

IT 280 Study Guide
Fall 2013

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Brigham Young University-Hawai'i

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Study Guide

This is the **Official IT 280 Study Guide** for the IT 280 Computer Networking class taught by Don Colton, Fall 2013.

This study guide is focused directly on “what” and “when.” It talks about the description and grading of the exams and labs. It tells what is required for each one.

<http://byuh.doncolton.com/it280/2135/sguide.pdf> has the latest version of this study guide. **It will be updated throughout the semester**, as new assignments are made, and as due dates are established, and as clarifications are developed.

Syllabus

<http://byuh.doncolton.com/it280/2135/syl.pdf> is the official syllabus for this course. It is largely reproduced in Chapter 2 (page 6) below.

Text Book

This study guide is a companion to the text book for the class.

The textbook tells “why” and “how.” Its role is explaining things and telling how to make things work.

The textbook is “Networking 101: An Introduction To Networking,” by Don Colton. It is available in PDF form, free.

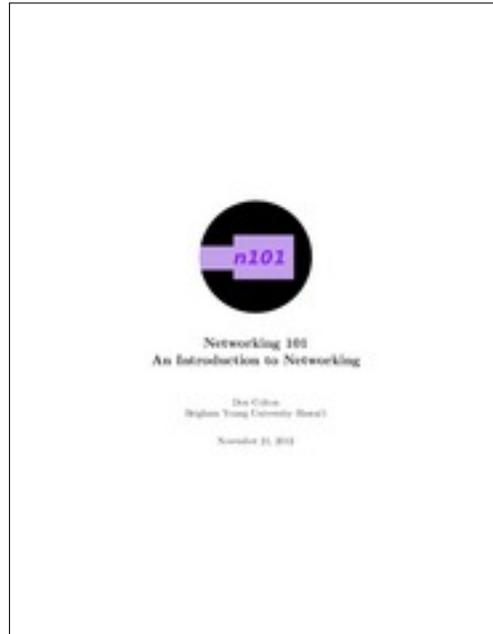
Free textbook (short URL):

<http://n101.tk/>

Alternate URL for textbook:

<http://n101.doncolton.com/>

The textbook is 99% stable, but new material is occasionally added and chapter numbering may even change. It has a good index.



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Chapter 1

Introduction

Contents

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1.1 Sending Me Email

These rules apply to all emails related to this class.

Rule One: Send emails to **doncolton2@gmail.com**

Rule Two: Put **it280** in your email subject line.

Rule Three: Single-topic emails get answered faster than multi-topic emails do. Avoid combining several topics in a single email.

I must confess, I sometimes get buried in email. I do not want to overlook your email to me, or have it end up caught in my spam filter. And for my own sanity I want to be able to find and deal with all the email related to this class at the same time. This is especially true for large classes.

My solution is to have you put **it280** in your email subject line, preferably as the first word. If you do this, my email system will immediately and automatically respond to you, telling you that I got your email and it is in my queue.

If you fail to do this, you will not get an immediate reply and your email will end up in some other queue in my work flow. Your email will not be noticed when I am grading for this class. In the best case I will read your

email and ask you to send it again with the correct word in the subject line. In the worst case your email will be in my spam folder and I will never even see it.

You have been warned.

Chapter 2

Syllabus Extracts

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The syllabus is intended to be stable and reliable. I publish the syllabus at the start of the semester, and then I do not make any substantial changes in it except in case of extreme emergency.

The study guide, on the other hand, gets changed and updated throughout the semester.

This chapter of the study guide simply repeats, for your convenience, material given in the syllabus. In case it differs from the syllabus, the syllabus itself is always correct and authoritative, and this study guide is probably out of date.

2.1 Overview

It is hard to imagine a world without the Internet. Networking has made the sharing of information much faster than it was before. We get emails and instant messages with pictures attached instead of waiting days for postal delivery. We register “online” for classes instead of waiting “in line” to pull computer cards. We buy worldwide from Amazon or eBay or locally from Craig’s List instead of visiting our local bricks-and-mortar store. We research on Google instead of at the library.

People love being connected. But sometimes networks break. The world needs workers with technical skills. This course is focused on those skills: creating wiring, connecting computers, and making networks.

This course is an introductory course that will prepare you to understand, set up, and operate your own home network, or small business, or maybe even Internet Café. You will understand the fundamentals of networking and what things are necessary for success with those activities.

This course lays the foundation to prepare you to take other courses in the IT major, such as:

IT 426, Computer Network Servers, is an advanced course where you can develop skill and experience configuring and operating network servers.

IT 480, Computer Network Design, is an advanced course where you can develop skill and experience configuring networking equipment such as switches and routers.

2.1.1 Preparation

We assume you have no special networking experience whatever. We expect you can read, type, send and receive email, and visit web sites. Everything else we will teach you.

2.1.2 There May Be Changes

Like all courses I teach, I will be keeping an eye out for ways this one could be improved. Changes generally take the form of opportunities for extra credit, so nobody gets hurt and some people may be helped. If I make a change to the course and it seems unfair to you, let me know and I will try to correct it. If you are brave enough, you are welcome to suggest ways the class could be improved.

I may digitally record the audio of my lectures some days. This is to help me improve my teaching materials.

2.2 Course Details

2.2.1 About the Course

- **Course Number:** IT 280
- **Title:** Computer Networking

- **Course Description:** End-user fundamentals including local area networks, home networks, wireless networks, routers, firewalls, ports, address sharing, dynamic host configuration, OSI model, IPv4, net-masks, subnets, and troubleshooting.
- **Textbook:** Networking 101, by Don Colton.
- **Classroom:** GCB 111
- **Start/End:** Mon, Sep 9 to Mon, Dec 8
- **Class Time:** MWF 14:30 to 15:30
- **Final Exam:** Fri, Dec 13, 16:00–18:50

2.2.2 My Websites

Here is a list of my other websites that you may encounter this semester.

- <http://byuh.doncolton.com/it280/> is my course homepage. It has links to everything.
- <http://n101.tk/> is the textbook I wrote for this class.
- <https://dcquiz.byuh.edu/> is the learning management system for my courses.
- <http://byuh.doncolton.com/> is my campus homepage. It has my calendar and links to the homepages for each of my classes.
- <http://doncolton.com/> is my off-campus homepage.

2.2.3 About the Instructor

- **Instructor (me):** Don Colton
- **My email:** doncolton2@gmail.com
- **My Office:** GCB 128
- **Office Hour:** MWF 13:10 to 13:40.

I have reserved GCB 111 on MWF 13:20 to 14:20, the hour between my CIS 101 class and my IT 280 class, so my students and others can study in a lab setting and meet with each other and with me. The room is available as an Open Lab for your use either individually or in groups, for my class or for other classes. MWF 13:10 to 13:40 I will be present in GCB 111 or in my office to assist students that come.

2.2.4 About the Study Guide

I provide a study guide for this course. The study guide provides current details and specific helps for each assignment. It provides guidance for taking the exams.

<http://byuh.doncolton.com/it280/2135/sguide.pdf> has the study guide for this course.

The study guide will be updated as needed throughout the semester, as new assignments are given or due dates are established.

2.3 Learning Objectives

The following is a statement of the high-level learning objectives for this course. Each objective can be further divided into many smaller objectives.

By the conclusion of this course, students will do the following:

Internet: Explain how the Internet works. This includes topics such as connecting to the Internet, using the domain name system and using dynamic host configuration.

Home Networking: Properly set up a home network. List and explain the different objects, media, and devices used in a home network that is connected to the Internet through an ISP. Design, install, configure, and manage a simple LAN, install services, and connect the LAN to the Internet.

Wireless Networking: Design, install, configure, and manage a simple wireless LAN. This includes channel selection, WEP/WPA, SSID, and antenna considerations.

Security: Explain what security typically exists and how to get more. Includes password selection, firewalls, and issues with opening up ports for gaming.

Theory: Explain the following basic concepts: OSI 7-layer stack, protocol data units (packets, frames, etc.), udp, tcp, arp, and ports.

IPv4 Addressing: Explain network masks, subnetting, address classes, private IP addresses, MAC addresses, collision domains, broadcast domains, and what a LAN is.

Power Tools: Demonstrate the use of common network applications and

utilities including ping, traceroute, ipconfig, dig, nmap, ssh, telnet, ftp, and Wireshark.

2.4 Grading

Here is the actual grade distribution from Fall 2012: (18 students): grade average 3.31, 4.0x9 3.7 3.4 3.0x3 2.7x2 2.0 0.0.

Here is the actual grade distribution from Winter 2013: (16 students): grade average 3.74, 4.0x11 3.7 3.4x2 3.0 2.4

Grading is based on Effort (30%), Labs (16%), Skills Tests (14%), and Memorization Exams (40%). I have made available about 10% extra credit.

2.4.1 Grading Scale

I use a 60/70/80/90 model based on 1000 points.

Based on 1000 points

930+	A	900+	A-	870+	B+
830+	B	800+	B-	770+	C+
730+	C	700+	C-	670+	D+
630+	D	600+	D-	0+	F

2.4.2 Tracking Your Grade

I keep an online gradebook so you can see how your points are coming along. It also lets you compare them with other students in the class (without seeing their names).

<https://dcquiz.byuh.edu/> is my personal Learning Management System. That is where I maintain my online grade book.

Your points are organized into two grade books: Overall and Effort.

2135 IT 280 Overall Grade Book: This includes the total from Effort and adds your exam performance. It also shows your final grade.

2135 IT 280 Effort Grade Book: This tracks the daily updates and study time.

2.4.3 Effort: Daily Update (50 points)

Each day in class starts with the “daily update” (DU). It is my way of reminding you of due dates and deadlines, sharing updates and news, and taking roll. It is your way of saying something anonymously to each other and to me. It must be taken in class during the 10-minute window of time that starts 5 minutes before class and ends 5 minutes into class.

The DU is worth two points per class period, with 50 points expected (for 25 out of about 37 class periods), and about 75 points possible. Anything beyond 50 is extra credit. It is also a reward for coming on time, or close enough that you can do the update.

As part of the Daily Update, once a week I will ask you how much time you spent studying the previous week. I will use your report to update your study time points.

2.4.4 Effort: Study Time (250 points)

We award points for study time (ST), which is time spent engaging with materials directly related to this course.

Each week you are invited to report, on your honor, how many hours you studied during the previous week, Sunday morning through Saturday night. We award two “effort” points per hour of “study,” for a goal of 18 points (9 hours, including class time) and a maximum of 20 points (10 hours) per week, whether there is a holiday or not.

There are 14 weeks. $14 \times 18 = 252$. $14 \times 20 = 280$ (max). Anything beyond 250 points is extra credit.

Most students max out the study time points each week. This provides them with extra credit that helps ensure they get a good grade in the class.

Carry Forward: If you study more than the maximum time for which I will give credit, you are invited to report them, and also carry forward the extra hours and report them in the next week. For example, since 10 hours is the maximum that counts, if you studied 15 hours, you would report 15 hours of study, and I would count the first 10 hours. You would then take the remaining 5 hours and count it toward the following week.

There is no Carry Backward.

2.4.5 Effort Points are Optional

The effort points (daily update and study time) are there as a safety net. They are easy to earn. They help to make sure you will pass the class.

But when I calculate your final grade, I do it two ways:

- (a) Counting every point, based on 1000 total points.
- (b) Counting all but daily update and study time, based on 700 total points.

I grade both ways because some students have previous experience (or natural genius) and do not need to study as much.

I use whichever method gives you the best grade.

2.4.6 Skill: (400 pts) “E” Exams

E1 through E7: These exams cover the readings in Units 1 through 7. Honestly the exams are mostly about memorizing terminology and knowing answers to commonly asked questions.

Each test has a regular take. Every test has a “pretake.” The pretake score is granted a 10% bonus. The tests are listed here with the estimated number of points in each test. If the actual number of points differs, the total will be scaled to 400.

E1: (47 pts) Basics, Unit 1

E2: (83 pts) OSI Model, Unit 2

E3: (57 pts) Home Networking, Unit 3

E4: (33 pts) Wi-Fi, Unit 4

E5: (57 pts) Security, Unit 5

E6: (78 pts) IPv4, Unit 6

E7: (45 pts) Tools, Unit 7

2.4.7 Skill: (140 pts) “S” Exams

SN: (70 pts) q25 Skill Numbers

SS: (70 pts) q50 Skill Subnets

SV: (50 pts) q51 VLSM Subnets (extra credit)

The SN and SS skills-based exams are based on skills taught in the book or in class and are worth 140 points (70 each). The SV exam is extra credit. It is also covered in the text book. SV is an all-or-nothing situation involving about 10 to 15 questions.

Retakes: Because these are easy to grade but can require time to master, you can take these each exam day, and your highest score will be kept.

The Final Exam time is Fri, Dec 13, 16:00–18:50. I plan that it will consist of an opportunity to retake any or all exams previously given. If you are already satisfied with your scores, you can skip the final.

2.4.8 Skill: (160 pts) Labs

L1: (40 pts) Lab 1: Ethernet Cables

L2: (40 pts) Lab 2: Router Configuration

L3: (40 pts) Lab 3: Wi-Fi Site Survey

L4: (40 pts) Lab 4: Dia Network Diagram

2.4.9 Extra Credit Presentation

You can get 50 points for doing a presentation. Propose a networking topic. Get me to approve it. Research it. Write up your research. Submit your write-up (PDF) to me. Then I will schedule your presentation. Do a 10-minute presentation in class where you teach us all about your research.

Sample networking topics: Spanning Tree, Virtual LANs, the Latest Thinking on Passwords, Certificates, Torrents, Ethics, Being anonymous, Firewalls, Topologies, Setting up a File Server, Setting up a Print Server.

You must submit your write-up by November 15.

2.4.10 Other Extra Credit

Report an error in the published materials I provide. In this class, they include the following:

- The course website, parts relating to this semester.

- The course syllabus.
- The course study guide.
- The course textbook, which I wrote.

Each error reported can earn you extra credit. (Typos in my email messages are too common and do not count.)

2.5 Calendar

We meet about 37 times plus the final.

See the study guide for dates and deadlines.

2.5.1 Special Dates

Mo Sep 09 First Day of Instruction
 Fr Sep 13 E1 pretake
 Fr Sep 20 E1 exam
 Fr Sep 27 E2 pretake
 Fr Oct 04 E2 exam
 Fr Oct 11 E3 pretake
 Fr Oct 18 E3 exam, E4 pretake
 Fr Oct 25 E4 exam
 Fr Nov 01 E5 pretake
 Fr Nov 08 ISECON, No Class
 Fr Nov 15 E5 exam, E6 pretake
 We Nov 20 EIL Program Review, No Class
 We Nov 27 E6 exam, E7 pretake
 Fr Nov 29 Thanksgiving Friday, No Class
 Fr Dec 06 E7 exam
 Mo Dec 09 Last Day of Instruction
 Fr Dec 13 Exam Retakes, 16:00–18:50

2.5.2 Excused Absences

I have built a bit of slack into the grading so you can miss a few days (or assignments) if you need to, and still earn an A. Taking a friend to the

airport? Taking your spouse or child to the doctor? Taking a field trip for another class? No problem. You are excused.

The scheduled final exam consists of an opportunity to retake **any** exam that was offered during the semester. If you are happy enough with your previous scores, **you can skip the final.**

Beyond that I do not offer special treatment to anyone except in **HIGHLY** unusual situations.

If you have to miss an E exam, since there are three chances to take each one, my advice is to study harder for one of the other opportunities.

If you have to miss an S exam, there are more than three chances to take each one, my advice is to study harder for one of the other opportunities.

2.6 Support

The major forms of support are (a) open lab, (b) study groups, and (c) tutoring.

If you still need help, please find me, even outside my posted office hours.

2.6.1 Office Hour / Open Lab

I have reserved GCB 111 on MWF 13:20 to 14:20, the hour between my CIS 101 class and my IT 280 class, so my students and others can study in a lab setting and meet with each other and with me. The room is available as an Open Lab for your use either individually or in groups, for my class or for other classes. MWF 13:10 to 13:40 I will be present in GCB 111 or in my office to assist students that come.

The CIS department operates an open lab with tutors in GCB 111 most afternoons and evenings.

2.6.2 Study Groups

You are encouraged to form a study group. If you are smart, being in a study group will give you the opportunity to assist others. By assisting others you will be exposed to ideas and approaches (and errors) that you might never have considered on your own. You will benefit.

A good time for your study group to meet is during the open lab time. Eat lunch together (carefully) and work on the class activities.

If you are struggling, being in a study group will give you the opportunity to ask questions from someone that remembers what it is like to be totally new at this subject. They are more likely to understand your questions because they sat through the same classes you did, took the same tests as you did, and probably thought about the same questions that you did.

Most of us are smart some of the time, and struggling some of the time. Study groups are good.

2.6.3 Tutoring

The CIS department provides tutoring in GCB 111, Monday through Friday, typically starting around 5 PM and ending around 11 PM (but earlier on Fridays). Normally a schedule is posted on one of the doors of GCB 111.

Tutors can be identified by the red vests they wear when they are on duty.

Not all of the tutors know about everything. But all of the tutors should know which tutors do know about whatever you are asking about, so they can direct you toward the best time to get your questions answered.

There are networking-savvy student workers in GCB 103. They are not dedicated tutors like the 111 tutors. Instead, they work on building the CIS network and maintaining the CIS labs. But they are sometimes available to answer questions.

If you still need help, please come and see me, even outside my posted office hours.

2.7 BYUH Learning Framework

I believe in the BYUH Framework for Learning. If we follow it, class will be better for everyone.

2.7.1 Prepare for IT 280

Prepare: Before class, study the course material and develop a solid understanding of it. Try to construct an understanding of the big picture and

how each of the ideas and concepts relate to each other. Where appropriate use study groups to improve your and others' understanding of the material.

In IT 280: Do the readings for each unit before the first unit test. There is more than we could cover in class because we all learn at different rates. Our in-class time is better spent doing activities and answering your questions than listening to my lectures.

2.7.2 Engage in IT 280

Engage: When attending class actively participate in discussions and ask questions. Test your ideas out with others and be open to their ideas and insights as well. As you leave class ask yourself, "Was class better because I was there today?"

In IT 280: Participate in the in-class activities. Those that finish first are requested to help those that want assistance. It is amazing what you can learn by trying to help someone else.

2.7.3 Improve at IT 280

Improve: Reflect on learning experiences and allow them to shape you into a more complete person: be willing to change your position or perspective on a certain subject. Take new risks and seek further opportunities to learn.

In IT 280: After each exam, I usually allow you to see every score and every comment and every answer submitted for every question. Review your answers and those of other students. See how your answers could be improved. If you feel lost, study the assigned readings again and ask questions.

2.8 Standard Statements

All syllabi are encouraged or required to address certain topics. These are generally considered to be common sense, but we find that it is useful to mention them explicitly anyway.

2.8.1 Dress and Grooming Standards

The dress and grooming of both men and women should always be modest, neat and clean, consistent with the dignity adherent to representing The Church of Jesus Christ of Latter-day Saints and any of its institutions of higher learning. Modesty and cleanliness are important values that reflect personal dignity and integrity, through which students, staff, and faculty represent the principles and standards of the Church. Members of the BYUH community commit themselves to observe these standards, which reflect the direction given by the Board of Trustees and the Church publication, “For the Strength of Youth.” The Dress and Grooming Standards are as follows:

Men. A clean and neat appearance should be maintained. Shorts must cover the knee. Hair should be clean and neat, avoiding extreme styles or colors, and trimmed above the collar leaving the ear uncovered. Sideburns should not extend below the earlobe. If worn, moustaches should be neatly trimmed and may not extend beyond or below the corners of mouth. Men are expected to be clean shaven and beards are not acceptable. (If you have an exception, notify the instructor.) Earrings and other body piercing are not acceptable. For safety, footwear must be worn in all public places.

Women. A modest, clean and neat appearance should be maintained. Clothing is inappropriate when it is sleeveless, strapless, backless, or revealing, has slits above the knee, or is form fitting. Dresses, skirts, and shorts must cover the knee. Hairstyles should be clean and neat, avoiding extremes in styles and color. Excessive ear piercing and all other body piercing are not appropriate. For safety, footwear must be worn in all public places.

2.8.2 Accommodating Special Needs

Brigham Young University–Hawai‘i is committed to providing a working and learning atmosphere which reasonably accommodates qualified persons with disabilities. If you have any disability that may impair your ability to complete this course successfully, you are invited to contact the Students With Special Needs Coordinator at 808-675-3518. Reasonable academic accommodations are made for all students who have qualified documented disabilities.

2.8.3 Plagiarism

We learn by watching others and then doing something similar.

Sometimes it is said that plagiarism is copying from one person, and research is copying from lots of people.

When you are having trouble with an assignment, I encourage you to look at not just one, but many examples of work done by others. Study the examples. See what you can learn from them. Do not automatically trust that they are right. They may be wrong.

<http://en.wikipedia.org/wiki/Plagiarism> has a wonderful article on plagiarism. Read it if you are not familiar with the term. Essentially, plagiarism is when you present the intellectual work of other people as though it were your own. This may happen by cut-and-paste from a website, or by group work on homework. In some cases, plagiarism may also create a violation of copyright law. If you borrow wording from someone else, identify the source.

Intentional plagiarism is a form of intellectual theft that violates widely recognized principles of academic integrity as well as the Honor Code. Such plagiarism may subject the student to appropriate disciplinary action administered through the university Honor Code Office, in addition to academic sanctions that may be applied by an instructor.

Inadvertent plagiarism, whereas not in violation of the Honor Code, is nevertheless a form of intellectual carelessness that is unacceptable in the academic community. Plagiarism of any kind is completely contrary to the established practices of higher education, where all members of the university are expected to acknowledge the original intellectual work of others that is included in one's own work.

IT 280: On exams you are required to work from personal memory, using only the resources that are normally present on your computer. This means the exams are closed book and closed notes.

Faculty are responsible to establish and communicate to students their expectations of behavior with respect to academic honesty and student conduct in the course. Observations and reports of academic dishonesty shall be investigated by the instructor, who will determine and take appropriate action, and report to the Honor Code Office the final disposition of any incident of academic dishonesty by completing an Academic Dishonesty Student Violation Report. If the incident of academic dishonesty involves the vio-

lation of a public law, e.g., breaking and entering into an office or stealing an examination, the act should also be reported to University Police. If an affected student disagrees with the determination or action and is unable to resolve the matter to the mutual satisfaction of the student and the instructor, the student may have the matter reviewed through the university's grievance process.

2.8.4 Sexual Harassment

BYUH's policy against sexual harassment complies with federal Title IX of the Education Amendments of 1972 to protect university students from student-to-student sexual harassment both in and out of the classroom setting. Any incidents of such student-to-student harassment should be reported to either the Director of Human Resources (808-675-3713) or the Honor Code Office (808-675-3531). Allegations of sexual harassment are taken seriously. Upon receiving a report of sexual harassment, the Director of Human Resources will take appropriate action to resolve and correct conditions resulting from individual perceptions or from inappropriate behavior.

Chapter 3

Task SN Skill with Numbers

Networking uses several different number bases, with the most important one being binary.

This exam consists of 40 questions. There is a practice test with many more questions. As you answer each question, it will tell you whether you got the answer right nor not, and will let you try again until you do get it right.

To study for this test, use the Networking 101 textbook. The training for this is currently in section 19.4, Converting Between Bases, that starts on about page 169.

Future changes to the textbook may cause this to move, but if so you can look in the textbook index for “convert”. You will find the following entries:

- convert binary to decimal
- convert binary to hex
- convert binary to octal
- convert decimal to binary
- convert hex to binary
- convert octal to binary

20 Easier Questions

There are 5 questions that ask you to convert a number from binary into base 8 (octal).

There are 5 questions that ask you to convert a number from base 8 (octal) into binary.

There are 5 questions that ask you to convert a number from binary into base 16 (hexadecimal, or hex).

There are 5 questions that ask you to convert a number from base 16 (hex) into binary.

20 Harder Questions

There are 10 questions that ask you to convert a number from binary into base 10 (decimal).

There are 10 questions that ask you to convert a number from base 10 (decimal) into binary.

Chapter 4

Task SS

Skill with Subnets

Networking uses IP addresses. The currently prevailing scheme is called IPv4, and divides the IP address into two parts: the network address and the host address. Subnetting divides the IP address into three parts: the network, the subnet, and the host.

This exam consists of 40 questions. There is a practice test with many more questions. As you answer each question, it will tell you whether you got the answer right nor not, and will let you try again until you do get it right.

Chapter 5

Task SV Skill with VLSM

This will be explained later in the semester. It is worth 50 points of pure extra credit.

Chapter 6

Task L1

Ethernet Cable

- Status: Officially Assigned.
- Discussed: Mon, Sep 23.
- Due Date: Mon, Sep 30, 14:20.
- Deadline: Fri, Oct 18, 14:20.
- Grading Label: **L1**

Summary: Construct a working cat5 cable.

Section 10.5 of the textbook provides background.

I will provide 8P8C (RJ45) ice cubes, cable, a cutter-crimper, and a cable tester. Most people complete the task in class within an hour, but some do not. You are allowed to borrow the equipment and return it later.

Grading Rubric (Rules for Grading)

20 Cable works as verified by cable tester.

20 Cable ends are neat (1/2 inch of wire).

Chapter 7

Task L2 Router Configuration

- Status: Officially Assigned.
- Discussed: Mon, Oct 14 and later.
- Due Date: Fri, Oct 25, 14:20
- Deadline: Fri, Nov 1, 14:20
- Grading Label: **L2**

7.1 BEFW11S4 Router

We will be using the Linksys BEFW11S4 home router.

<http://support.linksys.com/en-us/support/routers/BEFW11S4> has documentation.

7.2 Wiring

Our first task is to insert the router between our ISP (the school) and our lab computer. Before we do this, we must make sure the lab computer is properly logged in.

Set the router on your desktop. Plug it into its power supply.

Find the cable from the ISP (the school) to your lab computer.

(ISP) ~~old-cable~~ (Lab Computer)

Unplug the cable from the computer and plug it into the Internet port on the router. This port is sometimes labeled WAN (Wide Area Network) or Uplink.

(ISP) ~~old-cable~~ (Router) (nothing) (Lab Computer)

Next, run a cable from one of the four downlink ports (labeled 1, 2, 3, 4) on the router, right back into the network port on the lab computer.

(ISP) ~~old-cable~~ (Router) ~~new-cable~~ (Lab Computer)

When we are done, we will return the wiring to its original configuration.

7.3 Reset The Router

Unless you know the router's administrative password, it will be necessary to reset the router. This gets rid of any passwords and other settings that others may have established. It gives us a clean slate to work with.

Find the red button on the back of the router. It is recessed slightly. Use a pencil or pen (or some other appropriate tool) to hold down the reset button for about ten seconds.

While you are holding down the reset button, if possible, watch the lights on the front of the router. After about ten seconds they will flicker once or twice. This is a signal to you that the reset has been accomplished. If you cannot watch the lights, just hold the reset for a few more seconds to increase your chances of success.

If you are working with a different router, and the reset method is not obvious, do a Google search for "(router model) reset" for advice.

7.4 Find Your Gateway's IP Address

On the lab computer, run the ipconfig command. You are looking for the IP address of your gateway. If you did a reset, it will be:

```
192.168.1.1
```

If you are using a different router, similar rules apply.

7.5 Browse to the Gateway

The gateway is running its own mini-webserver. This webserver gives you the way to manage the configuration of the router.

On your lab computer, open a browser. In the URL space, type in the IP address of the gateway.

The router will respond by requiring you to authenticate (log in). For the BEFW11S4 router, the username and password are as follows:

Username: (just leave this blank)

Password: admin

If you are working with a different router, and you do not know the default password of that router, do a Google search for “(router model) default password” for advice.

7.6 Establish A New Password

Select the Administrative tab. You should see a way to key in a new administrative password. Do it. This will keep others from changing your configurations and taking control of your router.

After saving your new password, the router will require you to log in again because your old password is no longer correct.

7.7 Explore The Settings

You can look ahead to the graded task (the last section of this chapter) to see what things will be required of you.

You should explore the settings available to you through the web interface to the router. See if you can figure out what they do. Ask questions in class about the configuration options.

7.8 MAC Address Cloning

Some ISPs will tie a connection to a specific MAC address. If you want to change computers, you would need to wait for the old MAC address to expire. This can take several minutes (or possibly much longer).

To avoid this problem, many routers provide the ability to clone the MAC address of the computer you are using, and then present that MAC address when talking to the ISP.

You may be required to do this. Even if you are not required, it does not hurt, and is probably a good idea.

7.9 Use The Internet

The purpose of being connected is to use the Internet. Make sure the lab computer can browse the Internet. You already know it can reach the router. Going beyond the router will prove that the router is working.

7.10 Establish A Wi-Fi Hotspot

Create a suitable password for your Wi-Fi access point. It will probably need to be at least eight characters long.

Create a suitable SSID (Service Set Identifier) for your Wi-Fi access point. It can be up to 32 characters long.

7.11 The Graded Task

You will be working with the teaching assistants in GCB 103. They will have posted hours on their door. Check in GCB 103 for the correct times.

Print out the next page, write your name on the sheet, and take it to the teaching assistants.

The TA will fill in the other top blanks of the sheet. Then they will give you a router to work with and a place to work.

Complete the activities on the sheet and have the TA check your work. They

should sign the sheet.

Bring the sheet to me so I can record your credit.

7.12 Allowable Helps

As you do this lab, you should be working alone, without assistance of other students, and without consulting the Internet.

You are allowed to bring one page of personally hand-written notes. (Written by you yourself. Not printed. Not photocopied.)

Besides your notes you should have no other helps.

1 Teaching Assistant Selections

Use the BEFW11S4 router provided by Bro Colton via the TA.

The teaching assistant (TA) should randomly select values for the following items. Write the values selected in the blanks below.

- (1) _____ Specify a LAN network number (third quad) between 2 and 255.
- (2) _____ Specify the Router Inside IP Address (last quad) between 2 and 99.
- (3) _____ Specify an Administrative Password to be used.
- (4) _____ Specify a Wi-Fi Password to be used (8+ chars).
- (5) _____ Specify a Wi-Fi SSID to be used.
- (6) _____ Specify a Wi-Fi Channel (1-11) to be used. (Not 6.)

2 Router Configuration

Use a laptop provided by the student, or a computer provided by the TA. The student demonstrates each item to the TA, or the TA verifies the item. The TA should initial the blank at the start of the line. When all items are verified, the TA should sign below. Where (1) through (6) are mentioned, replace them by the values specified above.

_____ (1a) Reset the router. Prove that this was done by showing the router configuration.

Call for the TA to verify the item above.

_____ (2a) Set the router network to 192.168.(1).0.

_____ (2b) Set the router internal IP address to 192.168.(1).(2).

_____ (2c) Set the administrative password to the value (3) shown above.

_____ (2d) Set the Wi-Fi password to the value (4) shown above.

_____ (2e) Set the Wi-Fi SSID to the value (5) shown above.

_____ (2f) Set the Wi-Fi channel to the value (6) shown above.

_____ (2g) Activate Logging.

Call for the TA to verify the items above and below.

_____ (3a) Demonstrate that the laptop has an IP address issued by the router.

_____ (3b) Demonstrate that the laptop is connecting through the router to the Internet, and that several different web sites can be visited successfully.

_____ (3c) Demonstrate that Logging has occurred.

TA certifies that the lab was completed. Student or TA returns the form to the instructor.

_____ TA Signature

_____ TA Name

_____ Date

Chapter 8

Task L3

Wi-Fi Site Survey

- Status: planned.
- Discussed: Mon, Nov 18
- Due Date: Mon, Nov 25
- Deadline: Mon, Dec 02, 23:59
- Grading Label: **L3**

A Wi-Fi Site Survey is checking for Wi-Fi signals that already exist in various places.

Your task is to visit several locations and record your findings. Then you will report the things you found interesting.

What is interesting? It depends on your purpose.

Are you planning to set up a new hotspot? Then you do not want to conflict with the channels already in use.

Are you planning to connect to free Wi-Fi with your laptop? Then you want something that is unlocked and has a strong signal. (Some businesses provide Wi-Fi to their customers: food places, laundries, doctors, hospitals, anyplace that keeps you waiting around, or wants to keep you around.)

Are you just looking for amusing WAP names? Then that would be interesting all by itself.

I am told that the visits and recording can be done in an hour or two, and the write-up is not terribly hard. Do not procrastinate.

This lab is to be done alone. You can travel in a group, but do not share your results. Make this your own work.

You may already own a Wi-Fi Hotspot Finder. It might be built into your laptop or cell phone. You are welcome to use it instead of the one I make available.

But if you need one, I will check out a Hotspot Finder to you in class. I will show you how to use it. Step one: Basically you just go someplace, turn it on, let it find all the hotspots, and then you write down the results. Step two: summarize your results and report them.

8.1 Writing Your Report

Your report should not mention your own name or identify you in any way. Your report will be a plain-text write-up of your research. You will submit it through DCQuiz.

Probably you should prepare your report using a text editor like Notepad++, and then cut and paste it into DCQuiz.

Overview: Start your first paragraph with the word “Overview:”. Then explain what you are trying to do, which is discover the Wi-Fi hotspots that are conveniently available to you as a student at BYUH in Laie.

Equipment: Start your second paragraph with the word “Equipment:”. Then tell what equipment you used in doing this research. Did you use one of the hotspot detectors that I make available? Did you use an app on a smartphone? What app? What kind of smartphone? Android? Apple?

Locations: Your next seven paragraphs should each talk about one of the places that you researched. Start each paragraph by identifying the location. Then talk about each hotspot you found. Identify each hotspot by SSID name. If possible, tell what its signal strength was. If possible, tell what channel it was using. If possible, tell whether the connection was encrypted or not.

Conclusions: Start your final paragraph with the word “Conclusions:”. Then sum up what you learned.

8.2 Submitting Your Work

You must submit your work using my DCQuiz platform, the L3 assignment. It is basically one question: What is your report? Paste it in, plain text, make sure it is complete, and submit it for grading.

Work that is submitted early will be graded early, and if you did not get full credit, you will have an opportunity to update your report for more credit.

The deadline is Dec 2. The due date is a week earlier.

8.3 Visits

On Campus: Visit at least five places that students might like to study. Summarize your findings.

Off Campus: Visit at least two places around your neighborhood, or around Laie. Make a note of your findings.

8.4 Data

If you use your own smartphone app you will probably have different information available than this. Try to find an app that gives you good information.

The Hotspot Finder gives information about each hotspot it detected. Following are examples of the information you can pay attention to and record.

Scanning.



BYUH-Secure.



(Hidden)



Count: The finder may display something like “1/15”, “2/15”, etc. The bottom number tells how many wireless networks were found. The top number tells which of those networks you are reading about.

SSID: Each reading will tell the SSID, something like “BYUH-Setup” or “BYUH-Secure” or “(Hidden)”. There may be other possibilities. Some of these are very amusing.

Security: Each reading may display something like “WEP” or “WPA” or “unlocked icon”. There may be other possibilities.

ABG: Each reading may display something like “A” or “B” or “G” or “N”. These refer to 802.11(b) and related networking standards. There may be other possibilities.

Bars: Each reading will display signal strength, 0, 1, 2, 3, or 4 bars. There may be other possibilities.

Channel: Each reading will tell what channel is in use. It may be something like “CH1” or “CH11” or “CH48” or “CH149”. There may be other possibilities.

Chapter 9

Task L4

Dia - Network Diagramming

- Status: planned.
- Discussed: Mon, Nov 25
- Due Date: Wed, Nov 27
- Deadline: Wed, Dec 04, 23:59
- Grading Label: **L4**

Purpose: To give you a way to create a network diagram.

Summary: Using the network described below, construct a one-page diagram. Email a PDF of your diagram to me.

You are supporting 4 routers and 6 work groups.

Router r1 connects to: r2 r3.

Router r2 connects to: r1 r3 r4.

Router r3 connects to: r1 r2 r4.

Router r4 connects to: r2 r3.

Work group Frankfurt has 10 users and connects to router r1.

Work group Karachi has 5 users and connects to router r2.

Work group Lima has 39 users and connects to router r3.

Work group Paris has 15 users and connects to router r3.

Work group Quebec has 15 users and connects to router r4.

Work group Vienna has 47 users and connects to router r1.

We will use the Dia Diagram Editor. It is similar to Microsoft Visio. Dia is

available free for Mac, Windows, and Linux (including Ubuntu).

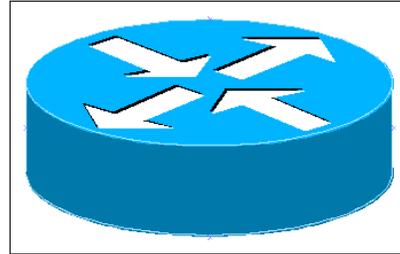
Google search “dia diagram editor tutorial” for instructions.

The required email subject line is:

Subject Line:

Also include it280, L4, your name, and today’s date on your diagram.

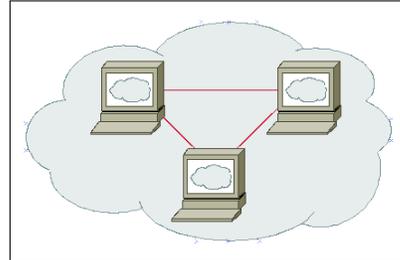
Use this symbol for each router. You can find it on the “Cisco - Switch” symbol sheet. Put a text label on each router that tells its designated name.



Use this symbol for each switch. (Put a switch between each router and its workgroup.) You can find it on the “Cisco - Switch” symbol sheet.



Use this symbol for each workgroup. You can find it on the “Cisco - Computer” symbol sheet. Put a text label on each workgroup that tells its designated name (location) and group size.



Connect the symbols with lines that indicate their wiring relationship to one another. Do not use arrow heads on your lines.

Appendix A

Appendix

A.1 Seeing Your Grade

<https://dcquiz.byuh.edu/> is where I maintain my online grade books.

There will be several grade books. One will have your overall grade. Another will have your effort points.

Each grade is identified by a short label.

A.2 Emailing Me

At times you may want to email me regarding this class, or I may ask you to email something to me.

If you follow these instructions, you will receive an instant reply letting you know that I received your email, and that I will respond to it.

Here are the rules.

To: Preferred destination is doncolton2@gmail.com but you could also use don.colton@byuh.edu. They both end up the same place.

Subject: The subject line is important.

For email in general, it looks like this:

it280 (normal subject line of your choice)

The it280 gets it past my spam filter and helps me organize my work flow.

Trust me, some days I get a lot of email. I don't want yours to be lost or overlooked.

The (normal subject line of your choice) is whatever you want it to be.

For email I requested, it looks like this:

```
it280 (item) (lastname, firstname)
```

The (item) is usually a program identifier, or the words "study time" or "lab 4".

The (lastname, firstname) is the name by which you are known on my roll sheet. We will agree on that name early in the semester.

I often reply with "done" so you know I updated your study points.

Email is not 100% reliable. Maybe your email was lost. Maybe my reply was lost. If you do not receive the first reply almost instantly, it probably means I did not get it. Check your sent mail, fix if necessary, and try again. Do you have the correct email address for me? Did you put "it280" at the start of the subject line?