System and Network Administration

Introduction & Overview

A Philosophy

- System Administration is about
  - Putting together a network of computers
  - Getting them to run some applications
  - Keeping them running in a dynamic world
- System Administration is as much about technology as it is about user behaviour
- System Administration requires constant monitoring and rapid response to problems

Network & System Administration

- Put together a network of computers
- Get them running
- Keep them running (despite Users….)
- **Provide a Service** to Users

Requires skills of

–Mechanic

–Sociologist

–Researcher

Challenges

- **Deploy and update many machines**
- **Understand how services support business tasks**
- **Plan and implement adequate security**
- **Be able to fix errors and problems**
- **Keep track of and be able to use knowledge**
- **Provide comfortable environment for users**

Systems & Network Administrator Skills

- **Unix/*Windows* usage, installation, configuration**
- **Shell utilities and script programming**
- ***C and* how to use make**
- **Network: TCP/IP, Ethernet, *hardware***
- **Infrastructure services: DNS, DHCP**
- **Shared storage: NFS, CIFS**
- **Directory services: LDAP, *Active Directory, NIS***
- **User services: web, mail, *database, groupware***
- ***System tuning and accounting***
- **Security consciousness**

Outcomes

Successful completion of this module means you will be able to:

1. Explain the role and operation of each of the software components essential to a corporate networked information system
2. Evaluate proposed improvements to the configuration of a corporate networked information system and the associated administration policies and procedures
3. Integrate DNS, DHCP, email, web, LDAP, and SSL to create a working system
4. Combine new elements into the basic system to meet the needs of diverse communities of interest


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Theme: Virtualization

One physical machine running a ***host*** OS, with one or more virtual machines running a possibly different ***guest*** operating system

Example:

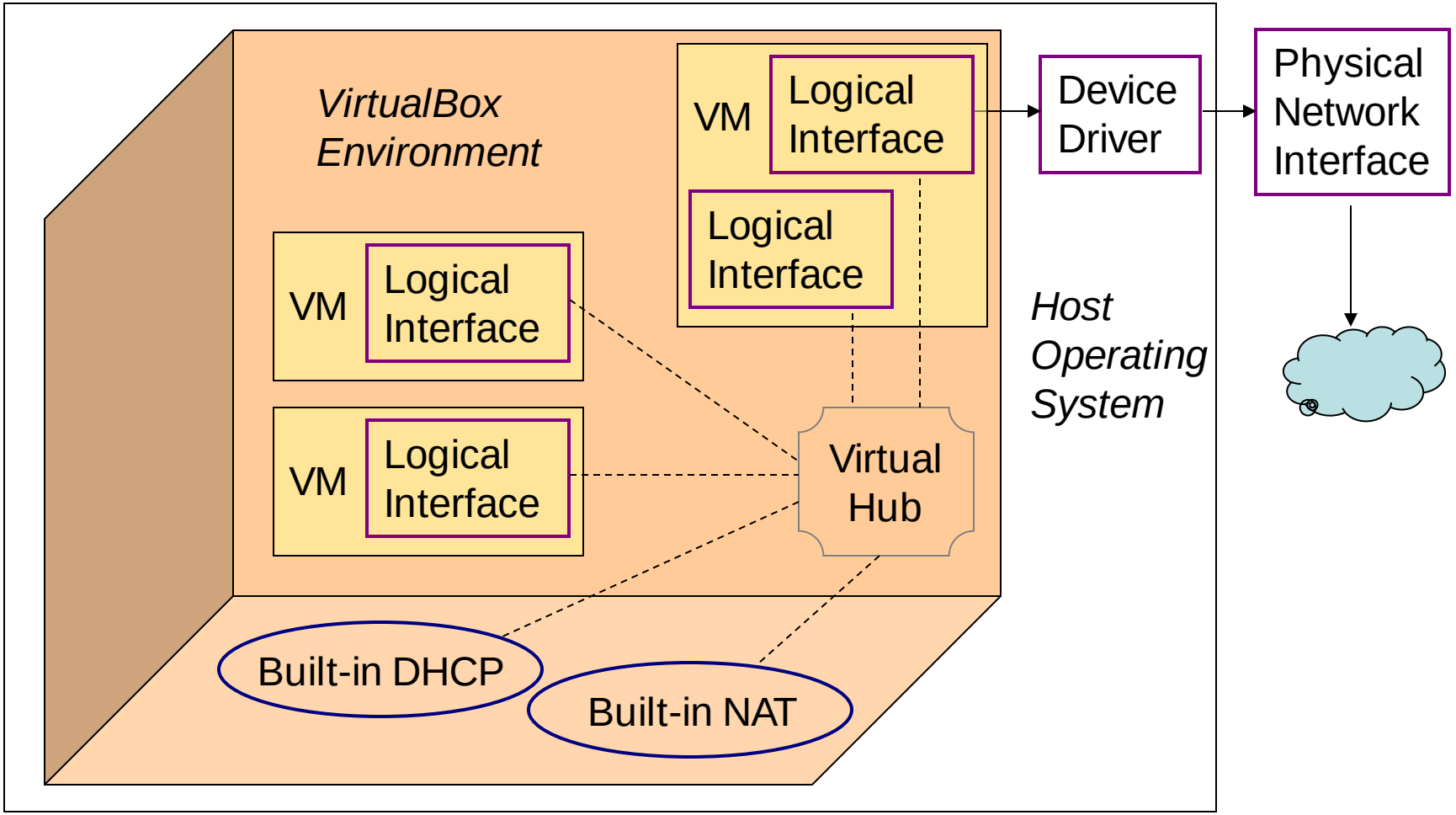
Hardware: blade server, 64-core Intel, 64 GB RAM
OS: Red Hat Enterprise Linux
Virtualization Platform: Xen
Virtual machines: 32 configured as a cluster

This is the main idea of Cloud Computing

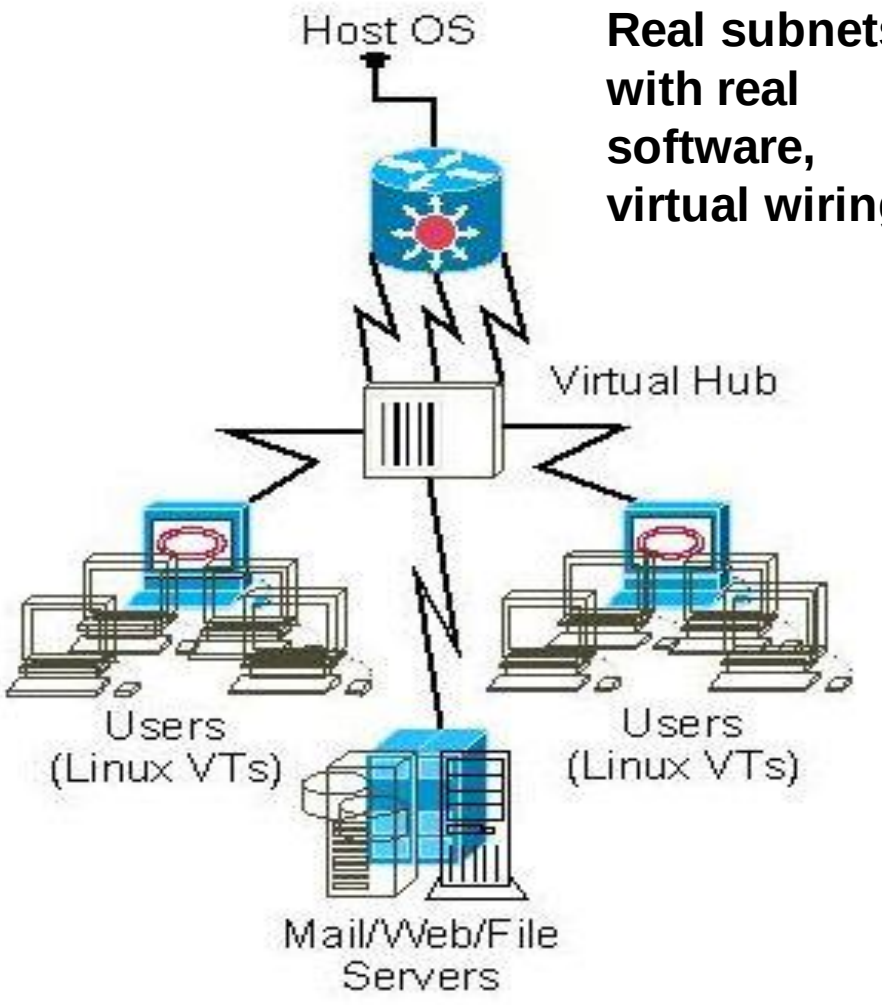
Lower cost of ownership

- labor costs
- capital expenditure
- power consumption
- rack space

Virtual Networking



VirtualBox "Virtual Physical" Architecture



Real subnets with real software, virtual wiring

Can we actually say that?

Think of it this way:

Would you expect to be able to paste what you copied *if you had to change chairs* to be in front of the screen, mouse, and keyboard?

That is what virtual means:

It acts like a real, separate machine but it runs in a window

How Nice Is That ... real systems with virtual hardware (VTs) and virtual connections (wires)

TinyNet: Virtualization

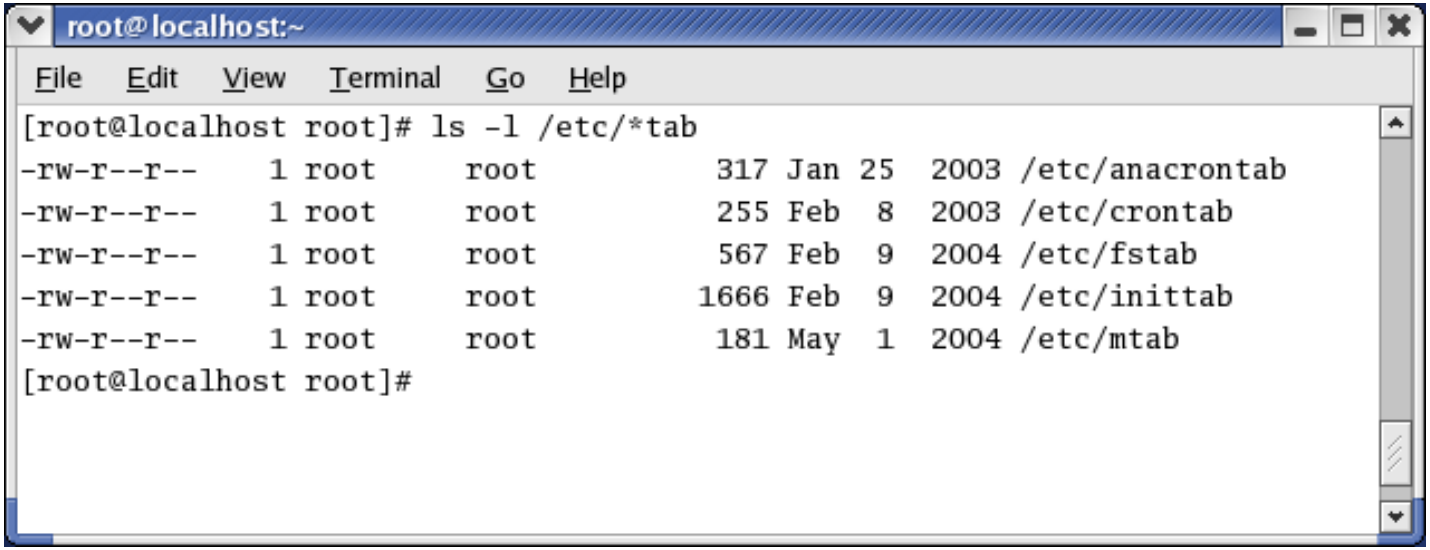
Philosophy:

- **One service, one server**
- **Minimal server footprint –** 128mb RAM, 200mb storage
  - run a 4-5 node network on a 4gb RAM Windows host
  - store everything on a 2gb thumbdrive
- **Open source, easy to replicate and configure**
  - (Sun) VirtualBox
  - Standard linux distribution: Slackware
- **Tool for learning and understanding**
  - curses interface, de-referenced scripts
  - *buggy* pre-configuration to provide good examples

- Because of Linux's UNIX roots, the primary method by which it is administered is the **command line**.

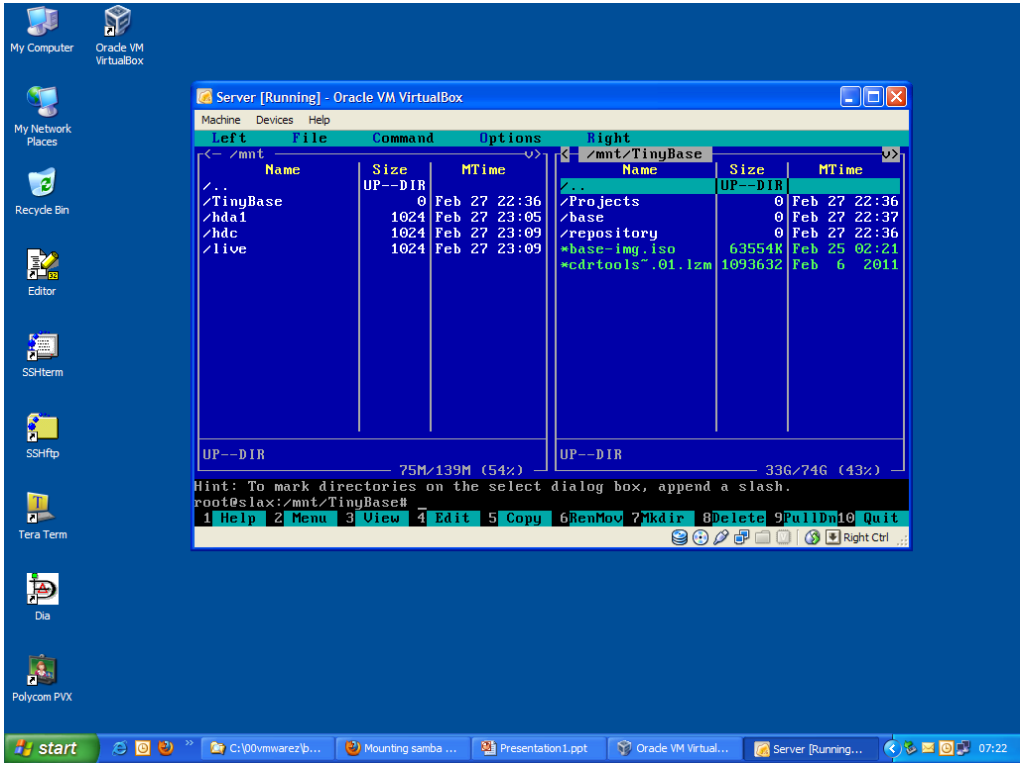
- Commands are often followed by **switches**, which allow different options to be used.

- All administrative tasks can be performed from the command line, either by issuing specific commands or editing text-based **Scripts** written to automate tasks. **configuration files**.



- Most Linux distributions have **GUI** configuration utilities as well.

- These are usually just a thin layer of interpreted code that calls the command line script
- We strike a balance with utilities that have a user interface built on the ***curses*** libraries



This will get to be familiar

VM running the ***mc*** file manager –

One of the greatest linux utilities ever!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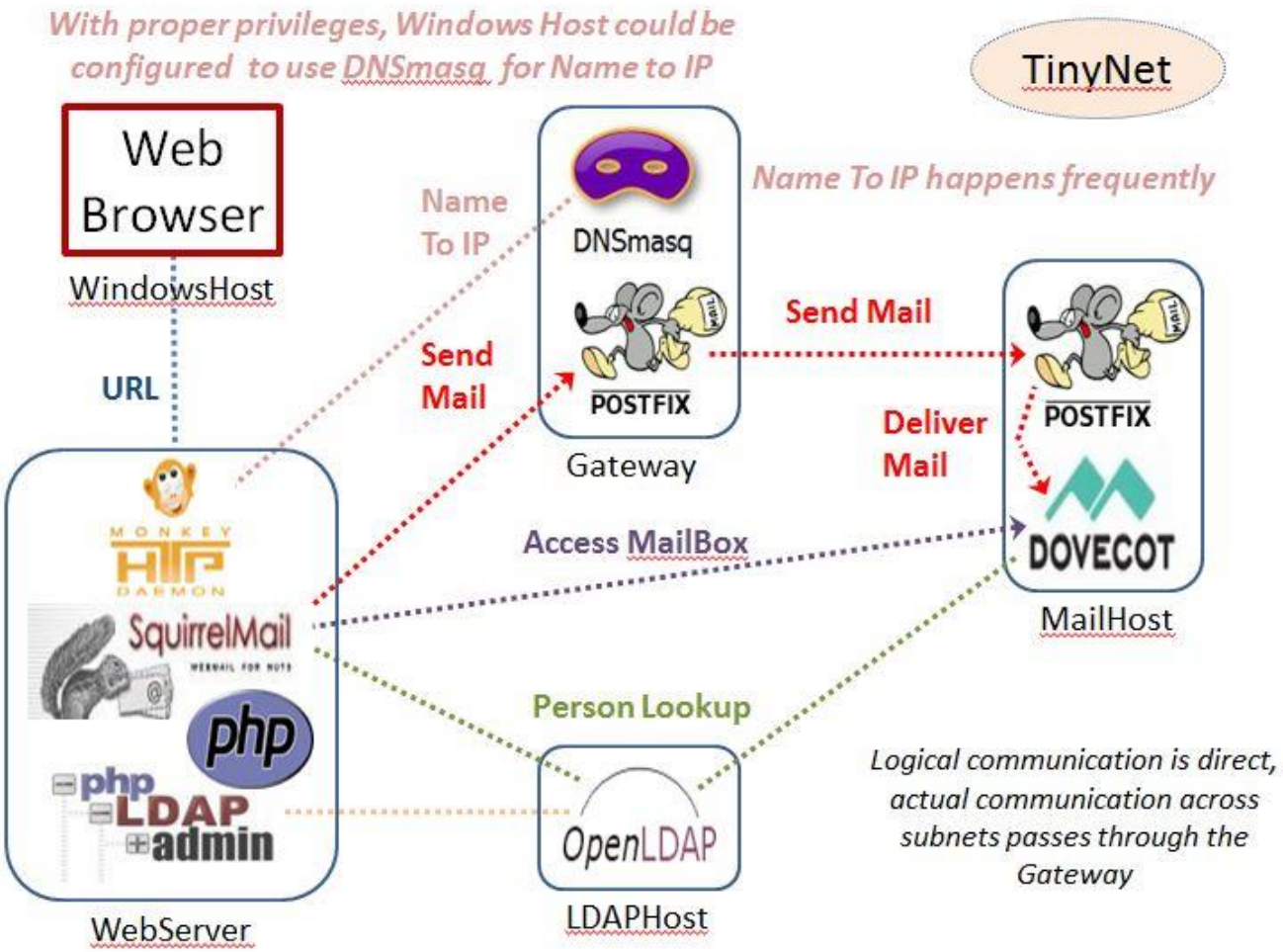
Week	Weekly Goals	Topics	In class Activities	Independent Activities (my-tiny.net)
1	Software installation	Virtual Machines	Virtualbox	Virtual Machines
2	Review key concepts	Operating Systems (OS)	OS Installation	Creating VMs
3		IPv4 over Ethernet	OS Configuration	First Things First Log files
4	Understand purpose and importance of basic components	DHCP & DNS	DHCP & DNS	Server Roles DNS & DHCP
5		eMail & CGI	smptd, httpd	Configure Mail Squirrelmail
6		Directory services	LDAP	LDAP Server LDAP Concepts
7	**Mid-Semester Progress**	Assignment Exploring possibilities	**Individual system demonstration**	Video: Network Tools Video: How to Troubleshoot Video: Service Troubleshooting
8	Deeper understanding of OS facilities, service configuration, and usable security	Pipes and redirection	Shell scripts	Redirection Script I/O
9		Users and sudo	.bashrc, sudo	ASCII Art Prompt Color
10		Firewalls & IDS	Iptables Quick Quiz (2)	Firewalls PenTestng
11		SSL, PKI	https, VPN Quick Quiz (2)	Stunnel OpenVPN
12		Network services	NFS, Virtualhosts	Shared Folders MonkeyShines
13		Policy-based management	FCAPS	Video: Communication Video: Professionalism
14	Exam Review			

TinyNet: base configuration



Everything is built on a generic image

Pre-configuration is limited to what is necessary to overcome some environmental oddities

software is packaged to meet dependencies, ease installation

Getting Started

Virtualbox

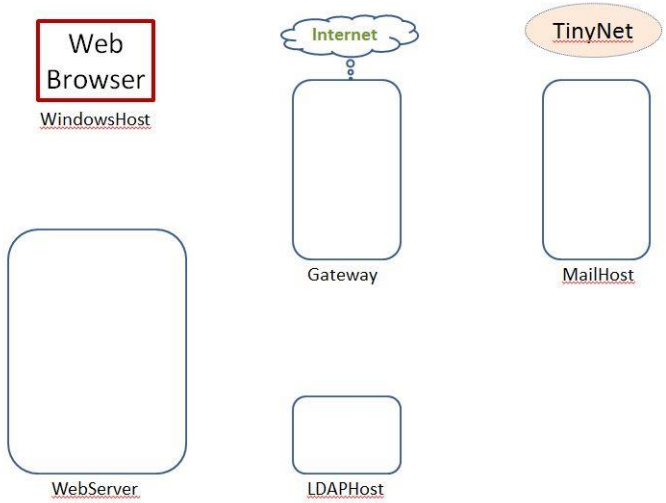
- Comes in two parts because of copyright
  - Platform Pack (main application)
  - Extension_Pack (licensed)

You must have Administrator privileges to install

Getting Started

TinyNet

- Comes in two parts
  - Base.iso (base image)
  - Config.iso (configuration and applications)

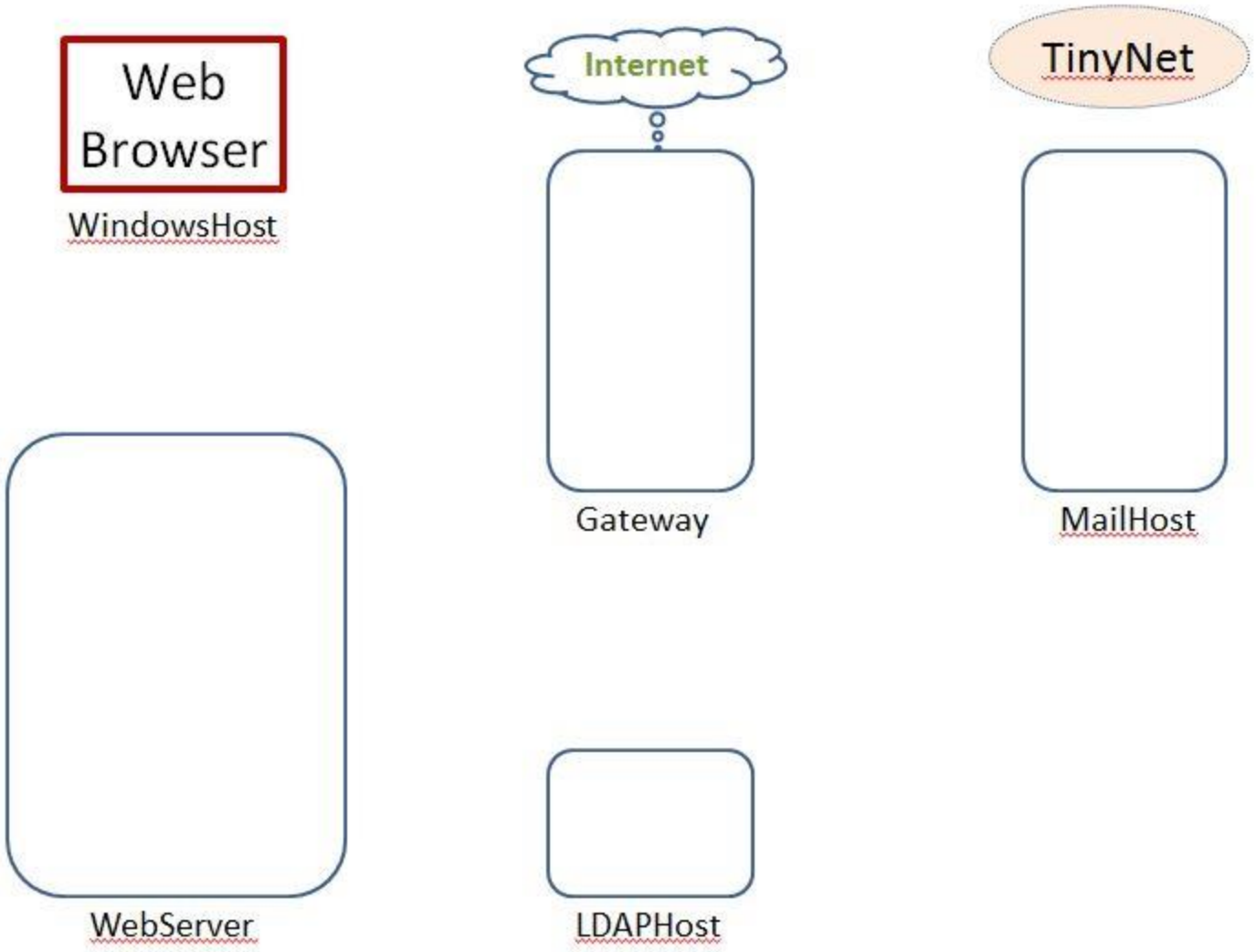


After installing VirtualBox, create VMs!

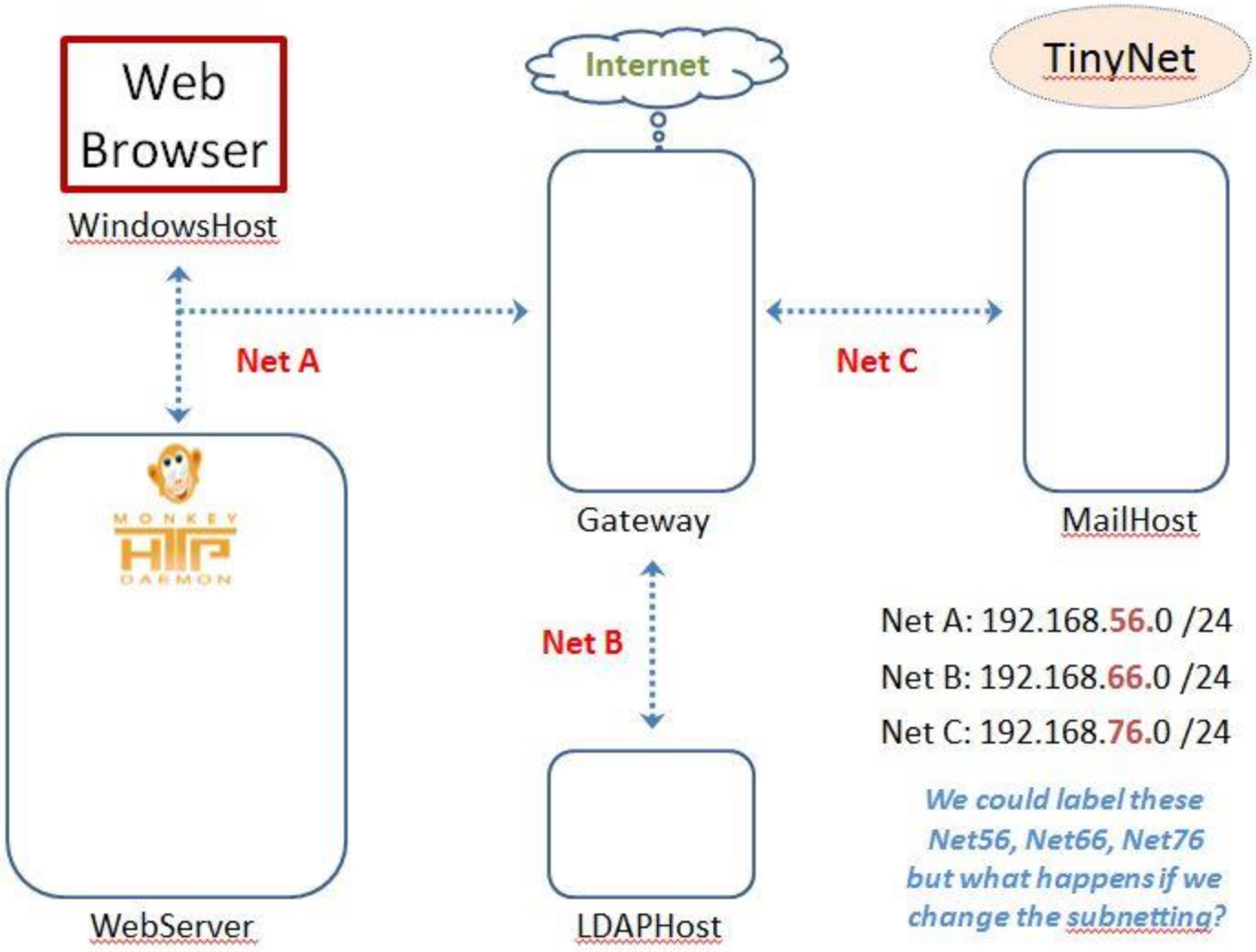
www.my-tiny.net

1. Create a virtual machine
2. Partition the disk
3. Create a filesystem
4. Copy the OS
5. Install the bootloader
6. Configure common services
7. Clone!

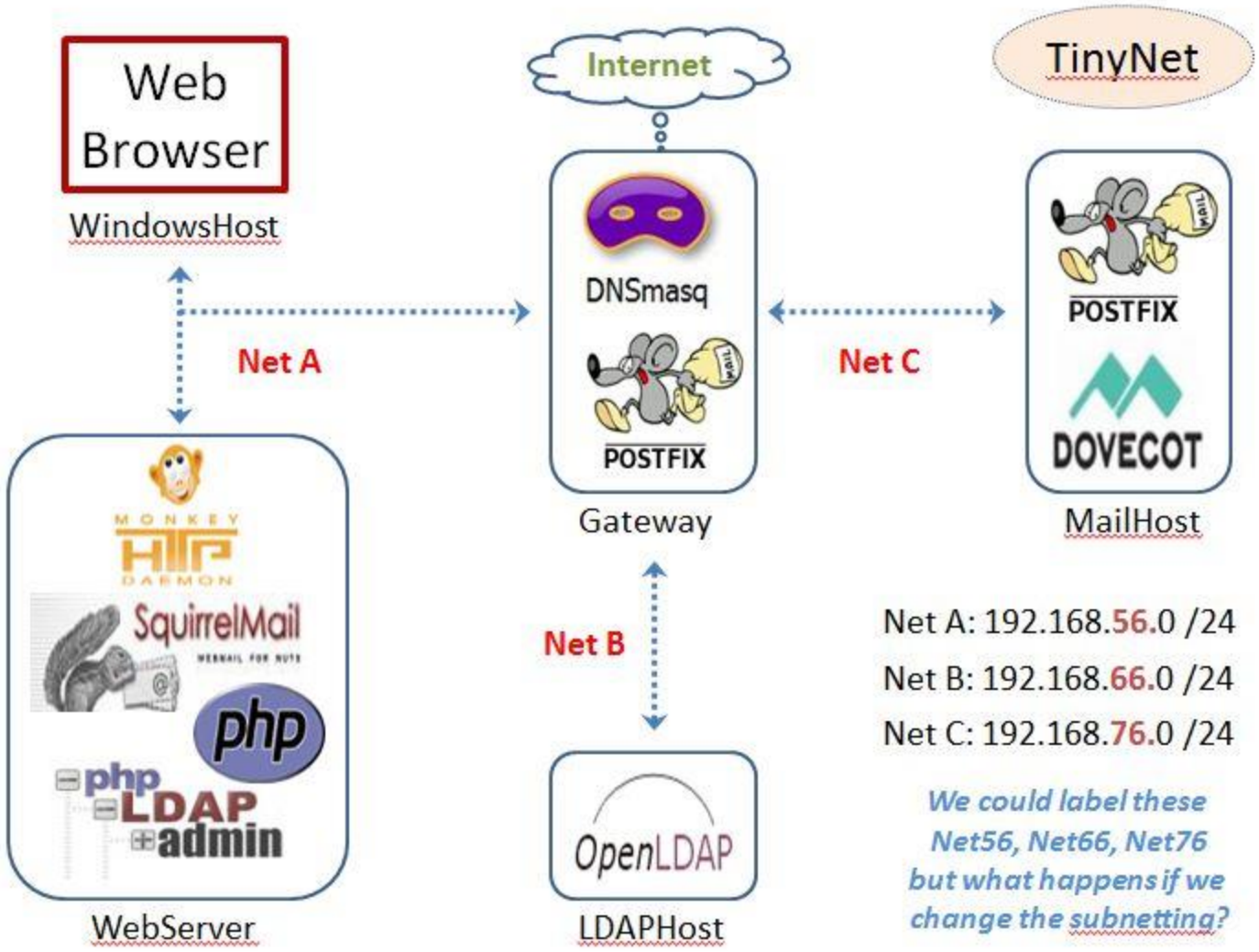
Setup VMs


Web Browser
WindowsHost
Internet
Gateway
TinyNet
MailHost
WebServer
LDAPHost

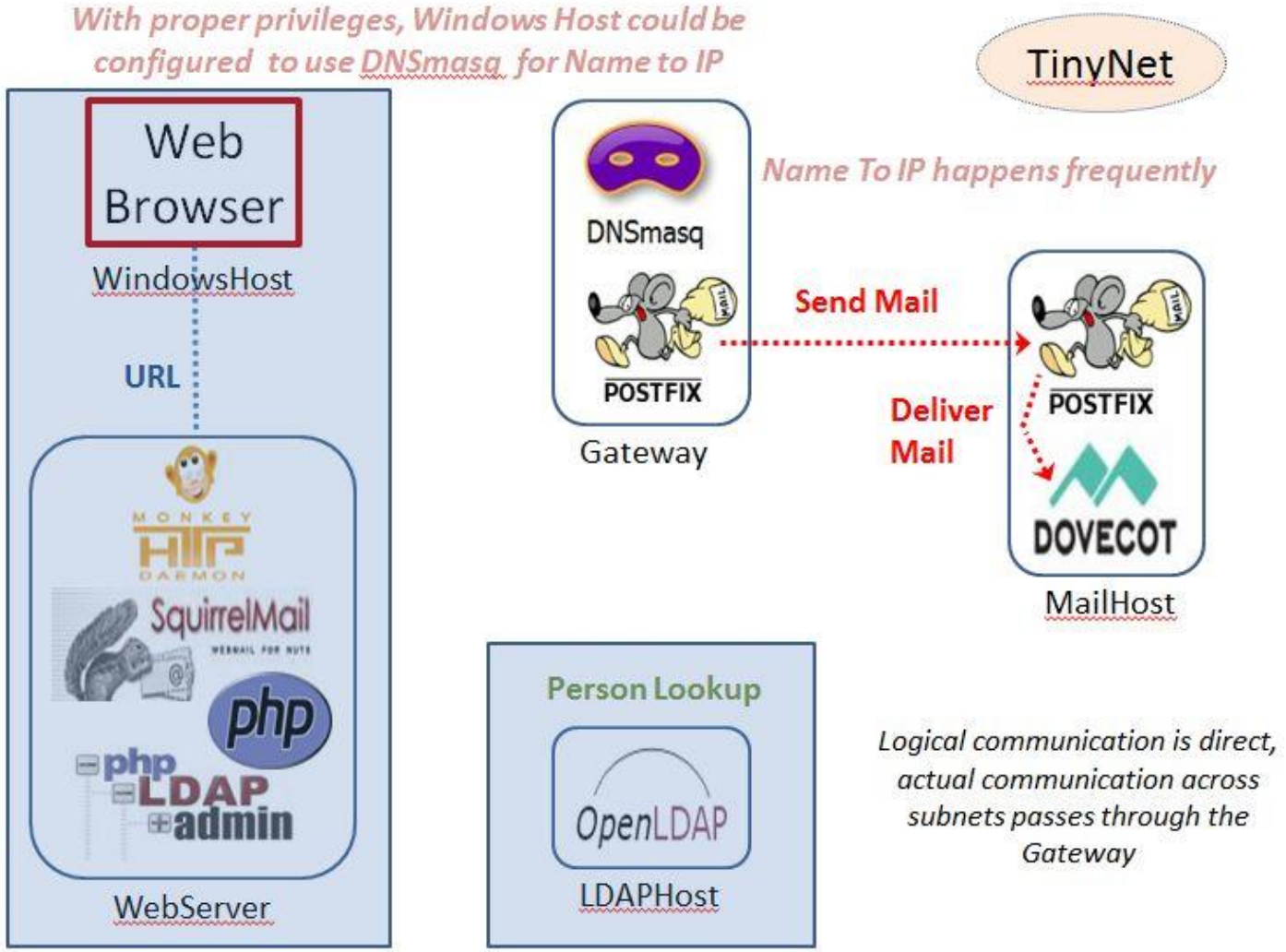
Network Hands-on



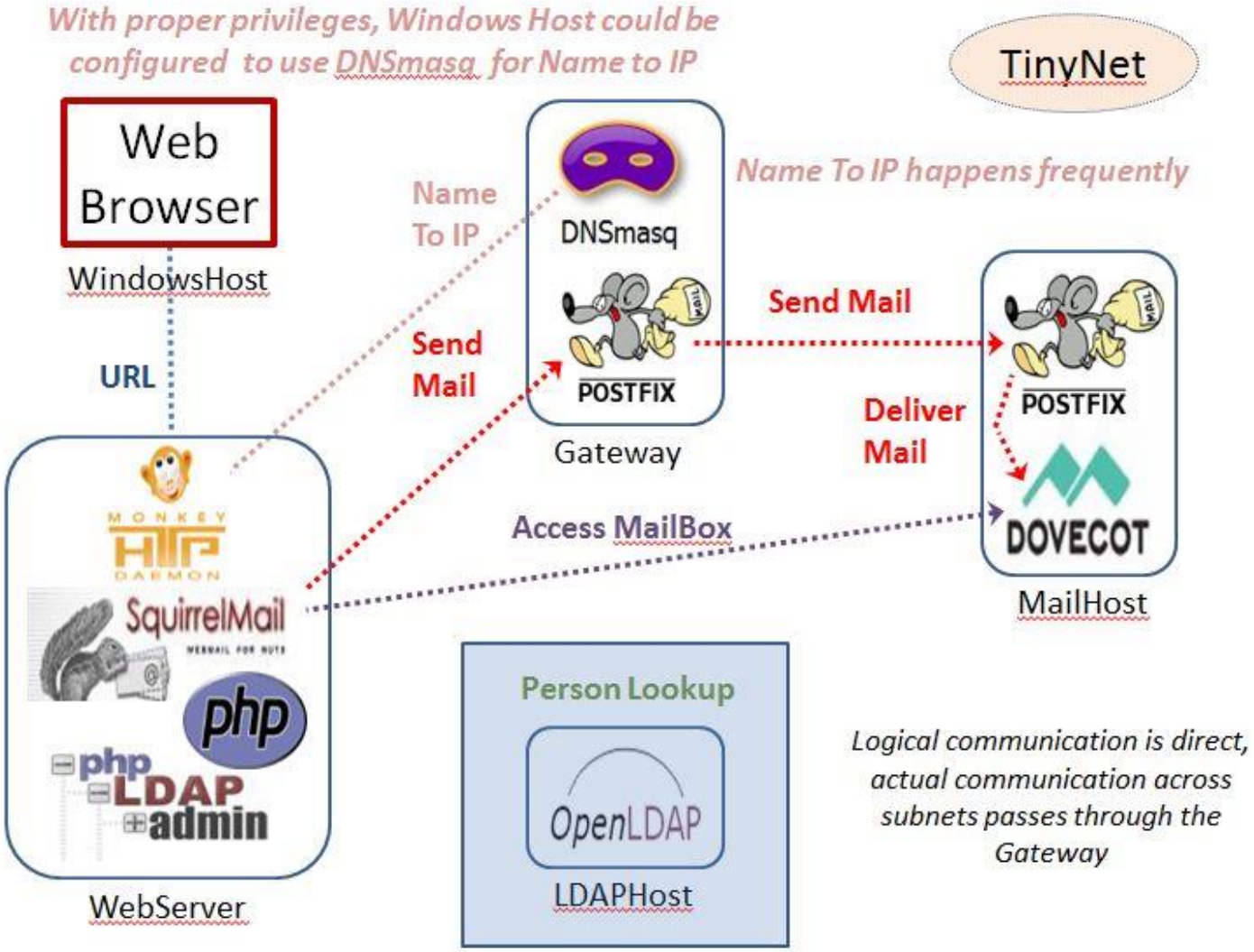
Configure Roles



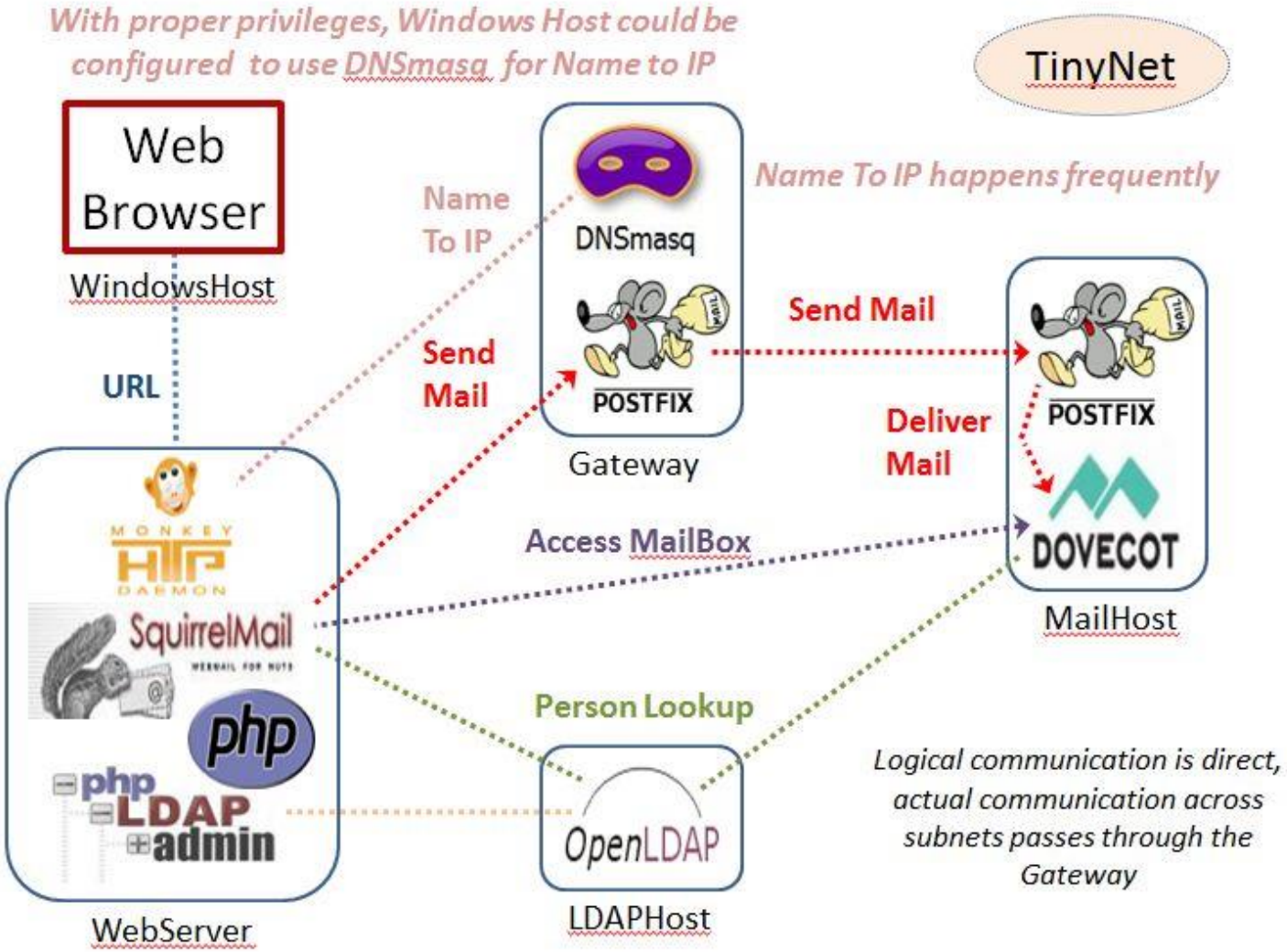
Configure Mail



Configure Webmail



Configure LDAP

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Assessment

Description	Hand in Date	Marks Allocation	CLOs Assessed
Individual Base System Demo	Week 7	10%	3. Integrate DNS, DHCP, email, web, LDAP, and SSL to create a working system
Assignment - Individual Component	Week 14	10%	
Assignment - Group Component	Week 14	25%	4. Combine new elements into the basic system to meet the needs of diverse communities of interest
Final Exam		55%	1. Explain the role and operation of each of the software components essential to a corporate networked information system 2. Evaluate proposed improvements to the configuration of a corporate networked information system and the associated administration policies and procedures

Theme: Problem Solving

1. Having detected the fault or Problem
2. Isolate the problem and identify/define it
3. Use tests and tools to diagnose the problem
4. Solve the problem and document the solution

Prioritize multiple problems

Requires skills of

- Mechanic
- Sociologist
- Researcher

Transferable skills

- Know what you want, discover how
- Being methodical, especially with troubleshooting
- Lifelong learning – search and discover, don't be intimidated
- Cultural sensitivity – people do the same thing in different ways

Requires skills of

– Mechanic

– Sociologist

– Researcher

Resources

Best General Linux Reference

- ✓ RedHat 9 Guides - www.my-tiny.net
  - – Close to our distribution – but different!
  - – (our distribution is small, but has all the capabilities we need)

Be careful looking at documentation, instructions, configurations: they are different for different distributions

Celebrate Diversity!

As you get familiar with what we have, you will be able to identify these differences and adapt


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Caution!

Running VMs on a laptop:

Check your power settings – close lid, low battery, etc.

Never **Hibernate**, only **Sleep**

("Hibernate" suspends too many host processes, and your VM will get corrupted – "Sleep" works well enough)

(or … just poweroff the VM)

Getting Started

Virtualbox

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Decide what version; No need try to stay current

1. Hardware virtualization is Definitely ON in the BIOS – 6.1 +
2. Don't know/don't care about the BIOS – 6.0 July 2020
3. Exact match the user interface in the videos – 5.2 July 2020

Getting Started

Virtualbox

- Use version 6.0 if you need to run VMs with software virtualization, as this has been discontinued in 6.1
- *Version 6.1.= **requires VT-x/AMD-v** to be available*

- https://forums.virtualbox.org/viewtopic.php?f=1&t=62339

- **Every version** requires hardware support for virtualization (**Intel VT-x or AMD-v**) in order to run **64bit VMs**, and any VM that uses more than one CPU core.

TinyNet: linux 2.6/3x/4x/ (32-bit)

- When creating a VM, make sure you choose the proper version of the guest OS template in

  <VM Settings> | *General* | *Basic* | *Version*,

- Choosing the correct template allows other modern processor features to be visible to the guest - it's not *just* about 64bit capability any more.
- If Create VM only shows 32 bit, hardware virtualization is OFF
- This works fine for TinyNet with Virtualbox 5.x and 6.0

Getting Started

BIOS Settings

- You need to enable **Intel VT-x or AMD-v** in the host PC BIOS.
- Note your exact system model, then go online and check how to get into the BIOS settings at boot time.
- Once you get there you need to look for something buried in a menu
- Usually under CPU Settings, possibly in the security category.

Getting Started

BIOS Settings

- The option *should be called something like* "Enable Virtualization Technology", "Secure Virtual Mode“, "Enable SVM Mode" (on AMD CPUs), or "Enable Vanderpool Technology" (Intel CPUs)
- If you see "Virtual Directed I/O" (Intel VT-d/AMD-Vi) then that is a different thing. If you find this option but not VT-x/AMD-v, then the setting you need is enabled.
- After saving BIOS changes a full restart from power off is best, just rebooting or resuming may not do the job.

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Additional Notes

- Hyper-v competes for resources and needs to be disabled. To check in Windows 10,

  <right click start> | *Run* | `OptionalFeatures.exe`

- and look for the "Hyper-V" option. The box should be empty, not checked or shaded.
- If you want to be absolutely sure that Hyper-v is gone then open command console with *Run as Administrator* and type

  ```
  bcdedit /set hypervisorlaunchtype off
  ```

- Make sure to fully power down and reboot the host after changing the Hyper-v setting.

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Additional Notes

- On some Windows hosts with an EFI BIOS, DeviceGuard or CredentialGuard may be active by default, and interferes with OS level virtualization apps in the same way that Hyper-v does. These features also need to be disabled.
- On Pro versions of Windows you can do this using `gpedit.msc` (set *Local Computer Policy* > *Computer Configuration* > *Administrative Templates* > *System* > *Device Guard* > *Turn on Virtualization Based Security* to Disabled.
- Disabling DeviceGuard should also disable CredentialGuard (it is a subset)

Additional Notes

- If you cannot use gpedit for some reason then the equivalent hack is to find the registry key

HKLM|SYSTEM|CurrentControlSet|Control|DeviceGuard|EnableVirtualizationBasedSecurity|Enabled

- and set it to 0.

Additional Notes

- On Win10 hosts, check

Windows Defender > Device Security > Core Isolation Details

- and make sure settings in this panel are turned off
- reboot the host from power down if you needed to make changes.
- "Core isolation [includes] security features available on your device that use virtualization-based security"
  ...which is why they can interfere with VirtualBox.


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