

1/25/2011

Abler Linux Lecture 1

29

3/5/2011 ☒ Assignment 1 is up on the Wiki

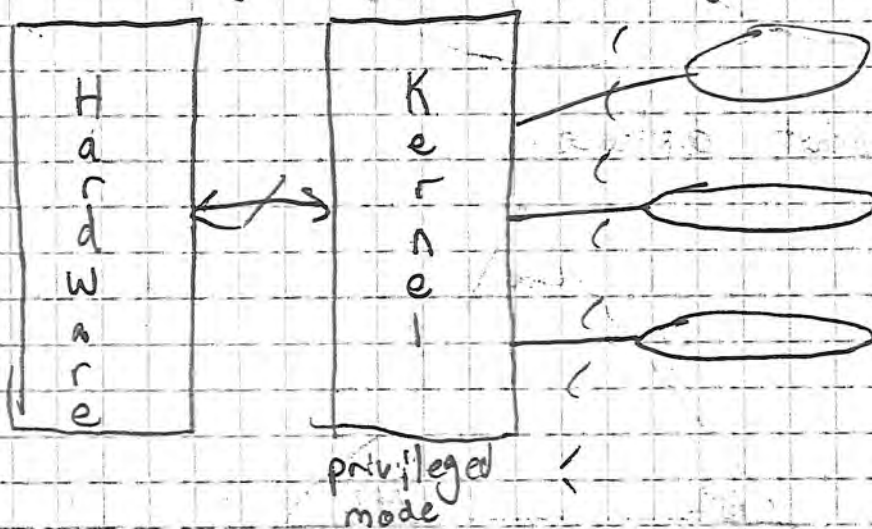
Richard Stallman - GNU (1983)

Linux is just the Kernel

Kernel - guts of the operating system

What makes up a Linux Operating System

- Boot components
- Kernel
 - Device Drivers
 - Modules
- Programs
- Libraries
- Filesystem



`man -k <keyword>`

`env` lists environment variables

`;` is a command delimiter

`while true; do`

`ls -lh xyz`

~~`touch xyz`~~

`sleep 10`

`done`

`echo hello >> xyz`

Wireless APs features / limitations

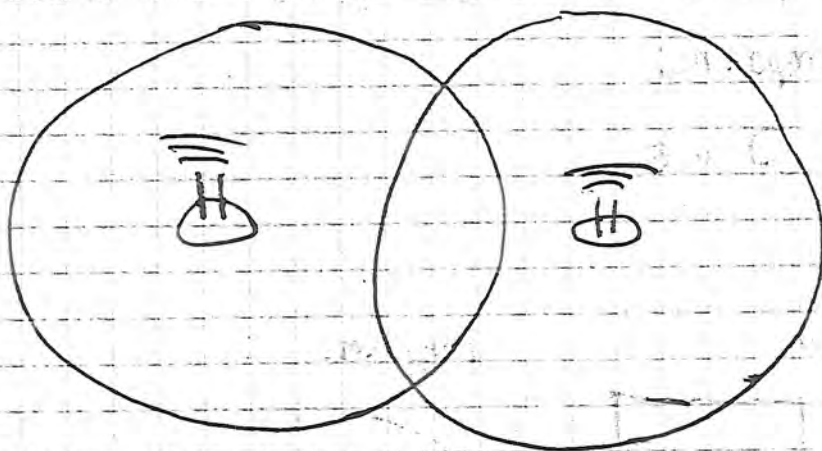
Tasks

Do readings

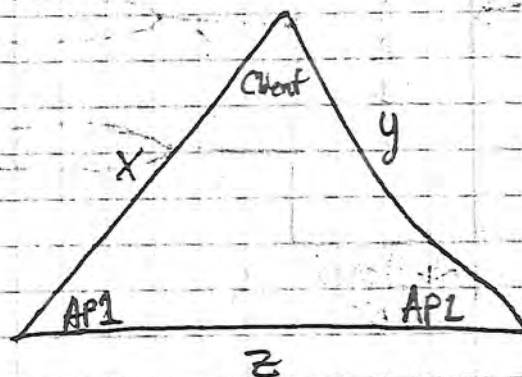
Piedmont Park Measurements (attempted 01/29/2011)

Put radiation patterns up on the Wiki.

Put Seksan's UDP code on SVN (Rich)
(check w/ Ghazi if there is a wireless subteam repo.)



- APs broadcast distance



What happens as x, y, z vary?

1/29/2011

Today Pepe, Martha, Jung, Mohamed, and I tried to take measurements in Piedmont but due to increasingly nice weather and an abundance of people we were unable to take any such measurements.

10/1/2011

Abler Linux Lecture 2

31

understanding linux file permissions

a program is run by some user. that program is associated with that user and has its permissions.

bash (born again shell)

programs inherit the userid of the user that executed the program.

userid unique # for the user

/etc/passwd



programs ask the kernel to do things; these requests have the userid of the program that asked the kernel.

most of linux security is file permissions:

triplet of permissions.

r w x r w x r w x
user group other

r : read

w : write

x : execute

groups : kind of like a user id that can be shared by multiple people.

a user can be associated with multiple groups.

hierarchy is user, then group, then other
the first match is used as the permissions.

kernel doesn't check file permissions if the user is root

id : has info about a user

32

02/04/2011
Conf

a file can only have one group associated with it.
root can change the owner of a file

chmod works well with a triplet of octal numbers.

$\begin{matrix} & s & & s & & (t) \\ r & w & x & r & w & x & r & w & x \\ & \uparrow & & \uparrow & & \uparrow & & \uparrow & \\ & \text{set user id} & & \text{set group id} & & & & & \end{matrix}$

chmod <triplet> filename
chown
chgrp
id
newgrp

default file permissions: uses umask

read a directory: ~~list~~ files in the directory.
write a " : write / delete a file in a directory
execute a directory: can execute a known file

/etc/passwd
/etc/group

/etc/shadow: where password hashes are stored.

02/08/2011



HW Assignment 2

02/02/2011

Sub-team Meeting

02/03/11



e-mail jdumond3@mail.gatech.edu about SVN

02/04/11



finish readings

Put URL on wiki

- note the physical makeup of the suites

02/06/11



Freedom Park, Inman Park

Sunday: 12(Noon) meet VL 465

- Price laser "tape" measure
- Lates

- Standard Input Keyboard

Standard Output } Window

Standard Error } Screen

- Standard Output redirect ">"

ls > <filename>

- Standard Input ~~file~~ redirect "<"

more <<filename>

- Connector (pipe) "|"

stdout → stdin

ls -lR | more

"|&" sends both stdout and stderr to the other process.

- grep Global Regular Expressions

~~grep~~

grep <pattern>

- ssh secure shell

can also be used to execute a command on the remote machine

- ~~&&~~ && only execute if successful exit status.

ex.: cmd1 && cmd2

- || only execute if unsuccessful exit status.

- /dev/null is kind of like a black hole for bits and just throws the contents away.

7

08/2011

cr. conf.

file system concepts

file 3, 7, 2, 58

list of free 0, 4, 5, ...

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- ...

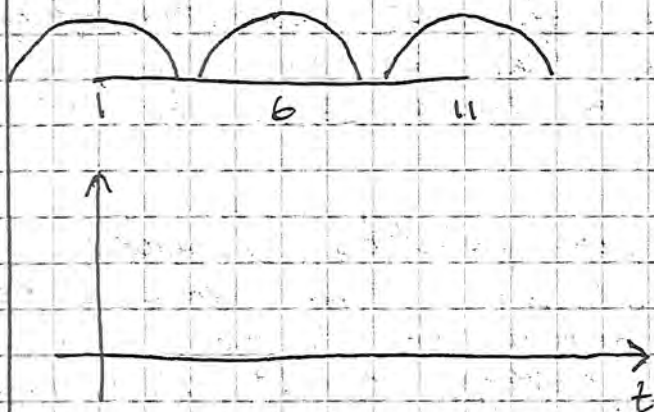
Useful Commands

- clear : clear the terminal's contents
- less : j, k, space for navigation
- du : disk usage
ex. du -sh <filename directory>
- the "&" when appended to the end of a command runs the job in the background.
- jobs : show the running jobs.
- kill : kill jobs, % uses local job #
- ctrl-c : abort
ctrl-z : stop (suspend)
- fg %<#> : resumes stopped process in foreground.
- bg %<#> : resumes stopped process in background.
- ps : shows this list of running commands
-ef ; everything, full details.
- top : lists the running processes sorted by CPU usage
- nice / renice : help set CPU priority for a process.
- pstree : tree structure of processes running.

09/2011

Sub Team Meeting

33



User A

User B

Carrier Sense Multiple
Access / Collision Avoidance

CSMA/CA

- Random Access Communication Protocol
- Time Division Multiplex
- Frequency Division Multiplex

Collision Avoidance

- Listen Before Transmit
- Transmit if Channel Idle
- Reschedule if Busy

A random time in next
 $2^i \times$ seconds where i
 is number of collisions
 suffered.

☐ Send e-mail with instructions on how/where to meet.
 (I showed them a Google Map in person)

$$\text{Bit Rate} = \text{BW} \times \text{Spectral Efficiency}$$

Bits/sec/Hz

Typ. 3~3

4/2010

Today we went into the President's Suite and took
 some measurements. We ran into a few problems with
 the APs so that limited what we were actually able to
 accomplish.

We did not receive useful data from the President's

12/18/2011
cont.

We have screenshots of the networks that we saw that give us an idea of what kind of wifi is already in the building. Perhaps the most interesting thing was the Zwire SSIDs that we saw. Pepe and Mohamed saw that those are the default SSIDs for ATRT's UVERSE.

Most of the APs were predictably GTwireless and on the typical channels 1, 6, & 11. There were a few odd things that we saw including the Zwire APs. The Zwire APs were on channels 4, 6, & 9 which means that they are interfering with each other and the GTwireless.

Later in the day I started to look for an alternative to WifiForum for the iPhone. During testing it became evident that WifiForum only displays the strongest AP for an SSID so an SSID like GTwireless in fact has many more APs than were shown. Searching on Cydia I found Wifi Analyzer, of which there were two of. I installed the free one and quote like it. It has many of the same features as WifiForum but it shows all of the APs that it can see.



Bring up Wifi Analyzer in the sub-team meeting

1/15/2011

Abler Linux Lecture 4

- echo \$PATH shows the path variable, a colon delimited string that shows where the OS will look for programs to run.
- export makes a variable a global variable in the shell
- PATH=\$PATH:/home/<username>/bin
export PATH
- LD_LIBRARY_PATH
- ldconfig
- ldd tells you what libraries are required to run a program. (ex: ldd /bin/rs)

13/2/11
t.

In Linux the first and only program that the kernel runs is init.

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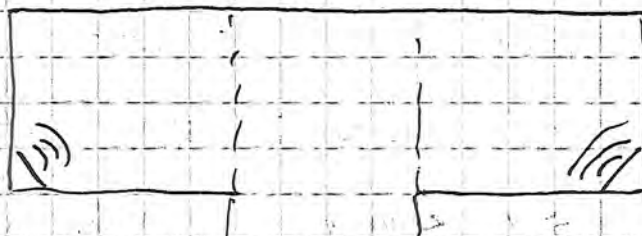
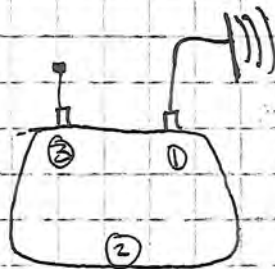
RPM - RedHat, Fedora
APT - Ubuntu, Debian

What package is falls gedit? What packages does gedit depend on?

✓

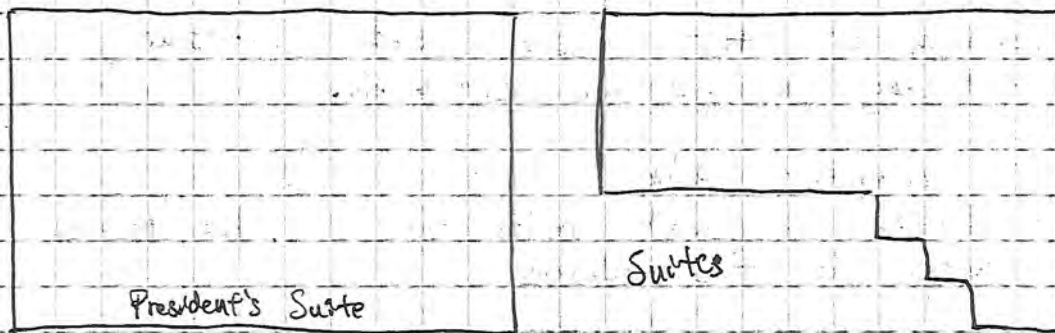
Assignment

16/2/11



~ 200 people in President's Suite

Cross Section of Suites



Report (Before Spring Break)

- 1) Configuration of Suites
 - types
 - sizes
 - number of people

- 4) Deployment Options
 - Better to be above than behind
 - From side
 - Cost

- 2) Data Usage Forecast
 - bits / sec / user
 - Usage

Goals

- Suites have best coverage
- Better BW (High throughput, low latency)
- Fewer dropped connections
- Suites have other ~~Suites~~ stuff (may not be avail. in stands)

- 3) Measurements

Abler Linux Lecture 5

1/22/2011

ifconfig -a

/etc/hosts

/etc/resolv.conf

The DNS configuration file

/etc/sysconfig

/etc/init.d

- |sof List open files

~/<user name>/, ssh/authorized_keys.

ssh-keygen make a Pub/Priv keys.

1/24/2011

March 11 Cisco People are showing up.

11



- Presentation for Cisco (each sub-team)
- Ready to go for next week.

am
meeting

- VIP computer Policies

- Dr. Abler & Ghauri added the PC. We no longer have admin access to the machines.

- Notebook check is next week. Peer evaluations are also likely to happen.

Web Apps

- Individual pages have been made.

Sensor Nets

- Purdue Competition contest
- hand waving, motion.

WiFi

- Take measurements.
- Get more data.

A/M - Association Point-to-Point Machines.

1/23/2011

Sub-Team Meeting

39

- Avg. Web Page Size : 320 KB = 2560 Kb
- Avg. Time / Site : 56 seconds
- Commercial APs : 30 users / AP
- Approximating the presidential suite @ 10yds x 35yds and 100 people there is 3.5 square yds / person.
- Estimate During Game Play

$$\frac{20 \text{ users} \mid 350 \text{ Kb/s}}{1 \text{ user} \mid 1000 \text{ Kb/s}} = 7 \text{ Mb/s}$$

$$\frac{7 \text{ Mb/s}}{4 \text{ Mb/s}} \mid 1 \text{ AP} = 1.75 \text{ APs}$$

Channel	# APs
1	8
4	4
6	7
9	1
11	15

- ☐ have references on wiki (papers, measurements, etc.)
- ☐ have new students try and read papers weekly run by Drs. Abler & Coyle
- ☒ find size of videos to figure out throughput of network
- ☒ make plans to measure the suites and send to Dr. Coyle
- Enable RTS/CTS; find recommendations online, when to use and when not.
- When do devices fall down in data rate? Are all users affected?

1/01/2011

Needed By Tomorrow (03/02/2011)

- Measurement Plans for Friday
 - What suites? Have redundant plans in case of conflicts.
- Answer Dr. Coyle's questions from his e-mail about modulation techniques.

Sub-Team Meeting

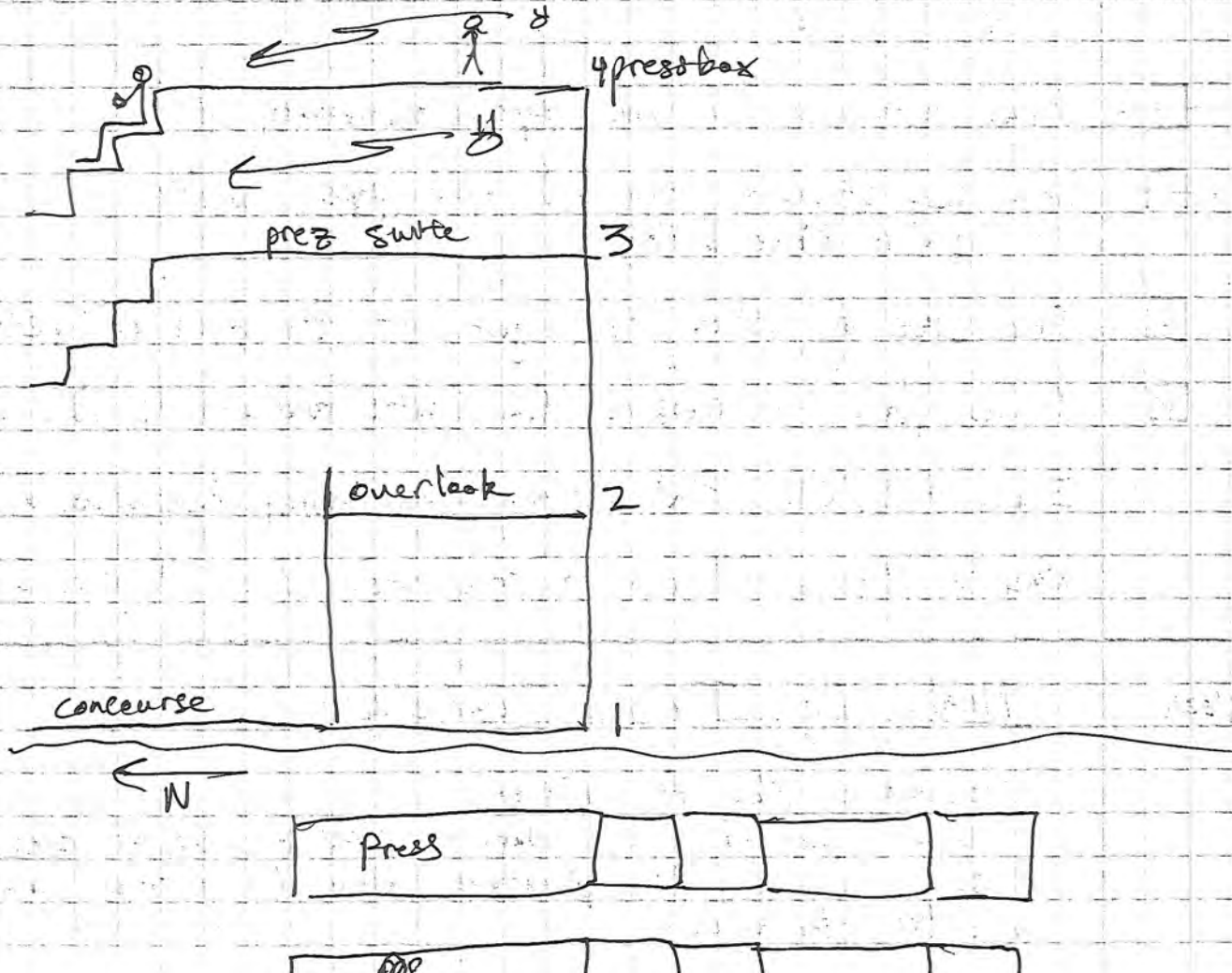
- 02/20/11 - New students read papers weekly
- figure out what happens when someone walks away from AP - Burger Bowl

Need to find out from Friday Measurements

- Do the floors block RF?
- what is the dB loss floor-to-floor?
- What impact do the suite walls/windows have on int-fl?
- Ethernet Locations
- Enable RTS/CTS?

Plan for Friday

- use suites on floor of President's suite & Press box above
 - use suites to left
 - if occupied use the suites to the right.
 - if can't use west use east suites.
- take measurements through out the suites to see if there are differences.



13/02/2011

time domain

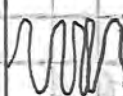
frequency domain

41

Coyle's Lecture

Modulation Stuff

3/2/11



IS.M

2

60

To
by

Use



Mat

$x(f)$

de
ee encyclopedia

sequence of N values of $+1$ and -1 ,
 $2, \dots, N$

≤ 1

1]

er codes

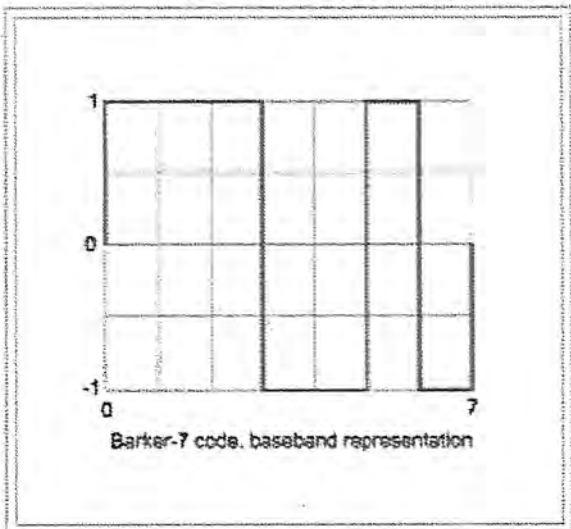
nown Barker codes, where negations and
have been omitted. A Barker code has a
tion sequence which has sidelobes no larger than
better RMS performance than the codes below.
s all known Barker codes; it is conjectured that
y phase codes exist.^[2]

1 Barker Codes

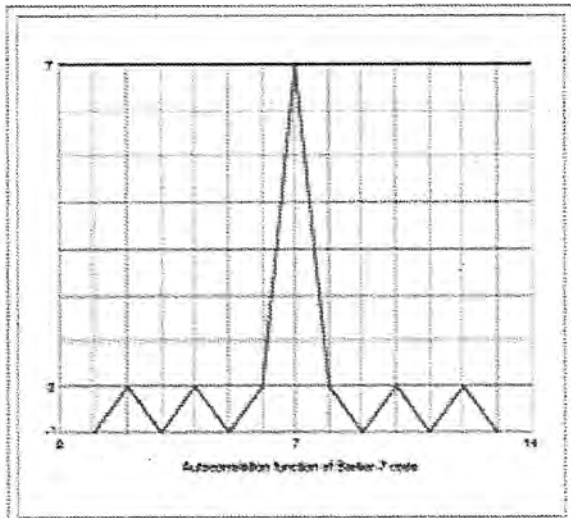
Codes
+1 +1
+1 +1 +1 -1
+1
-1 +1 -1
-1 -1 +1 -1 -1 +1 -1
+1 -1 -1 +1 +1 -1 +1 -1 +1

h 11 and 13 are used in direct-sequence spread spectrum and pulse compression radar
eir low autocorrelation properties.

litudes of the pulses forming the Barker codes imply the use of biphas modulation; that
e in the carrier wave is 180 degrees



Graphical representation of a Barker-7 code



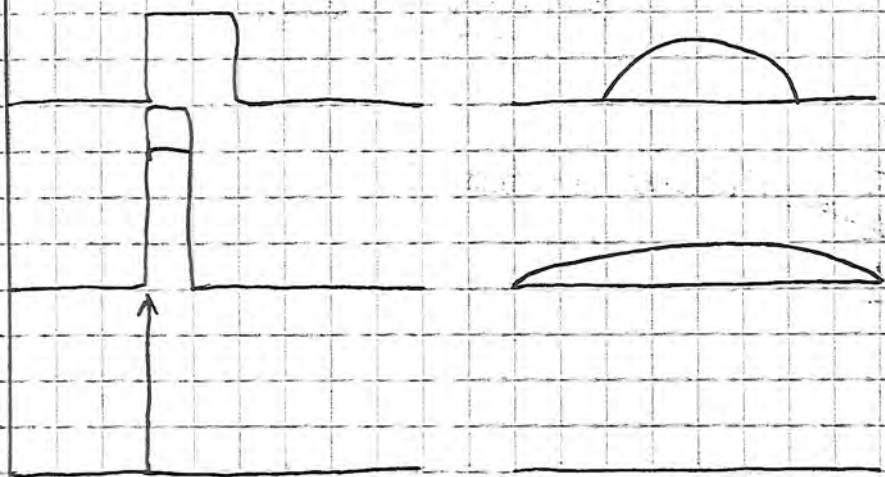
Autocorrelation function of a Barker-7 code

03/02/2011

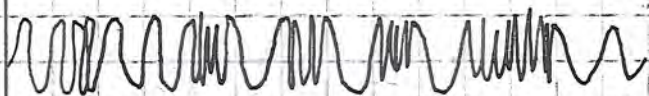
time domain

frequency domain

Coyle's Lecture of Spread Spectrum



Frequency Shift Keying



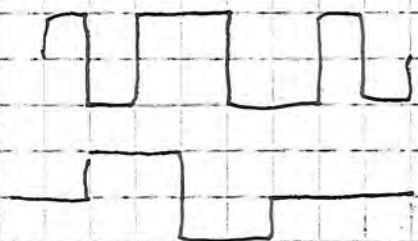
Maxwell's Equations

IS.M. Band - Unlicensed Communication.

2.4 GHz \rightarrow Water Absorbs 100 mW
60 GHz \rightarrow Oz
5 GHz \rightarrow ?

To spread the signal over a wider band can multiply each databit by a "p/n" sequence.

Use Barker Sequence



Data bits



Matched Filter

$$x(t) \rightarrow \boxed{h(t)} \rightarrow \int_{-\infty}^{\infty} x(\tau) h(t-\tau) d\tau$$

03/24/2011



03/03/11

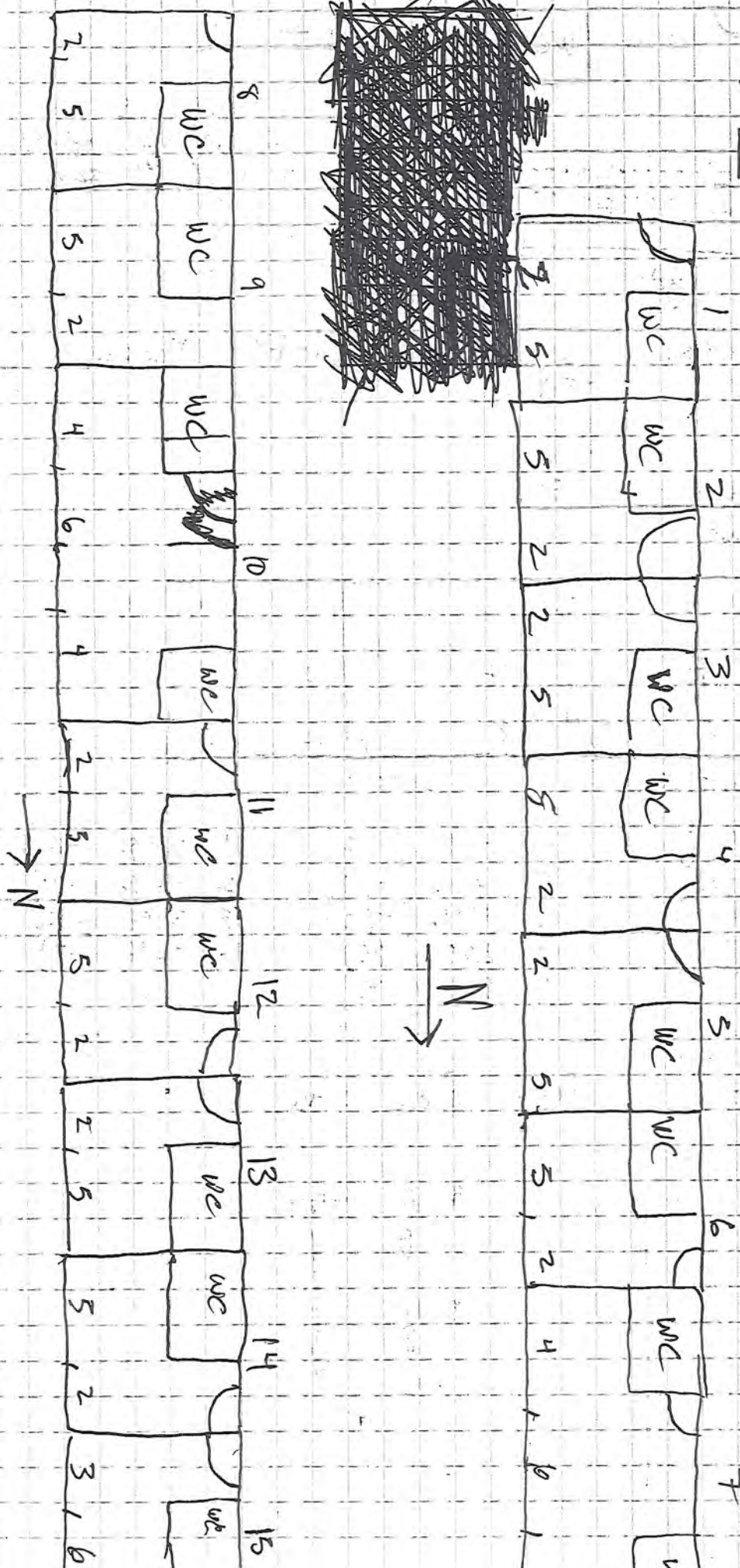
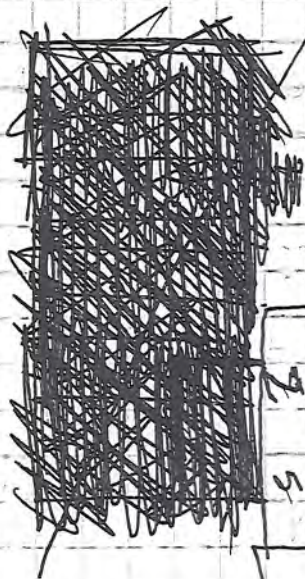
~~XXXXXXXXXXXXXXXXXXXX~~ General Team Meeting

- ✓ Make a PPT for Cisco.
 - ✓ Put model Numbers into PPT showing that we are using Cisco products.
 - Kyle Shields (Suite of the Future) Contact
 - DHS has installed an IP based CCTV network into the stadium.
 - Athletics is interested in North End zone if we can provide wireless internet to the Edge building.
 - Easier to donate "consumer" products rather than infrastructure (routers, switches).
- Title

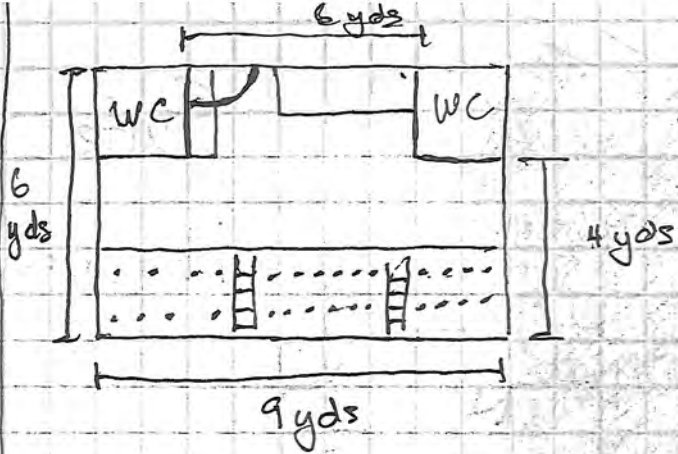
 - Goals for our team
 - Intro with names departments.
 - What we've learned
 - Ask about superbowl
 - Ask about # users on APs.
 - Problems w/ Sensor Nets same ISM band
 - Earlier semesters numbers w/ w/o people to show impact of people on propagation.

- Ultimate Goals
 - Semester Goals

Suite Measurements



03/04/2011
Stadium
cont.



Suite 10

28 suites
- 2 rows of 14 seats
- 4, 6, 7 seats

45%, -68dBm	60%
	-56dBm
73%, -63dBm	55%
	-64dBm

Suite 10

Wi-Fi Measurements

1	A	2	5	9
	E		6	11
3	B	C	4	8
			14	12
				13

Suite 10

Suite 11

1: 45% (-68)	6 48% (-70)	11 30% (-81)
2: 73% (-63)	7 55% (-67)	12 40% (-70)
3: 60% (-56)	8 49% (-62)	13 30% (-82)
4: 55% (-64)	9 23% (-85)	14 52% (-71)
5: 33% (-77)	10 31% (-77)	

AT&T

Pepe's iPhone 3Gs

Rm	Spot	Signal
10	A	-54
	B	
	C	
	D	
11	A	
	B	
	C	
12	A	
	B	
	C	
13	A	
	B	
	C	
14	A	-54
	B	
	C	
15	A	
	B	
	C	

46

3/08/2011

3/09/2011

~~XXXXXXXXXXXXXXXXXXXX~~

We worked on our powerpoint for Cisco.

Dr. Coyle & Dr. Abler couldn't join us due to conflicts.
We continued working on the Cisco presentation.

3/10/2011

General Meeting

Cisco presentation has been rescheduled to next Thursday, same time

TI is coming March 28, 3-5pm.

Where are RJ-45 in the PressBox.

Look at the Pressbox tomorrow (3-11 @ Noon)
w/ Martha & Gantman

We presented our initial findings to the team today
at the measurements we took in the west suites.

Did cisco provide full internet access or some local service @ the Cowboy's Stadium during Superbowl?

Web Apps & Sensor nets went over their presentation again with the entire team.

Have Resumes ready.

Resume site for each subteam

~ 15 Minutes per presentation

Suite & the future mock Suite setup somewhere is a possibility.

3-11-2011

X = ethernet jacks

RJ-45

X

Pressbox

11-2011
cont.

To
th
et
at

4/6/2011

Data Usage Model

16 Ne

17 Cos

- mul-
- theg
- 14,
- other
- Clea
- 51
- 473
- Adwe

30/2011 W
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Have



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Suite
Data
Measu

1/12/2011

1/13/2011 Dr

1/14/2011 - Dr.

- Dr. Atter talked about stack (stack trace) a useful debugging

$$= \frac{65 \text{ ppl}}{AP}$$

$$\hat{n} \rightarrow \frac{16 \text{ ppl}}{AP}$$

$$\frac{P}{6 \text{ ppl}} = \frac{7 \text{ Mbps}}{16 \text{ persons}} = .4375 \frac{\text{Mb/s}}{\text{person}}$$

$$n \rightarrow \frac{36 \text{ ppl}}{3 \text{ APs}} = \frac{12 \text{ ppl}}{AP}$$

$$\frac{P}{2 \text{ ppl}} = \frac{7 \text{ Mbps}}{12 \text{ person}} = .583 \frac{\text{Mb/s}}{\text{person}}$$

$$= \frac{50 \text{ ppl}}{AP}$$

$$\text{station} \rightarrow \frac{12.5 \text{ ppl}}{AP}$$

Stack (Stack trace) a useful debugging

Dr Hder talked about Linux program for

script B

(cond; cond2; cond3) &c

Rich Rave

GTM

11-2011
cont.

Today we went and took a quick look around the Press Box of the stadium looking for ethernet jacks. I drew a diagram (on previous page) of where they were located.

During the examination we noticed that none of the jacks work. We also noticed slight diff in the floor plan between the first and second floors.

-16

No Meeting!

-17

Cisco presentation

- multicast doesn't work well over wireless
- they had indoor & outdoor networks in Dallas. No encryption. Interf.
- 14,519 clients before game; 12,924 during game, 6,500 peak
- almost 1000 APs used, 2Tx antennas, 3Rx ant, 30% overlap, 30° antenna
- Clean Air to monitor actual RF spectrum, freq. monitoring (UHF)
- 51 APs changed power levels, 11 changed channel
- 473 unique rogue APs (Mi-Fi, sprint onardrone)
- Advertising for WiFi, Mesh networks for outdoor Applications

30/2011

We had a meeting no one showed up!
We went to Walter and AFE.

06/2011

Talked w/ Dr. Adler about priorities for the remainder of the semester.

We split the paper up into sections.



Have draft ready for next week.

(Apr 13)



Send out email with assignments.

Suite Configurations: Martha
Data Usage Forecast: Rich (Mo)
Measurements: Mike, Jung

Deployment Options: Mohamed
Goals: Gaetan, Pepe

1/12/2011

Worked on draft of paper.

1/13/2011

Dr. Coyle looked over our draft of the end-of-semester p

1/14/2011

- Dr. Adler talked w/ sensor nets about the notes. & simplified
- Dr. Adler talked about stack (stack trace) a useful debug

20-2011

Subteam Meeting

To-do

- End-of-semester paper
- Cisco paper (Donation Report / Request)
- Athletics Proposal (will do after SuiteTV demo)
- Competition paper (Due Friday)

Competition paper

Talked w/ Abler about papers.

- Park measurements > Appxes
- Stadium Measurements
- What Challenges we've had & what we've done
 - Lots of people
 - High Demand
 - Antenna Types
 - Existing networks (Lawn, Athletics)
 - Types of users
 - Retro fit Bobby Dodd
 - Shared Spectrum
 - Handoffs
 - Cost Benefits of APs (Nice Cisco vs. Consumer)

-21-2011

LTN

- Talked about Intellectual Property
- Talked about Suite of the Future
- Team Dinner next Thurs. 7 PM Gordon Bieroch

21-2011

We worked on the competition paper. Waggly to late.

-25-2011

We worked on the Cisco competition presentation.
There is finally a plan for West Stands

Intentionally left blank

26-11

Toby Krohn - GT Account Manager, Cisco
 Romie Harrell - College Stadium Sales, Cisco
 Kyle Shields - Premium Sales (Suites) Basketball & Football

70 Suites
 15-34 people

Club chair back seats

Letter Winners Lounge (North)

Terrace (South)

New BBall No Suites all club seats (approx. 500)

Dan Goldberger - Director of Technologies

Andy Blanton - Director of Video Production

IMG Rights Holder
 - All rights on air Radio + TV

- Large AT&T contract

- Cisco -
 Specialized Antennas and other products becoming available now/near future. Stuff that was used in Dallas.

- Concessions & Camera Angles for Suites

- History of Stats for comparisons between now & then

- Concessions are currently outsourced.
 - Revenue share

Radio Feed Stream?

On Demand Device in the home?

Meeting w/ Harrell & Krohn

26-2011

~~Will be a presentation~~
 Cisco competition presentations.
 - Suite TV 2nd / \$250 4au!!

50

4-26-2011

Dinner

Dr. Coyle, Dr. Abler, Pepe, Mo, and I went to
dinner with two cisco people.

Athletics Presentation

context

the problem

actually
have
they want a
team
a-Box.

48/4

26-2011

ues

Dr. Coyle, Dr. Abler, Pepe, Mo, and I went to dinner with two Cisco people.

Bill (Short bearded guy) > Cisco
Matt (Tall guy)

More business oriented presentations. Give context

Don't just jump into the problems explain the problem and then the solutions.

27-2011

Wireless presented to Athletics today. It actually went very well. It seems that we have finally explained what eStadium does. They want a more formal written report. They seem very interested in supporting the Press Box.



Send a formal report to Athletics.

18-2011

TM

- Swift TV gave a demo.

- Dinner is now @ 7:30 PM