Lesson Module Status

- Slides
- Whiteboard with 1st minute quiz

- Flashcards
- Web Calendar summary
- Web book pages
- Commands
- Howtos

- Practice Test #3 uploaded
- NIS Server configured

- Backup slides, Confer links, handouts on flash drive
- 9V backup battery for microphone

Course history and credits

Jim Griffin

- Jim created the original version of this course
- Jim's site: http://cabrillo.edu/~jgriffin/

Rick Graziani

- Thanks to Rick Graziani for the use of some of his great network slides
- Rick's site: http://cabrillo.edu/~rgraziani/

CIS 192 - Lesson 13

Instructor: **Rich Simms**
Dial-in: **888-450-4821**
Passcode: **761867**


Solomon


Sean C.


Chris


Corey


Bryan


Sean F.


Tony


David


Donna


Dave


Evan


Gabriel


Elia


Tajvia


Carlos


Adam

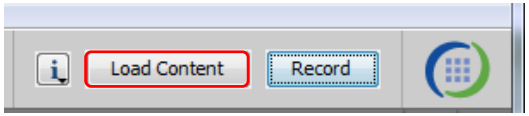

Ben


Laura

VMs for tonight
Celebrian, Frodo

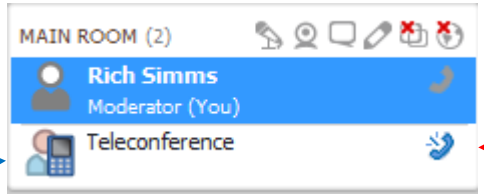
Email me (risimms@cabrillo.edu) a relatively current photo of your face for 3 points extra credit

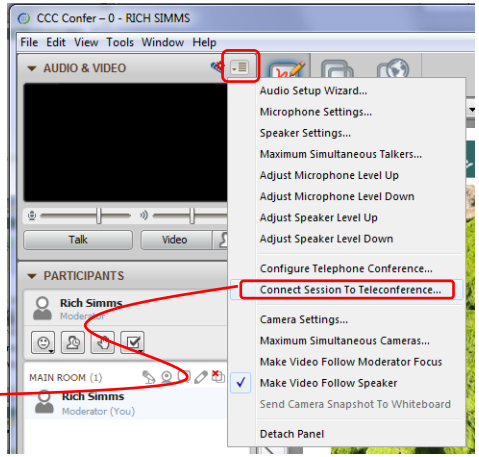
[ ] Preload White Board with *cis*lesson??*-WB*



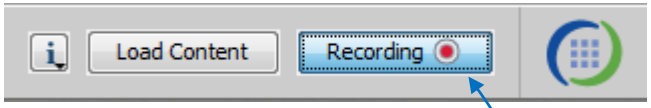
[ ] Connect session to Teleconference

Session now connected to teleconference





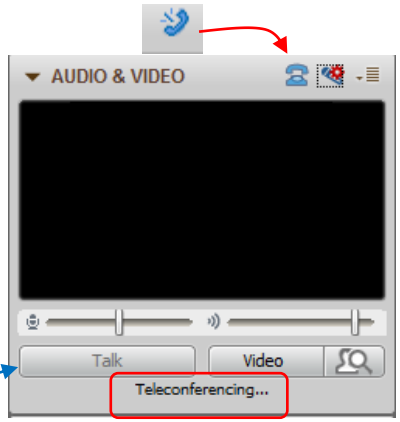
[ ] Is recording on?



Red dot means recording

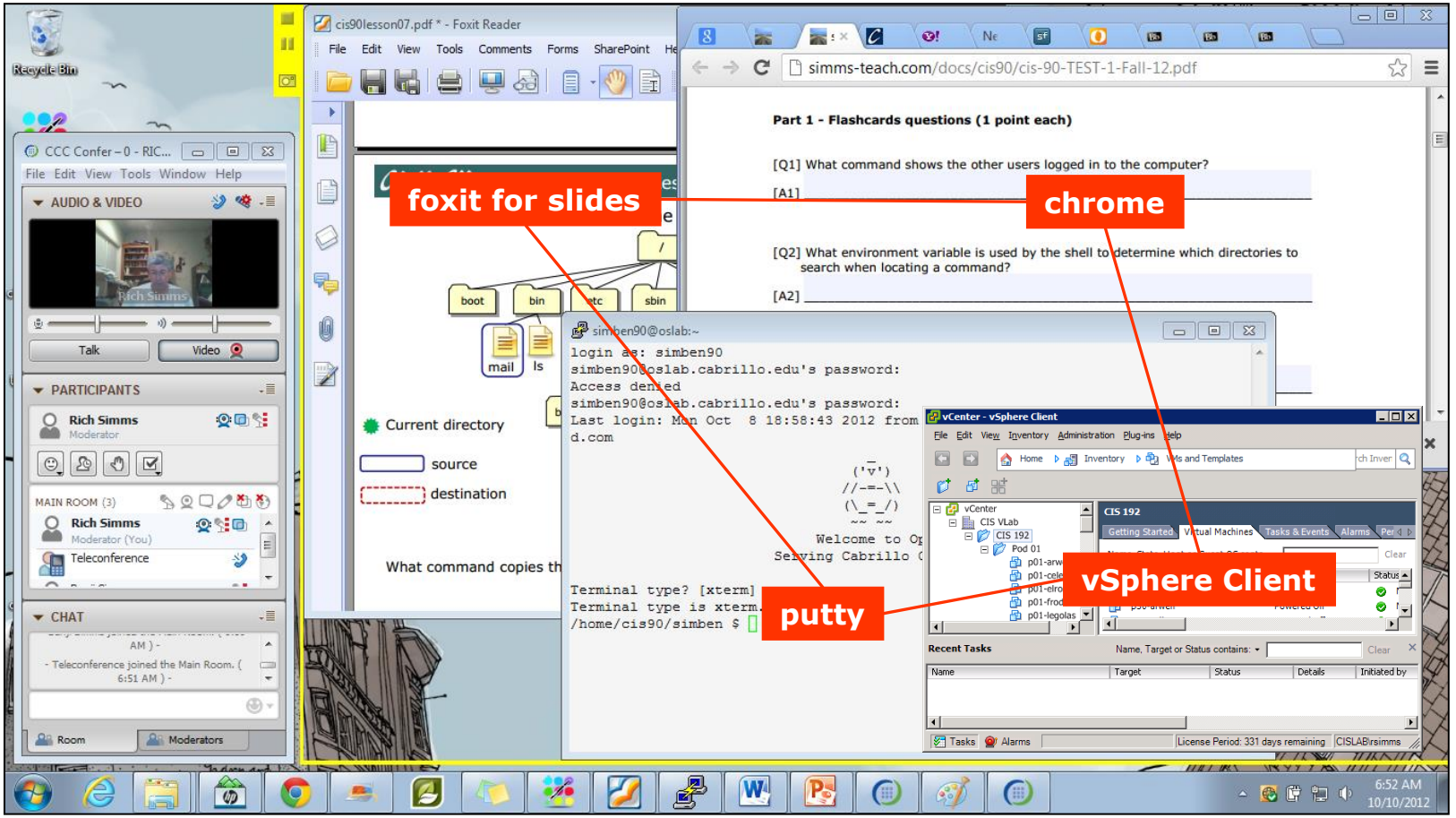
[ ] Use teleconferencing, not mic

Should be greyed out



CCC Confer

- [ ] **Video (webcam) optional**
- [ ] **layout and share apps**

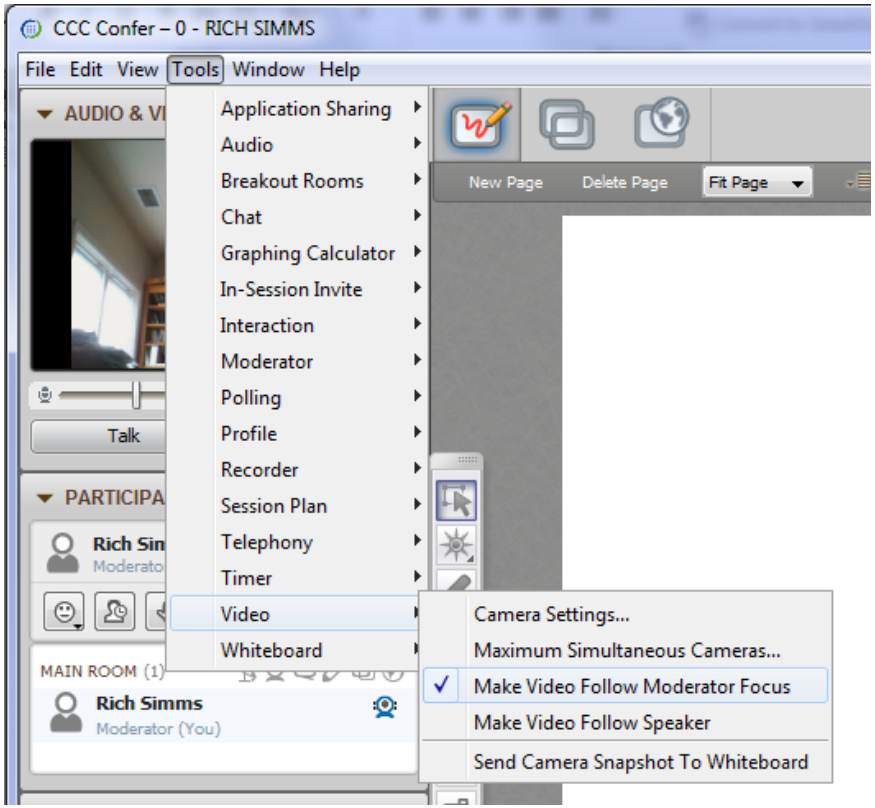


CCC Confer

[ ] Video (webcam) optional

[ ] Follow moderator

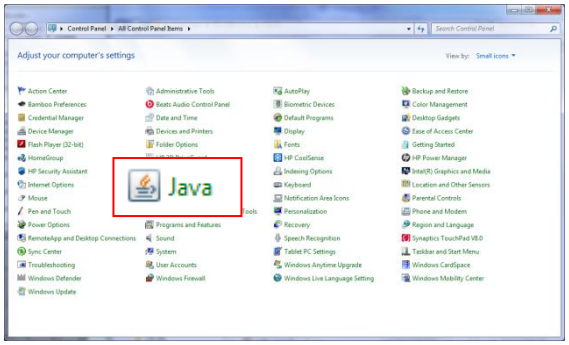
[ ] Double-click on postages stamps



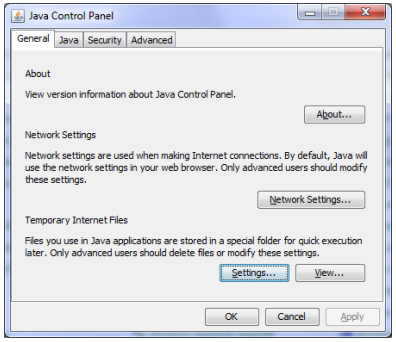
Universal Fix for CCC Confer:

1) Shrink (500 MB) and delete Java cache
2) Uninstall and reinstall latest Java runtime

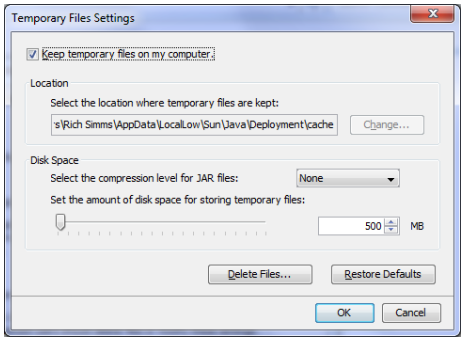
Control Panel (small icons)



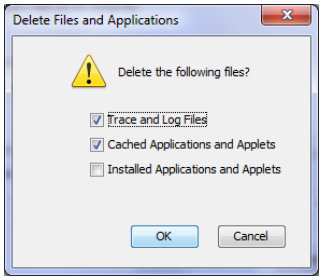
General Tab > Settings…



500MB cache size



Delete these



Google Java download

First Minute Quiz

Please answer these questions **in the order** shown:

THE LAST QUIZ!

For credit email answers to:
risimms@cabrillo.edu
within the first few minutes of class

Network Information Service

Objectives	Agenda
• Install and configure NIS to serve common system files to domain clients	• Quiz • Questions on previous material • Housekeeping • Troubleshooting SLO Assessment • NIS • Review for Test 3 • Wrap

Questions on previous material

Questions?

Lesson material?

Labs? Tests?

How this course works?

- Graded work in home directories
- Answers in /home/cis192/answers

Who questions much, shall learn much, and retain much.
- Francis Bacon

If you don't ask, you don't get.
- Mahatma Gandhi

Chinese Proverb	他問一個問題，五分鐘是個傻子，他不問一個問題仍然是一個傻瓜永遠。 *He who asks a question is a fool for five minutes; he who does not ask a question remains a fool forever.*

fetchmail on Ubuntu

Note: We used a Centos VM for this in Lab 9

fetchmail

- Fetches mail from remote Access Agents (POP and IMAP servers) that can then be read by a local MUA like /bin/mail.
- See http://fetchmail.berlios.de/
- Fetchmail is configured for each user with a .fetchmailrc file in their home directory.
- Read your mail locally using /bin/mail

Setup: Install mailx, fetchmail and sendmail

On Frodo

```
cis192@p23-frodo:~$ sudo apt-get install heirloom-mailx
cis192@p23-frodo:~$ sudo apt-get install fetchmail
cis192@p23-frodo:~$ apt-get install sendmail
```

We install the necessary mail components

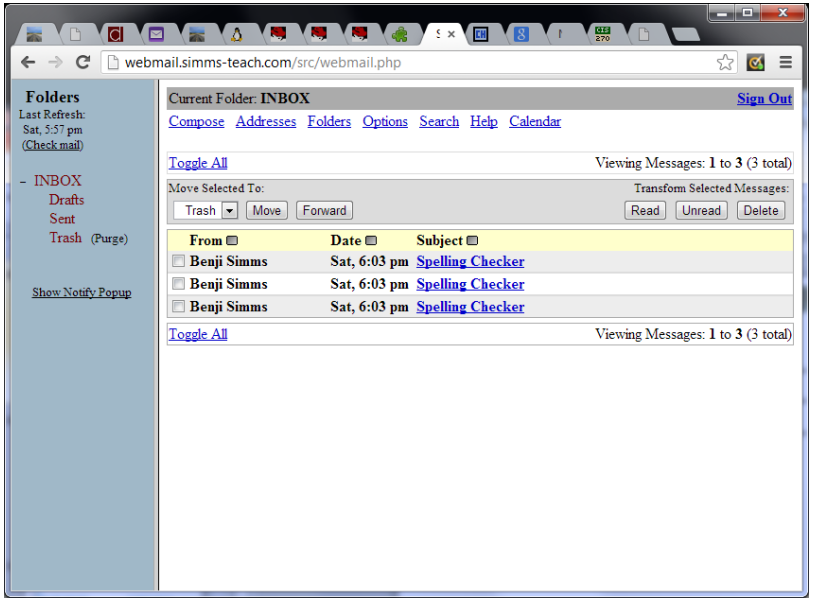
On Opus

```
[simben192@oslab ~]$ send-lab09-emails
Mailing simben192@hershey.cislab.net the file, MarkTwain (Plan to improve English spelling)
Mailing simben192@simms-teach.com the file, spellk (Spelling Checker)
[simben192@oslab ~]$ send-lab09-emails
Mailing simben192@hershey.cislab.net the file, MarkTwain (Plan to improve English spelling)
Mailing simben192@simms-teach.com the file, spellk (Spelling Checker)
[simben192@oslab ~]$ send-lab09-emails
Mailing simben192@hershey.cislab.net the file, MarkTwain (Plan to improve English spelling)
Mailing simben192@simms-teach.com the file, spellk (Spelling Checker)
```

From Opus, this sends some sample emails to:

- *simben192@hershey.cislab.net*
- *simben192@simms-teach.com*

On Simms-Teach.com



We check that the sample emails have been delivered to the simben192 user at simms-teach.com and Hershey.cislab.net

On Hershey.cislab.net

```
[simben192@hershey ~]$ mail
Mail version 8.1 6/6/93.  Type ? for help.
"/var/spool/mail/simben192": 3 messages 3 new
>N  1 simben192@oslab.cabr  Sat May 11 18:02  37/2104  "Plan to improve English spelling"
 N  2 simben192@oslab.cabr  Sat May 11 18:03  37/2101  "Plan to improve English spelling"
 N  3 simben192@oslab.cabr  Sat May 11 18:03  37/2104  "Plan to improve English spelling"
&
```

Fetch mail from Hershey using pop3

On Frodo

```
cis192@p23-frodo:~$ cat .fetchmailrc
poll hershey protocol pop3
user simben192
pass secret
keep

cis192@p23-frodo:~$ fetchmail
fetchmail: Server certificate verification error: self signed certificate
fetchmail: This means that the root signing certificate (issued for /OU=IMAP
  server/CN=imap.example.com/emailAddress=postmaster@example.com) is not in the trusted CA
  certificate locations, or that c_rehash needs to be run on the certificate directory. For
  details, please see the documentation of --sslcertpath and --sslcertfile in the manual
  page.
fetchmail: Warning: the connection is insecure, continuing anyways. (Better use --
  sslcertck!)
3 messages for simben192 at hershey (6231 octets).
reading message simben192@hershey.cislab.net:1 of 3 (2078 octets) not flushed
reading message simben192@hershey.cislab.net:2 of 3 (2075 octets) not flushed
reading message simben192@hershey.cislab.net:3 of 3 (2078 octets) not flushed

cis192@p23-frodo:~$ mail
Heirloom mailx version 12.5 6/20/10.  Type ? for help.
"/var/mail/cis192": 3 messages 3 new
>N  1 Benji Simms         Sat May 11 18:21   43/2453  Plan to improve English s
 N  2 Benji Simms         Sat May 11 18:21   43/2450  Plan to improve English s
 N  3 Benji Simms         Sat May 11 18:21   43/2453  Plan to improve English s
?
```

"not flushed" means the message was not deleted on the remote server Hershey

This pulls Mark Twain's English language proposal messages

Fetch mail from mail.simms-teach.com using pop3

```
cis192@p23-frodo:~$ cat .fetchmailrc
poll mail.simms-teach.com protocol pop3
user simben192@simms-teach.com
pass secret
keep
```

On Frodo

```
cis192@p23-frodo:~$ fetchmail
fetchmail: Server certificate verification error: unable to get local issuer certificate
fetchmail: This means that the root signing certificate (issued for
   /C=US/ST=California/L=Brea/O=Dreamhost.com/OU=Security/CN=*.mail.dreamhost.com/emailAddress=support@dreamhost.com) is
   not in the trusted CA certificate locations, or that c_rehash needs to be run on the certificate directory. For
   details, please see the documentation of --sslcertpath and --sslcertfile in the manual page.
fetchmail: Server certificate verification error: certificate not trusted
fetchmail: Server certificate verification error: unable to verify the first certificate
fetchmail: Warning: the connection is insecure, continuing anyways. (Better use --sslcertck!)
3 messages for simben192@simms-teach.com at mail.simms-teach.com (5034 octets).
reading message simben192@simms-teach.com@sub5.mail.dreamhost.com:1 of 3 (1678 octets) not flushed
reading message simben192@simms-teach.com@sub5.mail.dreamhost.com:2 of 3 (1678 octets) not flushed
reading message simben192@simms-teach.com@sub5.mail.dreamhost.com:3 of 3 (1678 octets) not flushed
```

"not flushed" means the message was not deleted on the remote server Hershey

```
cis192@p23-frodo:~$ mail
Heirloom mailx version 12.5 6/20/10.  Type ? for help.
"/var/mail/cis192": 6 messages 3 new 6 unread
 U  1 Benji Simms        Sat May 11 18:21   44/2463  Plan to improve English s
 U  2 Benji Simms        Sat May 11 18:21   44/2460  Plan to improve English s
 U  3 Benji Simms        Sat May 11 18:21   44/2463  Plan to improve English s
>N  4 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
 N  5 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
 N  6 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
?
```

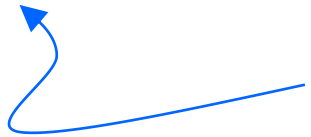
This pulls Mark Twain's the spelling checker messages

Importing mbox files into Thunderbird

On Frodo

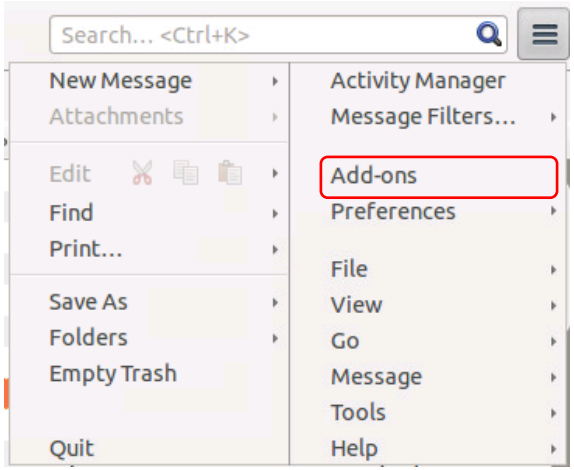
*After running fetchmail and using the **mailx** MUA to review your messages*

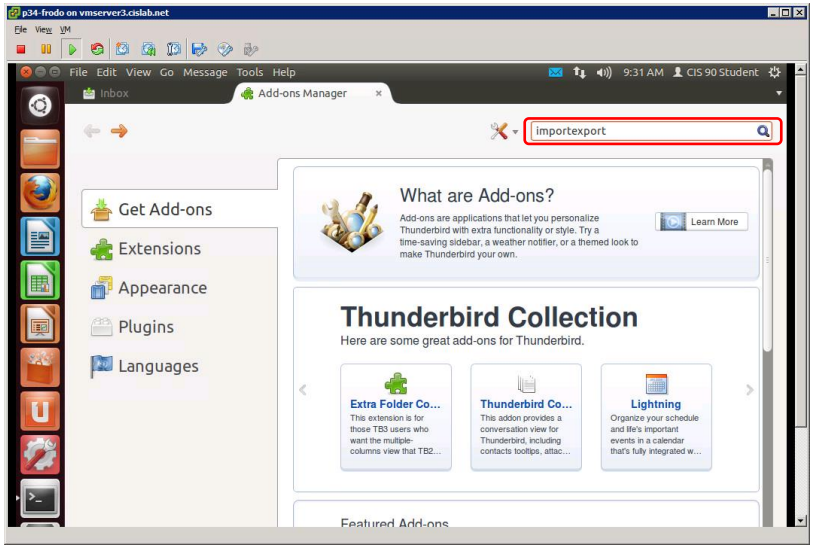
```
cis192@p23-frodo:~$ mail
Heirloom mailx version 12.5 6/20/10.  Type ? for help.
"/var/mail/cis192": 6 messages 3 new 6 unread
 U  1 Benji Simms        Sat May 11 18:21   44/2463  Plan to improve English s
 U  2 Benji Simms        Sat May 11 18:21   44/2460  Plan to improve English s
 U  3 Benji Simms        Sat May 11 18:21   44/2463  Plan to improve English s
>N  4 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
 N  5 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
 N  6 Benji Simms        Sat May 11 18:30   51/2052  Spelling Checker
?
```

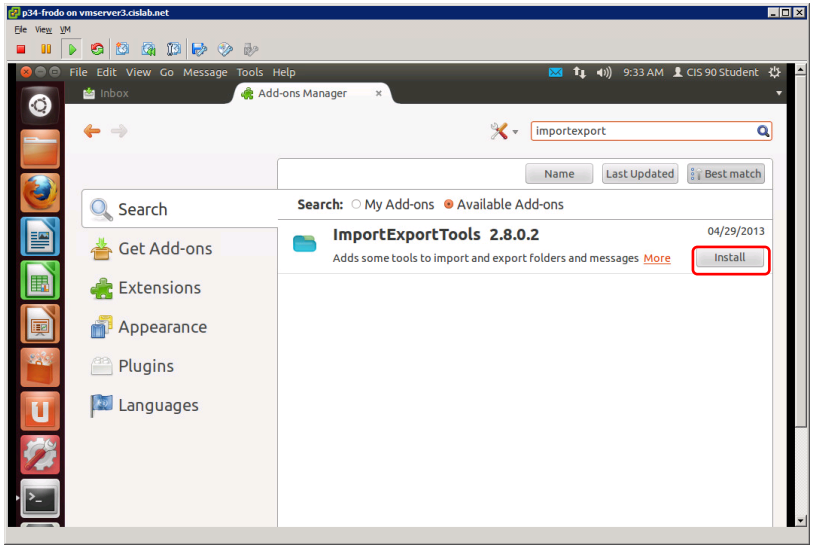


Your actual local message store (incoming "intray") is the file /var/mail/<username>

How could you review these messages on a graphical MUA (like Thunderbird)?



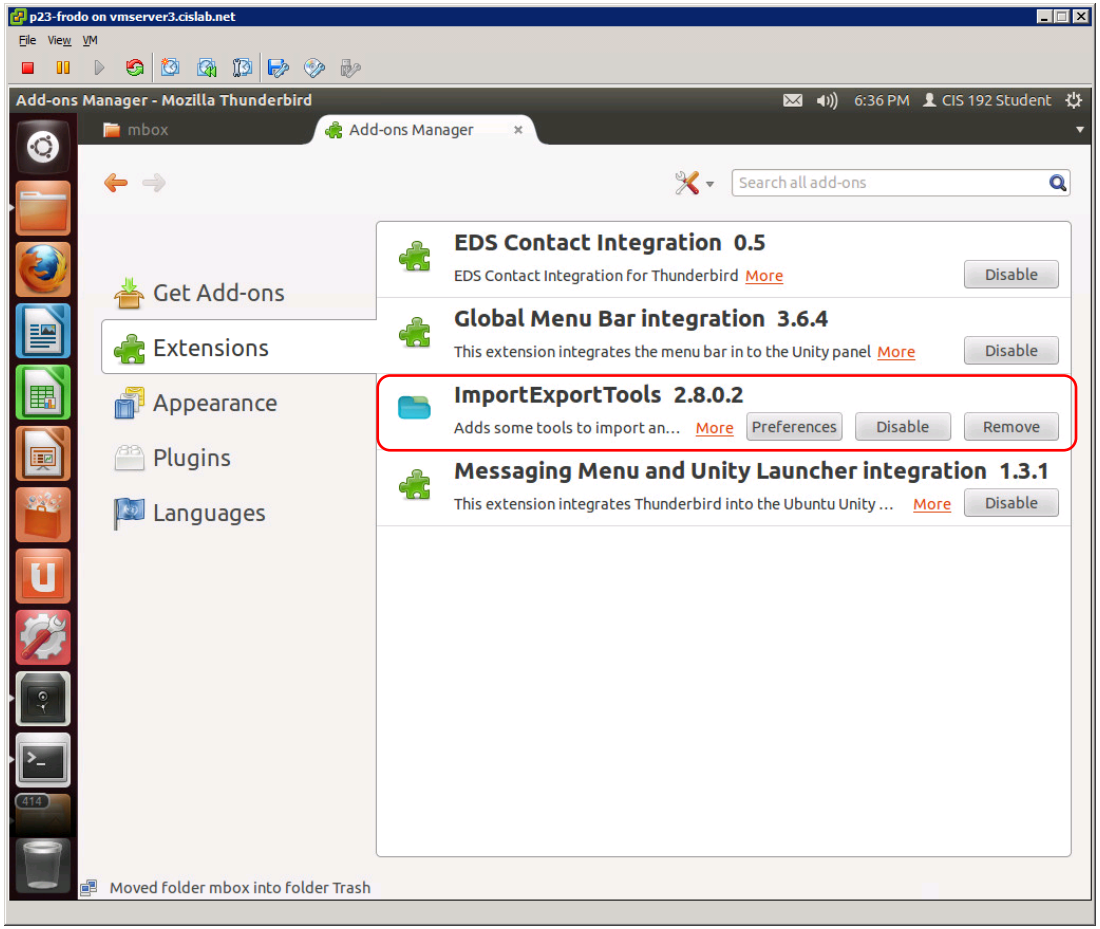




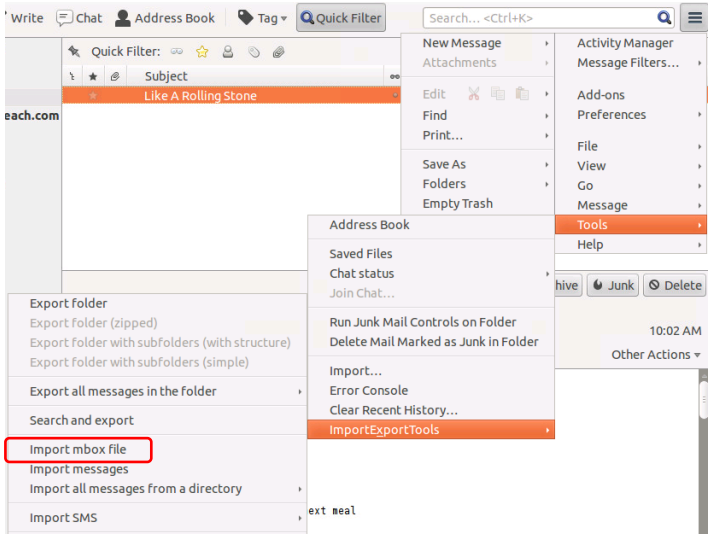
First add the ImportExportTools Add-on to Thunderbird Mail

After installing you will need to restart Thunderbird

On Frodo

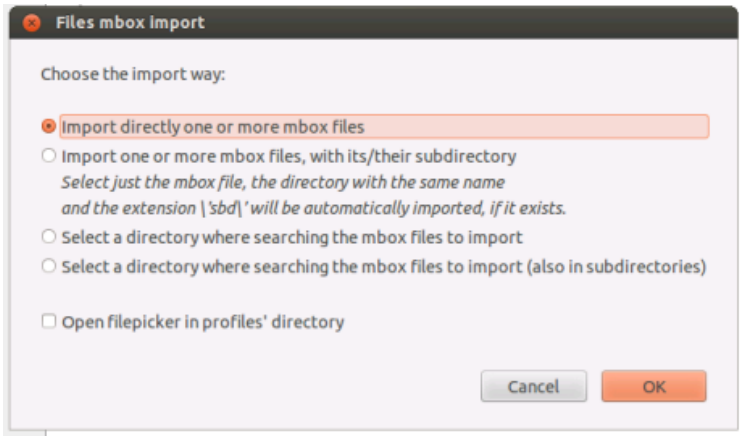


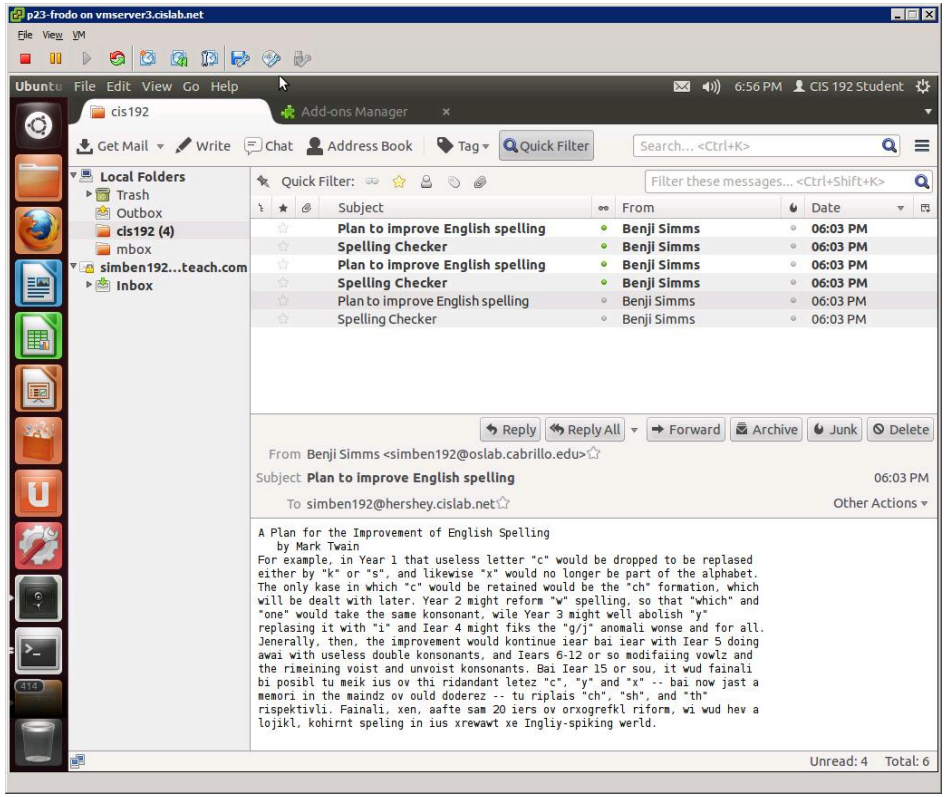
Verify it has been installed



On Frodo

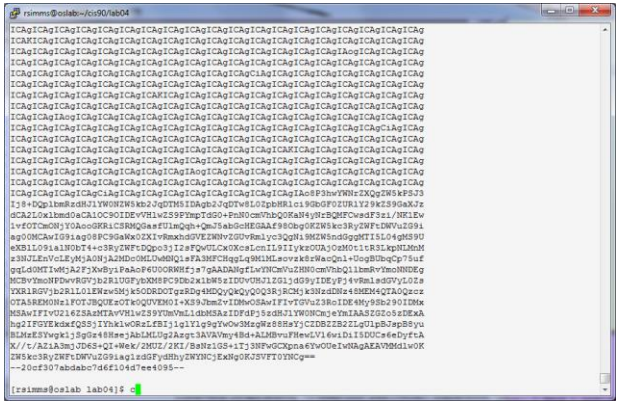
Note this extension enables Thunderbird to import message stores such as the mbox files you create by saving messages from mailx



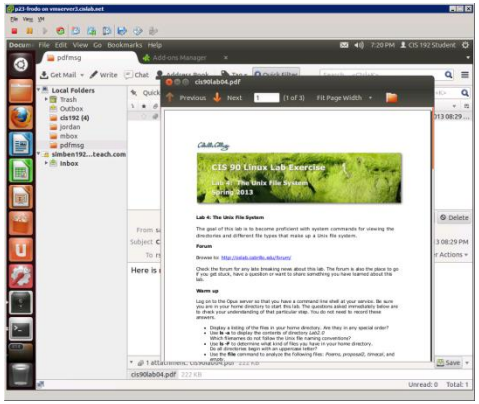


Footnote: I had a student send me an email on Opus with a PDF attachment. Since Opus does not operate in graphics mode this presented a challenge to read the PDF file. Forwarding the message to my Yahoo account did not work. The workaround was:

1. On Opus, use the save command in /bin/mail to save the message with the un-viewable PDF attachment to a new (mbox format) file.
2. scp the file to Frodo.
3. Install the ImportExportTools add-in to Thunderbird mail
4. Import the file into Thunderbird mail, open the message and view it!



PDF attachment on Opus



PDF attachment on Frodo

Let's try it

On Frodo

1) Run Thunderbird on Frodo

2) Add the ImportExportTools Add-on:

-  > Add-ons > Search for "importexport"
- Install the ImportExportTools Add-on
- Click restart button

Give me a green check in CCC Confer when finished

On Opus

Unlike send-lab09-emails this will also send mail to your Opus account

1) On Opus, send yourself some emails with: **send-192-emails**

2) On Opus, read your mail with the mail command and save the Rolling Stone message to an mbox file named bob

```
[simben192@oslab ~]$ mail
Heirloom Mail version 12.4 7/29/08.  Type ? for help.
"/var/spool/mail/simben192": 3 messages 1 new
    1 simben192@simms-teac  Sat May  4 14:15  37/1867  "test stdc to Opus 2"
    2 evil@spammer.org      Tue May  7 19:13  12/393
>N  3 Benji Simms           Tue May 14 10:02  87/2959  "Like A Rolling Stone"
& save 3 bob
"bob" [New file] 89/2980
& q
```

Give me a green check in CCC Confer when finished

1) On Frodo, copy your bob mbox file to your cis192 home directory with:

cis192@p34-frodo:~$ scp <username>@opus:/bob .

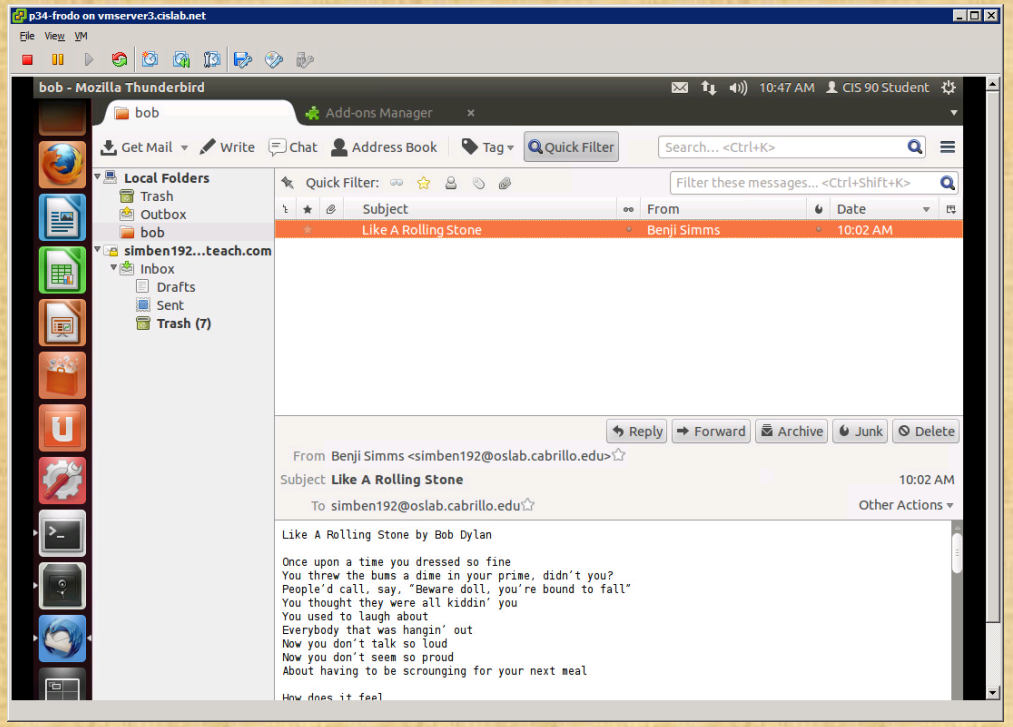
On Frodo

2) On Frodo, import your bob file:

Select the Local Folder area on the left panel

> Tools > ImportExportTools > Import mbox file

3) Read your Rolling Stone message



Give me a green check in CCC Confer when finished

application "ping"

Not Really … but I wish

- The ping command, operating at layer 3, can be used to test connectivity between hosts using IP addresses
- Ping cannot be used to ping application ports which is implemented at layer 4.
- However, the telnet command can be used in a way to "ping an application"
- Examples:

telnet mx.cruzio.com 25
telnet hershey 110
telnet mail.simms-teach.com 143
telnet simms-teach.com 80

There are also port scanning applications like nmap that can be used to probe a range or ports on a system

Check for an SMTP service (port 25)

```
[rsimms@oslab ~]$ telnet hershey 25
Trying 172.30.5.17...
Connected to hershey.
Escape character is '^]'.
220 hershey.cislab.net ESMTP Sendmail 8.13.8/8.13.8; Sat, 11 May 2013
07:54:20 -0700
quit
221 2.0.0 hershey.cislab.net closing connection
Connection closed by foreign host.
[rsimms@oslab ~]$
```

```
[rsimms@oslab ~]$ telnet mail.simms-teach.com 25
Trying 208.113.200.129...
Connected to mail.simms-teach.com.
Escape character is '^]'.
220 homiemail-a51.g.dreamhost.com ESMTP
quit
221 2.0.0 Bye
Connection closed by foreign host.
[rsimms@oslab ~]$
```

Check for a POP service (port 110)

```
[rsimms@oslab ~]$ telnet mail.simms-teach.com 110
Trying 208.113.200.129...
Connected to mail.simms-teach.com.
Escape character is '^]'.
+OK Dovecot ready.
quit
+OK Logging out
Connection closed by foreign host.
[rsimms@oslab ~]$
```

```
[[rsimms@oslab ~]$ telnet hershey 110
Trying 172.30.5.17...
Connected to hershey.
Escape character is '^]'.
+OK Dovecot ready.
quit
+OK Logging out
Connection closed by foreign host.
[rsimms@oslab ~]$
```

Check for an IMAP service (port 143)

```
[rsimms@oslab ~]$ telnet mail.simms-teach.com 143
Trying 208.113.200.129...
Connected to mail.simms-teach.com.
Escape character is '^]'.
* OK [CAPABILITY IMAP4rev1 LITERAL+ SASL-IR LOGIN-REFERRALS ID ENABLE
STARTTLS AUTH=PLAIN AUTH=LOGIN] Dovecot ready.
a01 logout
* BYE Logging out
a01 OK Logout completed.
Connection closed by foreign host.
[rsimms@oslab ~]$


[rsimms@oslab ~]$ telnet hershey 143
Trying 172.30.5.17...
Connected to hershey.
Escape character is '^]'.
* OK Dovecot ready.
a01 logout
* BYE Logging out
a01 OK Logout completed.
Connection closed by foreign host.
[rsimms@oslab ~]$
```

Check for a Web Server (port 80)

```
[rsimms@oslab ~]$ telnet simms-teach.com 80
Trying 208.113.154.64...
Connected to simms-teach.com.
Escape character is '^]'.
GET / HTTP/1.0
host: simms-teach.com

HTTP/1.1 200 OK
Date: Sat, 11 May 2013 15:02:07 GMT
Server: Apache
Vary: Accept-Encoding
Content-Length: 9422
Connection: close
Content-Type: text/html

<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Strict//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-strict.dtd">
<html xmlns="http://www.w3.org/1999/xhtml" xml:lang="en" lang="en">
        <head>
< snipped >
```

Don't forget to enter a blank line here

On Celebrian

Check connectivity with some application services using **telnet** ***<server>*** ***<port>***

- mail.hyrocket.com (SMTP server at port 25)
  - Use: **telnet mail.simms-teach.com 25** *use **quit** to teminate*
- www.google.com (web server at port 80)
  - Use: **telnet google.com 80** *use **quit** to teminate*
- hershey (IMAP and POP server at ports 143 and 110)
  - Use: **telnet hershey 143** *use **a1 logout** to teminate*
  - Use: **telnet hershey 110** *use **quit** to teminate*

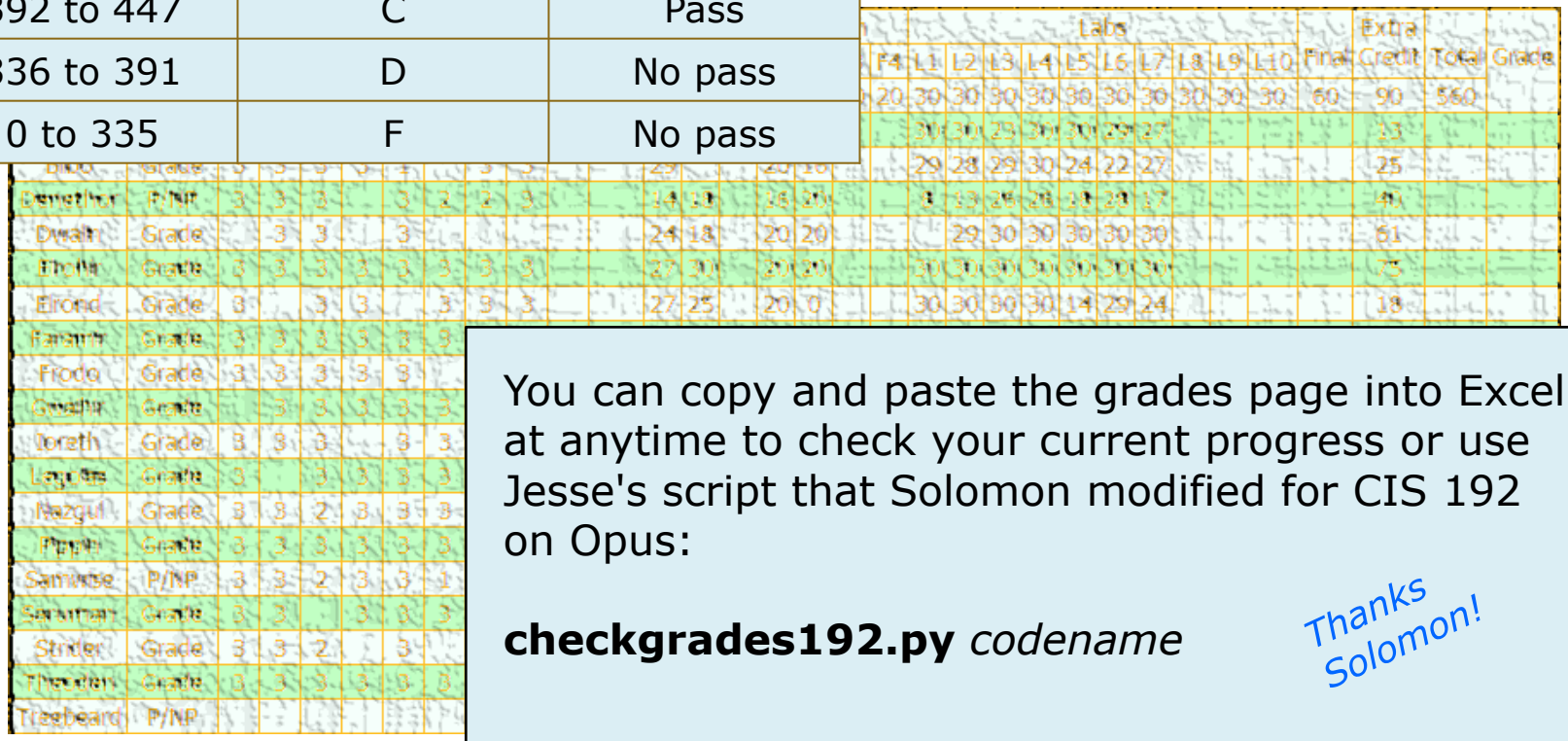
Housekeeping

- Lab 9 due tonight
- Test 3 next week

Grades Check

504 or higher	A	Pass
448 to 503	B	Pass
392 to 447	C	Pass
336 to 391	D	No pass
0 to 335	F	No pass

Your grade in this course is based solely on how many points you earn



You can copy and paste the grades page into Excel at anytime to check your current progress or use Jesse's script that Solomon modified for CIS 192 on Opus:

checkgrades192.py *codename*

Thanks Solomon!

Remaining point earning opportunities

Work	Points
Quizzes Q10	3
Test T3	30
Forum F4	20
Labs L9, L10	60
Final	60
Extra Credit	up to 90

Extra Credit

- Note you can earn up to 90 points of extra credit (labs, typos, HowTos, etc.)
- 3 extra credit labs
- HowTos
  - Up to 20 points extra credit for a publishable HowTo document (will be published on the class website)
  - 10 points additional if you do a class presentation
  - Topics must be pre-approved with instructor

Final Exam

- Timed test
- Open book, notes and computer
- You will be provided with a pristine exam pod
- There will be a number of tasks to implement
  - Some mandatory
  - Some optional
  - Some extra credit
  - Task specifications available one week in advance
- 60 points - the more tasks completed, the more points earned

- -	6/4	**Final Exam for CIS 192** **Time** • 5:30PM - 8:20PM in Room 2501 **Materials** • Presentation slides (download) • Test (download)		5 posts Extra Credit Labs

- Preparing for the final exam
  - Know where to locate information quickly
  - Make a network map & crib sheet
  - "Muscle memory" for basic commands
  - Practice makes perfect

Help with labs

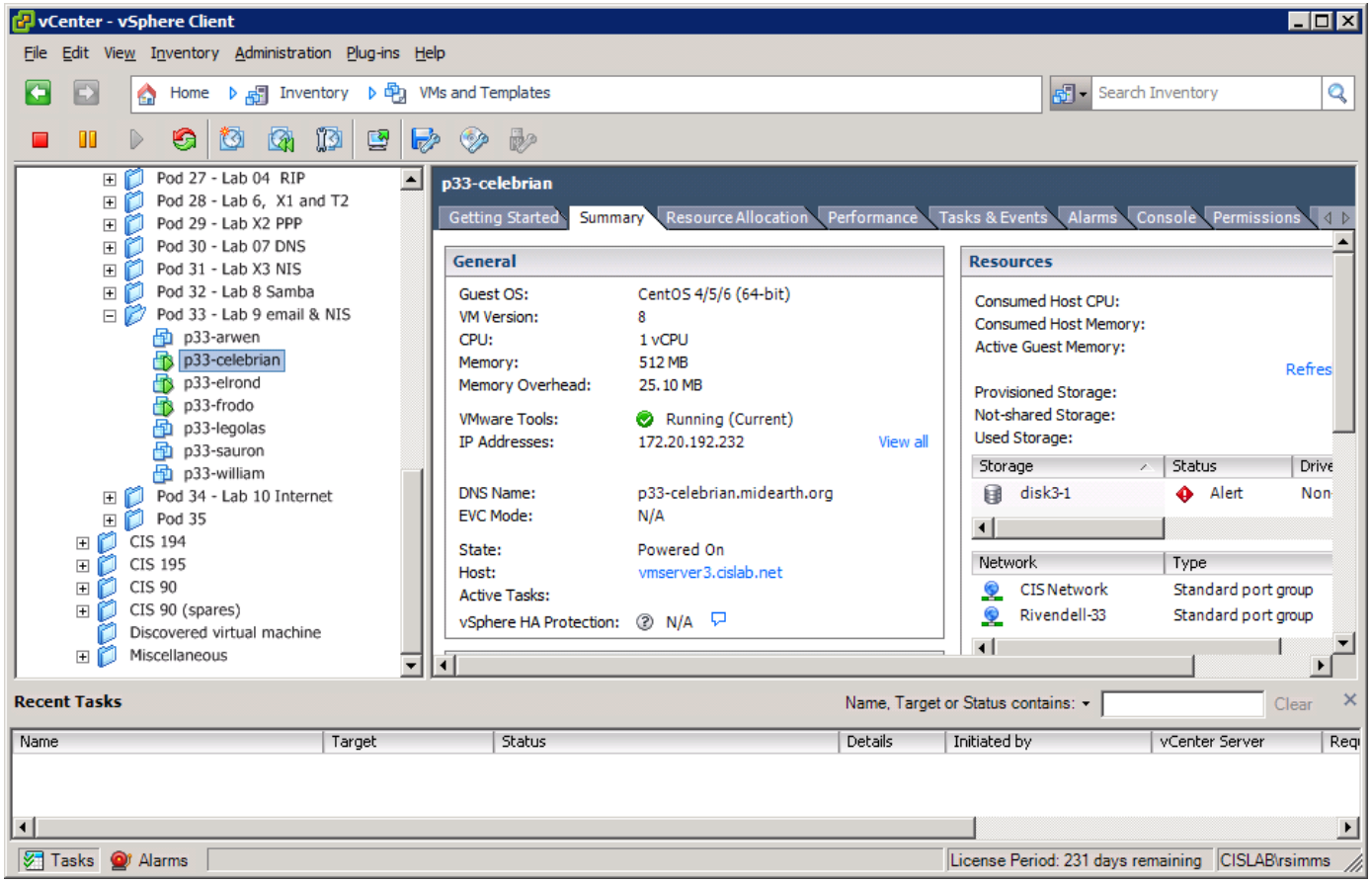
Like some help with labs?

I'm in the CIS Lab Monday afternoons
- See schedule at http://webhawks.org/~cislab/

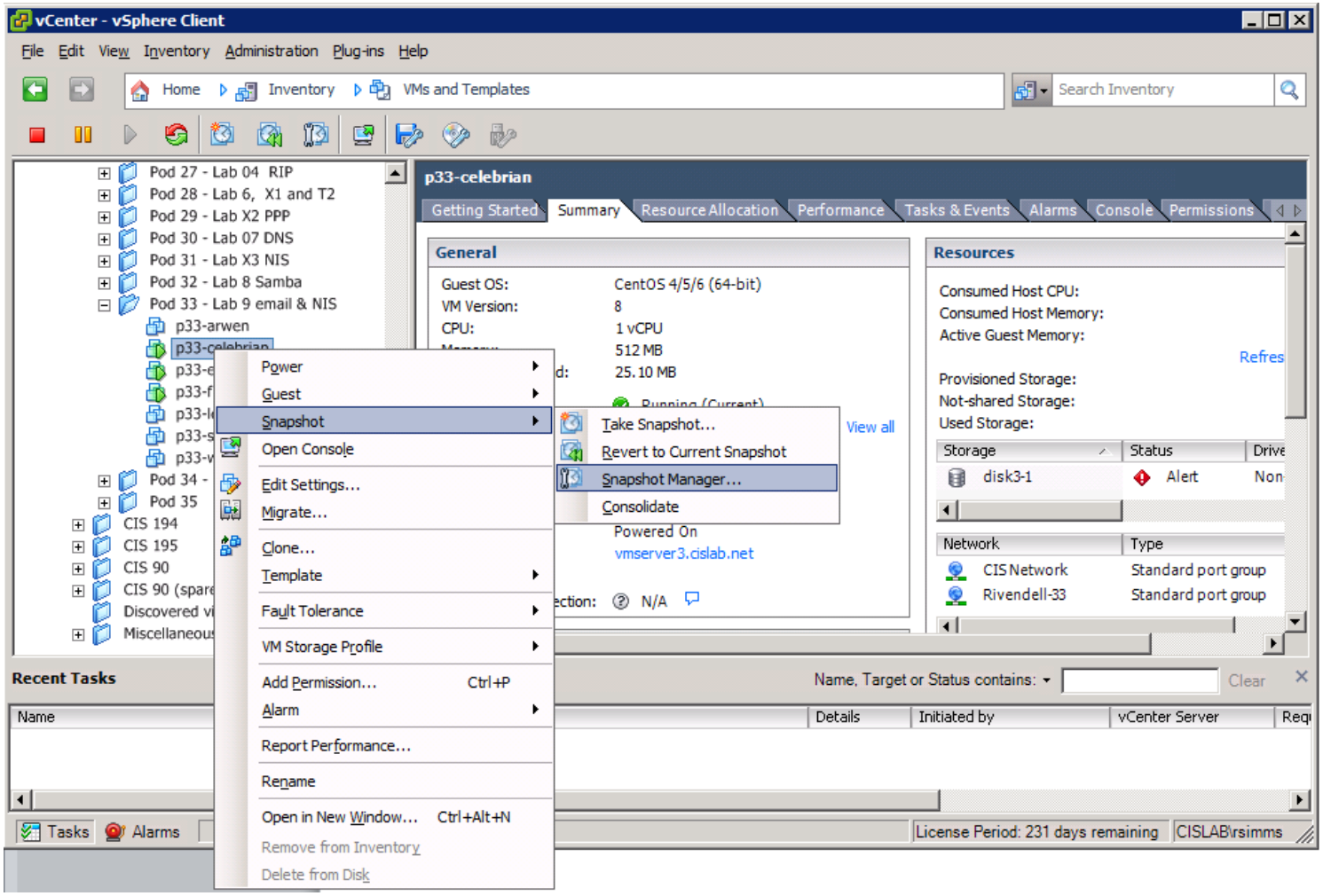
or see me during office hours

or contact me to arrange another time online

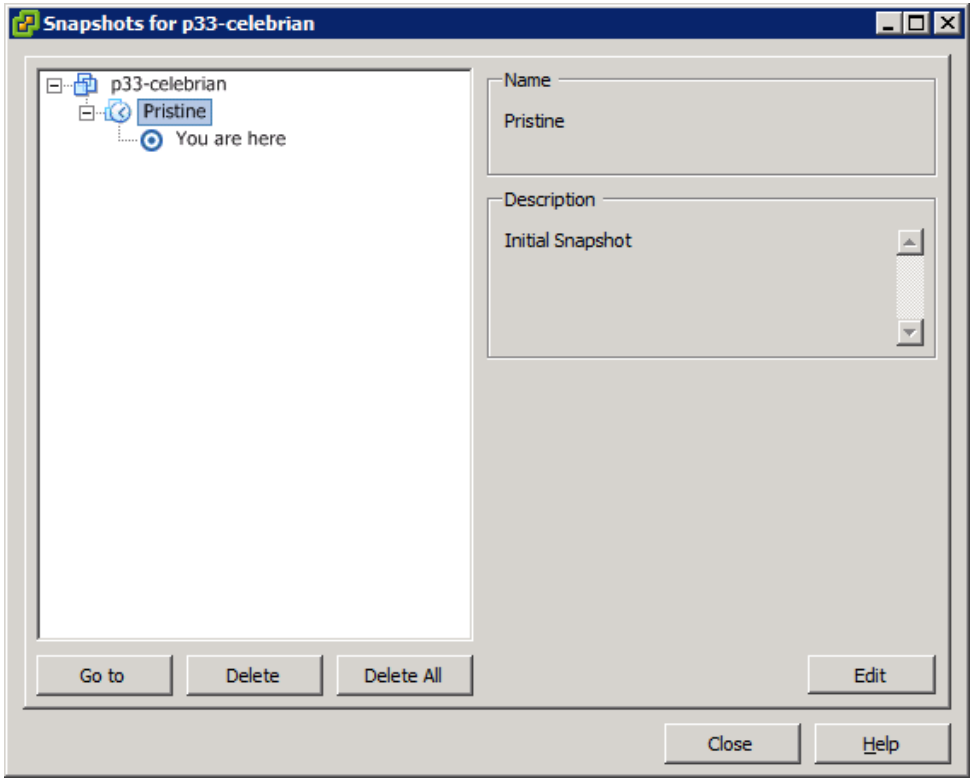
The Pristine snapshot



The CentOS VMs are "link" clones of a master CentOS VM. Each link clone requires very little disk space since it only keeps the delta changes from the master CentOS VM disk



Each snapshot is also a delta from the original link-clone (which is also a delta)



*The Pristine snapshot was taken either right before or after running a custom script called **me**.*

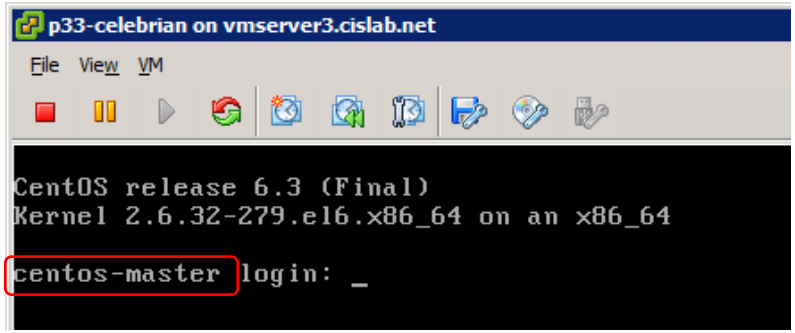
It not consistent because the script used to create the 192 pods was modified after some pods were created to automatically take the snapshot when the link clones is created.

```
#!/bin/bash
#
# Setup CIS 192 Centos VM
#
if [ $(id -u) == "0" ]; then
  echo user is root
else
  echo user is not root
  exit 1
fi

vm=$1
xx=$2

if [ "$vm" = "" ]; then
        read -p "VM types:
        0 - Centos Master
        1 - CIS 192 Elrond
        2 - CIS 192 Celebrian
        3 - CIS 192 Legolas
        4 - CIS 192 Arwen
        Your choice: " vm
fi

if [ "$xx" = "" ]; then
        read -p "Enter the xx pod or vm number: " xx
fi

if [ "${#xx}" = "1" ]; then xx="0$xx"; fi

case "$vm" in
0) hostname=centos-master.localdomain
;;
1) hostname="p${xx}-elrond.rivendell"
;;
2) hostname="p${xx}-celebrian.rivendell"
;;
3) hostname="p${xx}-legolas.rivendell"
;;
4) hostname="p${xx}-arwen.rivendell"
;;
*) echo "Bad vm type choice: $vm"
   exit 1
;;
esac
```

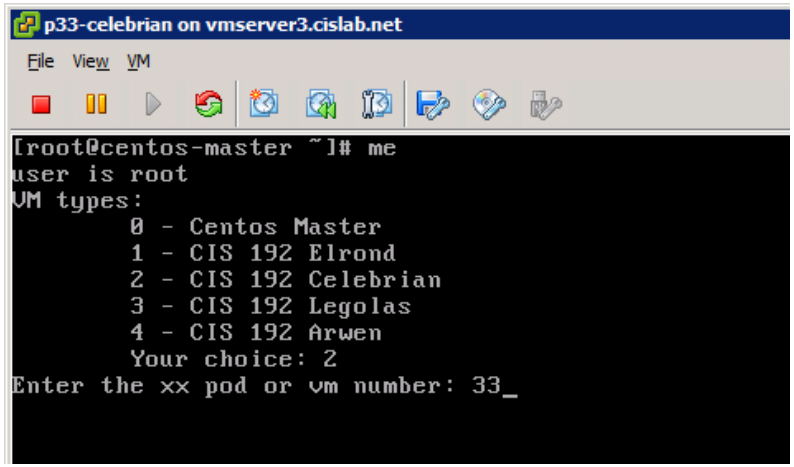
```
# No changes needed for /etc/hosts

# Update hostname
sed -i '/HOSTNAME/d' /etc/sysconfig/network
echo HOSTNAME="$hostname" >> /etc/sysconfig/network

# Clear entries in /etc/udev/rules.d/70-persistent-net.rules
sed -i '/PCI device/d' /etc/udev/rules.d/70-persistent-net.rules
sed -i '/NAME="eth/d' /etc/udev/rules.d/70-persistent-net.rules

# Clear entries from /etc/resolv.conf
> /etc/resolv.conf

echo
echo /etc/sysconfig/network:
cat /etc/sysconfig/network

echo
echo /etc/hosts:
cat /etc/hosts

echo
echo /etc/udev/rules.d/70-persistent-net.rules:
cat /etc/udev/rules.d/70-persistent-net.rules

echo
echo /etc/resolv.conf:
cat /etc/resolv.conf

exit 0
```

*The **me** script on the CentOS VMs is used to create an Elrond, Celebrian, Legolas or Arwen VM on a freshly created CentOS link-clone VM*

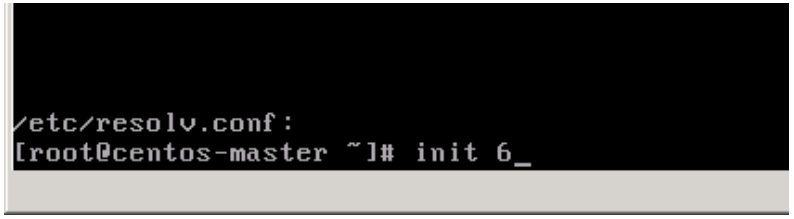
Reverting Celebrian VM to Master Snapshot



*If you get a generic "centos-master" prompt after reverting to the master snapshot then you need to run the **me** script*



Select VM type and your pod number



Reboot

Make a fresh Celebrian

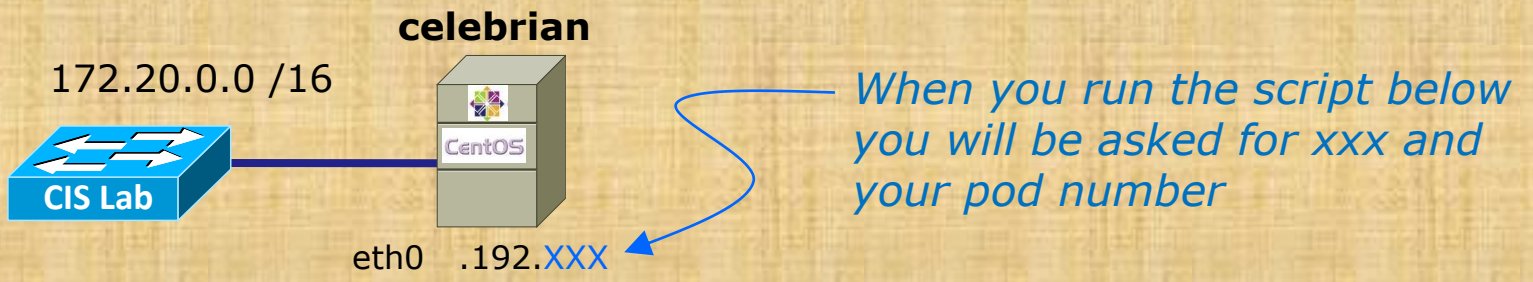
On Celebrian

- Revert to the Pristine snapshot
- Power up the reverted VM and check the prompt
- If the prompt contains "Celebrian" you are done
- If the prompt contains "centos-master" then you must run the **me** script and make it into a Celebrian VM for your pod

Automatically configuring Celebrian

Part 1

Configure your Celebrian for tonight

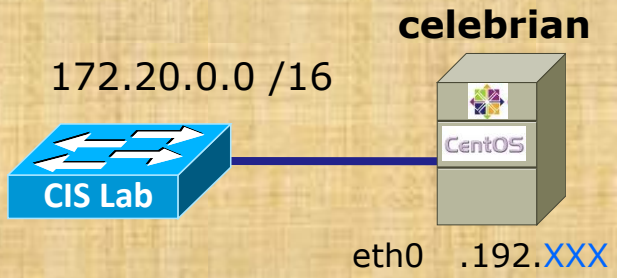


- Revert and power-up Celebrian (if you haven't already)
- Cable as shown
- Use **dhclient -v eth0** for an initial IP address
- **scp *logname*@opus:/home/cis192/scripts/down* .**

Automatically configuring Celebrian

Part 2

Configure your Celebrian for tonight



When you run the script below you will be asked for xxx and your pod number

- **chmod 700 download-scripts-packages** (use tab complete)
- **./download-scripts-packages** (and download everything)
- **cd bin**
- **./do-act13A-celebrian**

*When finished, run **ifconfig eth0** and type your IP address into the chat window for me to ping*

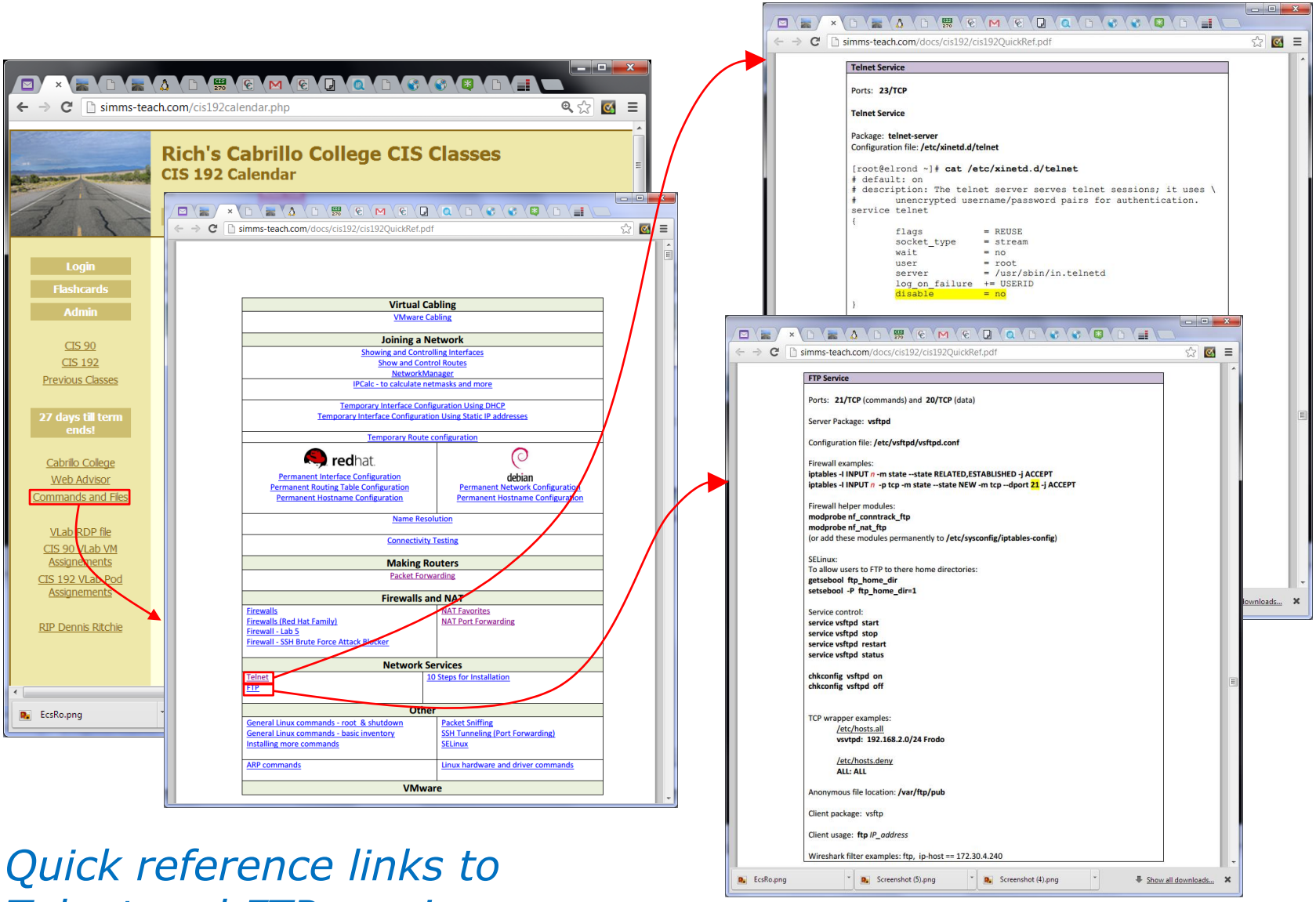
Warmup

http://simms-teach.com/cis192home.php

Student Learner Outcomes

- Install and configure a local area network (LAN) that meets the needs of a small business.
- Install and configure common network services.
- Troubleshoot and repair malfunctions in common network services.

For our warm-up tonight we will assess the last SLO above



Quick reference links to Telnet and FTP services

On Celebrian

The problem: The FTP and Telnet services on Celebrian are down and customers are getting very upset.

Situation: the original administrator who configured telnet and vsftpd the server has left the company. As a consultant you have just signed a Professional Services Agreement to get both these services back online.

Instructions: Troubleshoot and repair both FTP and Telenet services on Celebrian

When finished type your IP address into the chat window so I can test your fixes

NIS Overview

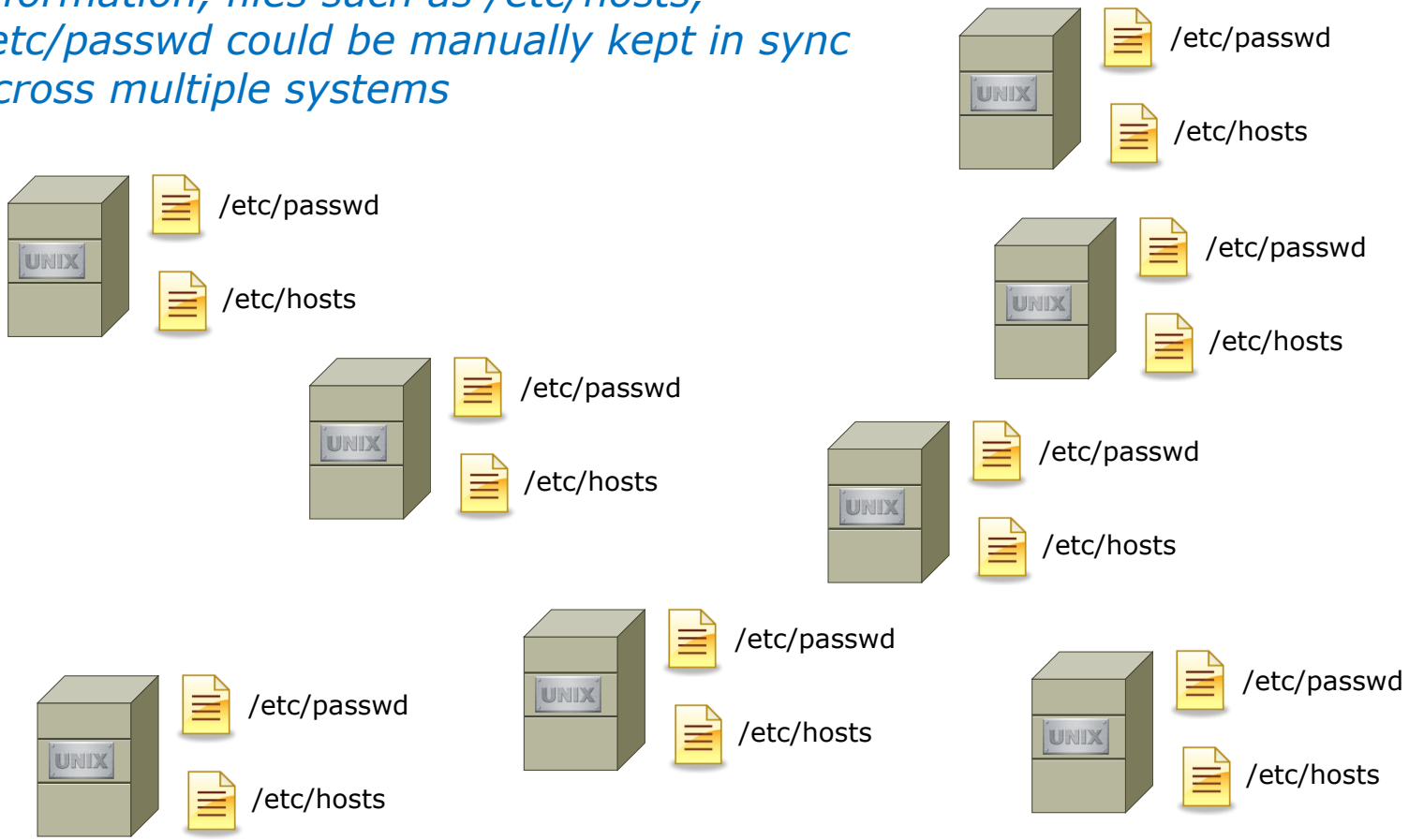
Network Information Service (NIS)

This lecture is about the Network Information Service (NIS). NIS allows centralization of system configuration files like /etc/hosts and /etc/passwd for use by other systems in an organization.

Based on Jim Griffin's Lesson #10 on Configuring Email at:
- http://cabrillo.edu/~jgriffin/CIS192/files/lesson10.html

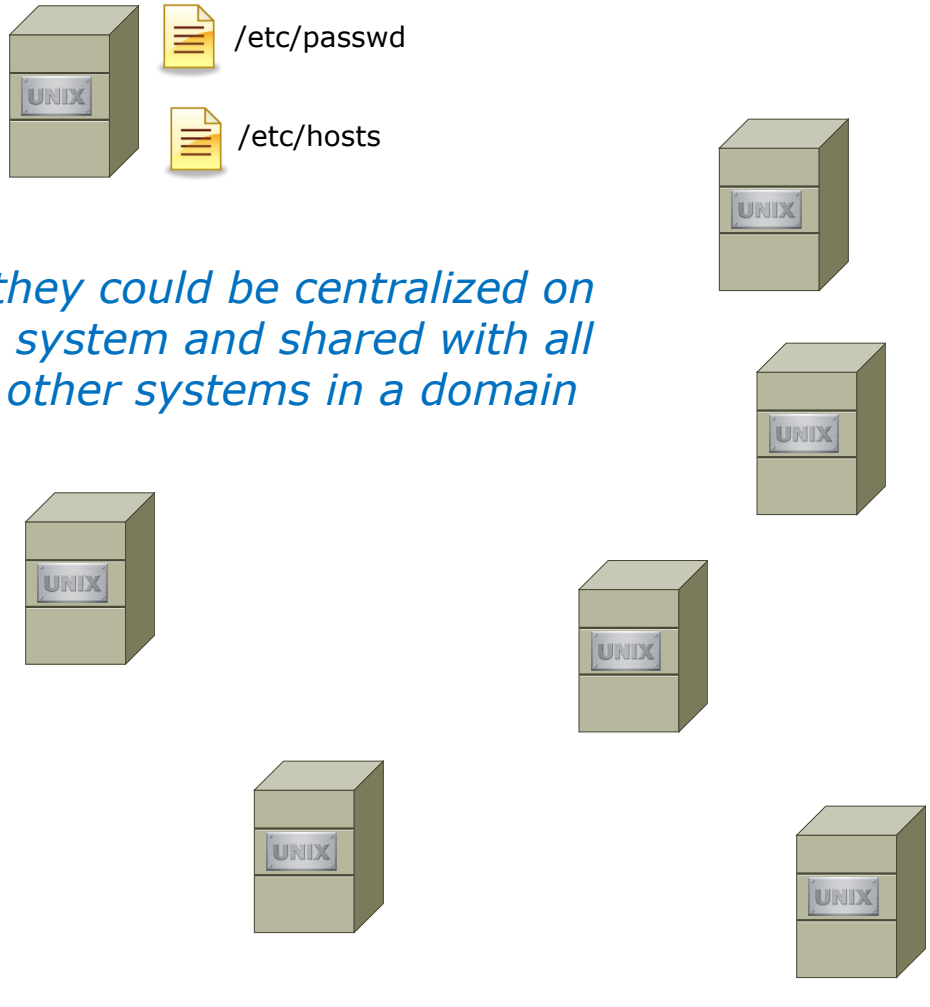
Network Information Service (NIS)

To have common host and account information, files such as /etc/hosts, /etc/passwd could be manually kept in sync across multiple systems



However this would require a great deal of administration effort

Network Information Service (NIS)



Or they could be centralized on one system and shared with all the other systems in a domain

Requiring far less system administration effort

Network Information Service (NIS)

- Allows system configuration information files to be shared across multiple systems
- Developed and licensed by SUN Microsystems
- NIS and NFS (Network File System) are independent and configured separately
- Originally known as Yellow Pages and that is why the file names start with yp
- Follows a client-server architecture
- Based on RPC (Remote Procedure Call) based and uses the port mapper (portmap)
- Analogous to the Windows domain system although internally completely different.
- NIS can run over TCP or UDP

Network Information Service (NIS)

- NIS is **Very simple** to set up
- But **NOT SECURE** - based on random ports used by RPC and portmapper makes it difficult to firewall
- Other solutions available today:
  - LDAP
  - Microsoft Active Directory

VLab uses Active Directory to manage student accounts running on a Windows 2008 server

Tim Childers, a past CIS 192 student, did a LDAP implementation. His presentation is on the Resources page of the website in the Student Howtos section:

http://simms-teach.com/howtos/students/LDAP-childers.pdf

Network Information Service (NIS)

Client-Server Operations

- NIS operates within a domain defined by an NISDOMAIN name.
- This name is not the same as a DNS domain.
- An NIS server, serves ASCII text UNIX database files to clients by compiling them into a DBM format for faster queries.
- The database files may include the following:
  - /etc/passwd
  - /etc/group
  - /etc/hosts
  - /etc/networks
  - /usr/lib/aliases
  - /etc/services
  - /etc/protocols
  - /etc/rpc
- The database files are called maps.
- All systems in the same NIS domain share the same set of maps.

Components

NIS Packages

- ypserv
  - the server daemon and its configuration file.

- ypbind
  - the client daemon and its configuration file.

- yp-tools
  - several client utilities including:
    ypcat
    dumps the content of a particular NIS map file
    ypwhich
    specifies the name of the NIS server you are using
    ypmatch
    like ypcat, but returns only specific key values
    yppasswd
    allows the user to change their password on the NIS server

Server side

Service Applications

Steps to installing services

1. Install software package using **yum**, **rpm** or build from source code
2. Customize service's configuration file
3. Modify the firewall to allow access to the service
4. Customize SELinux context settings to allow use
5. Start the service
6. Configure service to automatically start when system boots
7. Monitor and verify service is running
8. Troubleshoot as necessary
9. Monitor log files as appropriate
10. Configure additional security

Installing an NIS Server

Step 1 *Check software*

```
[root@arwen ~]# rpm -qa | grep ypserv
[root@arwen ~]# rpm -qa | grep ypbind
ypbind-1.19-12.el5
[root@arwen ~]# rpm -qa | grep yp-tools
yp-tools-2.9-0.1
[root@arwen ~]# rpm -qa | grep portmap
portmap-4.0-65.2.2.1
[root@arwen ~]#
```

server component is not installed

client package is installed

The tools package is already installed

NIS uses the portmapper which is also already installed

Installing NIS Server Files

Step 1 *Installing NIS server package (with yum)*

```
[root@arwen ~]# yum install ypserv
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * addons: centos.corenetworks.net
 * base: mirror.nyi.net
 * extras: ftp.ussg.iu.edu
 * updates: ftp.ussg.iu.edu
addons                                                  |  951 B     00:00
base                                                    | 2.1 kB     00:00
extras                                                  | 2.1 kB     00:00
updates                                                 | 1.9 kB     00:00
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package ypserv.i386 0:2.19-5.el5 set to be updated
--> Finished Dependency Resolution

Dependencies Resolved
```

Installing NIS Server Files

Step 1 *Installing NIS server package*

```
================================================================================
 Package            Arch             Version                 Repository       Size
================================================================================
Installing:
 ypserv             i386             2.19-5.el5              base            134 k

Transaction Summary
================================================================================
Install       1 Package(s)
Update        0 Package(s)
Remove        0 Package(s)

Total download size: 134 k
Is this ok [y/N]: y
Downloading Packages:
ypserv-2.19-5.el5.i386.rpm                               | 134 kB     00:01
Running rpm_check_debug
Running Transaction Test
Finished Transaction Test
Transaction Test Succeeded
```

Installing NIS Server Files

Step 1 *Installing NIS server package*

```
Running Transaction
  Installing     : ypserv                                                  1/1

Installed:
  ypserv.i386 0:2.19-5.el5

Complete!
[root@arwen ~]#
```

Installing NIS Server Files

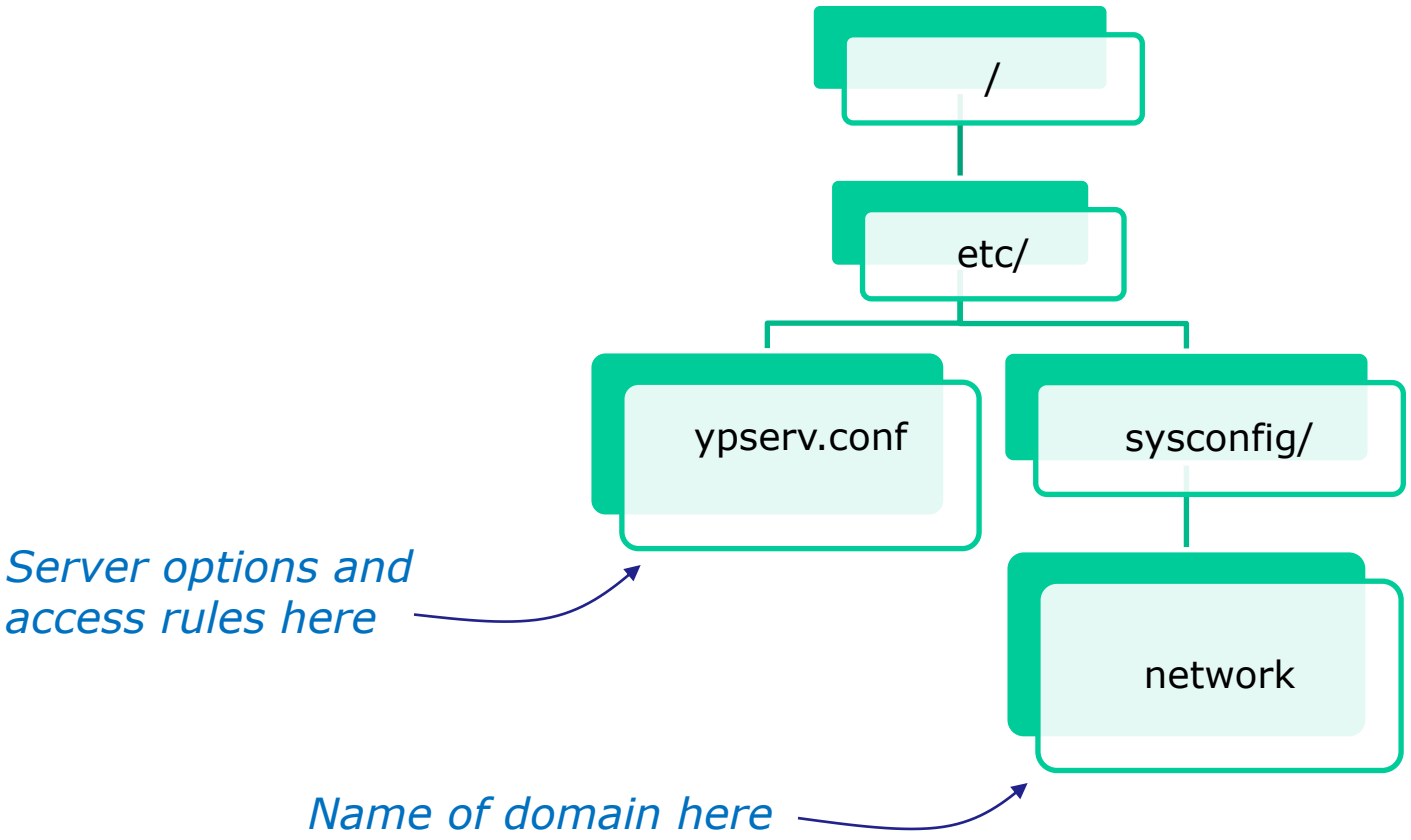
Step 1 *Installing NIS server package (with RPM)*

```
[root@arwen packages]# ls yp*
ypserv-2.19-5.el5.i386.rpm

[root@arwen packages]# rpm -Uhv ypserv-2.19-5.el5.i386.rpm
Preparing...                ########################################### [100%]
   1:ypserv                 ########################################### [100%]
[root@arwen packages]#
```

*Or using the **rpm** command*

NIS Server

Step 2 *Customize the configuration files*



Server-side NIS

/etc/ypserv.conf syntax *See **man ypserv.conf** for details*

```
option: <argument>                    # This is an option line
```

dns: no
files: 30
etc.

```
host : domain : map : security  # This is an access rule
```

none
port
deny

***
name

passwd.byname
passwd.byuid
hosts.byname
etc.

hostname or IP address
172.30.4.
172.30.4.0/255.255.255.0
***

Server-side NIS

```
[root@arwen bin]# cat /etc/ypserv.conf
#
# ypserv.conf   In this file you can set certain options for the NIS server,
#               and you can deny or restrict access to certain maps based
#               on the originating host.
#
#               See ypserv.conf(5) for a description of the syntax.
#

# Some options for ypserv. This things are all not needed, if
# you have a Linux net.

# Should we do DNS lookups for hosts not found in the hosts table ?
# This option is ignored in the moment.
dns: no

# How many map file handles should be cached ?
files: 30

# Should we register ypserv with SLP ?
slp: no
# After how many seconds we should re-register ypserv with SLP ?
slp_timeout: 3600

# xfr requests are only allowed from ports < 1024
xfr_check_port: yes
```

default ypserv.conf file

Server-side NIS

```
# The following, when uncommented,  will give you shadow like passwords.
# Note that it will not work if you have slave NIS servers in your
# network that do not run the same server as you.

# Host                      : Domain   : Map              : Security
#
# *                         : *        : passwd.byname    : port
# *                         : *        : passwd.byuid     : port

# Not everybody should see the shadow passwords, not secure, since
# under MSDOG everbody is root and can access ports < 1024 !!!
*                           : *        : shadow.byname    : port
*                           : *        : passwd.adjunct.byname : port

# If you comment out the next rule, ypserv and rpc.ypxfrd will
# look for YP_SECURE and YP_AUTHDES in the maps. This will make
# the security check a little bit slower, but you only have to
# change the keys on the master server, not the configuration files
# on each NIS server.
# If you have maps with YP_SECURE or YP_AUTHDES, you should create
# a rule for them above, that's much faster.
# *                         : *        : *                : none

[root@arwen bin]#
```

default ypserv.conf file

Server-side NIS

Setting up an NIS server

We will be using the default configuration file which looks like the following with all the comments stripped out

```
[root@arwen bin]# cat /etc/ypserv.conf | grep -v '^$' | grep -v '^ *#'
dns: no
files: 30
slp: no
slp_timeout: 3600
xfr_check_port: yes
*                       : *         : shadow.byname     : port
*                       : *         : passwd.adjunct.byname : port
```

do DNS lookups

how many data files should be cached

for service location protocol

forces NIS to run on privileged ports (<1024)

rules

Which hosts (=any)* : *The domain this rule to apply to (*=all)* : *The map (database) to be accessed* : *security:*
- *none=allow always*
- *port=allow (if port <1024)*
- *deny=no access*

Server-side NIS

Temporary but immediate setting

```
[root@arwen bin]# nisdomainname CISLAB
[root@arwen bin]#
```

Permanent setting

```
[root@ghiradelli ~]# cat /etc/sysconfig/network
NETWORKING=yes
NETWORKING_IPV6=no
GATEWAY=172.30.1.1
HOSTNAME=ghiradelli.rivendell
NISDOMAIN=CISLAB
```

Specifying the NIS domain name CISLAB

Server-side NIS

Step 2B *Create and maintain the maps (databases)*

- Use current systems files or optionally the ones in /var/yp
  - Add to passwd from /etc/passwd any lines you want to share
  - Add to shadow from /etc/shadow any lines you want to share
  - Add to hosts from /etc/hosts any line you want to share

- **ypinit -m** - identifies master and slave servers and makes map files
- **make -C /var/yp** - makes or updates the map files

Step 2B *Initialize NIS server and create map files*

NIS Server

```
[root@arwen bin]# /usr/lib/yp/ypinit -m
At this point, we have to construct a list of the hosts which will run NIS
servers.  ghiradelli.rivendell is in the list of NIS server hosts.  Please continue to add
the names for the other hosts, one per line.  When you are done with the
list, type a <control D>.
        next host to add:  ghiradelli.rivendell
        next host to add:       next host to add:
The current list of NIS servers looks like this:

ghiradelli.rivendell

Is this correct?  [y/n: y]  We need a few minutes to build the databases...
Building /var/yp/CISLAB/ypservers...
Running /var/yp/Makefile...
gmake[1]: Entering directory `/var/yp/CISLAB'
Updating passwd.byname...
Updating passwd.byuid...
Updating group.byname...
Updating group.bygid...
Updating hosts.byname...
Updating hosts.byaddr...
Updating rpc.byname...
Updating rpc.bynumber...
Updating services.byname...
Updating services.byservicename...
Updating netid.byname...
Updating protocols.bynumber...
Updating protocols.byname...
Updating mail.aliases...
gmake[1]: Leaving directory `/var/yp/CISLAB'

ghiradelli.rivendell has been set up as a NIS master server.
Now you can run ypinit -s ghiradelli.rivendell on all slave server.
```

Map (database) files are created for each system file

For example, hosts.byname and hosts.byaddr hold domain wide hostname-IP pairs for name resolution

NIS Server

Step 2B *Update map files when system information changes*

```
[root@arwen bin]# make -C /var/yp
gmake[1]: Entering directory `/var/yp/CISLAB'
Updating passwd.byname...

Updating passwd.byuid...
Updating group.byname...

Updating group.bygid...
Updating netid.byname...

gmake[1]: Leaving directory `/var/yp/CISLAB'
make: Leaving directory `/var/yp'
```

Maps must be updated every time one of the source files has been modified e.g. adding new users

NIS Server and the Firewall

Step 3 *Firewall*

Because NIS uses port mapper which uses random ports we will disable the firewall on the NIS server.

Configure your firewall rules on a gateway server instead for a protection barrier against outsiders.

NIS is NOT secure !!!!!!!!!!

NIS Server and SELinux

Step 4 *SELinux configuration*

Set permissive mode

```
[root@legolas ~]# setenforce permissive
[root@legolas ~]# getenforce
Permissive
```

Set enforcing mode

```
[root@legolas ~]# setenforce enforcing
[root@legolas ~]# getenforce
Enforcing
```

Show SELinux status

```
[root@legolas ~]# sestatus
SELinux status:                 enabled
SELinuxfs mount:                /selinux
Current mode:                   enforcing
Mode from config file:          enforcing
Policy version:                 21
Policy from config file:        targeted
```

No changes are needed for this lesson's activity

Keep SELinux in enforcing mode

NIS Server

Step 5 *Start the service*

```
[root@arwen bin]# service ypserv start
Starting YP server services:                               [  OK  ]
[root@arwen bin]#
```

Step 6 *Start the service automatically during system startup*

```
[root@arwen bin]# chkconfig ypserv on
[root@arwen bin]#
```

NIS Server

Step 7 *Monitor and verify service is running*

```
[root@arwen bin]# service ypserv status
ypserv (pid  10969) is running...
[root@arwen bin]#
```

NIS Server

Step 7 *Monitor and verify service is running*

```
[root@arwen bin]# netstat -tln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address               Foreign Address             State
tcp        0      0 127.0.0.1:2208              0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:2049                0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:705                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:840                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:782                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:111                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:854                 0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:631               0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:920                 0.0.0.0:*                   LISTEN
tcp        0      0 0.0.0.0:42328               0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:25                0.0.0.0:*                   LISTEN
tcp        0      0 127.0.0.1:2207              0.0.0.0:*                   LISTEN
tcp        0      0 :::22                       :::*                        LISTEN
[root@arwen bin]#
```

There are a lot of TCP ports in use by NFS, NIS and Port Mapper

NIS Server

Step 7 *Monitor and verify service is running*

```
[root@arwen bin]# rpcinfo -p localhost | grep tcp
    100000    2   tcp    111  portmapper
    100024    1   tcp    705  status
    100007    2   tcp    782  ypbind
    100007    1   tcp    782  ypbind
    100011    1   tcp    840  rquotad
    100011    2   tcp    840  rquotad
    100003    2   tcp   2049  nfs
    100003    3   tcp   2049  nfs
    100003    4   tcp   2049  nfs
    100021    1   tcp  42328  nlockmgr
    100021    3   tcp  42328  nlockmgr
    100021    4   tcp  42328  nlockmgr
    100005    1   tcp    854  mountd
    100005    2   tcp    854  mountd
    100005    3   tcp    854  mountd
    100004    2   tcp    920  ypserv
    100004    1   tcp    920  ypserv
[root@arwen bin]#
```

*User **rpcinfo** to see ports in use by NIS, NFS and Port Mapper*

NIS Server

Step 7 *Monitor and verify service is running*

```
[root@arwen bin]# netstat -uln
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address               Foreign Address             State
udp        0      0 0.0.0.0:2049                0.0.0.0:*
udp        0      0 0.0.0.0:779                 0.0.0.0:*
udp        0      0 0.0.0.0:37774               0.0.0.0:*
udp        0      0 0.0.0.0:917                 0.0.0.0:*
udp        0      0 0.0.0.0:935                 0.0.0.0:*
udp        0      0 0.0.0.0:936                 0.0.0.0:*
udp        0      0 0.0.0.0:699                 0.0.0.0:*
udp        0      0 0.0.0.0:702                 0.0.0.0:*
udp        0      0 0.0.0.0:837                 0.0.0.0:*
udp        0      0 0.0.0.0:851                 0.0.0.0:*
udp        0      0 0.0.0.0:53224               0.0.0.0:*
udp        0      0 0.0.0.0:5353                0.0.0.0:*
udp        0      0 0.0.0.0:111                 0.0.0.0:*
udp        0      0 0.0.0.0:631                 0.0.0.0:*
udp        0      0 :::35102                    :::*
udp        0      0 :::5353                     :::*
[root@arwen bin]#
```

There are a lot of UDP ports in use by NFS, NIS and Port Mapper

NIS Server

Step 7 *Monitor and verify service is running*

```
[root@arwen bin]# rpcinfo -p localhost | grep udp
    100000    2   udp    111  portmapper
    100024    1   udp    702  status
    100007    2   udp    779  ypbind
    100007    1   udp    779  ypbind
    100011    1   udp    837  rquotad
    100011    2   udp    837  rquotad
    100003    2   udp   2049  nfs
    100003    3   udp   2049  nfs
    100003    4   udp   2049  nfs
    100021    1   udp  37774  nlockmgr
    100021    3   udp  37774  nlockmgr
    100021    4   udp  37774  nlockmgr
    100005    1   udp    851  mountd
    100005    2   udp    851  mountd
    100005    3   udp    851  mountd
    100004    2   udp    917  ypserv
    100004    1   udp    917  ypserv
    100009    1   udp    935  yppasswdd
[root@arwen bin]#
```

*User **rpcinfo** to see ports in use by NIS, NFS and Port Mapper*

NIS Server

Step 8 *Troubleshoot*

```
[root@celebrian ~]# service ypbind start
Turning on allow_ypbind SELinux boolean
Binding to the NIS domain:                                 [  OK  ]
Turning off allow_ypbind SELinux boolean.............      [FAILED]

[root@celebrian ~]#
```

Problem: Client cannot join (bind to) the NIS domain

Fix: Disable firewall of NIS server

NIS Server

Step 8 *Troubleshoot*

Maps are missing users or groups

Problem: minimum UID and GID settings in /var/yp/Makefile are too high

Fix: Modify these lines:

```
# We do not put password entries with lower UIDs (the root and system
# entries) in the NIS password database, for security. MINUID is the
# lowest uid that will be included in the password maps. If you
# create shadow maps, the UserID for a shadow entry is taken from
# the passwd file. If no entry is found, this shadow entry is
# ignored.
# MINGID is the lowest gid that will be included in the group maps.
MINUID=500
MINGID=100
```

NIS Server

Step 9 *Monitor log files*

```
[root@elrond cat /var/log/messages | grep yp
[root@arwen bin]# cat /var/log/messages | grep yp
May 12 22:36:07 arwen ypserv[10418]: WARNING: no securenets file found!
May 12 22:36:07 arwen ypserv[10418]: Support for SLP (line 20) is not compiled in.
May 12 22:36:07 arwen ypserv[10418]: Support for SLP (line 22) is not compiled in.
May 12 22:42:51 arwen ypserv[10969]: WARNING: no securenets file found!
May 12 22:42:51 arwen ypserv[10969]: Support for SLP (line 20) is not compiled in.
May 12 22:42:51 arwen ypserv[10969]: Support for SLP (line 22) is not compiled in.
May 12 22:43:05 arwen setsebool: The allow_ypbind policy boolean was changed to 1 by root
May 12 22:43:07 arwen ypbind: bound to NIS server ghiradelli.rivendell
[root@arwen bin]#
```

Network Information Service (NIS)

Step 10 *Additional security*

- NIS has security vulnerabilities
- Getting an NIS server to broadcast a fictitious account allows an attacker to access any domain system.
- RPC (Remote Procedure Call) spoofing - early versions of portmap allowed any program to register as an RPC server. Attackers could provide their own NIS services with their own login information.
- NIS spoofing - early versions of NIS allows an attacker to inject a fake ypserv daemon that would respond to local client ypbind requests. Or an attacker could run a rogue computer to respond to client ypbind network requests with the attackers login information.
- If attackers are not firewalled out they can request copies of the NIS map files and obtain account names and encrypted passwords.

Client Side

Client-side NIS

Configuring an NIS client:

Clients need to run a daemon as well since accessing files like /etc/passwd and /etc/hosts is a common and continual process.

- Setup the NIS domain name
  - Run the command **domainname** *name*
  - Set the variable NISDOMAIN=*name* in **/etc/sysconfig/network**

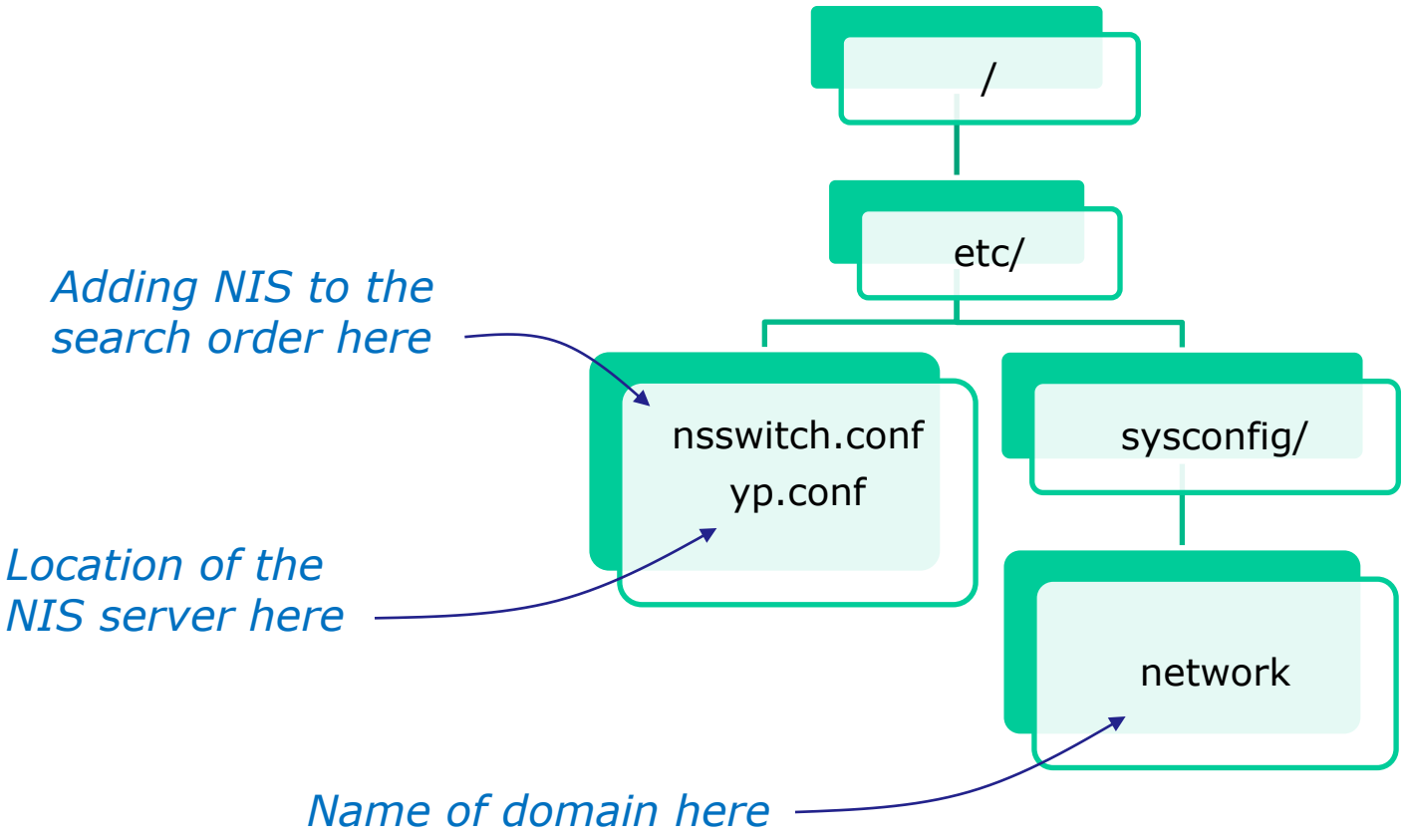
- Configure the **/etc/yp.conf** file using one of three syntaxes:
  - domain *name* server *hostname*
  - domain *name* broadcast
  - ypserver *name*

- Edit the **/etc/nsswitch.conf** file and add nis to the appropriate services

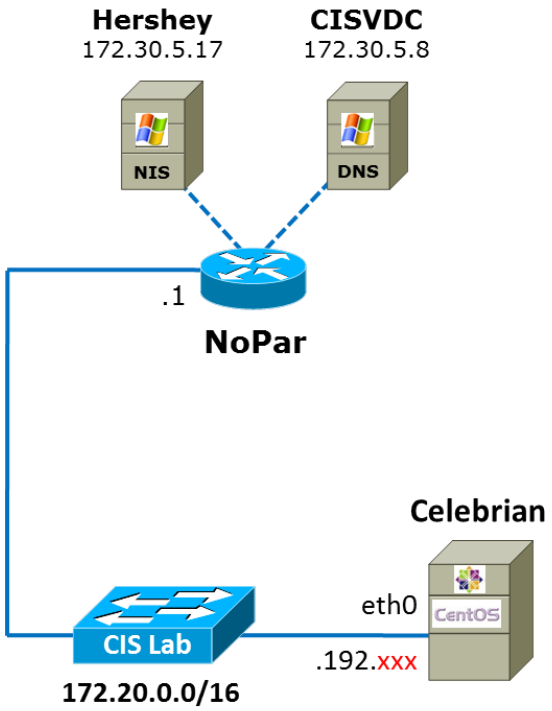
- Start the **ypbind** service

NIS Client

Step 2 *Customize the configuration files*



Hershey Example



For this example, Hershey has already been configured as the remote NIS Server

Celebrian will be the NIS client and will need the following installed:

yum install ypbind

Client-side NIS

Set the NIS domain name on the client

Temporary but immediate

```
# domainname CISLAB
# domainname
CISLAB
```

Permanent

```
# cat /etc/sysconfig/network
NETWORKING=yes
NETWORKING_IPV6=no
HOSTNAME=celebrian.rivendell
NISDOMAIN=CISLAB
```

Client-side NIS

Configure the /etc/yp.conf file on the NIS client

```
# cat /etc/yp.conf
# /etc/yp.conf - ypbind configuration file
# Valid entries are
#
# domain NISDOMAIN server HOSTNAME
#       Use server HOSTNAME for the domain NISDOMAIN.
#
# domain NISDOMAIN broadcast
#       Use  broadcast  on  the local net for domain NISDOMAIN
#
# domain NISDOMAIN slp
#       Query local SLP server for ypserver supporting NISDOMAIN
#
# ypserver HOSTNAME
#       Use server HOSTNAME for the  local  domain.  The
#       IP-address of server must be listed in /etc/hosts.
#
# broadcast
#       If no server for the default domain is specified or
#       none of them is rechable, try a broadcast call to
#       find a server.
#
domain CISLAB server 172.30.5.17
```

Add this line

```
# ls /home
cis90  rsimms
```

```
# showmount -e hershey
Export list for hershey:
/riddles        *
/install/rh     *
/simms/dylan    *
/install/suse   *
/install/rhel   *
/simms/mitchell *
/home           172.20.0.0/255.255.0.0
```

Mount the remote /home directory (on the NIS server) on the local /home directory of the NIS client

```
# mount hershey:/home /home

# ls /home
cis192  jimg  list  lost+found  quickbeam  rsimms  shadowfax  strider

# ls /home/cis192
bunsol  capchr  doucor  farsha  hovdav  lyoben  musdav  pangab  rysada  srelau  veleli
calsea  cis     drybry  garton  irvdon  milhom  noreva  rodduk  simben  vascar  wiltaj
```

Client-side NIS

Edit the /etc/nsswitch.conf file and add nis to the appropriate services.

```
# cat /etc/nsswitch.conf
#
# /etc/nsswitch.conf
#
# An example Name Service Switch config file. This file should be
# sorted with the most-used services at the beginning.
#
# The entry '[NOTFOUND=return]' means that the search for an
# entry should stop if the search in the previous entry turned
# up nothing. Note that if the search failed due to some other reason
# (like no NIS server responding) then the search continues with the
# next entry.
#
# Legal entries are:
#
#       nisplus or nis+         Use NIS+ (NIS version 3)
#       nis or yp               Use NIS (NIS version 2), also called YP
#       dns                     Use DNS (Domain Name Service)
#       files                   Use the local files
#       db                      Use the local database (.db) files
#       compat                  Use NIS on compat mode
#       hesiod                  Use Hesiod for user lookups
#       [NOTFOUND=return]       Stop searching if not found so far
#

# To use db, put the "db" in front of "files" for entries you want to be
# looked up first in the databases
#
# Example:
#passwd:   files nis nisplus nis
#shadow:   files nis nisplus nis
#group:    files nis nisplus nis

passwd:     files nis
shadow:     files nis
group:      files nis

#hosts:     db files nisplus nis dns
hosts:      files dns

# Example - obey only what nisplus tells us...
#services:   nisplus [NOTFOUND=return] files
#networks:   nisplus [NOTFOUND=return] files
#protocols:  nisplus [NOTFOUND=return] files
#rpc:        nisplus [NOTFOUND=return] files
#ethers:     nisplus [NOTFOUND=return] files
#netmasks:   nisplus [NOTFOUND=return] files

bootparams: nisplus [NOTFOUND=return] files

ethers:     files
netmasks:   files
networks:   files
protocols:  files
rpc:        files
services:   files

netgroup:   nisplus

publickey:  nisplus

automount:  files nisplus
aliases:    files nisplus

[root@celebrian ~]#
```

Modify these lines to include NIS

Client-side NIS

Start the NIS client (ypbind) service

```
# service ypbind start
Turning on allow_ypbind SELinux boolean
Binding to the NIS domain:                                 [  OK  ]
```

Note the SELinux setting is done automatically

Client-side NIS

Try it … you will like it!

```
# su - lopez
[lopez@celebrian ~]$ ls
lopez-file
[lopez@celebrian ~]$ cat /etc/passwd | grep lopez
[lopez@celebrian ~]$
```

Note the user does not show up in the local /etc/passwd file because they logged into the NIS domain instead

Join the CISLAB NIS domain

Celebrian

Hershey

Use **dhclient eth0** to join the shire network

yum install ypbind

showmount -e hershey
mount hershey:/home /home

domainname CISLAB

Add to /etc/yp.conf:
domain CISLAB server hershey

Update /etc/nsswitch.conf lines:
passwd: files nis
hosts: files nis
group: files nis

service ypbind start

Login to Celebrian using your Hershey account
(either change to tty2 **[Ctrl-Alt-F2]** or **su - username**)

Usernames
simben192
milhom192
rodduk192
bunsol192
calsea192
capchr192
doucor192
drybry192
farsha192
garton192
hovdav192
irvdon192
musdav192
noreva192
pangab192
veleli192
wiltaj192
vascar192
rysada192
lyoben192
srelau192

Review

Test 3 material

- Lesson 9 - DNS
- Lesson 10 - NFS & Printing
- Lesson 11 - Samba
- Lesson 12 - Mail
- Lesson 13 - NIS

- Labs: 7 (DNS), 8 (Samba), 9 (email), X3 (NFS)

DNS

Paul worked at the Information Sciences Institute of the University of Southern California

An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

An Overview of Domain Name System

Can you imagine trying to keep these files updated on every single host in the world?

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

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Maintained by the Internet Systems Consortium: www.ics.org

In reality, the DNS is a huge, global distributed database spread across all the DNS servers in the world.

Each DNS server is authoritative for its own domain and maintains these forward and reverse lookup zones.

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Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

The client side of DNS. It initiates and sequences the queries that lead to the resolution of a name into an IP address

Supports two type of queries:

- Recursive
- Iterative

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Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Also known as the master server. This server maintains a database of hostname/IP pairs for the systems it serves. This server also provides authoritative answers for these same systems.

Supports two type of queries:

- Recursive
- Iterative

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An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Also known as a slave server. This server is identical to the primary server except it does not maintain its own database. It's data is obtained instead from the primary server. Used as backup when the primary server is down and for load balancing.

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Has no database of its own and does not obtain one from another server. Caching servers make queries on behalf of clients and cache the answers. Caching servers are used for performance reasons.

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Contain the database resource records such as A records that map a hostname to a IP address, PTR records that map IP addresses to hostnames, NS records for name servers, and CNAME records for aliases.

Supports two type of queries:

- Recursive
- Iterative

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

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DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Supports two type of queries:

- Recursive
- Iterative

Provide either an answer or an error message

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

An Overview of Domain Name System

Created in 1983 from the work led by Paul Mockapetris

Improves the deficiencies of the /etc/hosts file

DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Supports two type of queries:

- Recursive
- Iterative

Provide either an answer or a referral to another DNS server

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

Maintained by the Internet Systems Consortium: www.ics.org

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Created in 1983 from the work led by Paul Mockapetris

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DNS manages two databases (zones)

- Forward lookup zones: for mapping Domain names to IP addresses
- Reverse lookup zones: for mapping IP addresses to Domain names

Three components to DNS:

- Resolver
- The Server
  - Primary
  - Secondary
  - Caching
- Database files (db.domain-name)

Supports two type of queries:

- Recursive
- Iterative

This is what we will install and configure in Lab 7

Most popular implementation of DNS is Berkely Internet Name Daemon (BIND)

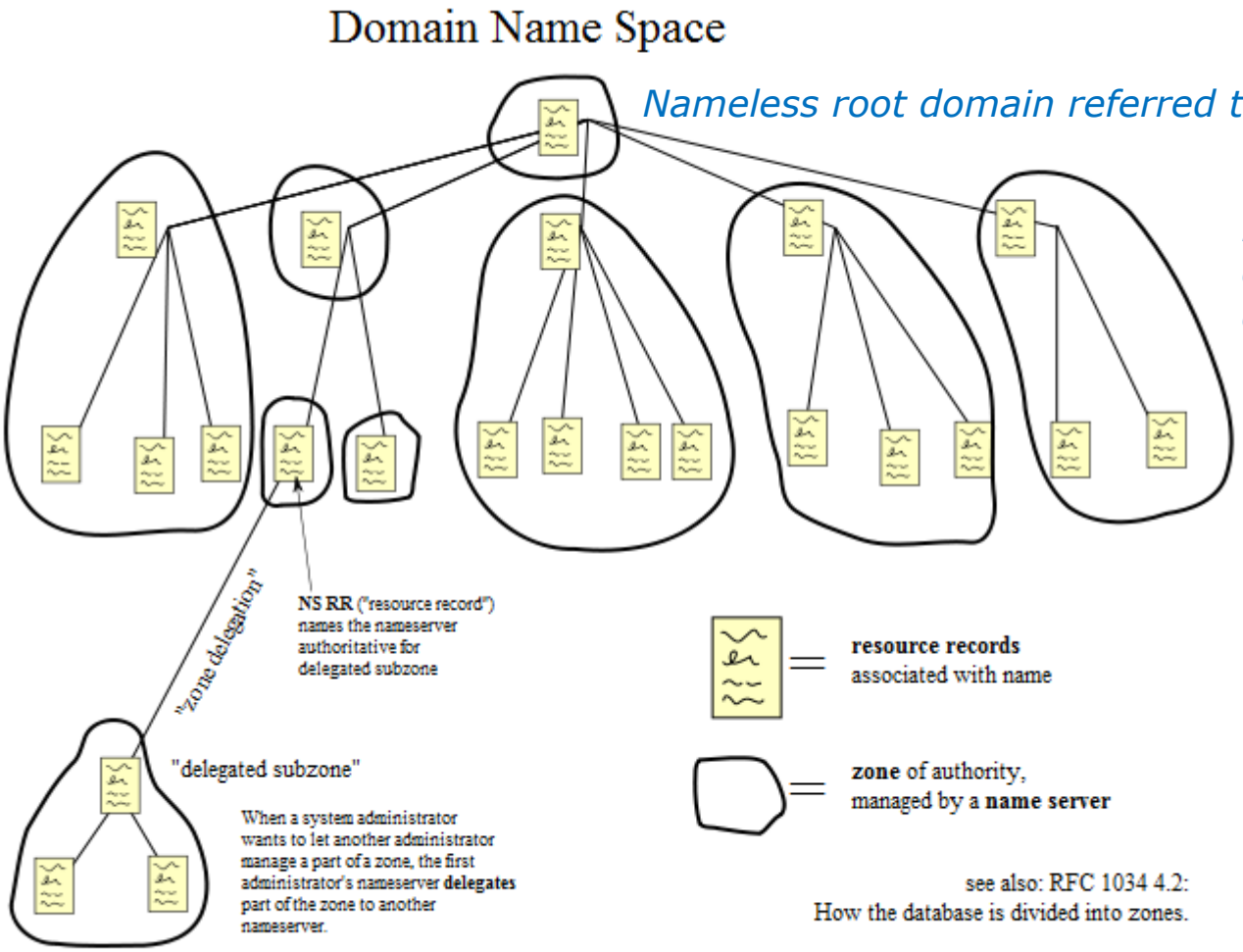
Maintained by the Internet Systems Consortium: www.ics.org

The DNS Namespace

- Top most domain in the namespace hierarchy is "."
- Top-level domains: .com, .net, .gov, .edu, .org .us, ...
- Special domain for reverse lookups: in-addr.arpa
- Fully Qualified Domain Names read from right to left
- Name registration was handled by InterNIC; now belongs to companies for profit.

InterNIC - Internet Network Information Center. Handled domain names and IP addresses prior to 1988 before getting turned over to ICANN

ICANN - Internet Corporation for Assigned Names and Numbers. ICANN accredits the domain name registrars (the companies that compete with other and register domain names)

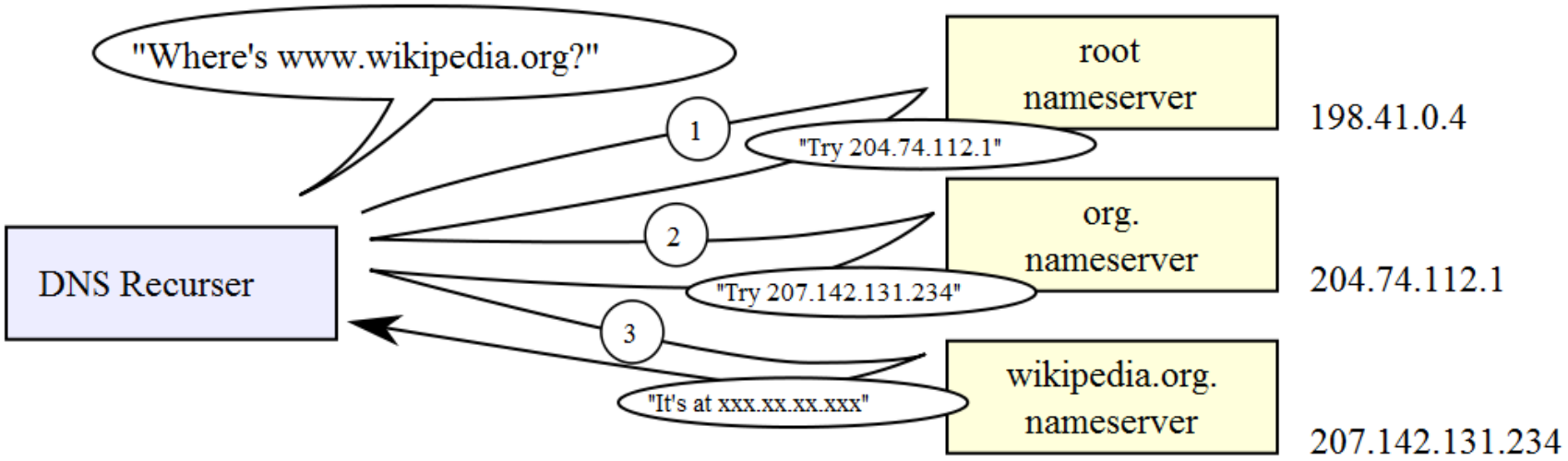


Nameless root domain referred to via "."

Generic TLD's - Top Level Domains (com, edu, net, org, mil, etc.)

Next level domains (e.g. hp.com, cabrillo.edu, yahoo.com, webhalks.org, etc.

source: http://en.wikipedia.org/wiki/File:Domain_name_space.svg



source: http://en.wikipedia.org/wiki/File:An_example_of_theoretical_DNS_recursion.svg

DNS Database Resource Record types:

SOA - Start of Authority
NS - Nameserver
A - Address
PTR - Pointer (for reverse lookups)
CNAME - Aliases
MX - Mail server

DNS Installation and Configuration

Package names:	bind, caching-nameserver
Daemon name:	/usr/sbin/named
Startup script:	/etc/rc.d/init.d/named start or **service named start**
Database files:	/var/named/named.ca *IP address of root servers* /var/named/db.*in-addr*.arpa *reverse lookups* /var/named/db.*domain* name *forward lookups*
Configuration files:	/etc/named.conf *Overall configuration file* /etc/resolv.conf *DNS server to use* /etc/nsswitch.conf *Lookup order definition*

To reload configuration files: **rndc reload**

DNS

Situation: A local community college needs your help with their network. The college just installed a new classroom system, named station-24 however they cannot access it by name like they can with the other stations. They mention they have a DNS server named Hershey in a small closet but the student that configured it has left. The IP address for Hershey is 172.30.1.20.

They demonstrate the problem from one of their client systems:

```
[root@elrond ~]# host station24
station24.localdomain has address 172.30.1.224
```

```
[root@elrond ~]# host station25
Host station25 not found: 3(NXDOMAIN)
```

DNS

What are three ways you could fix this problem?

DNS

What are three ways you could fix this problem?

1) Add station-24 to /etc/hosts on the client.
2) Add station-24 to the NIS hosts map on Hershey.
3) Add station-24 to the DNS service on Hershey

DNS

What are the pros and cons of each fix?

- Add station-24 to /etc/hosts on the client
- Add station-24 to the NIS hosts map on Hershey
- Add station-24 to the DNS service on Hershey

DNS

What are the pros and cons of each fix?

1) Add station-24 to /etc/hosts on the client.
   Quick and easy fix for one client, however the /etc/host file on every client would have to be updated. These files would have to be kept synchronized over time which would have a high administrative overhead.

2) Add station-24 to the NIS hosts map on Hershey.
   This would work. There are security vulnerabilities with NIS but this network is protected by the school firewall and the classroom network is NAT-ted by the router. The cost to fix would be having to manually join each client system to the NIS domain. NIS is UNIX centric so is not a good overall solution for a mixed environment.

3) Add station-24 to the DNS service on Hershey.
   This is the best solution given they already have a DNS server set up and working for their other systems.

DNS

Lets check out one of the Linux clients first ...

What name server has been configured?

DNS

Lets check out one of the Linux clients first …

What name server has been configured?

```
[root@elrond ~]# cat /etc/resolv.conf
search localdomain
nameserver 172.30.1.20
```

From this we can see the domain name used is middleearth.net and the nameserver is 172.30.1.20, the system in the closet.

DNS

Lets check out Hershey ...

What is the name of the DNS configuration file?

DNS

Lets check out Hershey ...

What is the name of the DNS configuration file?

/etc/named.conf

DNS

What do we need to find in this DNS configuration file?

DNS

What do we need to find in this DNS configuration file?

The zone file for the domain we want to update:

```
[root@hershey root]# cat /etc/named.conf
< snipped >
zone "localdomain" IN {
        type master;
        file "db.localdomain";
}; < snipped >
```

The other zones in this file are reverse lookup zones, the root . zone and the localhost zone

DNS

What DNS configuration file should we look at now?

DNS

What DNS configuration file should we look at now?

Look for the zone files in /var/named/

```
[root@hershey root]# ls /var/named
db.1.168.192  db.2.168.192    db.MiddleEarth  db.Whitehats    named.ca
db.1.30.172   db.localdomain  db.rivendell    localhost.zone  named.local
[root@hershey root]#
```

Look at the A records in the middleearth.net zone file

```
[root@hershey root]# cat /var/named/db.localdomain
 <snipped >
;Address Records
localhost         IN A    127.0.0.1
hershey           IN A    172.30.1.20
station00         IN A    172.30.1.200
station01         IN A    172.30.1.201
 <snipped >
```

DNS

How to we update DNS to add the IP address for station-24?

DNS

How to we update DNS to add the IP address for station-24?

Add the following line to the Address record section of the zone file (/var/named/db.localdomain)

```
station25       IN A    172.30.1.125
```

To be a good citizen you should also add the following PTR record to db.1.30.172 (the reverse lookup zone file)

```
125         IN      PTR     station25.MiddleEarth.net.
```

The last step is to reload the zone files

```
[root@hershey root]# rndc reload
```

DNS

- `[root@elrond ~]#` **host station25**
  `station25.middleearth.net has address 172.30.1.125`

- `[root@elrond ~]#` **host 172.30.1.124**
  `125.1.30.172.in-addr.arpa domain name pointer station25.localdomain.`

Success!

Explore the DNS configuration on treebeard

Treebeard

- Login to Treebeard
- Find the main DNS configuration file and identify all the zones being handled by this DNS server.
- Looking at the main DNS configuration file what source port will Treebeard use to contact other DNS servers?
- Find the forward lookup zone file for cis192pods.cislab.net and locate the A records. Is there an A record for each Elrond?
- Find the reverse lookup zone file for 172.20.192.x and locate the PTR records
- What name server is configured fro Treebeard when it acts as a DNS client? Does it call itself or another DNS server? Why is this?

NFS

NFS

Situation: You've been hired a by a small company that produces riddles. They have a share used by the riddle engineers to keep all their riddles on. They have just purchased new system and can't remember how to set up this share on it. All they remember is that the master share is kept on their Hershey computer.

NFS

How do you show the directories being shared from Hershey?

NFS

How do you show the directories being shared from Hershey?

```
[root@elrond ~]# showmount -e hershey
Export list for hershey:
/riddles          *
/install/rh       *
/misc/cis191      *
/install/suse     *
/install/rhel     *
/install/msdos    *
/install/fedora   *
/home             172.30.1.0/24,172.30.4.0/24
```

NFS

How could you view those riddles on the new computer?

NFS

How could you view those riddles on the new computer?

```
[root@elrond ~]# mkdir /riddles

[root@elrond ~]# mount hershey:/riddles /riddles

[root@elrond ~]# cd /riddles/

[root@elrond riddles]# ls -l
total 8
-rwxr-xr-x 1 root root  895 May 11  2009 riddle1
-rwxr-xr-x 1 root root 1028 May 11  2009 riddle2
```

NFS

How could you make the remote share permanent?

NFS

How could you make the remote share permanent?

```
[root@elrond riddles]# cat /etc/mtab
/dev/mapper/VolGroup-lv_root / ext4 rw 0 0
proc /proc proc rw 0 0
sysfs /sys sysfs rw 0 0
devpts /dev/pts devpts rw,gid=5,mode=620 0 0
tmpfs /dev/shm tmpfs rw,rootcontext="system_u:object_r:tmpfs_t:s0" 0 0
/dev/sda1 /boot ext4 rw 0 0
none /proc/sys/fs/binfmt_misc binfmt_misc rw 0 0
sunrpc /var/lib/nfs/rpc_pipefs rpc_pipefs rw 0 0
hershey:/riddles /riddles nfs rw,addr=172.30.5.17 0 0
```

Update /etc/fstab with NFS mount

```
[root@elrond riddles]# cat /etc/fstab
/dev/mapper/VolGroup-lv_root /                       ext4    defaults    1 1
UUID=c57e1f48-d3cf-403a-803e-aeb0c28aba62 /boot      ext4    defaults    1 2
/dev/mapper/VolGroup-lv_swap swap                    swap    defaults    0 0
tmpfs                   /dev/shm                tmpfs   defaults        0 0
devpts                  /dev/pts                devpts  gid=5,mode=620  0 0
sysfs                   /sys                    sysfs   defaults        0 0
proc                    /proc                   proc    defaults        0 0
hershey:/riddles /riddles nfs rw,addr=172.30.5.17 0 0
```

On Celebrian

Permanently add the remote NFS directory

Celebrian

- Work by yourself or with a neighbor
- Create a /riddles directory on Celebrian
  mkdir /riddles
- Temporarily mount the /riddles export on Hershey to your local /riddles directory

  mount hershey:/riddles /riddles
  mount
- Permanently mount the /riddles export on Hershey to your local /riddles directory. You will need to update /etc/fstab to do this.

  cp /etc/fstab /etc/fstab.bak
  tail -n1 /etc/mtab >> /etc/fstab
- Restart Celebrian and run one of the riddle scripts in /riddles

Printing

CUPS - Common UNIX Printing System
http://www.cups.org/

Packages
```
#  yum install cups
#  rpm -qa | grep cups
libgnomecups-0.2.2-8
cups-libs-1.2.4-11.18.el5_2.3
cups-1.2.4-11.18.el5_2.3
hal-cups-utils-0.6.2-5.2.el5
```

Firewall Ports Used
631/UDP
631/TCP

Configuration
```
http://localhost:631
```

Services and reloading configuration file changes
```
#  service cups restart
Stopping cups:                                             [  OK  ]
Starting cups:                                             [  OK  ]
```

Printing

Situation: You are helping your Uncle Steve who works for a big software company in Washington state. He uses an HP superdome for his home PC. You have just installed Ubuntu on this home system overwriting the previous OS that was installed. Now you need to configure the system so you can do remote printer management.

Printing

How do you determine if your current printer management software is running and then use it?

Printing

How do you determine if your current printer management software is running and then use it?

```
# service cups status
cupsd (pid 4584) is running...
```

Then browse to CUPS at http://localhost:631

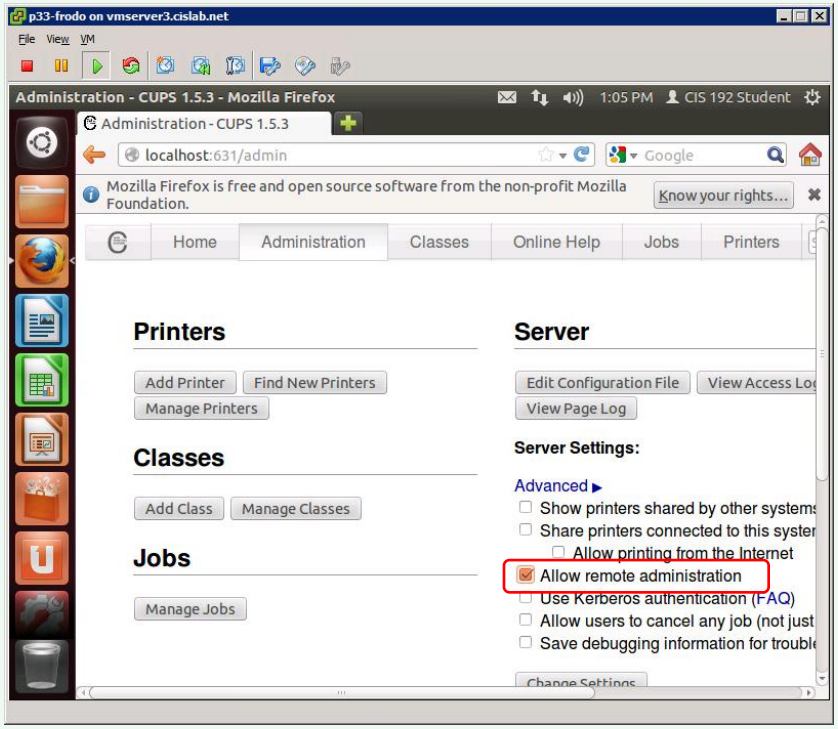
```
# firefox localhost:631   &
```

Printing

How would you enable this software to be used remotely?

Printing

How would you enable this software to be used remotely?



Click the Administration tab, check "Allow remote administration", then click Change Settings button

On Frodo

Frodo

- Login as cis192 (graphics mode)
- Bring up a terminal with **Ctrl-Alt-t**
- Browse to the web-based CUPS utility with

  firefox localhost:631 &

- Enable remote administration
  - Administration Tab
  - Check "Allow Remote Administration"
  - Click "Change Settings" button

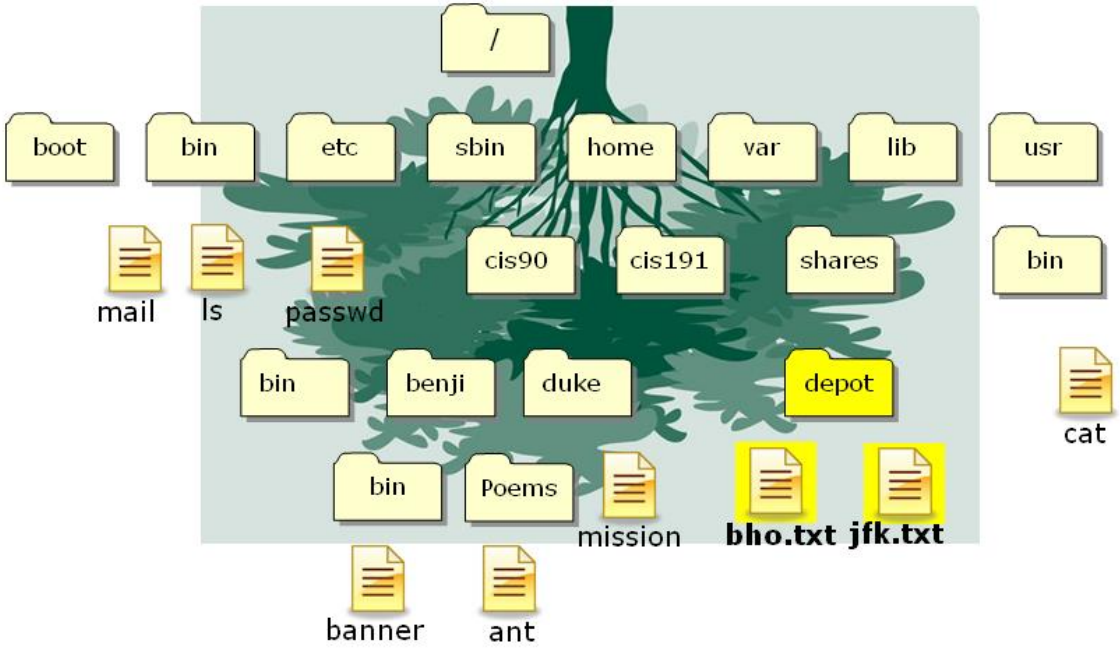
Samba

Samba

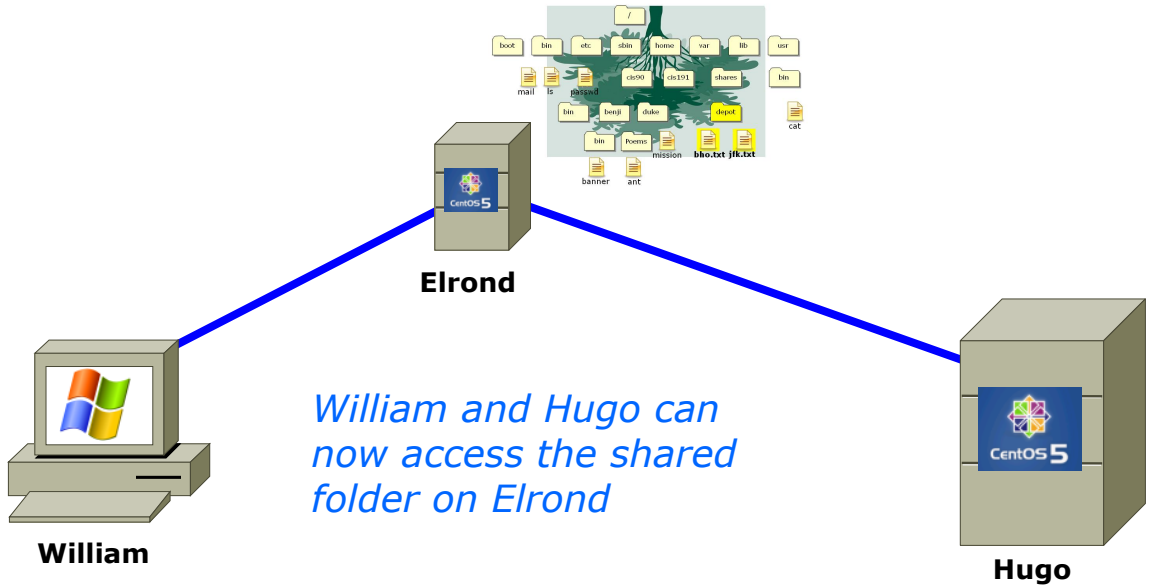
Elrond

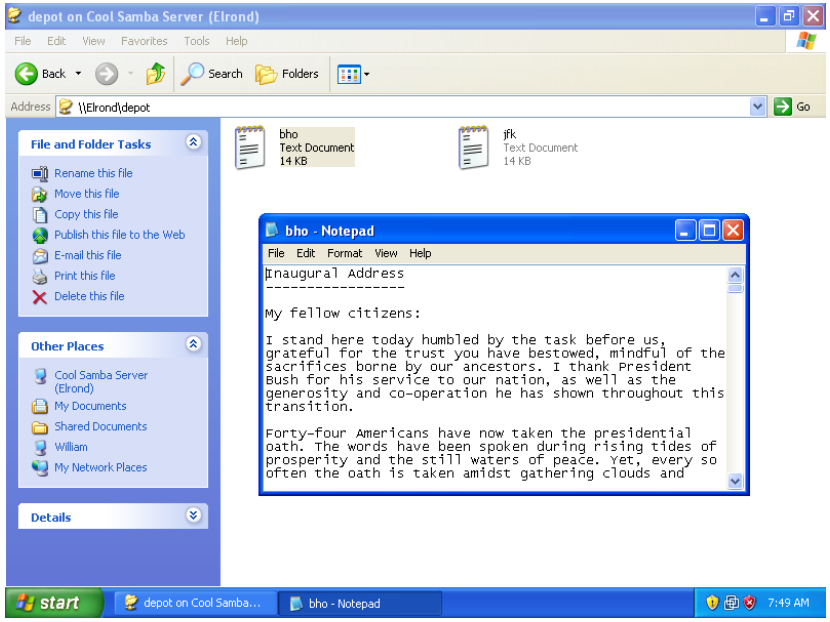
*To make a share, add the following lines to **/etc/samba/smb.conf** creates a shared directory on Elrond (and do a few other things)*

```
[depot]
        comment = Public files on Elrond
        path = /var/shares/depot
        read only = yes
        guest ok = yes
```



Samba






```
[root@hugo ~]# mount //elrond/depot /mnt
Password:
[root@hugo ~]# ls /mnt
bho.txt  jfk.txt
[root@hugo ~]# cd /mnt
[root@hugo mnt]# cat bho.txt
Inaugural Address
-----------------

My fellow citizens:

I stand here today humbled by the task
before us, grateful for the trust you
have bestowed, mindful of the sacrifices
```

www.samba.org

Packages

```
# rpm -qa | grep samba
samba-client-3.5.10-125.el6.x86_64
samba-winbind-clients-3.5.10-125.el6.x86_64
samba-common-3.5.10-125.el6.x86_64
samba-3.5.10-125.el6.x86_64
samba-swat-3.5.10-125.el6.x86_64
```

Services

```
# service smb start
# service nmb start

# service smb status
# service nmb status

# chkconfig smb on
# chkconfig nmb on
```

Configuration

```
# ls /etc/samba/smb.conf
# checkparm
```

Firewall Ports Used

137/udp - NetBIOS Name Service
138/udp - NetBIOS Datagram Service
139/tcp - NetBIOS Session Service
445/tcp - Microsoft Directory Service

SELinux

```
# chcon -R -t samba_share_t <sharedir(s)>
# setsebool -P samba_enable_home_dirs=1
```

Access shares

```
# smbclient -L hostname
# smbclient -U username hostname/share
# smbtree
```

Mount share

```
# mount //hostname/share /mount
```

Samba

Situation: Everyone in the class can access the depot192 share on Hershey (\\hershey\depot) except for milhom192. Why can't he?

```
[rsimms@oslab ~]$ smbclient -U simben192 //hershey/depot192
Enter simben192's password:
Domain=[WORKGROUP] OS=[Unix] Server=[Samba 3.0.33-3.39.el5_8]
smb: \> ls
  .                                   D        0  Tue May 14 13:40:18 2013
  ..                                  D        0  Tue May 14 13:40:18 2013
  hk.txt                              N       73  Tue May 14 13:40:18 2013

                63204 blocks of size 8192. 44755 blocks available
smb: \> get hk.txt
getting file \hk.txt of size 73 as hk.txt (71.3 KiloBytes/sec) (average 71.3 KiloBytes/sec)
smb: \> exit
[rsimms@oslab ~]$ cat hk.txt
We can do anything we want if we stick to it long enough. - Helen Keller
[rsimms@oslab ~]$
```

```
[rsimms@oslab ~]$ smbclient -U milhom192 //hershey/depot192
Enter milhom192's password:
Domain=[WORKGROUP] OS=[Unix] Server=[Samba 3.0.33-3.39.el5_8]
tree connect failed: NT_STATUS_ACCESS_DENIED
[rsimms@oslab ~]$
```

Wrap

References

Jim Griffin

- http://www.cabrillo.edu/~jgriffin/CIS192/files/lesson10.html

Next Class

Assignment: Check Calendar Page
http://simms-teach.com/cis192calendar.php

Test 3 - Open book, notes, and computer:

- Lesson 9 - DNS
- Lesson 10 - NFS & Printing
- Lesson 11 - Samba
- Lesson 12 - Mail
- Lesson 13 - NIS

Backup

Example Hershey

Server-side NIS

Example: hershey

```
[root@hershey yp]# cat /etc/sysconfig/network
NETWORKING=yes
HOSTNAME=hershey.MiddleEarth.net
NISDOMAIN=cismud.net
GATEWAY=172.30.1.1
```

```
[root@hershey root]# domainname
cismud.net
[root@hershey root]#
```

The NIS domain name on supported by Hershey is cismud.net

(Microsoft, Unix and Database classes)

Server-side NIS

Example: hershey

This file gets converted into database format

```
[root@hershey yp]# cat /var/yp/passwd
cis191:x:191:191:CIS191 Account:/home/cis191/cis191:/bin/bash
cis192:x:192:192:CIS192 Account:/home/cis192/cis192:/bin/bash
rsimms:x:749:100:Rich Simms:/home/rsimms:/bin/bash
daniel:x:1114:1114:CIS 192 student:/home/daniel:/bin/bash
denise:x:1115:1115:CIS 192 student:/home/denise:/bin/bash
doug:x:1116:1116:CIS 192 student:/home/doug:/bin/bash
fred:x:1117:1117:CIS 192 student:/home/fred:/bin/bash
john:x:1118:1118:CIS 192 student:/home/john:/bin/bash
jonathan:x:1119:1119:CIS 192 student:/home/jonathan:/bin/bash
kayla:x:1120:1120:CIS 192 student:/home/kayla:/bin/bash
kyle:x:1121:1121:CIS 192 student:/home/kyle:/bin/bash
lou:x:1122:1122:CIS 192 student:/home/lou:/bin/bash
marc:x:1123:1123:CIS 192 student:/home/marc:/bin/bash
tyler:x:1124:1124:CIS 192 student:/home/tyler:/bin/bash
wes:x:1125:1125:CIS 192 student:/home/wes:/bin/bash
greg:x:1126:1126:CIS 192 student:/home/greg:/bin/bash
rich:x:1127:1127:CIS 192 student:/home/rich:/bin/bash
[root@hershey yp]#
```

Server-side NIS

Example: hershey

```
[root@hershey yp]# cat /var/yp/hosts
172.30.1.100            instructor station-00
172.30.1.10             snickers
172.30.4.101            cis-lab-01
172.30.4.102            cis-lab-02
172.30.4.103            cis-lab-03
172.30.4.104            cis-lab-04
172.30.4.105            cis-lab-05
172.30.4.106            cis-lab-06
172.30.4.107            cis-lab-07
172.30.4.108            cis-lab-08
172.30.4.109            cis-lab-09
172.30.4.110            cis-lab-10
172.30.4.111            cis-lab-11
172.30.4.112            cis-lab-12
172.30.4.101            station-01
172.30.4.102            station-02
[root@hershey yp]#
```

This file gets converted into database format

Server-side NIS

Example: hershey

```
[root@hershey yp]# touch passwd
[root@hershey yp]# touch hosts
```

```
[root@hershey yp]# make -C /var/yp
make: Entering directory `/var/yp'
gmake[1]: Entering directory `/var/yp/cismud.net'
Updating passwd.byname...
Updating passwd.byuid...
Updating hosts.byname...
Updating hosts.byaddr...
gmake[1]: Leaving directory `/var/yp/cismud.net'
make: Leaving directory `/var/yp'
[root@hershey yp]#
```

The make will convert any modified files into database format

Server-side NIS

Example: hershey

These are the host and passwd database map files produced form the ASCII text host and passwd files

```
[root@hershey yp]# ls -l /var/yp/cismud.net/{host*,pass*}
-rw-------    1 root     root        12917 May  9 16:52 /var/yp/cismud.net/hosts.byaddr
-rw-------    1 root     root        13001 May  9 16:52 /var/yp/cismud.net/hosts.byname
-rw-------    1 root     root        13781 May  9 18:13 /var/yp/cismud.net/passwd.byname
-rw-------    1 root     root        13769 May  9 18:13 /var/yp/cismud.net/passwd.byuid
[root@hershey yp]#
```

```
[root@hershey yp]# file /var/yp/cismud.net/{host*,pass*}
/var/yp/cismud.net/hosts.byaddr:  GNU dbm 1.x or ndbm database, little endian
/var/yp/cismud.net/hosts.byname:  GNU dbm 1.x or ndbm database, little endian
/var/yp/cismud.net/passwd.byname: GNU dbm 1.x or ndbm database, little endian
/var/yp/cismud.net/passwd.byuid:  GNU dbm 1.x or ndbm database, little endian
[root@hershey yp]#
```

.byaddr = database indexed by address
.byname = database indexed by name
.byuid = database indexed by UID

Server-side NIS

Example: hershey

```
[root@hershey yp]# cat /etc/ypserv.conf

dns: no                  option ignored according to comment
files: 30                the number of files to cache
xfr_check_port: yes      if yes NIS server must run on port < 1024

# Host                      : Domain   : Map              : Security
172.30.4.0/255.255.255.0    : *        : passwd.byname    : none
172.30.4.0/255.255.255.0    : *        : passwd.byuid     : none
172.30.4.                   : *        : hosts.byname     : none

172.30.1.0/255.255.255.0    : *        : passwd.byname    : none
172.30.1.0/255.255.255.0    : *        : passwd.byuid     : none
172.30.1.                   : *        : hosts.byname     : none
```

Make the passwd file (with shadow passwords merged in) and hosts map available to classroom and lab stations.

Server-side NIS

Example: hershey

Start or restart the NIS service

```
[root@hershey root]# service ypserv restart
Stopping YP server services:                               [  OK  ]
Starting YP server services:                               [  OK  ]
[root@hershey root]#
```

Start or restart the NIS password service

```
[root@hershey root]# service yppasswdd restart
Stopping YP passwd service:                                [  OK  ]
Starting YP passwd service:                                [  OK  ]
[root@hershey root]#
```

Join the CISLAB domain

Celebrian

Ghiradelli

Login as root on local VM

Add to /etc/yp.conf:

echo 172.30.1.200 ghiradelli >> /etc/hosts

showmount -e ghiradelli

mount ghiradelli:/home /home

domainname CISLAB

Add to /etc/yp.conf:

domain bittersweet server ghiradelli

Update /etc/nsswitch.conf lines:

passwd:	**files nis**
hosts:	**files nis**
group:	**files nis**

service ypbind start

Login using your lastname as the account (either change to tty2 **[Ctrl-Alt-F2]** or use **su - lastname**)

Try after logging in:

ls

mount

cat /etc/password | grep $LOGNAME

exit

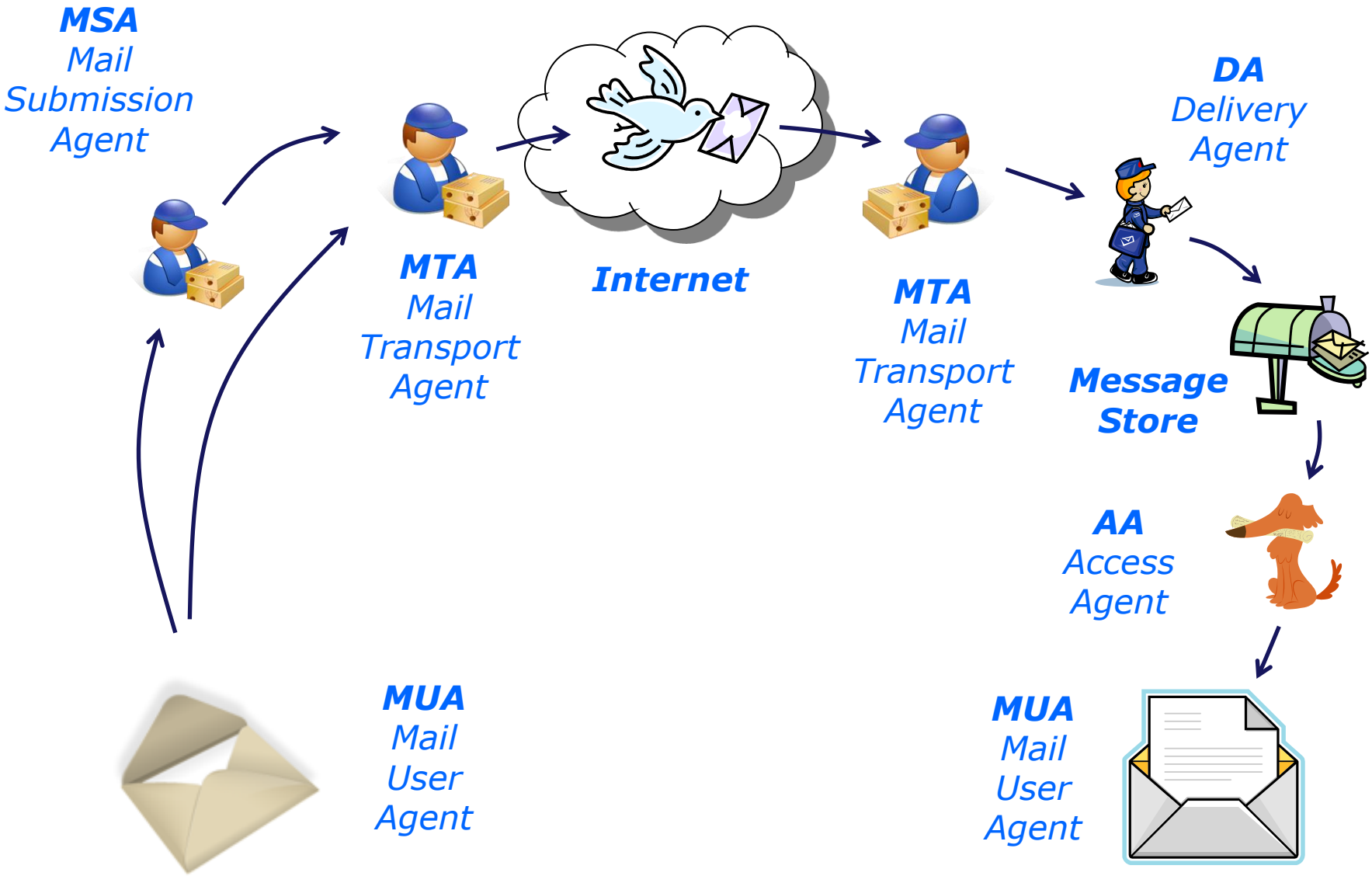
umount /home

serv

```
andes
armstrong
bobisuthi
collins
crivello
dahlin
hsieh
huberlantz
hutmacher
lee
lopez
mambulu
ordaz
ortega
prager
rivas
ross
saenz
unruh
```

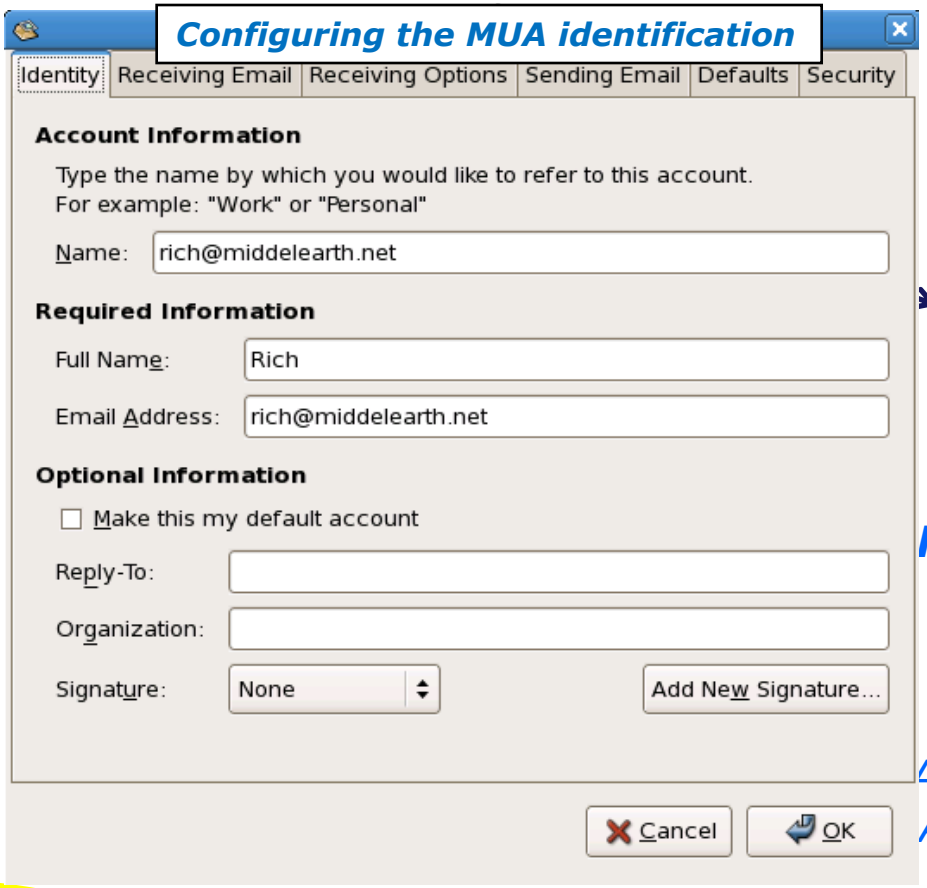
email

Overview of email

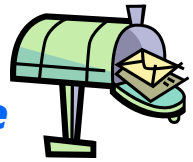


MSA
Mail Submission Agent

Configuring the MUA identification



DA
Delivery Agent



Message Store

AA
Access Agent

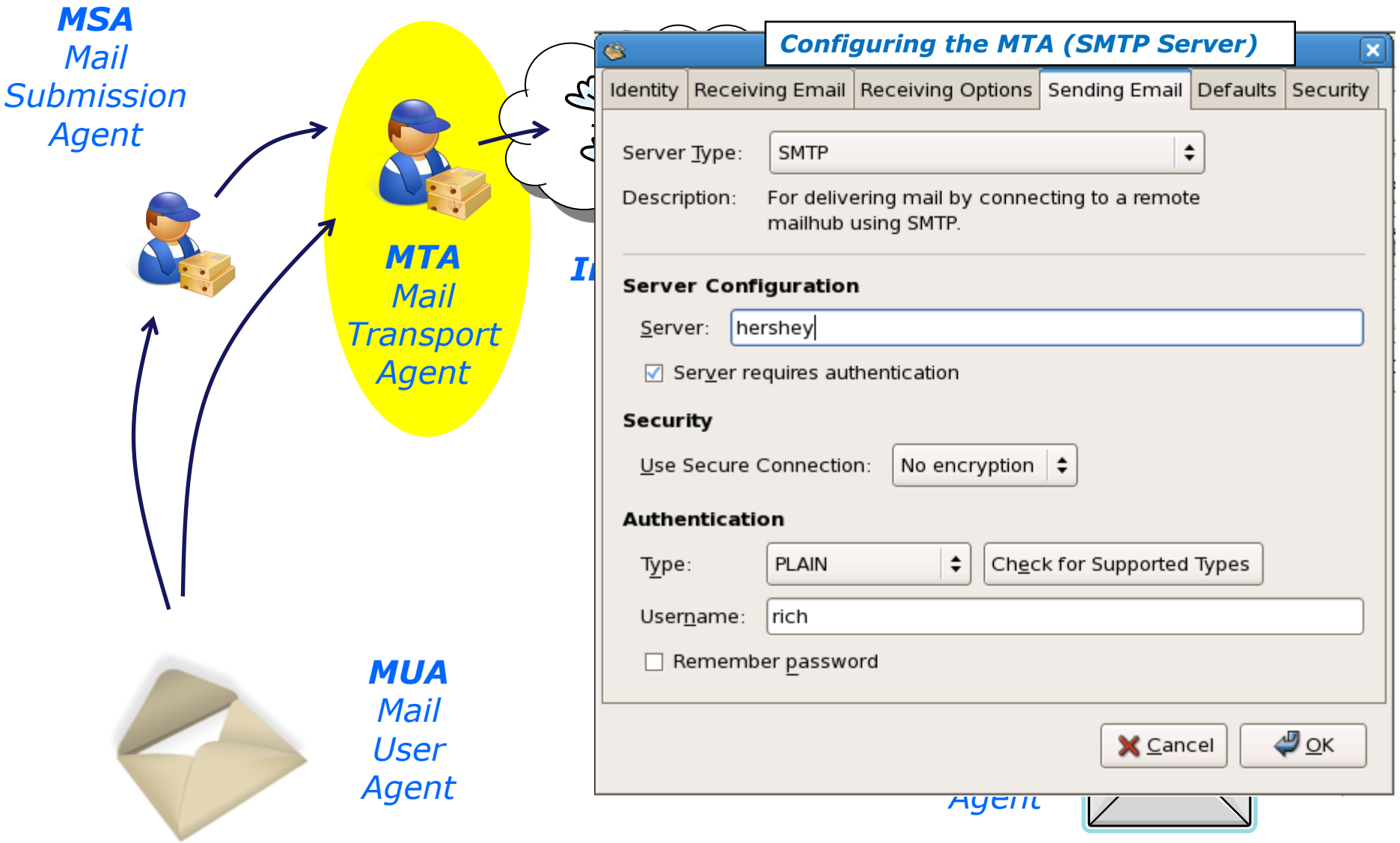
MUA
Mail User Agent

compose and send message

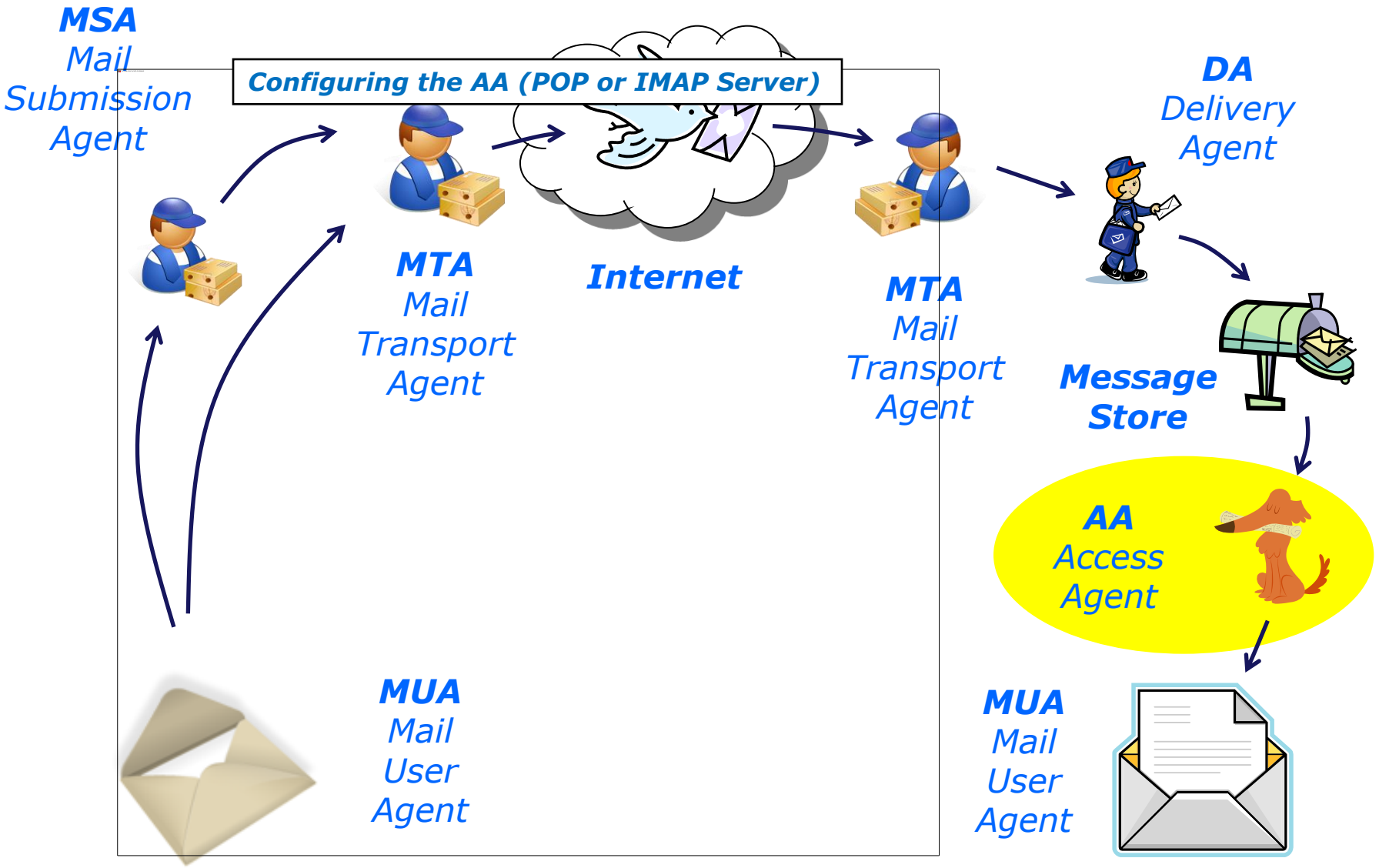
MUA
Mail User Agent

open and read message

Overview of email



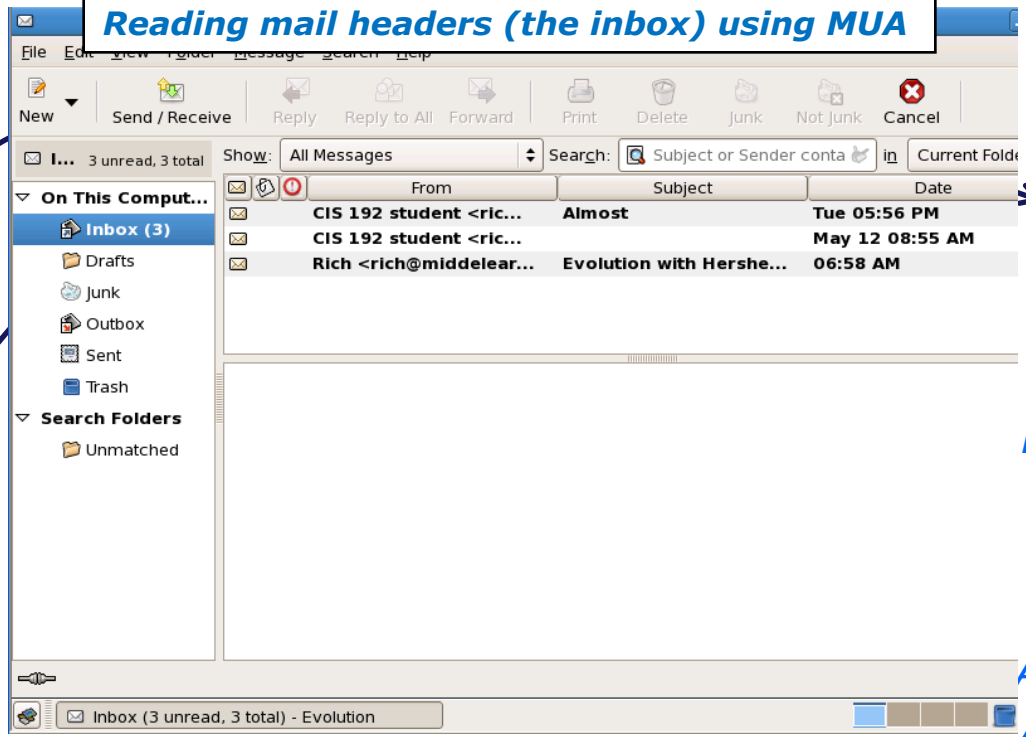
Overview of email



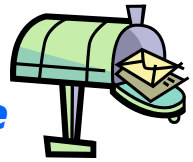
Overview of email

MSA
Mail Submission Agent

Reading mail headers (the inbox) using MUA



DA
Delivery Agent



Message Store

AA
Access Agent

MUA
Mail User Agent

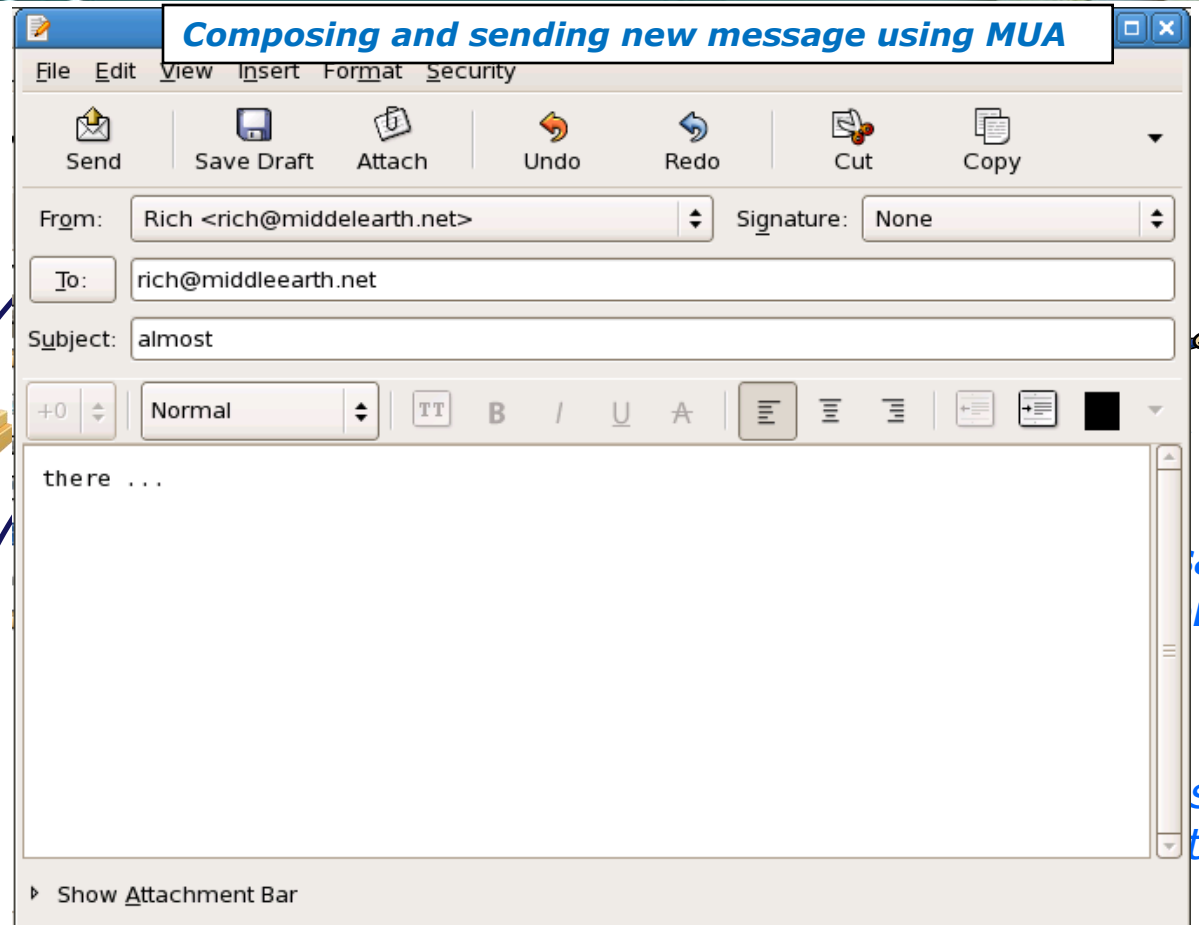
compose and send message

MUA
Mail User Agent

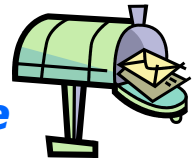
open and read message

Composing and sending new message using MUA

MSA
Mail Submission Agent



DA
Delivery Agent

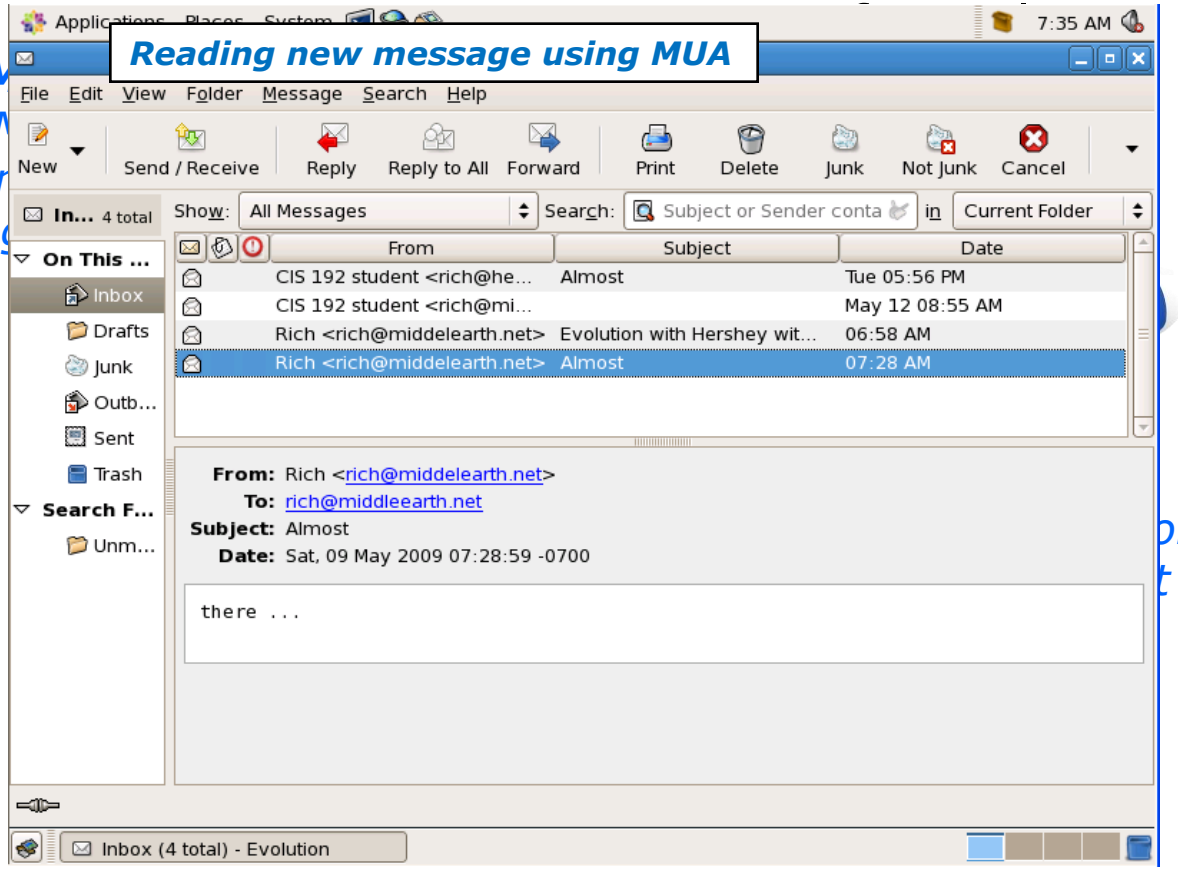


MUA
Mail User Agent

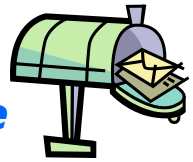
compose and send message

MUA
Mail User Agent

open and read message



DA
Delivery Agent



Message Store

AA
Access Agent

MUA
Mail User Agent

compose and send message

MUA
Mail User Agent

open and read message

Overview of email

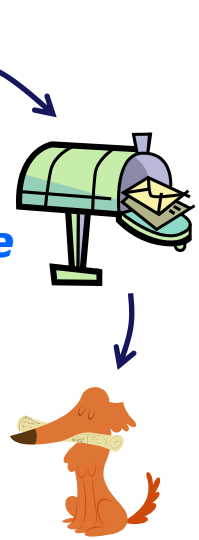
```
[cis192@elrond ~]$ cat .fetchmailrc
poll hershey protocol pop3
username rich
password ********
keep
fetchall

[cis192@elrond ~]$ fetchmail
fetchmail: Server CommonName mismatch: localhost.localdomain != hershey
fetchmail: Server certificate verification error: self signed certificate
fetchmail: Server certificate verification error: certificate has expired
1 message for rich at hershey (548 octets).
reading message rich@hershey:1 of 1 (548 octets) not flushed

[cis192@elrond ~]$ mail
Mail version 8.1 6/6/93.  Type ? for help.
"/var/spool/mail/cis192": 1 message
>   1 rich@middelearth.net  Sat May  9 07:29  24/941   "Almost"
& 1
Message 1:
From rich@middelearth.net  Sat May  9 07:29:23 2009
Subject: Almost
From: Rich <rich@middelearth.net>
To: rich@middleearth.net
Content-Type: text/plain
Date: Sat, 09 May 2009 07:28:59 -0700
Mime-Version: 1.0
X-Mailer: Evolution 2.12.3 (2.12.3-8.el5_2.3)
Content-Transfer-Encoding: 7bit

there …
```

Fetching from POP server and reading new message using another MUA (/bin/mail)

Su

DA
Delivery Agent

age
re



compose and send message

open and read message

Mail Exercise

```
andes
armstrong
bobisuthi
collins
crivello
dahlin
hsieh
huberlantz
hutmacher
lee
lopez
mambulu
ordaz
ortega
prager
rivas
ross
saenz
unruh
```

- Configure the Evolution MUA on Elrond to read mail using the MTA (SMTP service) and AA (POP server) on Hershey

  POP server: hershey
  SMTP server: hershey
  email ID: lastname**@middleearth.net**
  Username: lastname

  - Configure messages to not be deleted on the server
  - Send yourself some emails

- Configure .fetchmailrc to pull your messages from hershey's pop service and read them with **/bin/mail** MUA

  poll hershey protocol pop3
  username firstname
  password yourpassword
  keep
  fetchall

- Read one message saved on the pop server using **telnet**

  telnet hershey 110
  user firstname
  pass yourpassword
  list
  retr 1
  quit