.  
Press F10 to continue.

## LINUX/UNIX TIPS:

- fix telnet video with ^v^o e.g. control vo
- alias rm='rm -i'
- ls -lf
  
- Collection of Solaris/Unix Tips and Tricks  
<http://sysunconfig.net/unixtips/solaris.html>



# User Management

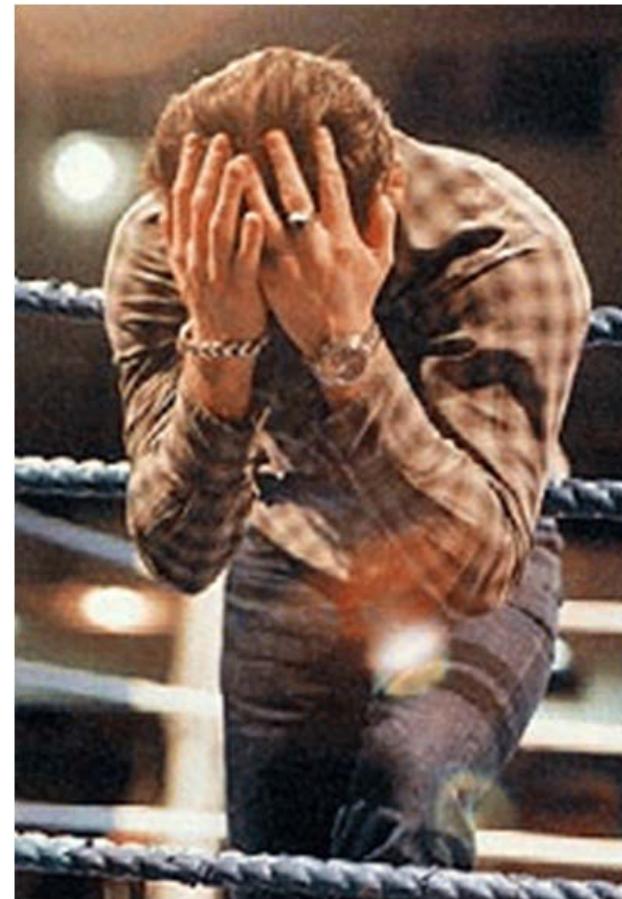
- Simple way to add user is adduser command
- Change passwords with passwd
- Group all common user to single group
- Commands: lastlog finger





# Lost Root Password

- Take ECPE/COMP 178 Computer Network Security
  - Spring 2019
- 
- Bring system up in single user mode





# Live CD

- Use a Live CD
- Download from ubuntu, CentOS (distro) website
- Set computer BIOS to boot from CD
- Current OS is left alone
- Persistence option
  
- Make a live USB



# Making A Live USB

- A USB flash drive needs to be connected to the system
- Create partitions as needed on the USB flash drive
- Set "bootable" flag on primary partition of USB flash drive
- Write MBR to primary partition of the USB flash drive
- The partition must be formatted (most often in FAT32 format, but other file systems can be used too)
- A bootloader must be installed to the partition (most often using syslinux when installing a Linux system)
- A bootloader configuration file (if used) must be written
- The necessary files of the operating system and default applications must be copied to the USB flash drive
  
- <https://help.ubuntu.com/community/Installation/FromUSBStick>
- <https://projects.centos.org/trac/livecd/wiki/ImageFlash>



# Kiosk Example

- Webconverger.org open-source kiosk
- Extract Disk Imager folder
- This program is an alpha, and has no warranty. It may eat your files, call you names, or explode in a massive shower of code. The authors take no responsibility for these possible events
- Why Kiosk? Banking, guests, relatives, clueless

<a href="#">win32diskimager-binary.zip</a>	9/8/2012 5:24 PM	Compressed (zipp...)	5,526 KB
<a href="#">webc-14.1.iso</a>	9/8/2012 3:49 PM	Image Files	214,016 KB



# Live USB Creator

- webConverger – Failed? Worked





# CentOS Live USB

- Fedora Live USB Creator on a Win 7 host
- CentOS 5.8-i386-bin-DVD disc1
- Installed to \$6-10 8GB USB





# References

- <http://www.tldp.org/> (The Linux Documentation Project) :  
HOWTOs Guides FAQs Books Manuals (free)
- <http://www.tldp.org/guides.html>
- The Linux System Administrators' Guide
- The Linux Cookbook: Tips & Techniques for Everyday Use
- The Linux Network Administrator's Guide, 2nd Edition
- Advanced Bash-Scripting Guide (4-2011)



# Remember

- Partitions
- Swap size
- Block size
  
- The 'test' is real world.
- Experience is the worst teacher. It always gives the test first and the instruction afterward.