

Lesson Module Status

- Slides (how the class works, lesson 1) draft
- Properties done
- Flash cards na
- First minute quiz na
- Web calendar summary done
- Web book pages done
- Commands done
- Lab tested
- Supplies (surveys, passwords) done
- Class PC's deployed na
- Scripts (submit) done
- CCC Confer room scheduled done
- Rosters printed done
- Backup headset charged -
- Backup slides, Confer links, handouts on flash drive -



[] Has the phone bridge been added?
[] Is recording on?
[] Does the phone bridge have the mike?
[] Share Powerpoint, Chrome, Putty, VirtualBox



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



	She	ell ands	
Permission	ns	Sec	cure logins
Processes Scheduling tasks	Welcome f Introduc UNIX/	to CIS 90 ction to Linux	<i>Navigate file tree</i> <i>Files and</i> <i>directories</i>
Mail			vi editor
Environment variables			Run programs/scripts
	Filters	Pipes	

Student Learner Outcomes

Upon successful completion of this course students will be able to: Navigate and manage the UNIX/Linux file system Automate and schedule tasks Customize the shell environment

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Introductions



Course history and credits

Jim Griffin

- Jim created this Linux course
- Jim's site: http://cabrillo.edu/~jgriffin/



Rich Simms

- Worked at HP for 27+ years
- Started teaching this course in 2008 when Jim went on sabbatical
- Added some teaching best practices he liked when he took classes at Cabrillo (e.g. John Govsky's online help forum, first minute quizzes, no late work policy)
- Also added the PowerPoint slides and Howto's for common Linux tasks



Class and Linux Overview

Objectives	Agenda
 Virtual classroom Course logistics Introduce UNIX/Linux Forum registration Login to Opus using SSH Login to Eko VM Learn first commands 	 Introductions How this class works Housekeeping UNIX/Linux Market Computers UNIX/Linux Architecture Using Linux Remote Access Local access Virtual Machines Equipment Simple Commands Navigating Terminals Wrap up



Virtual Classroom with CCC Confer

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- CCC = California Community Colleges
- Web conferencing tool + phone bridge (conference call)
- Online section will attend all classes online
- Listen using your computer's speakers (and ask ?'s using a chat window) or dial-in to the phone bridge (and ask ?'s by speaking)
- Each class is recorded and archived for viewing later



Class Activity Enter the online virtual classroom

a barrow manufact	Rich's Cabrillo College CIS Classes CIS 90 Calendar	
3.17	Home Resources Forums CIS Lab CTC	
Login Flashcards	CIS 90 (Fall 2010) Course Calendar Course Home Grades	
Admin CIS 90 Previous Classes 8 days till term starts! Cabrillo College Web Advisor	1. Browse to simms-teach.com 2. Click <i>CIS 90</i> link 3. Click <i>Calendar</i> link 4. Look for any CCC Confer section 5. Click <i>Enter virtual classroom</i> ling	on nk
<u>CCC Confer</u> <u>Static IPs</u> <u>Quick Ref</u> <u>VM Repairs</u> <u>GAH!</u>	1 9/1 • Use Linux running on a local virtual machine Materials • Presentation slides (download) 1.1-1.15 • Logins Sheet (download) • Logins Sheet (download) 6.1.1-1.15 • Howto #103: Installing PuTTY (download) • Howto #301: Bringing the Eko VM home (download) 1.1-1.15 • Howto #301: Bringing the Eko VM home (download) • Student Survey • Lab 1 • Enter virtual classroom • Enter virtual classroom • Enter virtual classroom	
	Class archives	10



CCC Confer - Attending class online



CCC Confer uses Java which requires a download and installation of the Java Runtime Environment from java.com (Oracle)



CCC Confer - Attending class online





CCC Confer - Attending class online

STUDENT CONFERENCE FEATURES

- *0 Contact the operator for assistance.
- *6 Mute/unmute your individual line with a private announcement.

This only works if you dial-in using your telephone



How this class works



February 2011

Su Mo Tu We Th Fr Sa 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

March 2011

Su Mo Tu We Th Fr Sa 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

April 2011

Su Mo Tu We Th Fr Sa 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

May 2011

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June 2011

Su Mo Tu We Th Fr Sa 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 CIS 90 Spring 2011

Class meets online every Thursday afternoon:

- 1:15-4:20PM, from Feb 10th to May 26th
- No class Apr 7th (spring break)
- 15 lessons (class meetings) total
- Final exam (Test #3) at 1-3:50PM, on Jun 2nd







Optional Textbooks:

Linux User's Guide: Using the Command Line and GNOME with Red Hat Linux 9.0 by Carolyn Z. Gillay Franklin Beedle & Associates ISBN: 1887902988

Harley Hahn's Guide to Unix and Linux by Harley Hahn McGraw-Hill ISBN: 0073133612







Contacting the instructor

- Use the forum for the fastest response on technical or class related questions.
- Use email for personal matters.
- Weekly office hours on the mornings (Thursdays 12-12:50) in room 2502 or next door in 2501
- The instructor will be available in the CIS Lab to help students with lab assignments or class material. See schedule at: http://webhawks.org/~cislab



 Leave a message on voice mail if you have no network access. Checked rarely so don't expect a fast response.



http://simms-teach.com/



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Class Exercise (class website)

Please browse to: http://simms-teach.com







Course Syllabus (on the CIS 90 home page)

It is a good idea to read through the syllabus carefully to avoid any surprises and get a good idea how this course works.





http://simms-teach.com/cis90calendar.php

1	2/10	Materials Presentation slides (<u>download</u>) Logins Sheet (<u>download</u>) CIS VM Lab RDP file: (<u>download</u>) Supplemental Howto #103: Installing PuTTY (<u>download</u>) Howto #301: Bringing Eko home (<u>download</u>) Video #100: Remote Putty login to Opus (<u>view</u>) 	(Gillay) 2,4,5, p113-115, p164-172 (Hahn)	
		Assignment <u>Student Survey</u> <u>Lab 1</u> CCC Confer Enter virtual classroom 		
		<u>Class archives</u>		
2	2/17	 Commands Understand the UNIX login operation works Meet John the Ripper and learn how vulnerable a poor password is Understand basic command syntax and operation Understand program files and what happens when they are run Understand how the shell works and environment variables Understand how to get documentation when online 	2.3-2.7 2.11 3.7-3.20 4.19-4.22 9.1-9.2 (Gillay)	Lab 1 Student Survey

Note: The first lab assignment and student survey is due by midnight of the next class meeting!



Course Grading



consider the forum as "low hanging fruit"

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More on Grading

Points can be earned from the following activities:

- 5% Quizzes
- 16% Tests
- 14% Help forum participation
- 54% Lab assignments
- 11% Final

How your grade is determined:

Quizzes: $10 \times 3 = 30$ pointsTests: $3 \times 30 = 90$ pointsForum: $4 \times 20 = 80$ pointsLabs: $10 \times 30 = 300$ pointsProject: $1 \times 60 = 60$ points

A student can earn up to 560 total points doing the activities listed above. The course grade is based on the number of points earned.

Percentage	Total Points	Letter Grade	Pass/No Pass
90% or higher	504 or higher	A	Pass
80% to 89.9%	448 to 503	В	Pass
70% to 79.9%	392 to 447	С	Pass
60% to 69.9%	336 to 391	D	No pass
0% to 59.9%	0 to 335	F	No pass

For some flexibility, personal preferences or family emergencies there is an additional 90 points available of extra credit activities.

Choice of Grade or Pass/No Pass

You indicate your grading choice on the Student Survey form passed out during the first class. You can verify your grading choice selection on the table below. Contact the instructor by email with any questions or to request a change in grading choice.

The student can decide the grade they want and how they want to earn it

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More on Grading

Code	Grading					Qı	Jizze	es 8	k Te	sts						For	um						La	abs					Final	Extra		
Name	Choice	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Τ1	T2	Т3	F1	F2	F3	F4	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	Project	Credit	Total	Grade
Max P	oints	3	3	3	3	3	3	3	3	3	3	30	30	30	20	20	20	20	30	30	30	30	30	30	30	30	30	30	60	90	560	
aragorn	Grade	3	3	3	3	3	3	3	3	3	3	28	27	25	20	20	20	16	28	30	30	24	30	29	29	30	30	30	57		533	Α
eomer	Grade	2	3	3	3	3	3	2		3	3	33	26		20	20	20	20	28	27	28	30	29	28	28	29	30	28	90	45	584	Α
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balrog	P/NP											26			12	0	0		28												66	NP
nazgul	Grade		2			3			3	3	1	24	19		20	8	20	20	28	24	30	24	28	30	29	30	30	30	9		415	С
sauron	Grade		3	3	3		0	1		3	3	28	22	18	20	0	20	20	30	28	30	28			29	30	30	27	90	35	501	В

Percentage	Total Points	Letter Grade	Pass/No Pass
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80% to 89.9%	448 to 503	В	Pass
70% to 79.9%	392 to 447	С	Pass
60% to 69.9%	336 to 391	D	No pass
0% to 59.9%	0 to 335	F	No pass

Observations on a previous class:

- Aragorn got an A by doing solid work across the board and never did any extra credit
- **Eomer** skipped the final yet still got an A by doing some extra credit
- **Balrog** probably should have just dropped the course
- **Sauron** kicked himself later for not doing any posts during the second quarter of the course to turn that B to an A



More on Grading





As an incentive to start class on time, 3 points are awarded for correctly answering 3 questions, in the correct order, at the very beginning of class.

- The quiz questions are shown on CCC Confer at 1:15PM sharp.
- The quiz questions are given out in advance and students can use the forum to collaborate on answers prior to class.
- The order of the questions will not be known until the quiz is given!
- Quizzes are closed book/notes. Students may not give or ask others for assistance while taking a quiz.
- To take the quiz, students email the answers to the instructor.
- There are no makeup's for these quizzes and they must be turned in within the first few minutes of class.



More on Grading



Tests (3 tests, 30 points each)

- Test 1 and Test 2 will be distributed by during the last half of the class.
- Test 3 is the final exam.
- Tests are usually comprised of fill-in-the-blank type questions. Often you will have to use the Opus Linux server to check the answer.
- Tests are open notes, open book, and open computer.
- Tests are designed to take about 1.5 hours and be turned in at the end of class. To minimize "clock stress" you may continue to work on the test after class is over and turn it no later than midnight.
- Students may not give or ask others for assistance while taking a test.



More on Grading

Forum Posts (4 quarters, up to 20 points per quarter)

- The end of each term quarter is shown on the course calendar.
- Each post in the forum for this class is worth 4 points, up to 20 points maximum per quarter.
- The posts for the quarter will be due at midnight (Forum time) on the date shown on the course Calendar.
- Extra posts in one quarter do not carry over to the next quarter.

As far as earning points, forum posts are "low hanging fruit" !!



More on Grading

Lab Assignments (10 labs, 30 points each)

- Will be due at midnight (Opus time) on the date shown on the course Calendar.
- Late work is not accepted. If you don't complete a lab assignment, please turn in what you have, by the due date, for partial credit.
- Students may work together and collaborate on labs but they must submit their own work to get credit.
- Lab resources, instructors, and assistants are available in the CTC and CIS lab. In addition the Linux Opus server may be accessed from anywhere over the Internet.

The TBA portion of this course requires spending on average of 3 hours and 5 minutes every week applying the skills learned during the lecture portion of the class.



More on Grading

Extra credit (up to 90 points)

- You need to attend to a family emergency and can't turn in a lab assignment on time ... don't worry!
- Your schedule/commute doesn't allow you to take any of the "first minute" quizzes don't worry!
- You crash and burn on a test ... don't worry!
- You just don't like making forum posts ... don't worry!

There are ample extra credit opportunities which provide you with the flexibility to get the grade you want.



Help Forum



Online Help Forum

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☆ Board index			~					
BUser Control Panel (0 new messages) • View your posts			(2) FAQ (2) Members (1) Logout [Rich Simms]					
is currently Sun Jan 17, 2010 9:16 am			Last visit was: Sat Jan 16, 2010 6:14 pr					
Hoderator Control Parler ; iew unanswered posts • View unread posts • View new posts • View active topics			Mark forums rea					
Practice Use this forum to practice using a bulletin board. Postings made to this forum will be deleted regularly.	3	3	by Rich Simms Q Sat Jan 16, 2010 6:14 pm					
ABRILLO COLLEGE SPRING 2010 COURSES	TOPICS	POSTS	LAST POST					
E CIS 90 Introduction to UNIX/Linux - Jim Griffin	0	0	No posts					
E CIS 192AB UNIX/Linux Network Administration - Rich Simms	0	0	No posts					
E CIS 193AB UNIX/Linux Security Administration - Jim Griffin	0	0	No posts					
INSA PROGRAM	TOPICS	POSTS	LAST POST					
B Alumni Stay in touch with former students!	0	0	No posts					
ARCHIVE S	TOPICS	POSTS	LAST POST					
CIS 90 - Spring 2009 Introduction to UNIX/Linux - Rich Simms	Total redire	cts: 1						
CIS 192 - Spring 2009 UNIX/Linux Network Administration - Rich Simms	Total redirects: 1							

- Post questions and answers
- Share Linux information
- Post class notes for classmates who miss class
- Get clarifications
- Collaborate on quiz questions
- Share Linux information
- Never post passwords!



As an incentive to use the forum - students can earn 4 points per CIS 90 forum post (capped at 20 points for each ¼ of the course calendar)



Class Activity Forum Registration

There is a Forums link on simms-teach.com



To Register:

- 1. Browse to the forum
- 2. Click on Register
- 3. Review and agree to terms
- 4. Your **Username** must be:
 - your first and last name separated by a space
 - e.g. Rich Simms
 - match a name on the class roster

Note: If you have already registered you don't need to do it again. If your username is incomplete or does not match a name of the class roster it will be modified or deleted by the instructor.

Cabrillo College

CIS 90 - Lesson 1

Forum Registration Activity

- 1. Browse http://simms-teach.com
- 2. Click on Forums link at top of page
- 3. Click on the Register link (between FAQ and Login)
- 4. Review and agree to terms
- 5. Your Username must:
 - Be your first and last name separated by a space e.g. Rich Simms (not rsimms or richsimms)
 - match a name on the class roster

Who would like to be a volunteer to share their desktop to demonstrate forum registration?

Using UNIX/Linux in this course


Online Lab Resources The Opus RHEL Server



Students can remotely log into Opus, a Red Hat Enterprise Linux server located on campus.

Students with Windows PC's will use Putty.

Students with Macs or Linux computers will use the ssh command from a terminal.

Note, all the lab assignments and the final project are done using Opus



Telnet vs SSH (Secure Shell)

Sniffer view of a Telnet session

With telnet, everything is transferred in clear text over the network

Remote computer





SSH is a network protocol that enables secure connections between computers

Sniffer view of a SSH session

Ŧ	server2	VMwa	are Remo	ote Cor	sole •	D	evices	•		
Y	root@ se	rver2-0	1:~							
	ssh-ses	ssion - E	Etherea	I						
1	Conte	nts of T	CP stre	am						
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	000005BE	01 7c 3	9 78 bd	c4 95	f2 6	1 93	73 a1	76 4	9 cf (00 .19x
	000005CE	68 c2 8	5 71 b0 b a1 dd	75 c6 81 4f	72 b	5 18	27 10 f5 f7	4b 5	7 ed 8	38 hq.u.r
	000005EE	55 70 e	9 73 b4	0a 6f	3f a	f 5b	f7 3c	4e 3	0 92 3	39 Up.so?
	000005FE	62 fc f 6d 1f 8	d a6 fd 5 44 a7	50 Jo	e2 5	6 12	d1 90	0c d	9 ce 3 1 da 4	34 bE.
	0000061E	21 87 2	d 32 67	48 d3	47 2	f 43	25 5b	ee 6	5 89 1	76 !29H.G
	0000062E	83 1c 7	4 91 b1	f5 3e	8b 5	7 ee	d9 fc	f5 4	5 e3 t	56t>.
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	0000065E	df	(SCL	J.	n	orv	nta	Ъ	b
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	0000068E	8c 8f a	3 07 6e	69 62	02 a	7 3f	e0 e1	9b e	c af (10nib.

With ssh, it is encrypted.

Local computer

username password cat secret

exit



Online Lab Resources The Opus RHEL Server



Quick Opus demo here

Cabrillo College

CIS 90 - Lesson 1

Logging into Opus

1	الله cis90@opus:~
	login as: cis90 cis90@opus.cabrillo.edu's password: Last login: Thu Feb 3 08:10:49 2011 from dsl-63-249-103-107.dhcp.cruzio.com
	('') //-=-\\ (_=_/)
	Welcome to Opus Serving Cabrillo College
	Terminal type? [xterm] whoTerminal type is xterm. /home/cis90ol/cis90 \$ who
Sector Sector	cis90 pts/1 2011-02-03 17:53 (dsl-63-249-103-107.dhcp.cruzio.com) root :0 2010-11-02 16:18 root pts/5 2010-11-02 16:18 (:0.0)
	/home/cis90ol/cis90 \$

Who would like to volunteer? To share their desktop and demonstrate logging into Opus?



Lab Resources CIS Lab (now inside the CTC)



The CIS Lab has moved It is now inside the CTC (Building 1400)





Lab Resources CIS Lab now in the CTC Building 1400

There are ten systems (labeled CIS-Lab-XX) in the CIS Lab for use by CIS90 students.



Each station has:

- Putty (for Opus access)
- VirtualBox (for Eko VM access)



Use these links to get the schedule and hours of operation



Lab Resources Eko VMs (Virtual Machines)





Lab Resources Eko VMs (Virtual Machines)





VMware vSphere client

CIS 90 - Lesson 1

Lab Resources Eko VMs (Virtual Machines)

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RedHat9-01	application machine is								
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Logging into Eko VM



Who would like to volunteer? To share their desktop and demonstrate logging into Eko VM?

Housekeeping



Can I add this class?

- Maybe!
- Both CIS 90 sections are completely full.
- It may not be possible to add everyone.
- CIS 90 will be offered again next term, so students may have to wait.
- The instructor will email add codes to students after the first class meeting.
- The last day for students to add CIS 90 is Feb 19th.
- Enrolled and wait-listed students that don't show up for class will be dropped or lose their space on the wait list unless they have made prior arrangements with the instructor.



Roll Call for both sections

Turn OFF the recording



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



Roll Call for both sections

Turn recording back ON



MSDN Academic Alliance

Be Edit View Higtory Bookmarks Jook Help C X C Inter/Index I Cook Help C Inter/Index I Co	🕲 Cabrillo College - Mozi	lla Firefox						
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In order to obtain and install the software on this site, you must be an eligible user in the System. Your Program Administrator is responsible for providing eligible users with a username dipassword. If you believe you are an eligible user but have not received a password via email, please send email to your Program Administrator: Jim Griffin x Find: vmsd Image: Software on the system. Your Program Administrator: Jim Griffin		Visio Professional 2003	Microsoft Office Visio Professional 2007 Visio Professional 2007	Visual Studio .NET 2005 Professional - Full Install	Windows Vista Business DVD			
× Find: vmsd ↓ Next ↑ Previous ŷ Highlight all Match case Done		In order to obtain and in: Administrator is respons user but have not receive	stall the software on this s ible for providing eligible ed a password via email, p	ite, you must be an eligible u users with a username and p lease send email to your Pro	iser in the System. Your assword. If you believe gram Administrator: Jin	r Program you are an eligible <u>n Griffin</u>		
Done	× Find: vmsd	↓ <u>N</u> ext ↑	Previous 🖌 Highlight	<u>a</u> ll 🔲 Mat <u>c</u> h case				
	Done							

- For students registered in a CIS or CS class at Cabrillo
- Email instructor after registration is final (two weeks after first class)

Cabrillo Networking Program Mailing list

Subscribe by sending an email (no subject or body) to:

networkers-subscribe@cabrillo.edu

- Program information
- Certification information
- Career and job information
- Short-term classes, events, lectures, tours, etc.
- Surveys
- Networking info and links





Logins Sheet



Download the login sheet for keeping track of class usernames and passwords (optional)

ß	
	Logins and Passwords for CIS 90
	Class Computer:
1	Username: <u>cis90</u> Password:
	CIS-Lab-XX PC's (in the CIS Lab)
	Username: cis90 Password:
	Eko VMs (on the CIS-Lab-XX PC's)
	Username: cis90 Password:
	Username: <u>root</u> Password:
	Opus (opus.cabrillo.edu)
	Username: Password:
	Username: Password:
	Demote VMs (sybil cabrillo edu)
	Username: Password:
	Username: Password:
	Help Forum
	Username: Password:
	Other:
	System: Username: Password:
10	System: Username: Password:
	System: Usemame: Password:
Ø	System. Username. Password.



Passwords

Switch to CCC whiteboard

Turn OFF the recording

Ē	
	Logins and Passwords for CIS 90
	Class Computer:
1	Username: _cis90 Password:
	CIS-Lab-XX PC's (in the CIS Lab)
	Username: _cis90 Password:
	Eko VMs (on the CIS-Lab-XX PC's)
	Username: _cis90 Password:
	Username: <u>root</u> Password:
	Opus (opus.cabrillo.edu)
	Username: Password:
	Username: Password:
	Remote VMs (sybil.cabrillo.edu)
	Username: Password:
	Username: Password:
	Help Forum
	Username: Password:
	Other:
	System: Username: Password:
50	System: Username: Password:
	System: Username: Password:
n.	System: Username: Password:

Bring up and fill out while recording is turned off



Passwords

Switch to Powerpoints

Turn recording back ON



Student Survey

Andrew - mainting	Rich's Cabrillo College CIS Classes CIS 90 Calendar		Introduction to UNIX/Linux (CIS 90) Sprint 2011 - Student Survey
117	Home Resources Forums CIS Lab CTC		Student Information Preferred first name: Last name:
Login Flashcards Admin	CIS 90 (Fall 2010) Course Calendar <u>Course Home</u> <u>Grades</u> (content subject to change)		Date: Email address: Web site, if any: Grading choice:pass/no-passgrade (choose one, you may change your mind later) Computer Background
<u>CIS 90</u>	Lesson Date Topics Chapter	Due	Previous computer classes or training taken:
7 days till term starts!	Understand how this course will work High-level overview of computers, operating systems and virtual machines Overview of UND/Unux market and architecture		Work or other experience using computers:
Cabrillo College Web Advisor CCC Confer Static IPs Ouick Ref	Learn first commands and how to navigate between terminals Use a remote Linux server Use Linux running on a local virtual machine Materials		Home equipment
<u>VM Repairs</u> <u>GAH!</u>	1 9/1 • How this class works (<u>download</u>) 1.1-1.15 • Presentation slides (<u>download</u>) (Gillay) • Logins Sheet (<u>download</u>) • Howto #103: Installing PuTTY (<u>download</u>) • Howto #301: Bringing the Eko VM home		Do you have a computer with at least 2 GB of RAM? _ yes _ no Operating system? _ Windows _ Mac _ Linux Intermet connection? _ none _ dial-up _ dsl/cable
	(download)		What are you hoping to learn in this class?
	CCC Confer Enter virtual classroom Class archives		Other comments or special learning needs?
			(Please save & email completed survey to risimms@cabrillo.edu)

Please download survey, fill it out, save it, and email to risimms@cabrillo.edu



UNIX/Linux Market



Public Works Infrastructure



Roads



Water



Bridges



Airways



Power



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IT (Information Technology) Infrastructure



Cabrillo College

Network



Servers



Storage



Desktops



Operating Systems Applications Data bases Middleware

Software



Computing Infrastructure Where UNIX/Linux is used

- Internet services Web, DNS, DHCP, Net News, Mail, etc.
- Enterprise and mission critical applications Large databases, Enterprise Resource Management (ERM), Customer Relationship Management (CRM), data warehouse, manufacturing, supply chain management, etc.
- Hollywood feature animation, visual effects, rendering farms.
- Scientific applications and number-crunching
- Embedded in smartphones and other appliances



Operating Systems Various UNIX Based Products

SCO UNIX

-SCO



Berkeley Software



Distribution







AIX













The kernel is UNIX based



Operating Systems Various Linux Distributions



Note: A distribution is built by a company or organization. They start with the **Linux kernel** then add a custom mix of open source components. They may then add some of their own unique software to differentiate their distribution.



Tux, the penguin, is the Linux kernel mascot



Operating Systems Embedding Linux in Products



Google Chrome OS (coming soon) for Netbooks and Tablets



Buffalo NAS storage



Android





Operating Systems Embedding UNIX in Products

Apple iOS



The Apple iOS, like Mac OS X, runs on a UNIX like kernel (Mach kernel + BSD components)

Source: http://en.wikipedia.org/wiki/Darwin_(operating_system) http://en.wikipedia.org/wiki/IOS_(Apple)



UNIX/Linux Overview Server, PC, Smartphone markets





Worldwide Server Market

\$10.4B Server Revenue 1Q 2010

Year over Year Change



http://www.idc.com/getdoc.jsp?containerId=prUS22360110



Website hits by OS Implies "ballpark market share" for PCs

May	2008 ¹
-----	-------------------

Jan 2009²

Jul 2010³

Оре	rating Systems		Ope	rating Systems		Oper	ating Systems	
1	Windows XP	78.24%	1	Windows XP	72.17%	1	Windows XP	48.17%
2	Windows Vista	7.69%	2	Windows Vista	13.44%	2	Windows 7	17.02%
3	Mac OS X	4.73%	3	Mac OS X	5.24%	3	Windows Vista	16.60%
4	Windows 2000	3.07%	4	Linux	2.13%	4	Mac OS X	4.84%
5	Linux	1.95%	5	Windows 2000	2.12%	5	Linux	1.45%
6	Windows 98	0.96%	6	Windows 2003	0.68%	6	Windows 2003	1.02%
7	Windows 2003	0.74%	7	Windows 98	0.55%	7	iPhone OSX	0.56%
8	Windows ME	0.36%	8	Windows ME	0.22%	8	Windows 2000	0.31%
9	Windows NT	0.05%	9	SymbianOS	0.12%	9	WAP	0.12%
10	SymbianOS	0.04%	10	WAP	0.04%	10	Android	0.08%

1-This report was generated 05/31/2008 based on the last 24,031,012 unique visits to all tracked websites at that time. W3Counter's sample currently includes 11,976 websites. The last 25,000 page views to each website are analyzed to identify unique visits. Some visits may occur before the month of the report.

2-This report was generated 12/31/2008 based on the last 53,892,847 unique visits to all tracked websites at that time. W3Counter's sample currently includes 19,174 websites. The last 25,000 page views to each website are analyzed to identify unique visits. Some visits may occur before the month of the report.

3 - This report was generated 07/31/2010 based on the last 15,000 page views to each website tracked by W3Counter. W3Counter's sample currently includes 38,996 websites. The browser market share graph includes data from all versions of the named browser families, not only the top 10 as listed below.



source: http://www.w3counter.com/globalstats.php

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Worldwide Smartphone Sales

Table 2 Worldwide Smartphone Sales to End Users by Operating System in 2Q10 (Thousands of Units)

	Company	2Q10 2Q1 Units	0 Market Share (%)	2Q09 Units	2Q09 Market Share (%)
Nokia	Symbian 🗸	25,386.8	41.2	20,880.8	51.0
Blackberry	Research In Motion 🔶	11,228.8	18.2	7,782.2	19.0
Google	Android 🕇	10,606.1	17.2	755.9	1.8
Apple	iOS	8,743.0	14.2	5,325.0	13.0
	Microsoft Windows Mob	ile 3 ,096.4	5.0	3,829.7	9.3
	Linux	1,503.1	2.4	1,901.1	4.6
	Other OSs 🕇	1,084.8	1.8	497.1	1.2
	Total	61,649.1	100.04	0,971.8	100.0

Source: Gartner (August 2010)

http://www.gartner.com/it/page.jsp?id=1421013 http://www.mobiletechreview.com/smartphone.htm



iso.linuxquestions.org 15 Most Popular Downloads

Jan 30, 2009 Mandriva Fedora SUSE Red Hat Ubuntu Damn Small Linux Knoppix **MEPIS** Slackware Debian CentOS **PCLinuxOS** Gentoo Linspire **Xandros**

Aug 17, 2010 Mandriva Fedora SUSE Red Hat Ubuntu Damn Small Linux Linux XP Knoppix Slackware Debian CentOS MEPIS PCI inuxOS Gentoo Linspire

There are hundreds of Linux distributions. The one thing they have in common is they all use the Linux kernel.



distrowatch.com Top "Ten" Lists

Ladislav Bodnar 2007

Jan 2009

Jan 2010

- 1. Ubuntu
- 2. openSUSE
- 3. Fedora
- 4. Debian
- 5. Mandriva
- 6. PCLinuxOS
- 7. MEPIS
- 8. KNOPPIX
- 9. Slackware
- 10. Gentoo
- 11. FreeBSD

- 1. Ubuntu
- 2. openSUSE
- 3. Fedora
- 4. Debian
- 5. Mandriva
- 6. Linux Mint
- 7. PCLinuxOS
- 8. Slackware
- 9. Gentoo
- 10. CentOS
- 11. FreeBSD

- 1. Ubuntu 9.10
- 2. Fedora 12
- 3. openSUSE 11.2
- 4. Debian 5.0
- 5. Mandriva 2010
- 6. Linux Mint 8
- 7. PCLinuxOS 2009.2
- 8. Slackware 13.0
- 9. Gentoo 10.1
- 10. CentOS 5.4
- 11. FreeBSD 8.0
Linux distros mentioned by top server vendors Server market share source: IDC 1Q10 report

Vendor	HP (32.5%)	IBM (27.5%)	Dell (16.3%)	Oracle/Sun (6.6%)
Red Hat Enterprise	\checkmark	\checkmark	\checkmark	\checkmark
Novell SUSE	\checkmark	\checkmark	\checkmark	\checkmark
Debian/GNU Linux	\checkmark	\checkmark		
Oracle EL	\checkmark	\checkmark		\checkmark
Asianux	\checkmark	\checkmark		
Ubuntu	\checkmark	\checkmark		
CentOs	\checkmark	\checkmark		
Fedora	\checkmark	\checkmark		
OpenSUSE	\checkmark	\checkmark		

For CIS 90 we will be using Red Hat Enterprise and Ubuntu



What is a computer



What is a computer? Desktops





What is a computer? Mobile Devices



Mobile Devices (designed for mobility)



What is a computer? Servers









Usually many users at the same time

Software

Hardware





What is a computer? Virtual Machines



Virtual Hardware









Software





Virtual Machines



What is a virtual machine?

- There are software programs (e.g. VMWare, VirtualBox, MS Virtual Server) that simulate perfectly all the hardware of a real computer.
- These simulated computers are called virtual machines or VMs.



- You load an operating system and applications on virtual machines just like you would any other computer.
- The guest OS and apps don't even know they are not running on a "real" computer.
- Over the network the virtual machines appear just like any other computer.
- Opus used to be a 1U rack mounted server in building 1300. Now it's a VM in building 1200.



The EMH doctor on Star Trek Voyager was a simulation



Software



Software - The Programs

Users

Software









Programs

- Some programs come as part of the OS
- Some programs are add-ons purchases or downloads
- Provide the interface between user and computer
- Depends on the OS for all access to the hardware

Operating System













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Software - The Programs

Users

Software



















Software - The Operating System

Users

Software

Hardware



Operating System

- Interface to the hardware
- Shares hardware resources
- Schedules/executes programs
- Process management

- Input/output services
- System monitoring
- Network stack

















Types of software

Public Domain (paid for by the taxpayer)

- Source code is available
- No license, no copyright, maybe modified and redistributed
- Examples: USGS mapping software, NASA aerodynamics software.

Open Source

- Source code is available
- Community of developers doing online collaboration
- Pragmatic redistribution licenses
- Examples: Apache, Firefox, Android, OpenOffice

Free Software Movement

- Source code is available
- GNU ("GNU is not UNIX") license, COPYLEFT
- Examples: GNU/Linux, GIMP

Proprietary

- Intellectual property
- Copyright law
- Examples: Adobe Photoshop, Microsoft Windows, Mac OS X, AT&T UNIX System V



UNIX/Linux Architecture simplified



UNIX/Linux Architecture Simplified View - Four Major Components

Users 😧 🚱 🚳 👧 🖗







UNIX/Linux Architecture The Shell





- Allows users to interact with the computer via a "command line".
- Prompts for a command, parses the command, finds the right program and gets that program executed.
- Called a "shell" because it hides the underlying operating system.
- Many shell programs are available: sh (Bourne shell), bash (born again shell), csh (C shell), ksh (Korn shell).
- The shell is a user interface and a programming language (scripts).
- GNOME and KDE desktops could be called graphical shells



UNIX/Linux Architecture

The Shell is a user interface and a programming language







UNIX/Linux Architecture Shells, graphical shells and in-between





UNIX/Linux Architecture System Commands





- 100's of system commands and utilities .
- Commands like **Is** (list directories), **cat** (print a file), **rm** (remove a file), ... etc.
- Utilities like **vi** (text editor), **sort** (sorts file contents), **find** (searches), ... etc.
- Larger utilities like sendmail (email), tar (backup), tcpdump (sniffer), ... etc.
- Administrative utilities like useradd, groupadd, passwd (change password), ... etc.



UNIX/Linux Architecture Applications





- Could be included in the distribution or optionally installed.
- Could be an add-on program developed by an ISV (Independent Software Vendor) or Open Source organization.
- Could be an in-house developed custom application.
- Examples are Apache (web server), GIMP (GNU image manipulation program), OpenOffice (word processing, spreadsheets, presentations), Oracle (commercial database), ... etc.



UNIX/Linux Architecture Kernel







- Lowest level, inner-most core of the operating system.
- <u>Process management</u> what programs are called when they are loaded and running).
- <u>Memory management</u> handles all the reads and writes to memory (RAM and virtual memory)
- <u>File System</u> handle all the reads and writes to files on drives.
- <u>Network stack</u> provides the communication layers to exchange packets with other computers



UNIX/Linux Architectures

How is UNIX/Linux put together?

What are the fundamental components?



GNU/Linux Distributions



Lets peel off the covers and look inside



¹See "Anatomy of the Linux kernel" by M. Tim Jones at http://www-128.ibm.com/developerworks/linux/library/l-linux-kernel/



The Android software stack uses the Linux 2.6 kernel



Android



Lets peel off the covers and look inside

Cabrillo College

The Android software stack uses the Linux 2.6 kernel 💍



Source: http://developer.android.com/guide/basics/what-is-android.html

UNIX/Linux Design "Observations"

- Multi-tasking and multi-user capabilities
- Unlike Windows, the GUI does not run in the kernel (adds stability)
- Unlike Windows, multiple graphical desktops available
- Linux kernel is "monolithic", not a "microkernel"
- Dynamic can load and unload modules on the fly
- Programs restricted to the privileges of the user running them (more secure)
- Scalable scales up to handle the largest enterprise and missioncritical applications
- Portable runs on a variety of hardware platforms
- Reliable and robust
- Powerful, but NOT friendly !!



Course Lingo



Some lingo for this class

- "VM" = a virtual machine
- "machine" = the hardware portion of a computer
- * "system" = a computer (hardware and software)
- * "host" = a computer or system on the network
- * "OS" = Operating System
- distro" = a distribution of Linux, e.g. Red Hat, SUSE, Ubuntu.
- * "SSH" = secure shell
- Shell" = The user interface to UNIX/Linux
- SSH into Opus" = use Putty if on Windows or the ssh command if on Linux to connect to Opus.
- Putty into Opus" = run the Putty program on windows and connect remotely using SSH to the computer on campus named Opus.cabrillo.edu
- "revert a VM to it's snapshot" = restore a VM back to the original pristine state. This undoes any configuration changes, VMware settings and restores the contents of the hard drive(s)
- start up a VM" = the same as powering up any computer, first the BIOS runs, then the OS is loaded, then services are started



Some lingo for this class

- VMware or VirtualBox host" = the physical computer that all the VMs are running on.
- VMware or VirtualBox guest" = the virtual machine running on the VMware host.
- ✤ "Guest OS" = the operating system running on the VM.
- "console" = a local terminal for entering commands. No scrollbars.
- Virtual terminal" = when using a local console there are a number of virtual terminals that can be used. Ctrl-Alt-Fn, where n=1 to 7 will bring up different terminals. For example, Ctrl-Alt-F2 brings up tty2. These terminals have no scroll bars.
- Itty = a teletype, very early and noisy way to interact with a computer. A teletype had a keyboard and a printer and was connected to a computer. The virtual terminals are named tty1, tty2, etc.
- "graphical terminal" = A terminal program that can be run on a graphical desktop. These terminals have scroll bars.
- "bring up tty2" bring up the tty2 console by pressing Ctrl-Alt-F2 keys at the same time



Commands



who

shows who is logged in and which terminals they are using

	[rsimms@	frida rsi	imms]\$ who)			
	root	ttyl	Jul	3	13:54		
	root	tty2	Jul	3	13:55		
	rsimms	tty3	Jul	3	13 : 55		
	cisco	:0	Jul	3	13:48		
	cisco	pts/0	Jul	3	13:49	(:0.0)	
	cisco	pts/1	Jul	3	13:49	(:0.0)	
	bsimms	pts/2	Jul	3	13:53	(192.168.0.26)	
	hmiller	pts/3	Jul	3	13:55	(192.168.0.26)	
	droddy	pts/4	Jul	3	13 : 57	(192.168.0.25)	
Use	ernames	Terminal devices	Date of lo	an gin	d time	Where logged in from (blar or :0.0) if local, hostname of IP if remote	nk or

Note the same user can login more that once using different terminals



tty's (virtual terminals)



pts's (graphical terminal windows)





More pts's (SSH logins)



Always keep this mental model in mind that every UNIX/Linux computer has lots of terminals attached





who (continued) various who command options

[rsimms@	frida	rsimms]\$ W	าด	am i		
rsimms	tty3	Jul	3	13:55	I dle time	Process ID
[rsimms@	frida	rsimms]\$ W	סר	-Hu	K	
NAME	LINE	TIMI	Ξ		IDLE	PID COMMENT
root	tty1	Jul	3	13:54	00:07	1390
root	tty2	Jul	3	13:55	00:07	1391
rsimms	tty3	Jul	3	13:55	00:07	1392
cisco	:0	Jul	3	13:48	?	1451
cisco	pts/0) Jul	3	13:49	00:03	1581 (:0.0)
cisco	pts/1	. Jul	3	13:49	00:08	1581 (:0.0)
bsimms	pts/2	2 Jul	3	13:53	00:08	1753 (192.168.0.26)
hmiller	pts/3	Jul	3	13:55	•	1924 (192.168.0.26)
droddy	pts/4	Jul	3	13 : 57	00:04	1962 (192.168.0.25)

[rsimms@frida rsimms]\$ who -q
root root rsimms cisco cisco cisco bsimms hmiller droddy
users=9

H=add heading, u=show idle time, q=login names and count

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The **uid** (user ID number) of the simmsben user is 1160, the **uid** of root is 0. root is the "superuser" account.



clear clear the terminal display

Prsimms@opus:~		
0 pts/35 2010-05-19	5:34 149	254 id=s/35 term=0 exit=
pts/36 2010-05-19	5:47 90	37 id=s/36 term=0 exit=
[rsimms@opus ~]\$ [rsimms@opus ~]\$ [rsimms@opus ~]\$ [rsimms@opus ~]\$ [rsimms@opus ~]\$ who -Hu		
NAME LINE TIME	IDLE PID	COMMENT
root :0 2009-12-18 17	30 Prsimms@opus:~	
<pre>[rsimms@opus ~]\$ who -Hi who: Warning: -i will be removed in NAME LINE TIME rsimms pts/1 2010-08-24 11 root :0 2009-12-18 17 [rsimms@opus ~]\$ who -H NAME LINE TIME rsimms pts/1 2010-08-24 11 root :0 2009-12-18 17 [rsimms@opus ~]\$ clear</pre>	[rsimms@opus ~]\$ 12 30 12 30	This is what happens right after typing the clear command



hostname show the name of the current computer

/home/c	is90/guest \$ hostname	Connected to Opus
opus.ca	brillo.edu	using PuTTY
ci	s90@eko∶~\$ hostname	<i>Connected to Eko using</i>
ek	o	<i>PuTTY</i>
	C:\Users\Administrator> hostr dv2000	name In the DOS command

Hostname will always tell you the name of the computer you are talking to. It even works in Windows!



cal show calendar

```
[simmsben@opus ~]$ Cal
June 2008
Su Mo Tu We Th Fr Sa
1 2 3 4 5 6 7
8 9 10 11 12 13 14
15 16 17 18 19 20 21
22 23 24 25 26 27 28
29 30
```

If month and year not specified then current month is shown

What day of the week were you born on? Specify your birth month and year as arguments to the **cal** command



cal show calendar

/home/cis90/guest s_{2010} cal 2010

		Ja	anua	ary					Feb	orua	ary					ľ	Maro	ch		
Su	Мо	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa
					1	2		1	2	3	4	5	б		1	2	3	4	5	б
3	4	5	б	7	8	9	7	8	9	10	11	12	13	7	8	9	10	11	12	13
10	11	12	13	14	15	16	14	15	16	17	18	19	20	14	15	16	17	18	19	20
17	18	19	20	21	22	23	21	22	23	24	25	26	27	21	22	23	24	25	26	27
24	25	26	27	28	29	30	28							28	29	30	31			
31																				
		1	Apri	il						May	7					ċ	June	е		
Su	Мо	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa
				1	2	3							1			1	2	3	4	5
4	5	б	7	8	9	10	2	3	4	5	б	7	8	б	7	8	9	10	11	12
11	12	13	14	15	16	17	9	10	11	12	13	14	15	13	14	15	16	17	18	19
18	19	20	21	22	23	24	16	17	18	19	20	21	22	20	21	22	23	24	25	26
25	26	27	28	29	30		23	24	25	26	27	28	29	27	28	29	30			
							30	31												
		ċ	July	7					Aι	igus	st					Ser	pter	nber	r	
C	Mo	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa	Su	Мо	Tu	We	Th	Fr	Sa
ъu	MO					-		0	2	Δ	F	~	7				- 1	-	2	4
Su	MO			1	2	3	T	2	5	-	5	6	/				T	2	3	
su 4	мо 5	6	7	1 8	2 9	3 10	1 8	2 9	10	11	12	6 13	, 14	5	б	7	1 8	2 9	3 10	11
4 11	5 12	6 13	7 14	1 8 15	2 9 16	3 10 17	1 8 15	2 9 16	10 17	11 18	12 19	6 13 20	/ 14 21	5 12	6 13	7 14	1 8 15	2 9 16	3 10 17	11 18
4 11 18	5 12 19	6 13 20	7 14 21	1 8 15 22	2 9 16 23	3 10 17 24	1 8 15 22	2 9 16 23	10 17 24	11 18 25	12 19 26	6 13 20 27	/ 14 21 28	5 12 19	6 13 20	7 14 21	1 8 15 22	2 9 16 23	3 10 17 24	11 18 25
4 11 18 25	5 12 19 26	6 13 20 27	7 14 21 28	1 8 15 22 29	2 9 16 23 30	3 10 17 24 31	1 8 15 22 29	2 9 16 23 30	10 17 24 31	11 18 25	12 19 26	6 13 20 27	/ 14 21 28	5 12 19 26	6 13 20 27	7 14 21 28	1 8 15 22 29	2 9 16 23 30	3 10 17 24	11 18 25
4 11 18 25	5 12 19 26	6 13 20 27	7 14 21 28	1 8 15 22 29	2 9 16 23 30	3 10 17 24 31	1 8 15 22 29	9 16 23 30	10 17 24 31	11 18 25	12 19 26	6 13 20 27	/ 14 21 28	5 12 19 26	6 13 20 27	7 14 21 28	1 8 15 22 29	2 9 16 23 30	3 10 17 24	11 18 25
4 11 18 25	5 12 19 26	6 13 20 27 00	7 14 21 28	1 8 15 22 29	2 9 16 23 30	3 10 17 24 31	1 8 15 22 29	9 16 23 30	10 17 24 31 Nov	11 18 25 7emk	12 19 26	6 13 20 27	14 21 28	5 12 19 26	6 13 20 27	7 14 21 28 Dec	8 15 22 29	2 9 16 23 30	3 10 17 24	11 18 25
4 11 18 25 Su	5 12 19 26 Mo	6 13 20 27 00 Tu	7 14 21 28 ctok	1 8 15 22 29 Der Th	2 9 16 23 30 Fr	3 10 17 24 31 Sa	1 8 15 22 29 Su	2 9 16 23 30 Mo	10 17 24 31 Nov Tu	11 18 25 7emk We	12 19 26 Der Th	6 13 20 27 Fr	7 14 21 28 Sa	5 12 19 26 Su	6 13 20 27 Mo	7 14 21 28 Dec Tu	1 8 15 22 29 ceml We	2 9 16 23 30 Der Th	3 10 17 24 Fr	11 18 25 Sa
4 11 18 25 Su	5 12 19 26 Mo	6 13 20 27 00 Tu	7 14 21 28 ctoł We	1 8 15 22 29 Der Th	2 9 16 23 30 Fr 1	3 10 17 24 31 Sa 2	1 8 15 22 29 Su	2 9 16 23 30 Mo 1	10 17 24 31 Nov Tu 2	11 18 25 7emk We 3	12 19 26 Der Th 4	6 13 20 27 Fr 5	7 14 21 28 Sa 6	5 12 19 26 Su	6 13 20 27 Mo	7 14 21 28 Dec Tu	1 8 15 22 29 Ceml We 1	2 9 16 23 30 Der Th 2	3 10 17 24 Fr 3	11 18 25 Sa
4 11 18 25 Su 3	MO 5 12 19 26 Mo 4	6 13 20 27 00 Tu 5	7 14 21 28 20 We	1 8 15 22 29 Der Th	2 9 16 23 30 Fr 1 8	3 10 17 24 31 Sa 2 9	1 8 15 22 29 Su 7	2 9 16 23 30 Mo 1 8	10 17 24 31 Nov Tu 2 9	11 18 25 7emk We 3 10	12 19 26 Der Th 4 11	6 13 20 27 Fr 5 12	7 14 21 28 Sa 6 13	5 12 19 26 Su 5	6 13 20 27 Mo	7 14 21 28 Dec Tu 7	1 8 15 22 29 Ceml We 1 8	2 9 16 23 30 Der Th 2 9	3 10 17 24 Fr 3 10	11 18 25 Sa 4
4 11 18 25 Su 3 10	MO 5 12 19 26 MO 4 11	6 13 20 27 00 Tu 5 12	7 14 21 28 ctok We 6 13	1 8 15 22 29 Der Th 7 14	2 9 16 23 30 Fr 1 8 15	3 10 17 24 31 Sa 2 9 16	1 8 15 22 29 Su 7 14	2 9 16 23 30 Mo 1 8 15	10 17 24 31 Nov Tu 2 9 16	11 18 25 7emk We 3 10 17	12 19 26 Der Th 4 11	6 13 20 27 Fr 5 12 19	7 14 21 28 Sa 6 13 20	5 12 19 26 Su 5 12	6 13 20 27 Mo 6 13	7 14 21 28 Dec Tu 7 14	1 8 22 29 Ceml We 1 8 15	2 9 16 23 30 0er Th 2 9 16	3 10 17 24 Fr 3 10 17	11 18 25 Sa 4 11
4 11 18 25 Su 3 10 17	MO 5 12 19 26 MO 4 11 18	6 13 20 27 00 Tu 5 12 19	7 14 21 28 ctok We 6 13 20	1 8 15 22 29 Der Th 7 14 21	2 9 16 23 30 Fr 1 8 15 22	3 10 17 24 31 Sa 2 9 16 23	1 8 15 22 29 Su 7 14 21	2 9 16 23 30 Mo 1 8 15 22	10 17 24 31 Nov Tu 2 9 16 23	11 18 25 7em We 3 10 17 24	12 19 26 Der Th 4 11 18 25	6 13 20 27 Fr 5 12 19 26	7 14 21 28 Sa 6 13 20 27	5 12 19 26 Su 5 12 19	6 13 20 27 Mo 6 13 20	7 14 21 28 Dec Tu 7 14 21	1 8 22 29 We 1 8 15 22	2 9 16 23 30 0er Th 2 9 16 23	3 10 17 24 Fr 3 10 17 24	11 18 25 Sa 4 11 18 25
4 11 18 25 Su 3 10 17 24	MO 5 12 19 26 Mo 4 11 18 25	6 13 20 27 00 Tu 5 12 19 26	7 14 21 28 Ctok We 6 13 20 27	1 8 15 22 29 Der Th 7 14 21 28	2 9 16 23 30 Fr 1 5 22 29	3 10 17 24 31 Sa 2 9 16 23 30	1 8 15 22 29 Su 7 14 21 28	2 9 16 23 30 Mo 1 8 15 22 29	10 17 24 31 Nov Tu 2 9 16 23 30	11 18 25 7emk We 3 10 17 24	12 19 26 Der Th 4 11 18 25	6 13 20 27 Fr 5 12 19 26	7 14 21 28 Sa 6 13 20 27	5 12 19 26 Su 5 12 19 26	6 13 20 27 Mo 6 13 20 27	7 14 21 28 Dec Tu 7 14 21 28	1 8 22 29 We 1 8 15 22 29	2 9 16 23 30 0er Th 2 9 16 23 30	3 10 17 24 Fr 3 10 17 24 31	11 18 25 Sa 4 11 18 25

Specify just the year to see all 12 months





When a program is loaded into memory and being executed (run) by the kernel it is called a process



TIP: For Lab 1 this is how you answer the question on which shell you are using!



ssh user@host login to a remote system

ssh cis90@opus.cabrillo.edu







tty show which terminal is being used for session

[simmsben@opus ~]\$ **tty** /dev/pts/1

pts's are pseudo terminal devices. You will see these used for remote PuTTY sessions and for terminals you open on the graphical desktop.



[rsimms@frida rsimms]\$ **tty** /dev/tty1

tty's are virtual teletype terminal devices tty1 through tty6. They are available locally by pressing Ctrl-Alt-F1 though Ctrl-Alt-F6





UNAME show name of the operating system

[simmsben@opus ~]\$ **uname** Linux

uname shows the name of the operating system



history show command history

/home/cis90/guest \$ history

- 1 date
- 2 cal
- 3 who
- 4 who am i
- 5 hostname
- 6 id
- 7 clear
- 8 ps
- 9 tty
- 10 uname
- 11 exit
- 12 history

Separate histories are maintained for the same user while using different terminals.

Histories are merged when user has logged off them.



/sbin/ifconfig show network interface status

odo:~\$ /sbin/ifconfig
Link encap:Ethernet HWaddr 00:0c:29:6f:53:d9
inet addr:192.168.0.24 Bcast:192.168.0.255 Mask:255.255.255.0
inet6 addr: fe80::20c:29ff:fe6f:53d9/64 Scope:Link
UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
RX packets:113172 errors:0 dropped:0 overruns:0 frame:0
TX packets:728 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:1000
RX bytes:15963968 (15.9 MB) TX bytes:84589 (84.5 KB)
Interrupt:18 Base address:0x1400
Link encap:Local Loopback
inet addr:127.0.0.1 Mask:255.0.0.0
inet6 addr: ::1/128 Scope:Host
UP LOOPBACK RUNNING MTU:16436 Metric:1
RX packets:8 errors:0 dropped:0 overruns:0 frame:0
TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
collisions:0 txqueuelen:0
RX bytes:460 (460.0 B) TX bytes:460 (460.0 B)

cis192@frodo:~\$

The **inet addr** is the IP address for your system. Use this with Putty or SSH command for remote logins.



exit terminate shell and log off





Navigating Terminals



Teletype Terminals (tty), Pseudo Terminals (pts), X windows displays

/dev/pts/3 (Putty)		/dev/tty/2 (Ctrl-Alt-F2)
Prinnumstass FIDX [rsimms@frida rsimms]\$ who Image: State Sta		[rsimmsθfrida rsimms1\$ who root tty1 Jun 23 16:00 rsimms tty2 Jun 23 16:00 rsimms :0 Jun 23 15:00 rsimms :0 Jun 22 15:43 rsimms pts/0 Jun 23 16:08 (192.168.0.25) root pts/1 Jun 23 16:08 (192.168.0.25) rsimms pts/2 Jun 23 16:08 (192.168.0.25) rsimms pts/2 Jun 23 16:08 (192.160.0.25) (rsimms0frida rsimms1\$ tty /dev/tty2 [rsimms0frida rsimms1\$
[rsimms@rrida rsimms]\$ tty /dev/pts/3 [rsimms@frida rsimms]\$ [root] root rsimms t0 Jun 22 15:43 	:0 (Ctrl-Alt-F7)	[root@frida root]# who root tty1 Jun 23 16:00 rsimms tty2 Jun 23 16:00 rsimms :0 Jun 22 15:43 rsimms pts/0 Jun 22 15:43 (:0.0) root pts/1 Jun 23 16:00 (192.168.0.25) rsimms pts/2 Jun 23 16:00 (192.168.0.25) [root@frida root]# tty /dev/tty1 [root@frida root]#
root pts/1 Jun 23 16:08 (192.168.0.25) rsimms pts/2 Jun 23 16:04 (:0.0) rsimms pts/3 Jun 23 16:08 (192.168.0.25) [root#frida root]# ps PID TTY TIME CMD 3369 pts/1 00:00:00 bash 3592 pts/1 00:00:00 ps [root#frida root]# [[root#frida root]# tty /dev/pts/1	pir [rsime@frida rsimes]\$ who	/dev/tty/1 (Ctrl-Alt-F1)
/dev/pts/1 (Putty) /dev/pts/0	rsimms@ftda rsimms@ftda_rsimms]\$ tty /dev/pts/2 [rsimms@ftida rsimms]\$]	/dev/pts/2

Output from who command:

root	tty1	Jun	23	16:00	
rsimms	tty2	Jun	23	16:00	
rsimms	:0	Jun	22	15:43	
rsimms	pts/0	Jun	22	15:43	(:0.0)
root	pts/1	Jun	23	16:08	(192.168.0.25)
rsimms	pts/2	Jun	23	16:04	(:0.0)
rsimms	pts/3	Jun	23	16:08	(192.168.0.25)

Notes:

:0 = X display 0 :0.0 = X display 0, screen 0

No scroll bars on tty's



What computer am I really using anyway ?????





Use hostname command to know for sure





Wrap up



http://simms-teach.com/cis90calendar.php

1	2/10	Materials Presentation slides (<u>download</u>) Logins Sheet (<u>download</u>) CIS VM Lab RDP file: (<u>download</u>) Supplemental Howto #103: Installing PuTTY (<u>download</u>) Howto #301: Bringing Eko home (<u>download</u>) Video #100: Remote Putty login to Opus (<u>view</u>) 	(Gillay) 2,4,5, p113-115, p164-172 (Hahn)	
		Assignment <u>Student Survey</u> <u>Lab 1</u> CCC Confer <u>Enter virtual classroom</u> <u>Class archives</u> 		
2	2/17	Quiz 1 Commands • Understand the UNIX login operation works • Meet John the Ripper and learn how vulnerable a poor password is • Understand basic command syntax and operation • Understand program files and what happens when they are run • Understand how the shell works and environment variables • Understand how to get documentation when online	2.3-2.7 2.11 3.7-3.20 4.19-4.22 9.1-9.2 (Gillay)	Lab 1 Student Survey

Note: The first lab assignment and student survey is due by midnight of the next class meeting!

Please remember that late work is not accepted



Lab Assignment Tips



Pearls of Wisdom:

- Don't wait till the last minute to start.
- The *slower* you go the *sooner* you will be finished.
- A few minutes reading the forum can save you hour(s).
- Line up materials, references, equipment and software ahead of time.
- Use Google when trouble-shooting
- Late work is not accepted so submit what you have for partial credit.



Lab 1 Quick Demo





New commands:	
cal	- show calendars
clear	- clear the terminal screen
exit	 terminate your shell and log off
history	- show previous commands
hostname	- show the name of the computer being accessed
id	- show user and group id information
ifconfig	 show network interface info
ps	 show processes (loaded programs) being run
ssh	 secure login to a remote system
uname	- show OS name
tty	 show terminal information
who	 show who else is logged on
Ctrl-Alt-F1	 Change between terminals and X windows
to Ctrl-Alt-F7	(graphics)

New Files and Directories:

VirtualBox: Right Ctrl

- to release mouse cursor out of VM



Next Class

Assignment: Check the Calendar Page on the web site to see what is due next week.

Quiz questions for next class:

- What part of UNIX/Linux is both a user interface and a programming language?
- What is the lowest level, inner-most component of a UNIX/Linux Operating System called?
- What command shows the other users logged in to the computer?

END

Backup





Installing SSH (Putty) at Home

Cabrills College

Accessing UNIX/Linux systems over the network

- Linux has SSH built in
- Windows does not include SSH
- Putty is a free download for adding SSH to Windows
- We will be using Putty this term on the Windows classroom systems to access Opus
- You can also install Putty on Windows at home to access Opus



Putty is written and maintained primarily by Simon Tatham. http://www.chiark.greenend.org.uk/~sgtatham/ Thank you Simon!



Installing SSH (Putty) at Home

On Windows Systems

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





Installing SSH (Putty) at Home

On Windows Systems

C ↑ C ↑ C ↑ ttp://www.chiark.greenend.org.uk/~sgtatham/putty/download.html	Image:					
PuTTY Download Pag Home Licence EAQ Docs Download <u>Mirrors Updates Feedback Changes W</u> Here are the PuTTY files themselves:	ie Keys Links ïishlist Team E					
 PuTTY (the Telnet and SSH client itself) PSCP (an SCP client, i.e. command-line secure file copy) PSFTP (an SFTP client, i.e. general file transfer sessions much like FTP) PuTTYtel (a Telnet-only client) Plink (a command-line interface to the PuTTY back ends) Pageant (an SSH authentication agent for PuTTY, PSCP and Plink) PuTTYgen (an RSA and DSA key generation utility). 	Click on the putty.exe link and download to your desktop or a folder where you can find it.					
LEGAL WARNING: Use of PuTTY, PSCP, PSFTP and Plink is illegal in countries where encryption is outlawed. I believe it is legal to use PuTTY, PSCP, PSFTP and Plink in England and Wales and in many other countries, but I am not a lawyer and so if in doubt you should seek legal advice before downloading it. You may find this site useful (it's a survey of cryptography laws in many countries) but I can't vouch for its correctness.						
Use of the Telnet-only binary (PuTTYtel) is unrestricted by any cryptography laws. The files we offer below are cryptographically signed. We also supply cryptographically signed lists of MD5 checksums. To download our public keys and find out more about our signature policy, visit the <u>Keys page</u> . If you need a Windows program to compute MD5 checksums, you could try the one at <u>this site</u> . (This MD5 program is also cryptographically signed by its author.)						
Binaries The latest release version (beta 0.60). This will generally be a version I think is reasonably likely to work well. If you have a problem with the release version, it might be worth trying out the latest development snapshot (below) to see if I've already fixed the bug, before reporting it to me.						
For Windows on Intel x86 Image: Constraint of the second	-					
simms (2).docx	Show all downloads ×					

http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html



Installing SSH (Putty) at Home

On Windows Systems

Reputry Configuration		×				
Category:						
- Session	Basic options for your PuTTY session					
Logging	Specify the destination you want t	o connect to				
Keyboard	Host <u>N</u> ame (or IP address)	Port				
Bell	opus.cabrillo.edu	22				
Features	Connection type: <u>R</u> aw <u>T</u> elnet Rlogie					
···· Appearance ···· Behaviour ···· Translation ···· Selection	Load, save or delete a stored sess Sav <u>e</u> d Sessions	sion				
Colours Connection Data Proxy Telnet Riogin SSH	Default Settings	▲ <u>L</u> oad E Sa <u>v</u> e Delete				
Serial	Close <u>w</u> indow on exit:	only on clean exit				
About		<u>C</u> ancel				

That's it. Just double click on the putty.exe file you downloaded to run PuTTY.

Type the full hostname or IP address of the computer you wish to access here.





Class Exercise for Online Students Installing PuTTY

Install PuTTY at home on Windows:

- 1. http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
- 2. Scroll down to the "latest release version" in the Binaries section
- 3. Click on putty.exe link and download the file to the desktop or a folder
- 4. Locate the downloaded putty.exe file and run it

PuTTY is a program that can be installed on Microsoft Windows to securely access a remote computer. PuTTY uses the SSH network protocol to encrypt all connections between computers.



Local Access





Bringing up a graphical terminal window



Open graphical terminal on Eko by double clicking on Terminal icon

Type commands into graphical terminal window



Shutting down the Ubuntu VM Eko



Please shut down any VMs you use just like you would shut down a regular computer


Using Linux



The two Linux systems we will use in this course

Eko

- OS = Linux
- Distro = Ubuntu 10.04
- Hardware = VirtualBox VM
- Host hardware = Desktop (Pentium CPU)
- Host hardware = on all CIS classroom/lab stations, and on one HP ProLiant server
- Access = local or remote (GUI or CLI)





Opus

- OS = Linux
- Distro = Red Hat Enterprise Linux 5
- Hardware = VMware ESXi VM
- Host hardware = Cluster of 5 racked servers (2 Xeon CPUs each)
- Location of host = building 1200
- Access = remote only (CLI only)











Using Linux systems

Local and remote access



Remote access to Opus (from Windows) with PuTTY



Cabrills Collese

Set the Host Name to opus.cabrillo.edu and insure the Connection type is SSH

Opus is Linux server located in building 1200 on campus



150

Remote access to Opus (from Linux) using SSH command

ssh guest90@opus.cabrillo.edu

Cabrills Collese



Opus is Linux server located in building 1200 on campus





Logging into Opus for CIS 90 (Need username, password and terminal type)

login as: guest90 Type user name here
guest90@opus.cabrillo.edu's password: Type password here (not echoed)
Last login: Tue Aug 24 14:29:11 2010 from dsl-63-249-103-123.dhcp.cruzio.com



Welcome to Opus Serving Cabrillo College

Terminal type? [xterm] *Hit enter key here* Terminal type is xterm. /home/cis90/guest \$

— Prompt string on Opus for CIS 90

Use the **guest90** account initially. After Lab 1 all students will get their own unique login accounts for Opus.



Telnet vs SSH (Secure Shell)

Sniffer view of a Telnet session

With telnet, everything is transferred in clear text over the network

Remote computer





SSH is a network protocol that enables secure connections between computers

Sniffer view of a SSH session

6	✓ ssh-set	ssion	Eth	erea	1												
h	Y Conte	nts of	ТСР	stre	am			////	////			////	////		////	7/////	2
IF	100000JJL	10 20	DT 0	50 /a	1.0	vu	41	vJ	T.J	JZ	20	aJ	JL	IJIJ	33	• \ • • •	۷.
Ш	000005AE	80 72	2b 7	72 d4	3Ь	46	a6	7Ь	67	6Ь	d4	df	a2	Ь2	8c	.r+r.	. :
Ш	000005BE	01 7c	39 7	78 bd	c4	95	f2	61	93	73	a1	76	49	cf	00	.19x.	• •
Ш	000005CE	68 c2	85 7	71 Ь0	75	c6	72	Ь5	18	27	10	4Ь	57	ed	88	h q.	.۱
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Ш	000005EE	55 70	e9 7	73 Б4	0a	6f	3f	af	5Ь	f7	3c	4e	30	92	39	Up.s.	• •
Ш	000005FE	62 fc	fd a	a6 fd	Ь9	45	e2	56	12	d1	90	0c	d9	ce	34	b	• •
Ш	0000060E	6d 1f	8b 4	44 a7	50	3c	59	aa	ÛЬ	2a	c2	04	c1	da	43	mD.	•
Ш	0000061E	21 87	2d 3	32 67	48	d3	47	2f	43	25	5Ь	ee	65	89	76	129	gł
Ш	0000062E	83 1c	74 9	Э1 Ь1	f5	3e	8Ь	57	ee	d9	fc	f5	45	e3	Ь6	t	• •
Ш	0000063E	ef 9c	f0 8	39 eb	f7	1d	c9	fd	29	69	44	a9	75	98	5a		•
Ш	0000064E	b2 ba	d5 6	52 9f	35	e1	1a	ee	06	8b	79	fe	e9	fQ	0a	•••b.	•
Ш	0000065E	df			$\sim c$	`											
Ш	0000066E	ea			১১	⊳⊢	1 -	•е	n	cr	ï۷I	ρτ	e	a			
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Ш	0000068E	8C 8t	as (И Бе	69	62	02	a/	St	ev	e1	9D	ec	at	dV		11
	IOOOOOEDE	CC 00	70 .			01	4-	C7	E.E.	C-	77	69	07	76	-14		

With ssh, it is encrypted.

Local computer

username password cat secret

exit





Section	Basic options for your Pu	TTY easeion
Session Cogging Terminal Keyboard Bell Features Window Appearance Behaviour	Basic options for your "un Specify the destination you want to Host Name (or IP address) opus cabrillo edu Connection type: Baw Ielnet Riogi Load, save or delete a stored sess Saved Sessions	o connect to <u>Port</u> 22 <u>SSH</u> ○ Seria ion
- Selection - Colours - Connection - Data - Proxy - Telnet - Rilogin ()- SSH	Default Settings frida hershey nosmo opus-root opus-snimms opus-snimmsben	Load E Save Delete
Serial	Close <u>w</u> indow on exit: Always Never Or	nly on clean exit

login a						
	s: guest90					*
Server	refused ou:	r	key			
guest90	Copus.cabr	11	lo.edu's pass	word:		
Last lo	gin: Sat A	ug	21 08:11:43	2010 fi	rom nosmo-nat.cabrillo.edu	
				(' <u>v</u> ')		
				//-=-\\		
				(= /)		
				~~ ~~		
			Welco	ome to	Opus	
			Serving (Cabrill	Lo College	
Termina	1 type? [x	te	rm]			
Termina	l type is :	xt	erm.			
/home/c	is90/guest	Ş	hostname			
	brillo.edu					
opus.ca		100	who			
/home/c	is90/guest	Ş	WIIO			
opus.ca /home/c rsimms	is90/guest pts/1	Ş	2010-08-24	11:12	(dsl-63-249-103-107.dhcp.cruzio.com)	
opus.ca /home/c rsimms root	is90/guest pts/1 :0	Ş	2010-08-24 2009-12-18	11:12 17:30	(dsl-63-249-103-107.dhcp.cruzio.com)	
opus.ca /home/c rsimms root guest90	is90/guest pts/1 :0 pts/2	Ş	2010-08-24 2009-12-18 2010-08-24	11:12 17:30 11:59	(ds1-63-249-103-107.dhcp.cruzio.com) (ds1-63-249-103-107.dhcp.cruzio.com)	
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opus.ca /home/c rsimms root guest90 guest90 /home/c guest90 /home/c /dev/pt	is90/guest pts/1 :0 pts/2 pts/3 is90/guest pts/2 is90/guest s/2	40 40 40	2010-08-24 2009-12-18 2010-08-24 2010-08-24 who am i 2010-08-24 tty	11:12 17:30 11:59 12:05 11:59	(ds1-63-249-103-107.dhcp.cruzio.com) (ds1-63-249-103-107.dhcp.cruzio.com) (ds1-63-249-103-107.dhcp.cruzio.com) (ds1-63-249-103-107.dhcp.cruzio.com)	

Class Exercise Remote access to Opus

Access Opus with PuTTY:

- 1. Open Putty on Windows desktop
- Enter opus.cabrillo.edu as hostname and SSH as connection type
- 3. Click Open
- 4. Login as **guest90** and password on the CCC Confer whiteboard.
- 5. Type hostname, who, who am i, and tty commands
- 6. Type exit to end session

PuTTY is a program that can be installed on Microsoft Windows to securely access a remote computer. PuTTY uses the SSH network protocol to encrypt all connections between computers.