name: Linus R.

period: 3

**2.2.2 and 2.2.3B part 1: How the Internet Works**

We might come back to look at 2.2.1 later when we look at Computational Innovations during the 4th quarter. But for the rest of this quarter I would like to focus on how the internet works.

It’s video time! A lot of this information will be presented to you through videos (and more professionally done than the ones I make!) I want you to be able to understand some of the basics and basic terminology around the internet. The videos and PLTW activities will help you do that.

**2.2.2 A quick review**

This is basically a review of decimal and binary number systems and how characters and images can be represented by binary numbers. You will not have to answer questions for the first half of the activity in PLTW, but look through it to make sure you understand all of the concepts.

12-15.

a)What is ASCII (don’t tell me the abbreviation, just tell me what it is used for)?

It is used for representing characters that aren’t numbers.

b) What is Unicode? How is it different from ASCII?

Unicode is similar, but it uses multiple bytes to support most languages.

c) How does a CPU know whether to evaluate a byte as a number or as a character?

The software distinguishes between numbers and characters.

d) What is a bitmap file?

A file where an image is stored by saving every pixel as an rgb value.

16. What will the bitmap file given in PLTW render on the screen?

A diamond

17. a) Let's now consider a bitmap that has a 2-bit color scheme. How many unique colors can be represented using 2 bits? List them here.

4, white, light gray, dark gray, black

b) Explain how vector images can be used to render images in a file of smaller size than if the file were a bitmap image.

They render images in smaller size by defining them using shapes and lines, instead of by pixels.

Conclusion

C1. *Without* converting the numbers to decimal, sort the following binary numbers in descending order (largest to smallest):

* 1. 10100101
  2. 10100011
  3. 10001100
  4. 10001010
  5. 01000100

C2. Create your own numbering system:

* 1. Choose a single-digit base that is greater than 2.

3

* 1. Identify all the available digits in your system.

012

* 1. Create a table showing the first four place values of your system.

|  |  |  |
| --- | --- | --- |
| 0000 | 0001 | 0002 |
| 0010 | 0011 | 0012 |
| 0020 | 0021 | 0022 |
| 0100 | 0101 | 0102 |
| 0110 | 0111 | 0112 |
| 0120 | 0121 | 0122 |
| 0200 | 0201 | 0202 |
| 0210 | 0211 | 0212 |
| 0220 | 0221 | 0222 |
| 1000 | 1001 | 1002 |
| 1010 | 1011 | 1012 |
| 1020 | 1021 | 1022 |
| 1100 | 1101 | 1102 |
| 1110 | 1111 | 1112 |
| 1120 | 1121 | 1122 |
| 1200 | 1201 | 1202 |
| 1210 | 1211 | 1212 |
| 1220 | 1221 | 1222 |
| 2000 | 2001 | 2002 |
| 2010 | 2011 | 2012 |
| 2020 | 2021 | 2022 |
| 2100 | 2101 | 2102 |
| 2110 | 2111 | 2112 |
| 2120 | 2121 | 2122 |
| 2200 | 2201 | 2202 |
| 2210 | 2211 | 2212 |
| 2220 | 2221 | 2222 |

* 1. Show an example of a number in your number system and its conversion to decimal.

1221 --> 52

**2.2.3B part 1**

Time to watch some videos.

We will watch the first video from this PLTW activity, as well as [The Dawn of the Internet](https://www.youtube.com/watch?v=hymzoUpM0K0&t=63s) in class. There are a couple other videos in this activity in steps 2 and 3 you will watch. There is also a great collection of videos put out by code.org that I have linked in the Modules in Canvas. All of these should help you understand the basics of how a computer works and how data is transmitted across the internet.

2.

1. What is metadata and where is it found in a packet?
2. Give an example of IP packet metadata.
3. What does a packet's payload contain?
4. What is the main difference between an IPv4 and an IPv6 packet?
5. Roughly how many people are there in the world?
6. Roughly how many computer devices that can be connected to the internet do you think there are in the world?
7. Why did we have to come up with another version of IP after IPv4?
8. How many times more IPv6 addresses are there than IPv4 addresses?
9. Do you ever think we will run out of IPv6 addresses? Why or why not?

3. a) What are the two main protocols on the Transport layer and how do they differ?

b) Under Figure 4 in the Other Protocols section of the PLTW activity, there is a little multiple choice quiz. If you didn’t get 6 out of 6 and can’t re-set the quiz, take it again in activity 2.2.3A (they have the same quiz in there in the same section). Paste a snip of your 6 out of 6 question quiz here:

Mr. W’s conclusion

1. What does it mean that the internet has built-in redundancy which makes it fault-tolerant?

**2. Fill in the following phrases in red** after the appropriate term in blue that follows. You may also fill in what the acronym stands for if it helps you to remember, but you must include the phrase given here, as well:

G - software that uses rules to determine whether or not data shall pass from one device to another.

X - a device which acts as an access point for wireless devices to connect to a network.

A - the amount of bits available for data to be used during a session in which applications are run (RAM)

C - The part of the computer that does the processing of data: it receives input, sends out output, puts data in storage and processes data. It’s really the computing part of the computer.

D - The system in which destination IP addresses are found for data transmission to the correct destination.

Hard Drive - A relatively cheap medium for physically sending bits between devices over a short distance, for example in your house or in the classroom or business office.

E - An expensive medium for physically sending bits between devices over long distances, very quickly and with very little data loss.

FTP - A standardized set of rules for transferring a file across the internet.

I - A standardized set of rules related to transferring html files (web pages) across the internet securely.

SMTP - A standardized set of rules related to transferring emails across the internet.

IP - A standardized set of rules related to ensuring that information about packet source, destination and other key information is included in the packet.

TCP - A standardized set of rules that includes identifying the packet sequence number and ensures that an established connection has been made and that all packets have been received at the destination.

UDP - A standardized set of rules that sits on top of IP that is typically used in situations where a lot of data is being streamed and thus shortening the amount of time it takes to deliver packets is more important than verifying their sequence and confirming their delivery.

Z - A relatively cheap medium for sending bits between devices over a short distance via radio waves.

L - A company that provides a service of connecting people’s devices in their homes to the internet through the company’s servers.

J - The large, decentralized, relatively leaderless network of networks that are connected to each other throughout the world, allowing data to be transmitted from one device through to another through the billions of paths available to make this transmission possible.

Y - The collection of files, servers and protocols which make up the web pages people can access and visit for everything from looking at colleges to shopping to watching movies and playing games.

M - A device used to modulate discrete digital data (binary) into continuous wave data (analog) so that it can be transmitted better, and to demodulate analog to digital data so that it can format carried data to be read by the CPU.

U - The amount of persistent data that can be kept on a device.

B - The amount of data that can be transmitted through a medium per second; the “thickness of the pipe” using a plumbing analogy.

Q - Standardized sets of rules.

O - A collection of bytes that is transmitted through the internet.

R - A device used to send packets onto an appropriate path towards its destination.

S - A computer customized to hold a lot of a particular type of data (e.g. database files, web pages or mail folders)

N - Devices that can exchange data with each other.

P - The route that a packet takes from the source to its destination.

1. active memory
2. bandwidth
3. CPU
4. DNS
5. ethernet
6. fiber-optic cable
7. firewall
8. FTP
9. HTTPS
10. the internet
11. IP
12. ISP
13. modem
14. network
15. packet
16. path
17. protocols
18. router
19. server
20. SMTP
21. storage
22. TCP
23. UDP
24. WAP
25. the web
26. wifi