



## Lesson Module Status

- Slides
- Whiteboard with 1st minute quiz
  
- Flashcards
- Web Calendar summary
- Web book pages
- Commands
- Howtos
  
- Final exam preview uploaded
  
- 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/>



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



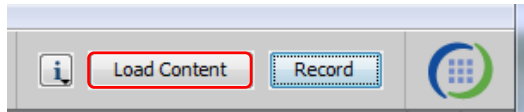
Laura



VMs for tonight  
**Celebrian, Frodo**

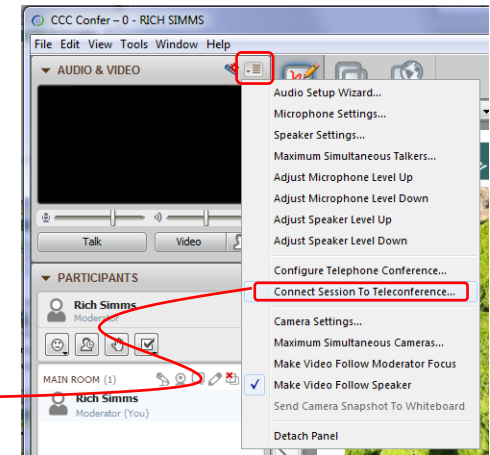
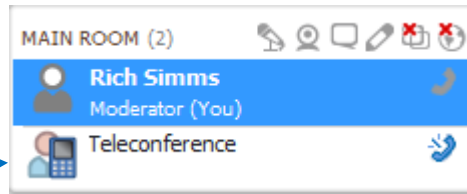


# [ ] Preload White Board with *cis\*lesson??\*-WB*



# [ ] Connect session to Teleconference

*Session now connected to teleconference*



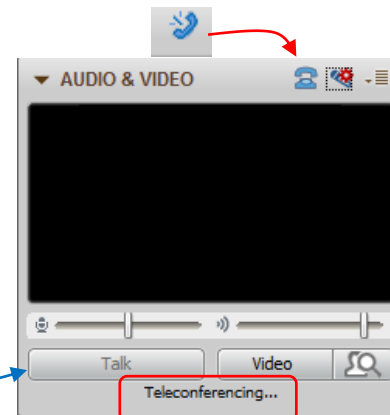
# [ ] Is recording on?



*Red dot means recording*

# [ ] Use teleconferencing, not mic

*Should be greyed out*





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

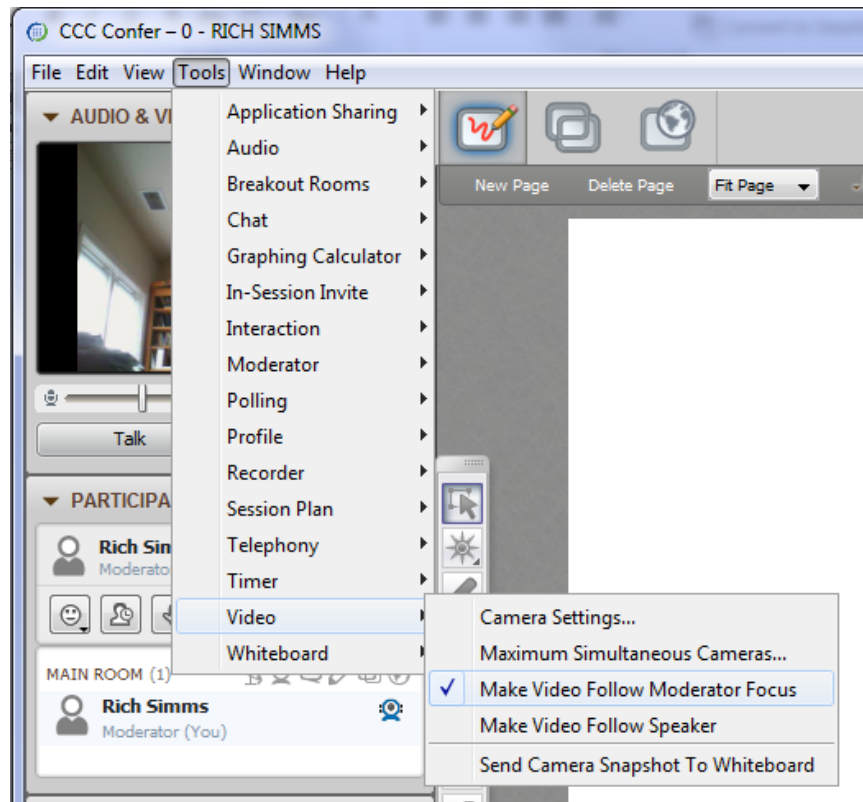
The screenshot displays a Windows desktop environment during a teleconference. On the left, the 'CCC Confer' window shows a video feed of Rich Simms and a list of participants. The main desktop area contains several open applications:

- foxit for slides:** A PDF viewer window titled 'cis90lesson07.pdf' showing a directory tree with folders like 'boot', 'bin', 'etc', and 'sbin'. A red box labeled 'foxit for slides' points to this window.
- chrome:** A Google Chrome browser window displaying a webpage from 'simms-teach.com' with flashcard questions. A red box labeled 'chrome' points to this window.
- putty:** A terminal window showing a login attempt for 'simben90' on 'oslab.cabrillo.edu'. A red box labeled 'putty' points to this window.
- vSphere Client:** A vCenter console window showing the 'CIS 192' vSphere environment. A red box labeled 'vSphere Client' points to this window.

At the bottom, the Windows taskbar shows icons for various applications, and the system tray displays the time as 6:52 AM on 10/10/2012.



- [ ] Video (webcam) optional
- [ ] Follow moderator
- [ ] Double-click on postages stamps



## Universal Fix for CCC Confer:

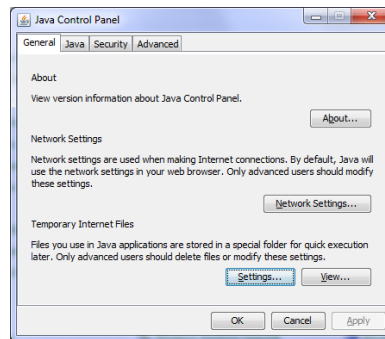
- 1) Shrink (500 MB) and delete Java cache
- 2) Uninstall and reinstall latest Java runtime



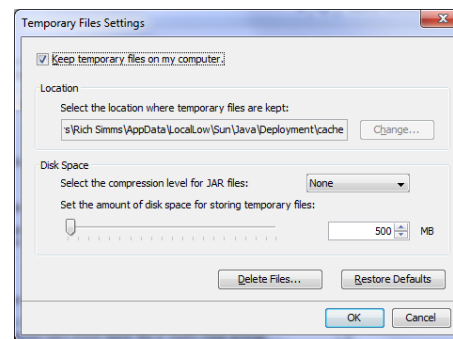
Control Panel (small icons)



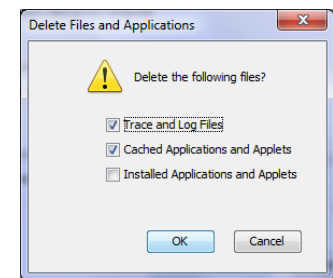
General Tab > Settings...



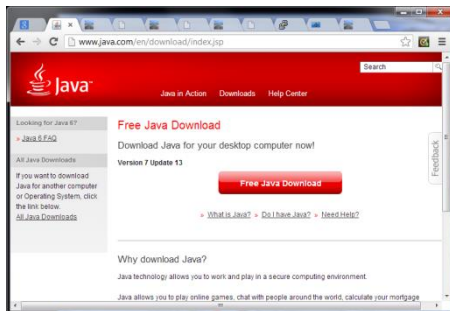
500MB cache size



Delete these



## Google Java download





# Management tools and utilities

## Objectives

- Identify, isolate, and correct malfunctions in a computer network.

## Agenda

- Questions on previous material
- Housekeeping
- Group Troubleshooting
- Various tools
- Prepping for the final
- Lab and final prep workshop
- Wrap



## First Minute Quiz

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

**NO MORE  
QUIZZES!**

**For credit email answers to:  
[risimms@cabrillo.edu](mailto:risimms@cabrillo.edu)  
within the first few minutes of class**



# 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.*

# Housekeeping

- Preview of Final now available
- Final in one week
- Extra credit labs due in one week

# Grades Check

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

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

Labs											Extra	Total	Grade	
F4	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Final	Credit	Total	Grade
20	30	30	30	30	30	30	30	30	30	30	60	90	560	
30	30	29	30	30	29	27						23		
29	28	29	30	24	22	27						25		
14	18	14	20									40		
24	18	20	20									51		
27	30	20	20									75		
27	25	20	0									18		
30	30	30	30	14	29	24								

Student	Grade	0	3	9	0	4	9	3	3	29	20	20	30	29	28	29	30	24	22	27	25
Demetris	P/MP	3	3	3	3	3	2	2	3	14	18	14	20	3	13	25	28	14	24	17	40
Drew	Grade		3	3	3					24	18	20	20		29	30	30	30	30	30	51
Ethel	Grade	3	3	3	3	3	3	3	3	27	30	20	20	30	30	30	30	30	30	30	75
Efron	Grade	3		3	3	3	9	3		27	25	20	0	30	30	30	30	14	29	24	18
Farrah	Grade	3	3	3	3	3	9														
Fredo	Grade	3	3	3	3	3															
Genelle	Grade		3	3	3	3	3														
Joseph	Grade	3	3	3	3	3	3														
Langston	Grade	3		3	3	3	3														
Nazgul	Grade	3	3	2	3	3	3														
Phyllis	Grade	3	3	3	3	3	3														
Samwise	P/MP	3	3	2	3	3	1														
Sarahann	Grade	3	3		3	3	3														
Strider	Grade	3	3	2	3																
Theoden	Grade	3	3	3	3	3	3														
Treebeard	P/MP																				

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 points to earn

Work	Points
Forum F4	20
Lab L10	30
Final	60
Extra Credit	up to 90



## Extra Credit

- Note you can earn up to 90 points maximum of extra credit
- 3 extra credit labs
- Do additional tasks on the final exam - up to 30 points
- Pics for photo page - 3 points
- 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	<p><b>Final Exam for CIS 192</b></p> <p><b>Time</b></p> <ul style="list-style-type: none"> <li>• 5:30PM - 8:20PM in Room 2501</li> </ul> <p><b>Materials</b></p> <ul style="list-style-type: none"> <li>• Presentation slides (<a href="#">download</a>)</li> <li>• Test (<a href="#">download</a>)</li> </ul>	<p><u>5 posts</u></p> <p>Extra Credit Labs</p>
----	-----	--	--



## Help with labs



### Like some help with labs?

I'm in the CIS Lab Monday afternoons

- See schedule at <http://webhawks.org/~cislabs/>

or see me during office hours

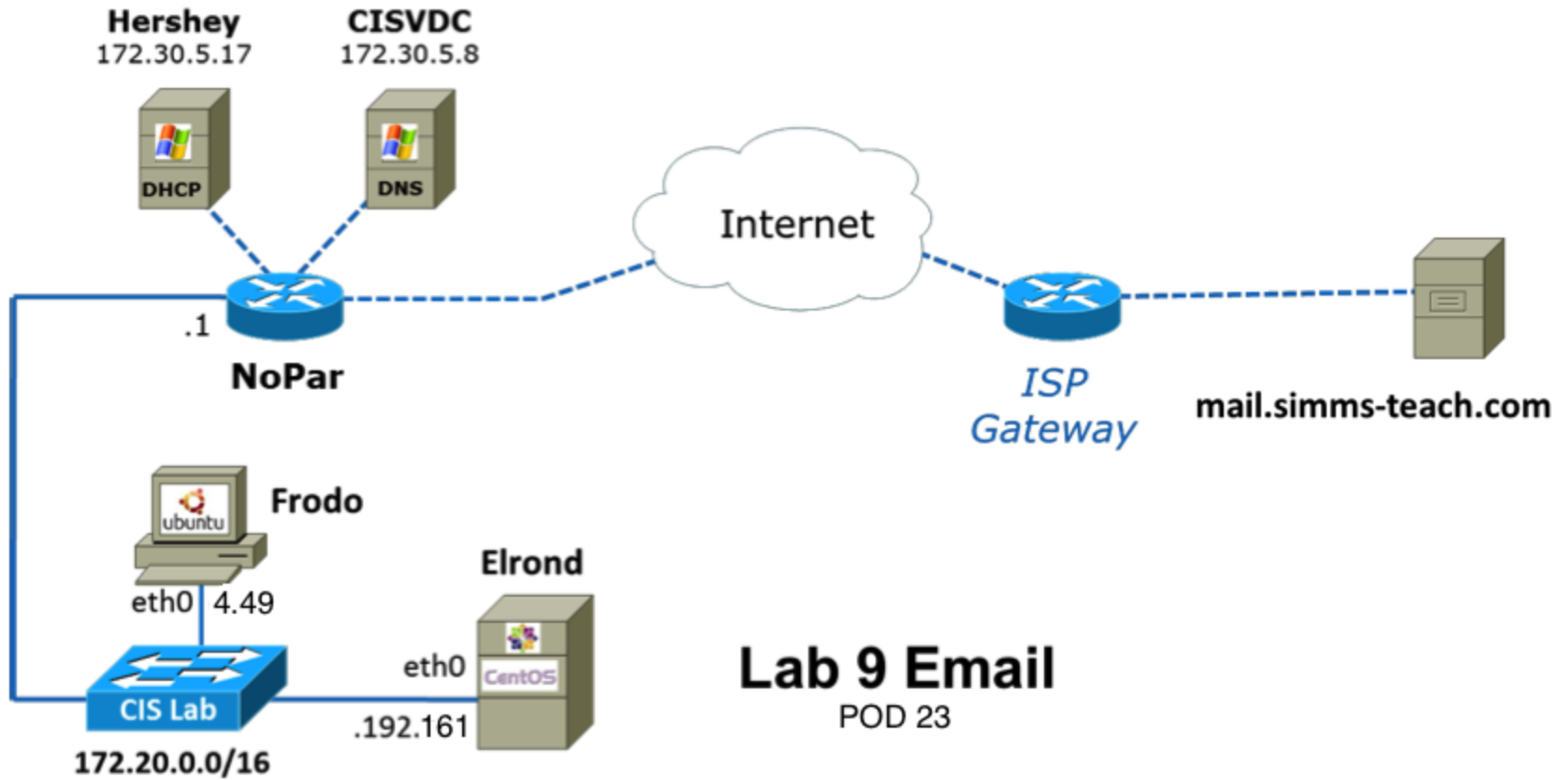
or contact me to arrange another time online

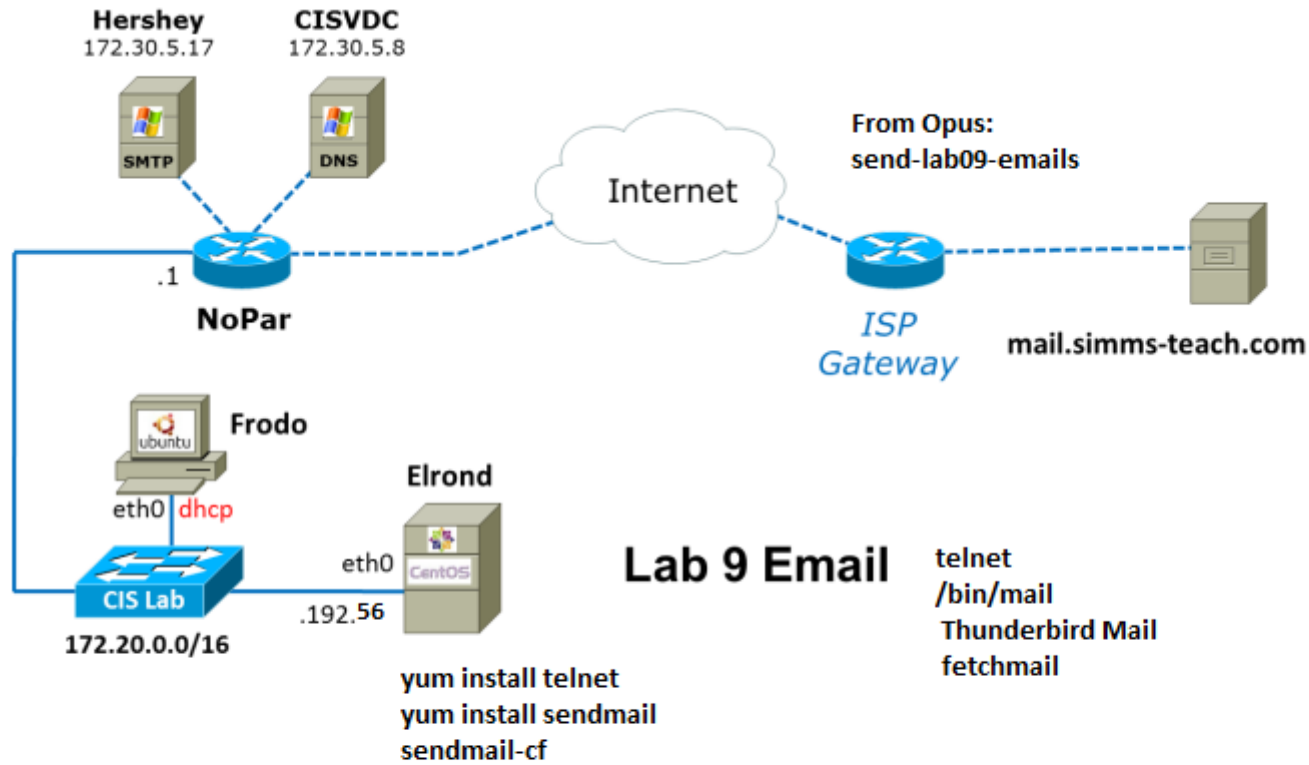


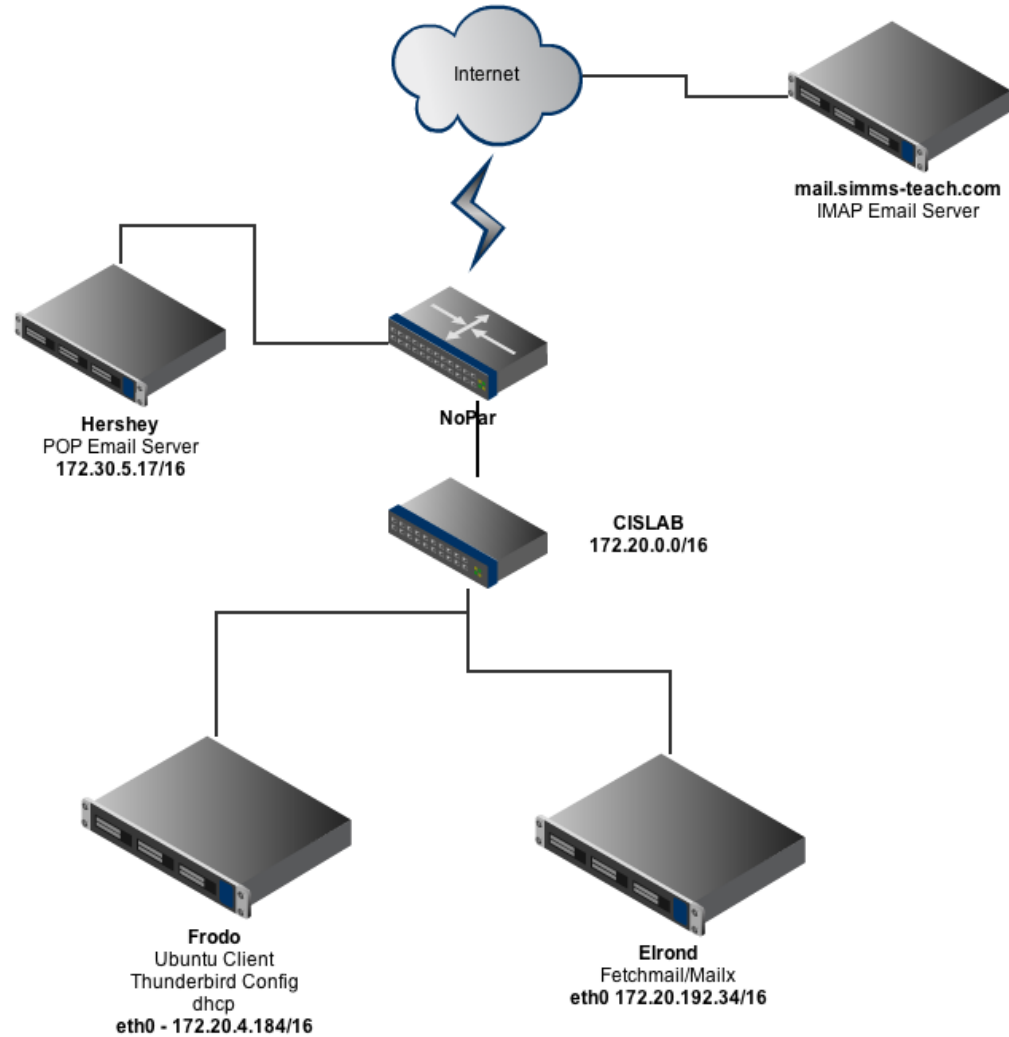
# Lab 9

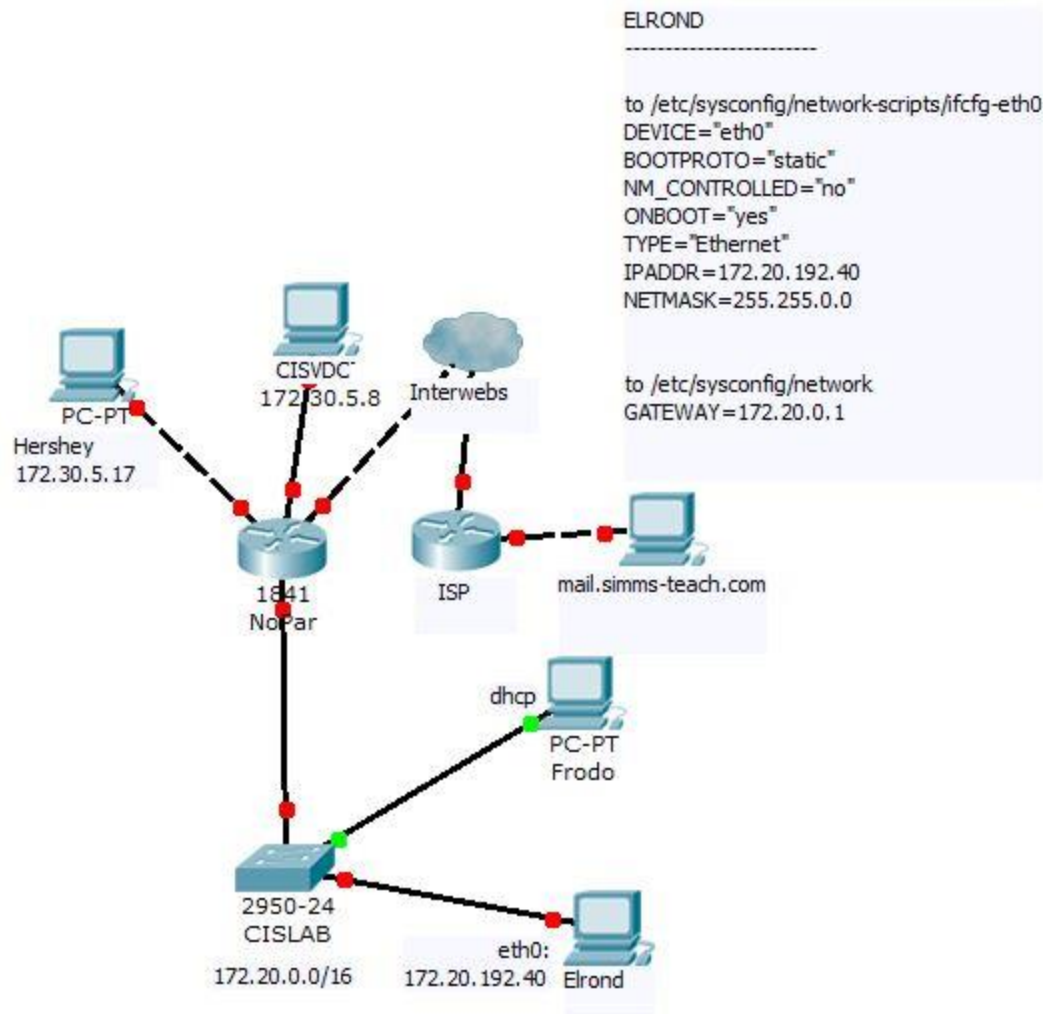
# Map

# Gallery



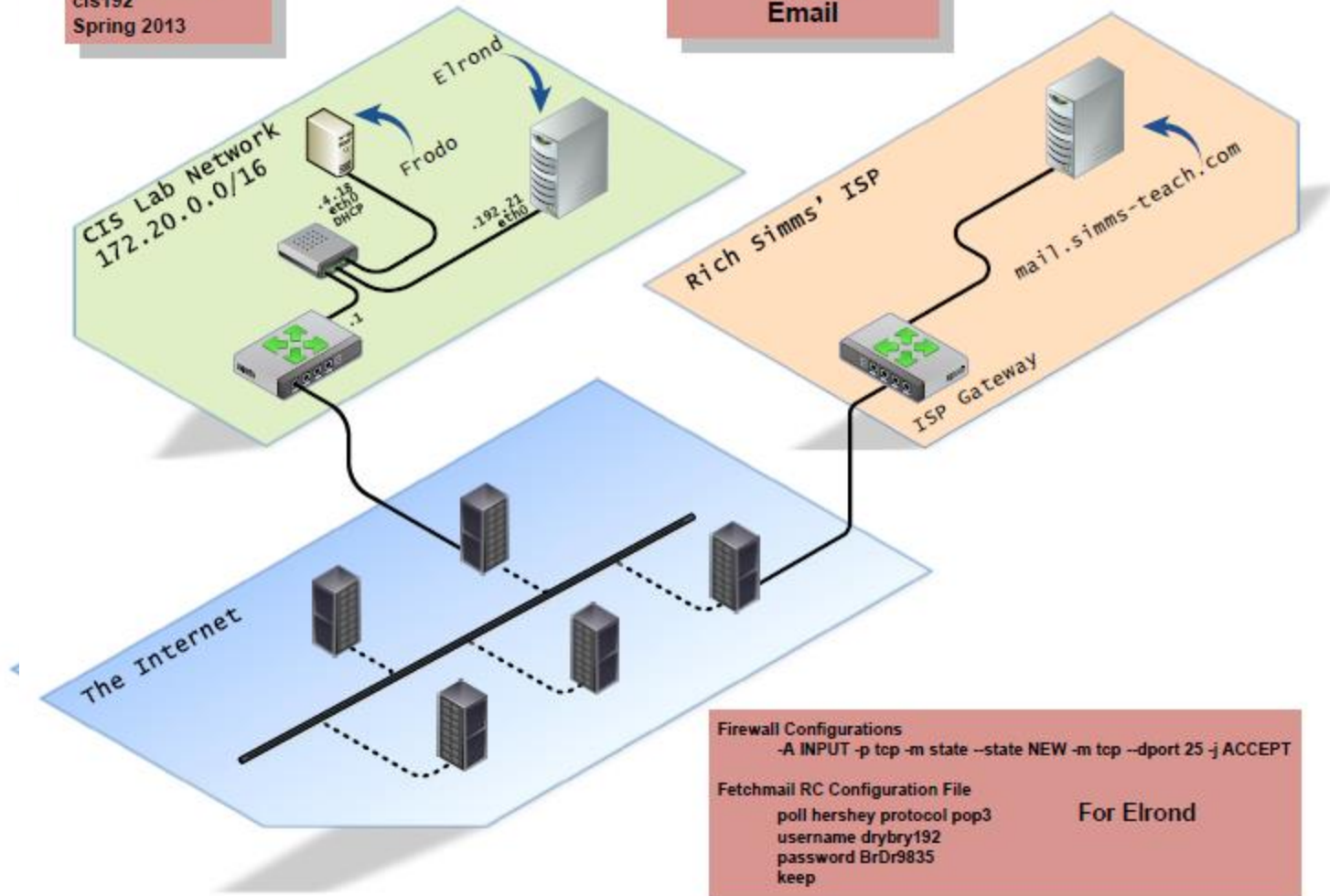




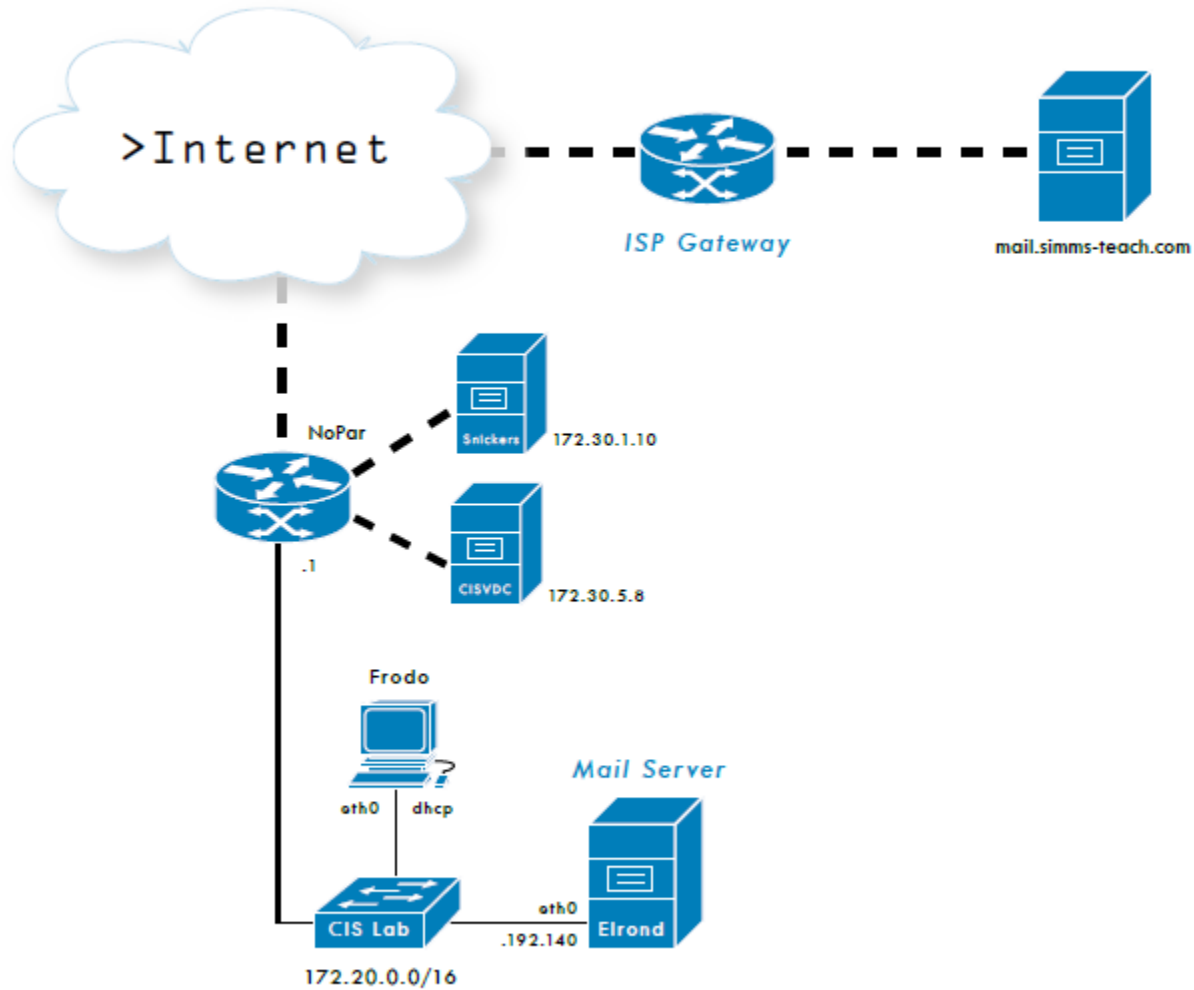


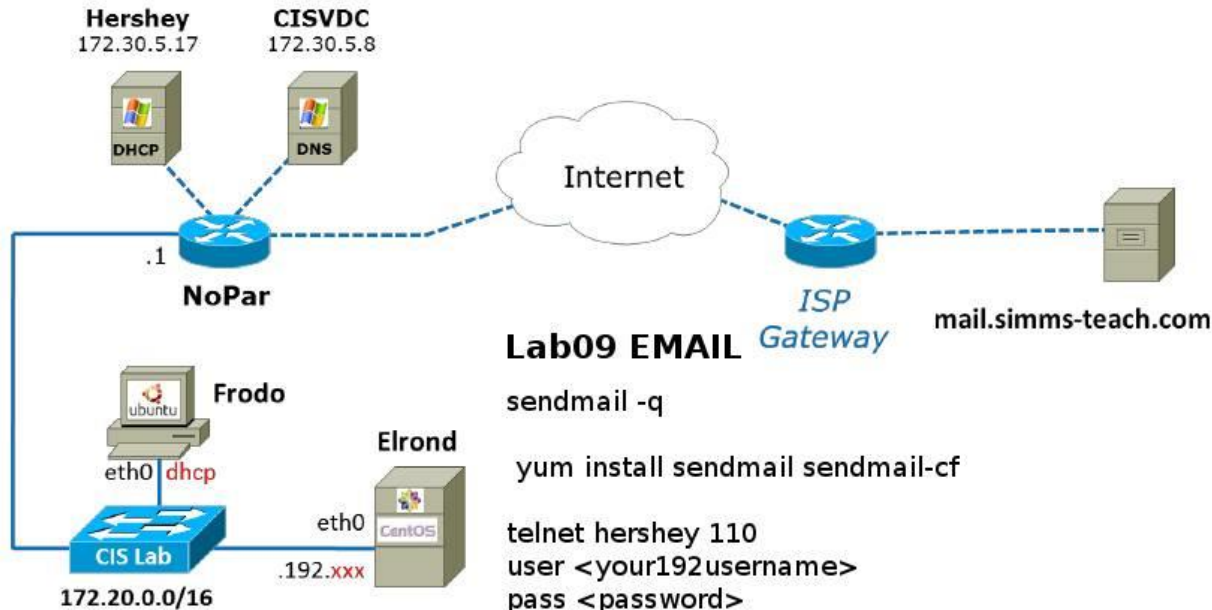
Bryan Drysdale  
cis192  
Spring 2013

Lab09  
Email









### Lab09 EMAIL

```
sendmail -q
```

```
yum install sendmail sendmail-cf
```

```
telnet hershey 110
user <your192username>
pass <password>
list
retr <message number>
quit
```

```
a001 login <your192username>@simms-teach.com <password>
a002 list "" ""
a003 select INBOX
a004 fetch <message number> full
a005 fetch <message number> body[text]
a006 logout
```

```
yum install fetchmail mailx
fetchmail
```

```
grep -r 'fullName|username|smtp' .thunderbird/ | grep prefs
```

## Frodo

```
/etc/network/interfaces
auto lo
iface lo inet loopback
auto eth0
iface eth0 inet dhcp
```

```
/etc/init.d/networking restart
```

## Elrond

```
/etc/sysconfig/network-scripts/ifcfg-eth0
DEVICE="eth0"
BOOTPROTO="static"
NM_CONTROLLED="no"
ONBOOT="yes"
TYPE="Ethernet"
IPADDR=172.20.192.66
NETMASK=255.255.0.0
```

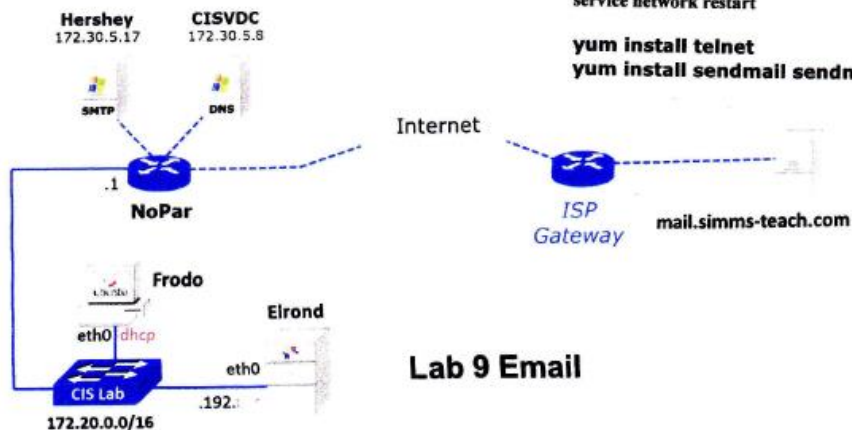
```
/etc/sysconfig/network-scripts/ifcfg-eth1
DEVICE="eth1"
BOOTPROTO="none"
NM_CONTROLLED="no"
ONBOOT="no"
TYPE="Ethernet"
```

```
/etc/sysconfig/network
NETWORKING=yes
HOSTNAME=p09-elrond.cislab
GATEWAY=172.20.0.1
```

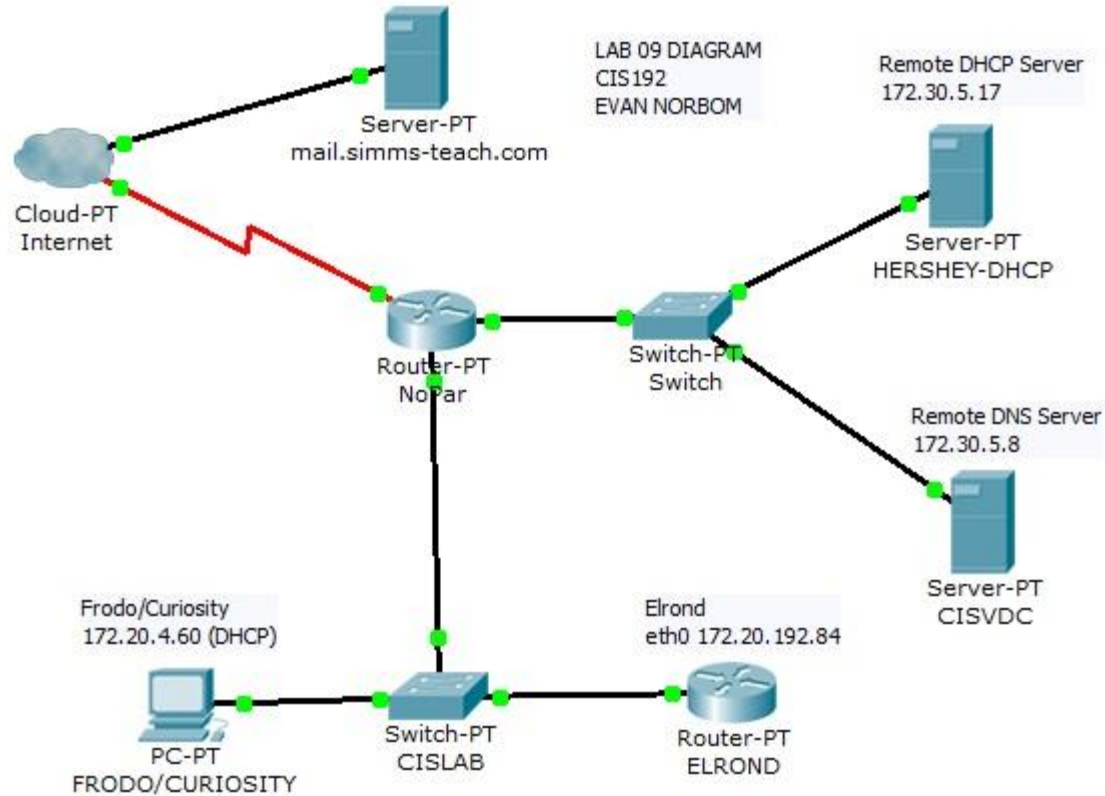
```
/etc/resolv.conf
search cislab.net
nameserver 172.30.5.8
```

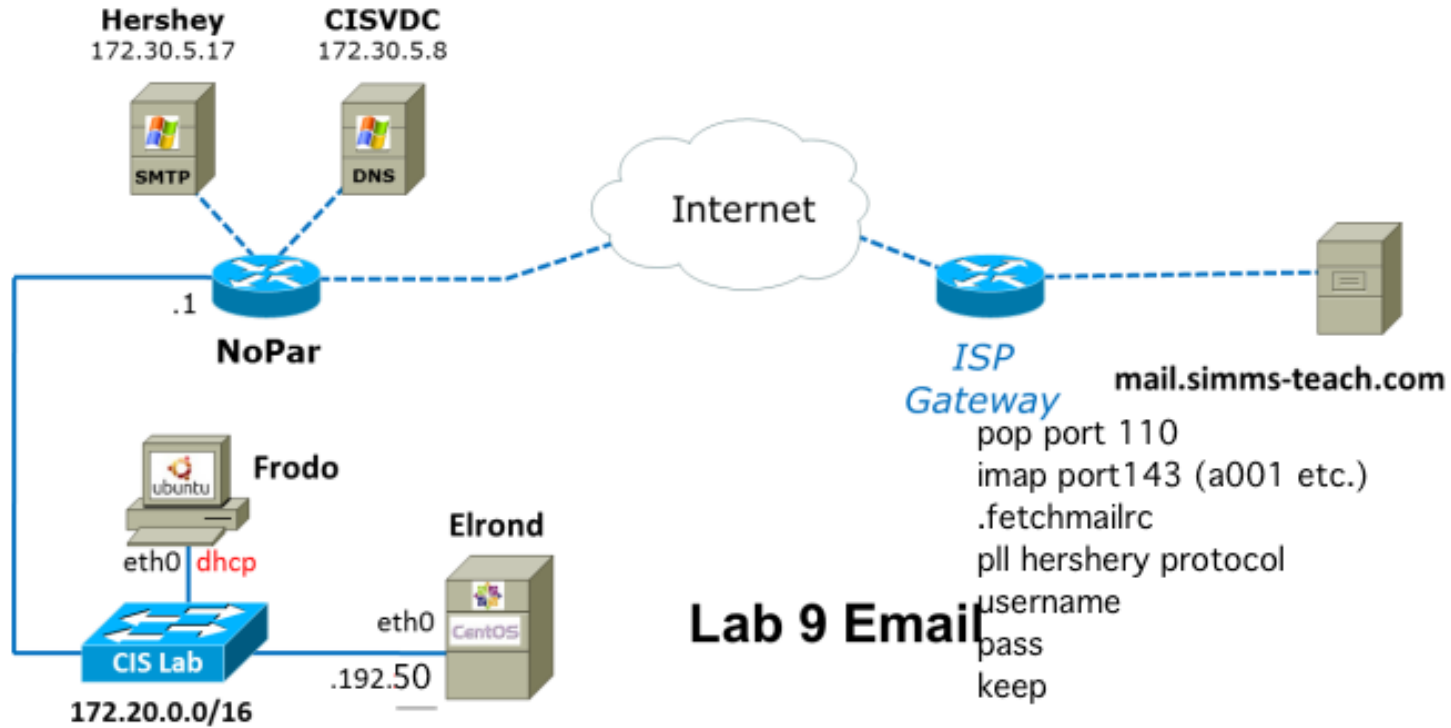
```
/etc/hosts
127.0.0.1 localhost <snipped> ::1 localhost
172.20.4.11 p09-william william
192.168.9.105 arwen
service network restart
```

```
yum install telnet
yum install sendmail sendmail-cf
```

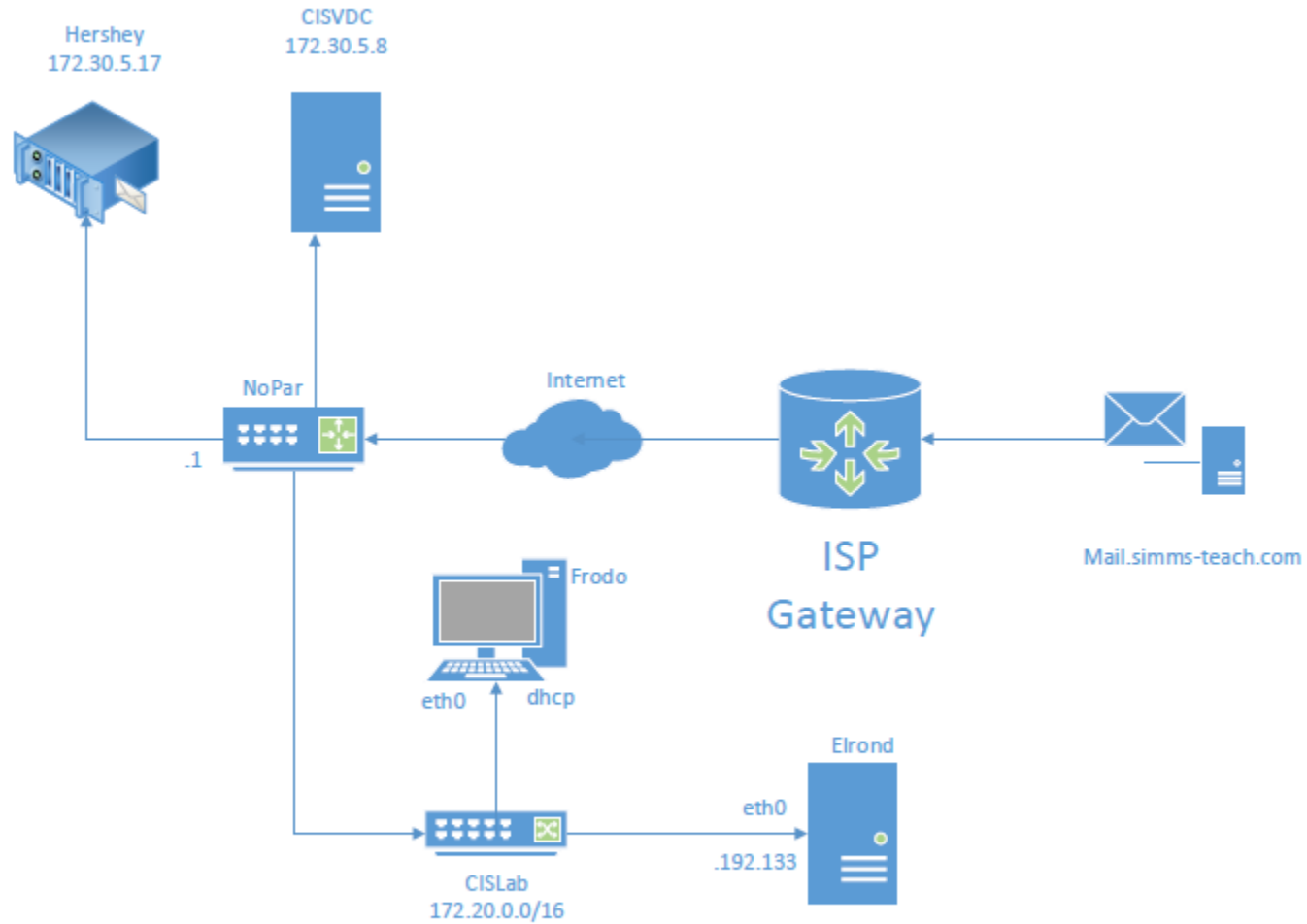


## Lab 9 Email

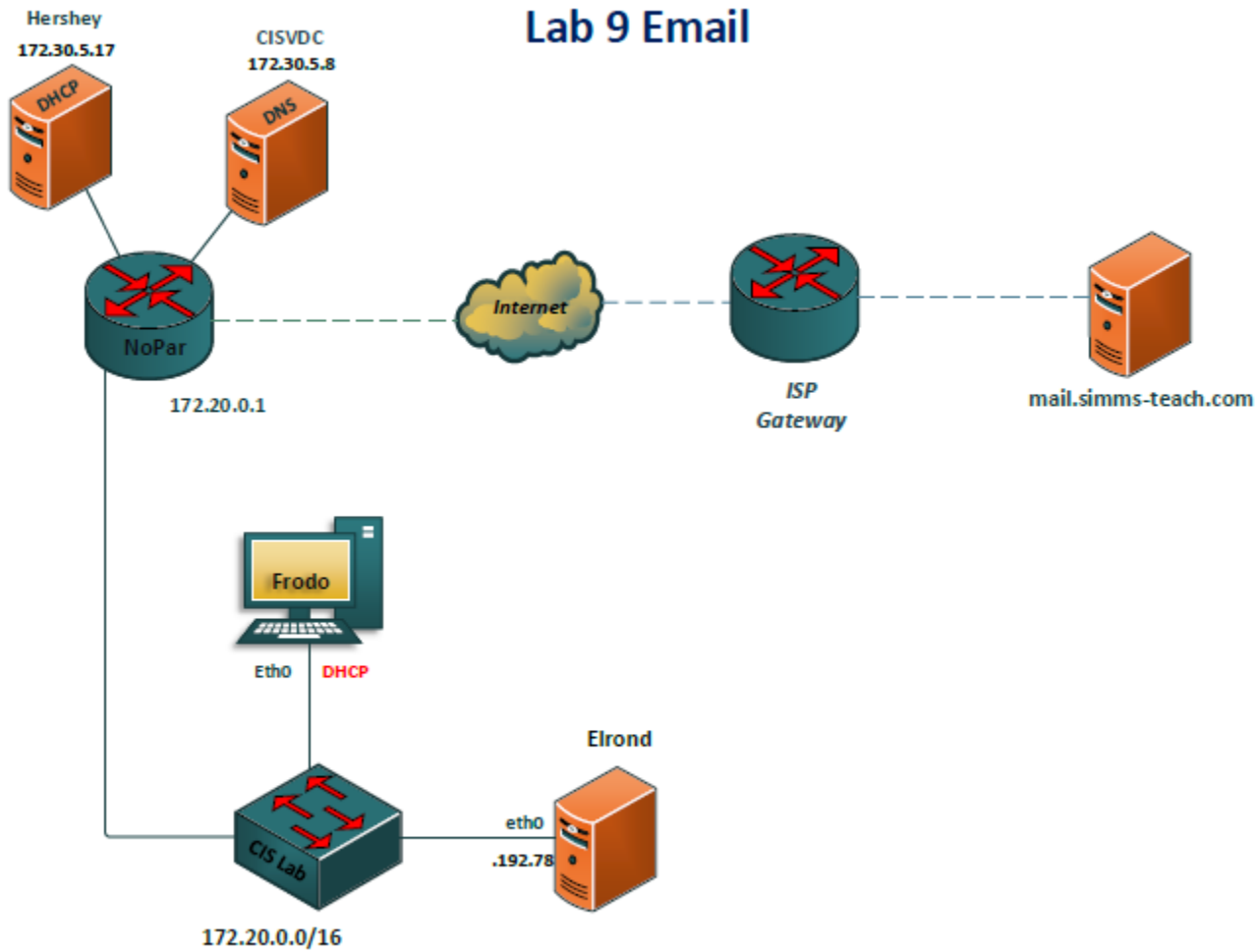


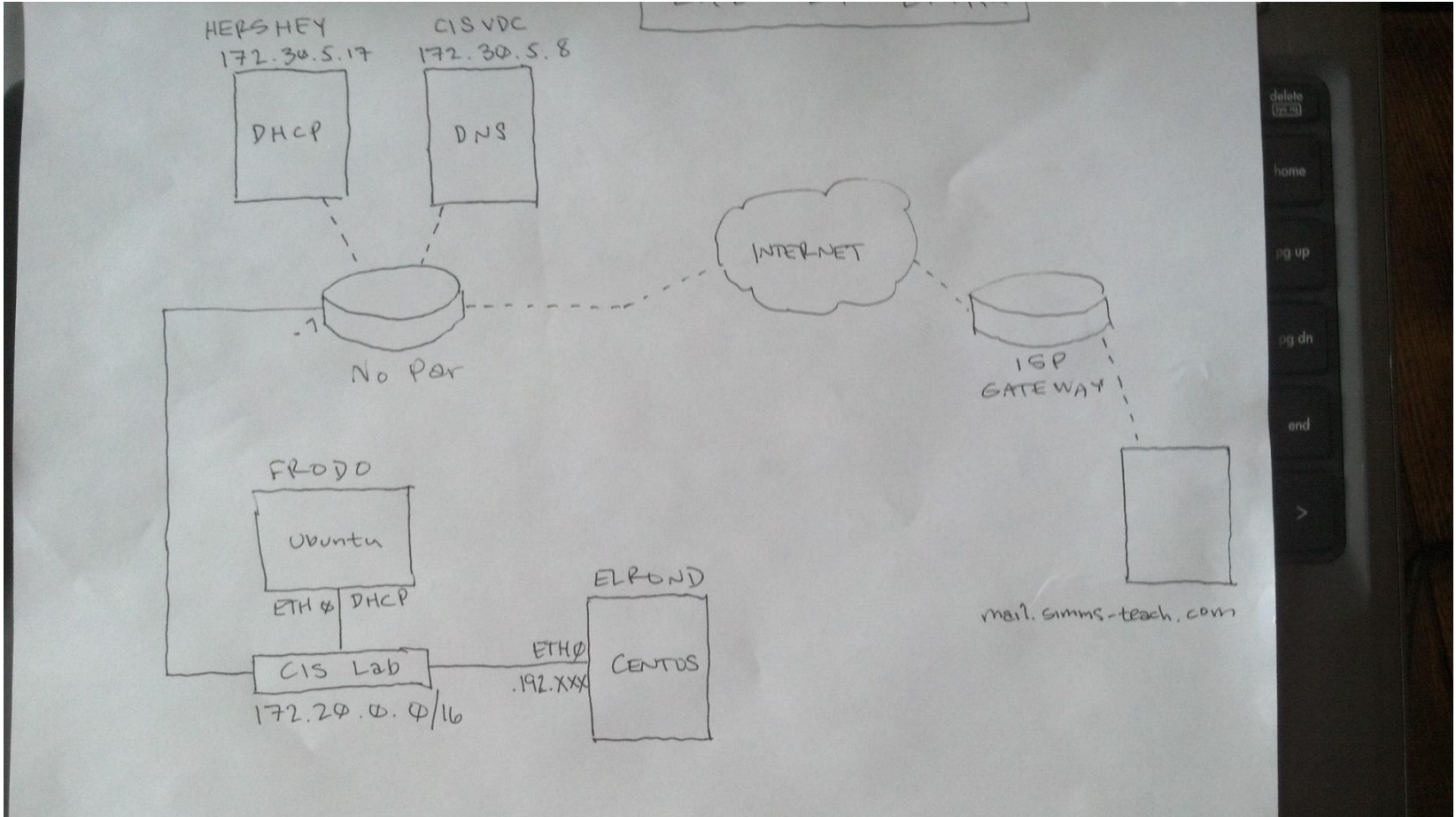


## Lab 9 Email



## Lab 9 Email





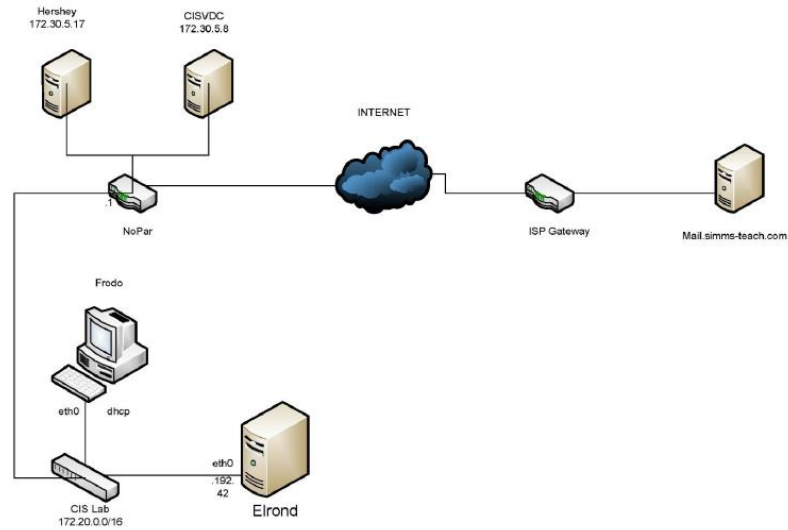


Corey Douthett

LAB09

CRIBSHEET

Host	IP	Gateway
Elrond	172.20.192.42	172.20.0.1
Frodo	172.20.4.61	172.20.0.1
	Syntax	Effect
Commands	telnet [host] [port]	connect to POP(110)/IMAP(143) server
	user, pass, list, retr, quit	POP mail commands
	a00* login, list, select, fetch, logout	IMAP mail commands
	fetchmail, mailx	mail client packages
	sendmail, sendmail-cf	MTA packages
	touch .fetchmailrc ~/	config file for POP
	poll [hostname] protocol [protocol]	entry for .fetchmailrc



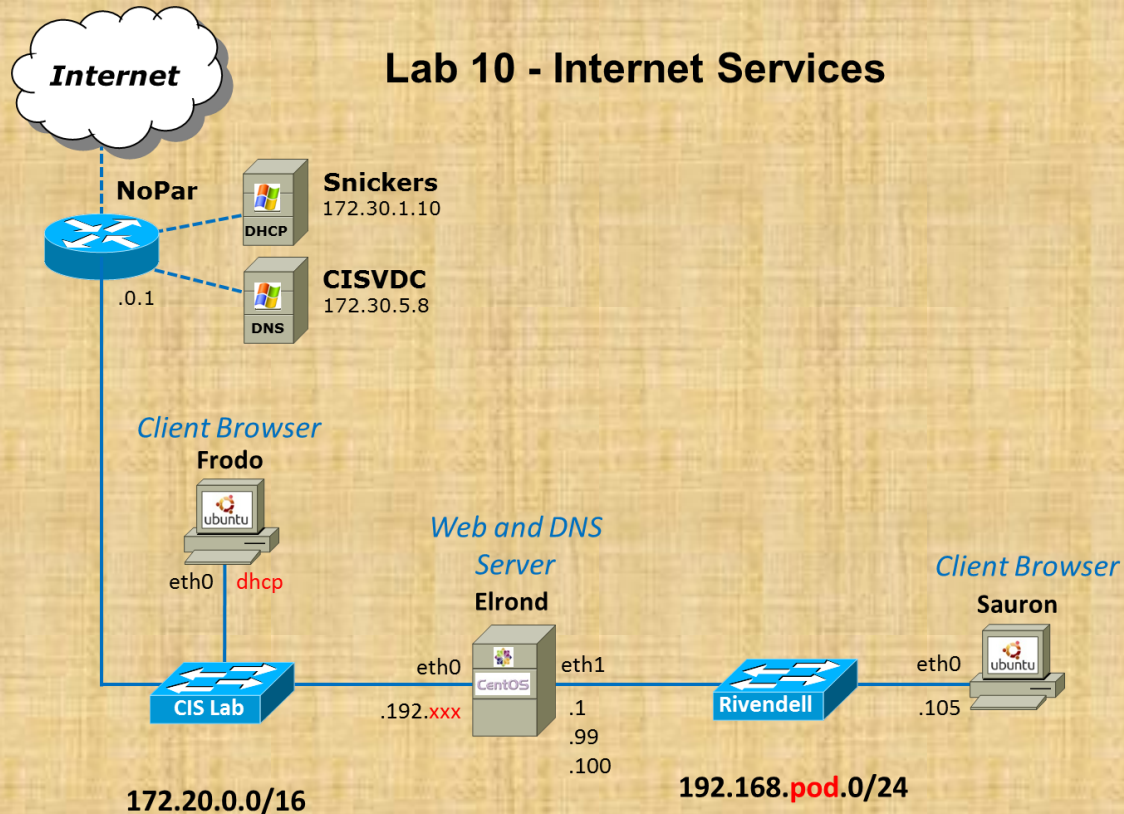


# Lab 10

## Group

# Troubleshoot

# Group Troubleshooting



**Who would like the class to look at your Lab 10 to help troubleshoot the current step you are on?**

# NSM Tools



## Troubleshooting Tools

### *Applications and Ports*

telnet *app-port* (Lesson 13)  
netstat -utln (Lesson 5)

### *Routes and Connectivity*

tracert *ip-addr* or mtr *ip-addr* (Lesson 2)  
route -n (Lesson 3)  
ping *ip-addr* (Lesson 1)

### *Connection*

arp -a (Lesson 2)  
ifconfig (Lesson 1)

*Basic troubleshooting tools we have been using in this course*

## Monitoring Tools

wireshark - graphical packet sniffer (Lesson 2)

tcpdump - text based packet sniffer (Lesson 2)

arpwatch - collect IP MAC pairs (Lesson 2)

*Packet and ARP level monitoring*

# Network and System Management Tools

fing  
nmap  
Nagios  
Cacti  
Webmin  
OpenNMS  
many more ...

*Free tools that run on Linux*

# Network and System Management Tools

**fing**  
network discovery and  
scanning tool

```

root@sniffer:~
File Edit View Terminal Help

[root@sniffer ~]# fing
04:03:49 > Discovery profile: Default discovery profile
04:03:49 > Discovery class:  data-link (data-link layer)
04:03:49 > Discovery on:      172.30.4.0/24

04:03:49 > Discovery round starting.
04:03:49 > Host is up:      172.30.4.201
           HW Address:    08:00:27:4A:59:89 (Cadmus Co
04:03:49 > Host is up:      172.30.4.1
           HW Address:    00:B0:64:53:42:01 (Cisco Sys
04:03:49 > Host is up:      172.30.4.10
           HW Address:    00:40:05:7D:0B:64 (ANI Commu
04:03:49 > Host is up:      172.30.4.12
           HW Address:    00:1D:73:19:F4:86 (Buffalo)
04:03:49 > Host is up:      172.30.4.20
           HW Address:    00:AA:00:30:96:48 (Intel)
04:03:50 > Host is up:      172.30.4.101
           HW Address:    00:21:9B:88:0F:5C (Dell)
    
```

```

root@sniffer:~
File Edit View Terminal Help

-----
UP      | 172.30.4.1      | 00:B0:64:53:42:01 |
UP      | 172.30.4.10     | 00:40:05:7D:0B:64 |
UP      | 172.30.4.12     | 00:1D:73:19:F4:86 | 02:40:25
UP      | 172.30.4.20     | 00:AA:00:30:96:48 | 02:45:23
DOWN    | 172.30.4.57     | 00:0C:29:A8:B5:53 | 02:40:28
UP      | 172.30.4.101    | 00:21:9B:88:0F:5C |
DOWN    | 172.30.4.102    | 00:21:9B:88:0B:16 | 02:43:28
UP      | 172.30.4.106    | 00:21:9B:88:0F:0A | 02:48:43
UP      | 172.30.4.107    | 00:21:9B:88:0C:5A |
UP      | 172.30.4.110    | 00:21:9B:88:0A:FE | 03:32:54
UP      | 172.30.4.138    | 00:21:9B:88:0F:84 |
UP      | 172.30.4.150    | 00:1D:72:54:0C:68 |
DOWN    | 172.30.4.151    | 00:0C:29:A8:B5:53 | 02:37:28
DOWN    | 172.30.4.152    | 00:0C:29:82:4B:58 | 03:55:28
UP      | 172.30.4.201    | 08:00:27:4A:59:89 |
-----

03:56:28 > Discovery round completed in 4.816 seconds.
03:56:28 > Network 172.30.4.0/24 has 11/15 hosts up.

03:56:28 > Next round starting at 03:57:23. Press Ctrl^C to exit.
    
```

<http://www.overlooksoft.com>



# Network and System Management Tools

```

root@sniffer:~/bin
File Edit View Terminal Help
[root@sniffer bin]# nmap -sS -p 21-23,25,111 172.30.4.1-201

Starting Nmap 5.21 ( http://nmap.org ) at 2010-05-13 04:10 PDT
Nmap scan report for 172.30.4.1
Host is up (0.0056s latency).
PORT      STATE SERVICE
21/tcp    closed ftp
22/tcp    closed ssh
23/tcp    open  telnet
25/tcp    closed smtp
111/tcp   closed rpcbind
MAC Address: 00:B0:64:53:42:01 (Cisco Systems)

Nmap scan report for 172.30.4.10
Host is up (0.0017s latency).
PORT      STATE SERVICE
21/tcp    closed ftp
22/tcp    closed ssh
23/tcp    closed telnet
25/tcp    closed smtp
111/tcp   closed rpcbind
MAC Address: 00:40:05:7D:0B:64 (ANI Communications)

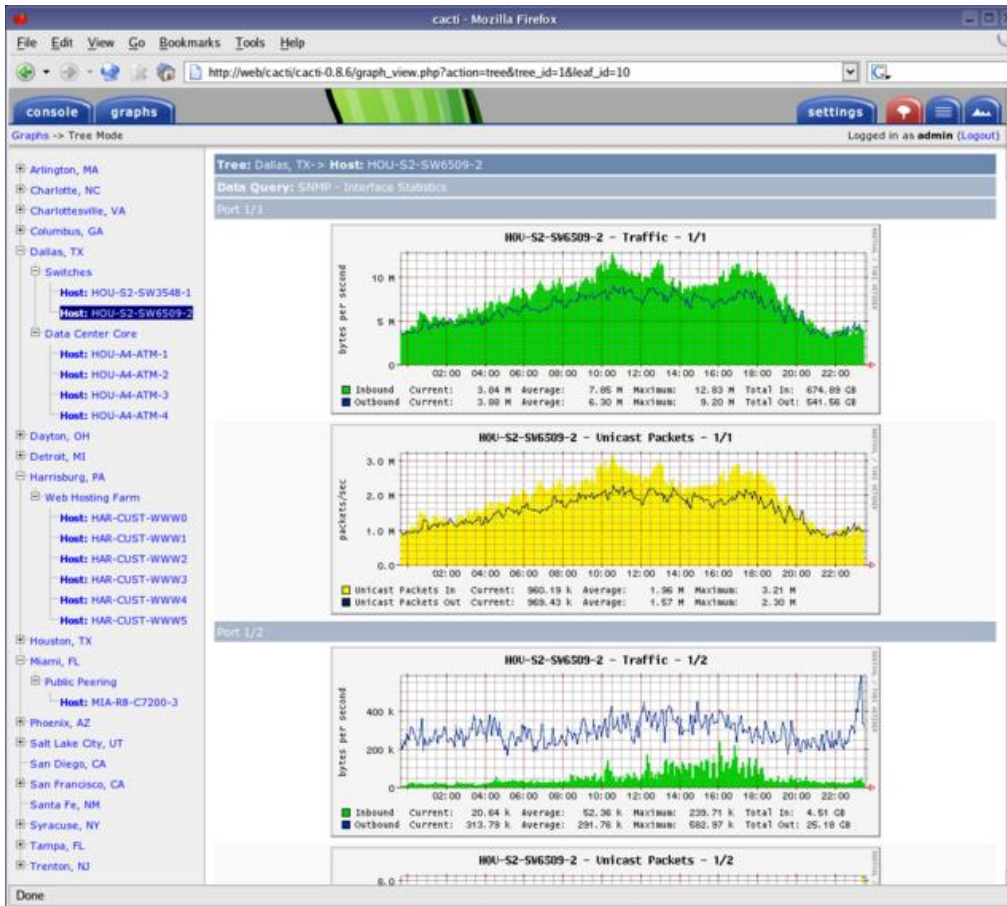
Nmap scan report for 172.30.4.12
Host is up (0.0029s latency).
PORT      STATE SERVICE
21/tcp    open  ftp
22/tcp    closed ssh
23/tcp    closed telnet
25/tcp    closed smtp
111/tcp   closed rpcbind
MAC Address: 00:1D:73:19:F4:86 (Buffalo)

```

**nmap**  
network scanning tool

*yum install nmap*

# Network and System Management Tools



## Cacti

Open source graphing tool for RRDTool data

# Network and System Management Tools

The image shows two overlapping windows from the Nagios web interface. The top window is the 'Nagios Tactical Monitoring Overview' and the bottom window is the 'Network Map'.

**Nagios Tactical Monitoring Overview**

**Tactical Monitoring Overview**  
Last Updated: Fri Jan 11 11:48:14 CST 2008  
Updated every 90 seconds  
Nagios® 3.0rc1 - www.nagios.org  
Logged in as nagiosadmin

**Monitoring Performance**

Service Check Execution Time:	0.02 / 10.28 / 0.445 sec
Service Check Latency:	0.00 / 0.85 / 0.153 sec
Host Check Execution Time:	0.26 / 4.06 / 3.147 sec
Host Check Latency:	0.00 / 0.94 / 0.535 sec
# Active Host / Service Checks:	17 / 175
# Passive Host / Service Checks:	0 / 0

**Network Outages:** 0 Outages

**Network Health:** Host Health: ██████████

**Hosts:** 0 Down, 0 Unreachable

**Services:** 2 Critical, 4 Warning

**Monitoring Features:**

Flap Detection	Notifications
Enabled	Enabled
All Services Enabled	All Services Enabled
No Services Flapping	All Hosts Enabled
All Hosts Enabled	No Hosts Flapping

**Network Map**

Network Map For All Hosts  
Last Updated: Fri Jan 11 11:53:03 CST 2008  
Updated every 90 seconds  
Nagios® 3.0rc1 - www.nagios.org  
Logged in as nagiosadmin

Layout Method: Collapsed tree | Scaling factor: 0.0

Drawing Layers:  
 Environmental Probes  
 Fedora Core 8 Production Servers  
 Printers  
 Production Linux Servers

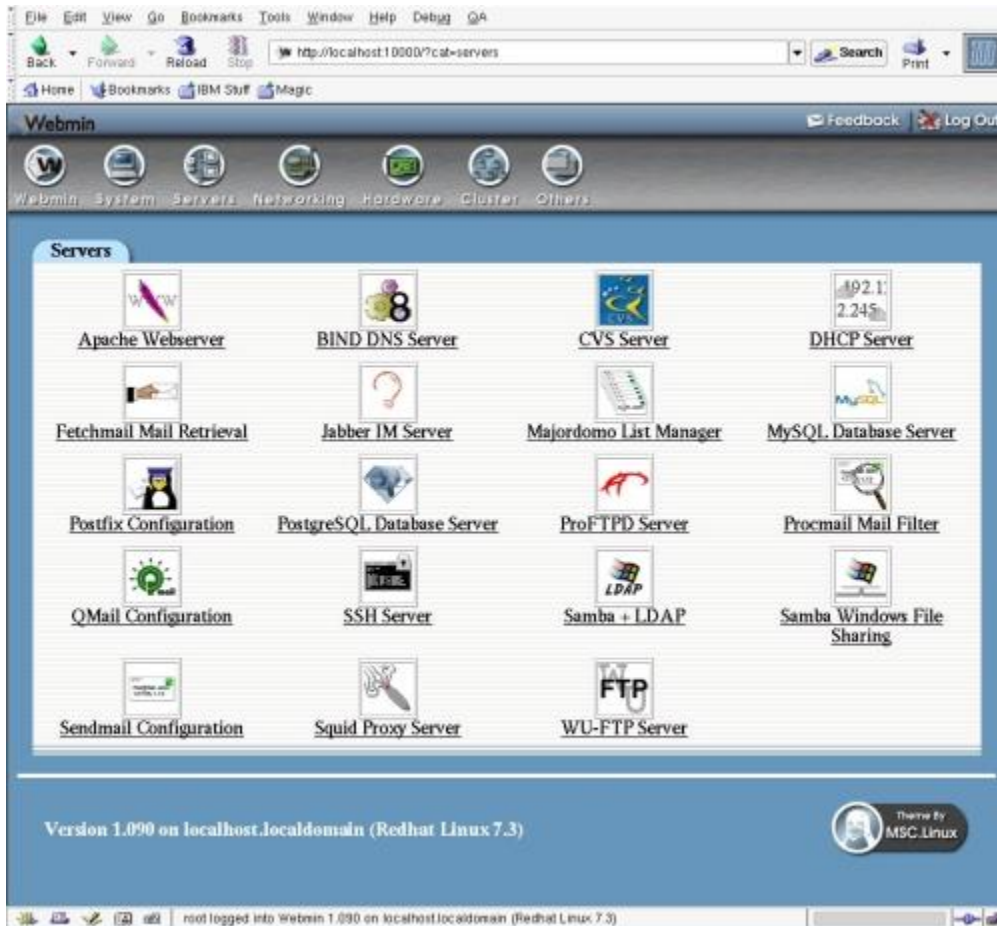
Suppress popups:  | Update

The network map shows a central 'Nagios Process' node connected to a 'linksys-sw2204p' switch. The switch is connected to several other nodes, including 'es01b', 'filer', 'homefirewall', 'hp1260xdn', 'hp1250p', 'lanman', 'nero', 'opengear', 'task', and 'temptravel'. Each node has a status indicator (e.g., 'Up' or 'Down').

## Nagios

Open source system and network monitoring tool

# Network and System Management Tools



## webmin

Web based system  
administration tool

<http://www.webmin.com/>

## Network and System Management Tools

openNMS®  
User: demo (Notices On) - Log out  
Aug 26, 2008 10:54 EDT

Node List Search Outages Path Outages Dashboard Events Alarms Notifications Assets Reports Charts Surveillance Distributed Status

Home

Nodes with Outages  
mysearchnode (10 hours)

Categories	Outages	Availability
Network Interfaces	1 of 11	96.158%
Web Servers	0 of 19	99.279%
Email Servers	0 of 8	98.973%
DNS and DHCP Servers	0 of 5	99.810%
Database Servers	0 of 1	100.000%
JMX Servers	0 of 0	100.000%
Other Servers	0 of 8	94.110%

Southeast U.S.	Outages	Availability
Mobile	0 of 1	100.000%
Raleigh	0 of 1	100.000%

Southwest U.S.	Outages	Availability
Dallas	0 of 3	100.000%

Northwest U.S.	Outages	Availability
Seattle	0 of 1	100.000%

Notification  
You: No outstanding notices (Check)  
All: 3 outstanding notices (Check)  
On-Call Schedule

Resource Graphs  
-- Choose a node --

KSC Reports  
-- Choose a report to view --

openNMS®  
User: demo (Notices Off) - Log out  
26-Aug-2008 12:12:29 EDT

Home / Charts

Alarms Severity Chart  
Last 7 Days Outages Outages Chart

Node Inventory

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### OpenNMS

### Network Application Platform

openNMS®  
OpenNMS Remote Poller Map  
User: opennms (Business Off) - Log out  
Aug 26, 2010 7:12:38 EDT

Locations Applications  
mapquest

Tags  
00489 TN  
03783 CA  
03549 AZ  
03248 IL  
02970 NY  
02929 MO  
02774 WA  
02820 TX  
02513 ND  
02448 CA

Waiting for localhost...

openNMS®  
User: admin (Notices Off) - Log out  
Dec 1, 2008 08:40 EST

Node List Search Outages Path Outages Dashboard Events Alarms Notifications Assets Reports Charts Surveillance Admin Help

Home / Search / Node  
Node: 132.177.194.93

View Events View Alarms Asset Info HTTP Resource Graphs Rescan Admin

General (Status: Active)  
View Node Link Detailed Info

Availability  
Availability (last 24 hours) 100.000%

Service	Availability
Overall	100.000%
HTTP	100.000%
HTTPS	100.000%
ICMP	100.000%
SSH	100.000%
StrafePing	Not Monitored

Interfaces

Interface	Index	Description
132.		

Surveillance Category Memberships (Edit)  
This node is not a member of any categories

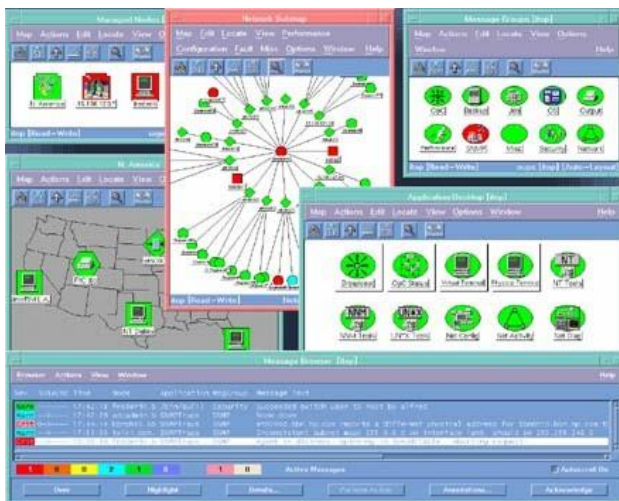
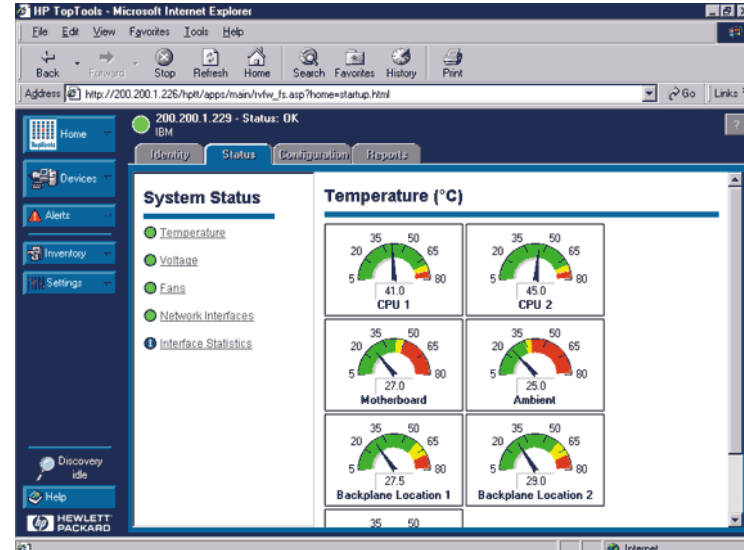
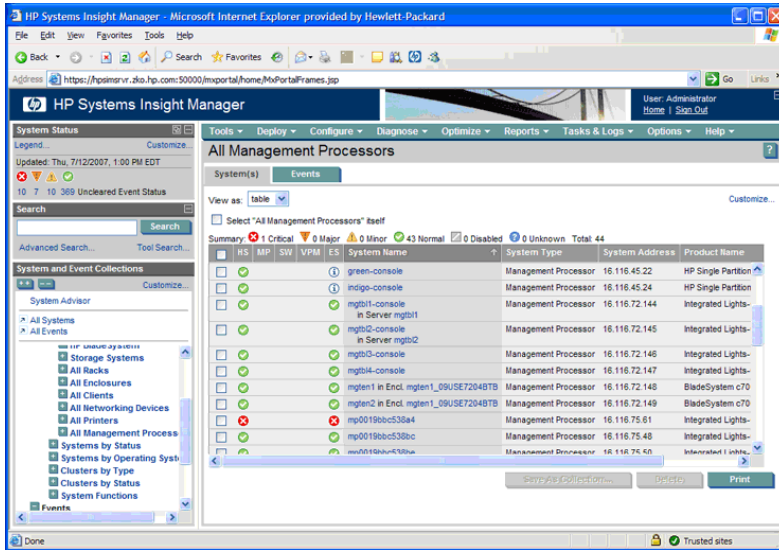
Notification  
You: Outstanding: (Check)  
You: Acknowledged: (Check)

Recent Events

Event ID	Time	Severity	Message
1671	12/1/08 08:39:12	Warning	The SSH service has been discovered on interface 132.
1670	12/1/08 08:39:12	Warning	The HTTPS service has been discovered on interface 132.
1669	12/1/08 08:39:12	Warning	The StrafePing service has been discovered on interface 132.
1668	12/1/08 08:39:12	Warning	Interface 132. has been associated with Node #1.
1667	12/1/08 08:39:12	Warning	The ICMP service has been discovered on interface 132.

Recent Outages  
There have been no outages on this node in the last 24 hours.

# Network and System Management Tools



## Rich's favorites:

- HP SIM
- HP TopTools
- HP OpenView (NNM)
- HP OpenView for Windows

# Network and System Management Tools

OpenView

Tivoli

CA-Unicenter

Big Brother

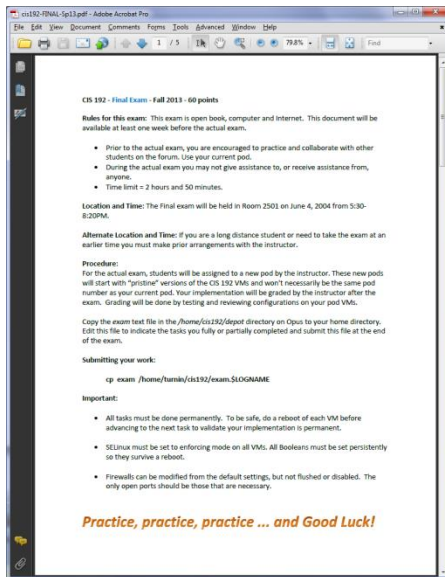
many more ...

# Final



## Final - 60 points

- There are 12 possible tasks to implement from scratch during the final exam. The description of these tasks are available one week prior to the exam.
- Four tasks are mandatory (40 points). All other tasks are optional and can be done for the remaining 20 points.
- Additional tasks can be done for a maximum of 30 points extra credit.
- You may use the forum and work with other students to prepare for final. During the final you must work by yourself.
- The exam is open, book, open notes and open computer.
- Your are not allowed to ask for or give assistance during the exam. Your implementation must be completed entirely as a result of your own work.



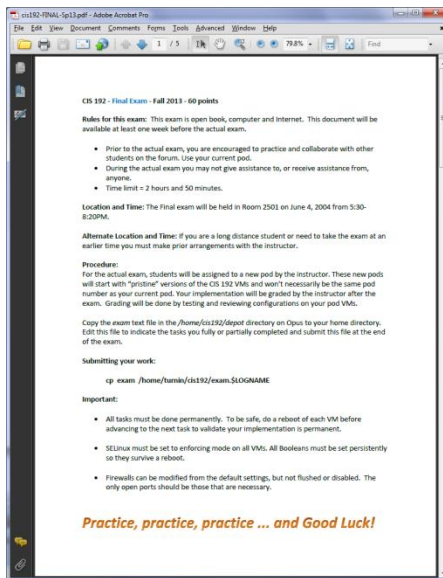
*The final is available now on the web site*

# Final - 60 points



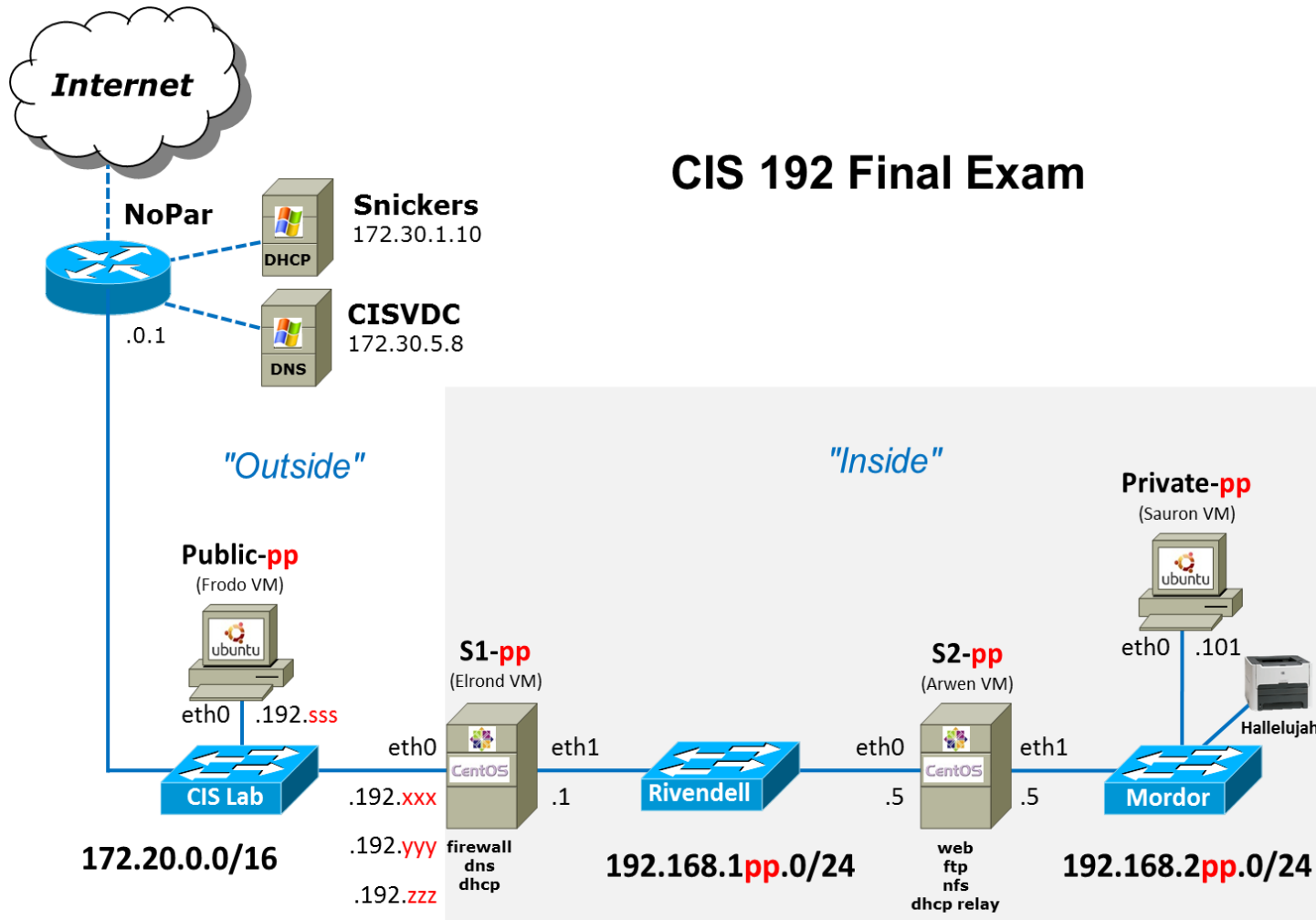
## Tips

- Prior to the final, select the tasks you plan to do and practice implementing them over and over till you can do them in your sleep.
- Take note of any implementation problems that come up and record the troubleshooting solutions you discovered to fix them.
- Make yourself a network map and custom checklists with notes, commands and references to help things go smoothly during the exam.



*The final is available  
now on the web site*

## CIS 192 Final Exam



### Procedure:

On the day of the exam, students will be assigned a new pod by the instructor. These new pods will start with "pristine" versions of the CIS 192 VMs and won't necessarily be the same pod number as your current pod. **All the old pods will be shut down an hour before the exam begins and remain unavailable.**

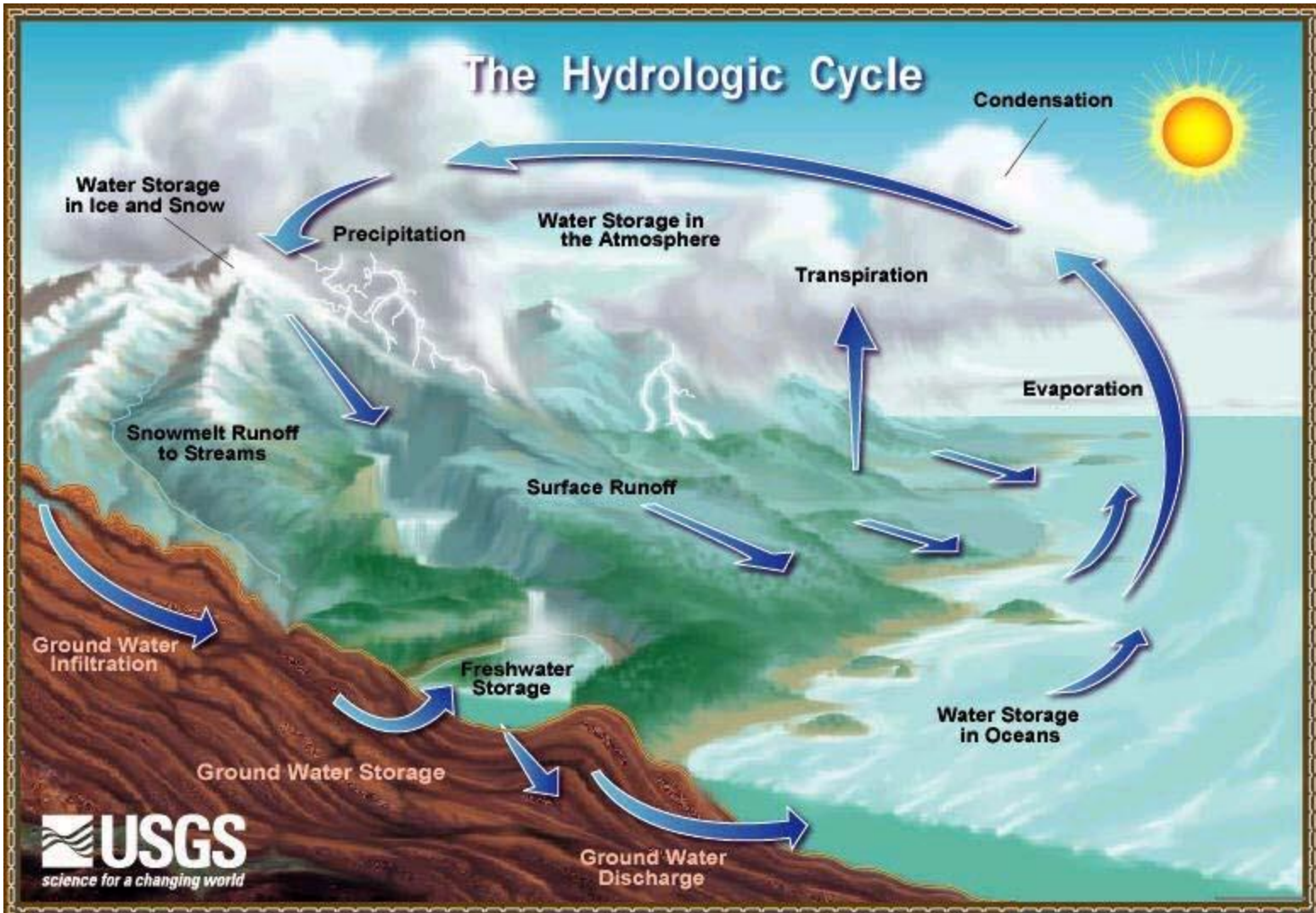
Task	Task	Verification	Type	Points
T1	Interfaces	<b>init 6</b> <b>ifconfig</b> <b>route -n</b> <b>hostname</b> <b>ping</b> neighbors by IP On Ubuntu, check that network-manager is disabled	Mandatory	10
T2	Names via /etc/hosts	<b>ping</b> neighbors by name	Mandatory	10
T3	Static routes	<b>ping</b> all VMs from each VM	Mandatory	10
T4	NAT	View iptables and check that all VMs can ping Internet hosts	Mandatory	10
T5	FTP service	Test passive and active connections to anonymous or cis192 user	Optional	10
T6	Apache web service	View main or cis192 user web pages from <b>Private-pp</b>	Optional	10
T7	BIND name service	Check name resolution on VMs for Rivendell, Mordor and external domains.	Optional	10
T8	DHCP service	Check that <b>Private-pp</b> gets reserved IP address when cabled to Mordor and a pool address when cabled to Rivendell	Optional	10
T9	NFS service	Check <b>mount</b> output and contents of mounted directory on <b>s1-pp</b> . Check /etc/exports and /etc/sysconfig/nfs and firewall on <b>s2-pp</b> .	Optional	10
T10	Add printer	Print some test files and check print queue using CUPS and <b>lpstat</b>	Optional	5
T11	TCP Wrappers	Check that server refuses SSH connections from Treebeard or Hershey	Optional	5
T12	Firewall	Confirm outside access to the web server using .yyy and the FTP server using .zzz from the CIS Lab network. Confirm only other outside access is via port 22 using .xxx	Optional (requires T5 and T6)	10

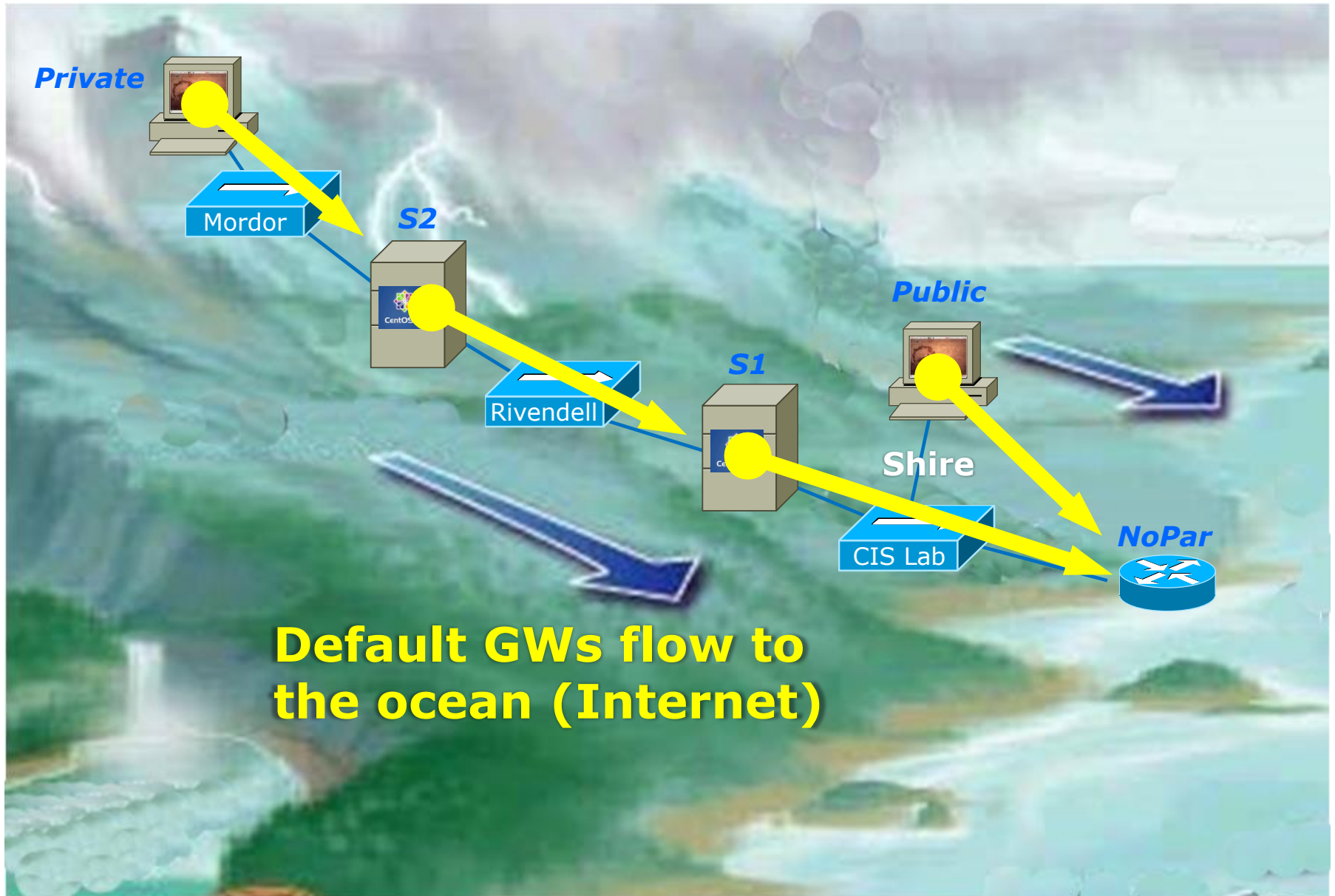
The first four tasks are mandatory and worth 40 points. All other tasks are optional.

Students can complete any of the optional tasks for the remaining 20 points.

Additional tasks can be completed for a maximum of 30 points extra credit. Record the tasks you implemented in your *exam* text file.

# Default & Static Routes







**Use static routes to send traffic towards private networks**



The Final is Tuesday June 4  
Room 2501  
5:30 PM to 8:20 PM

- Extra credit labs are due midnight June 4
- Five forum posts are due midnight June 4
- The final will be open book open notes, open computer

# Workshop



# Open Lab Workshop

Lab 10 - Internet Services

Extra Credit Labs

Final preparation

# Wrap

# Backup