Lab 1.2.6 Binary to Decimal Conversion – Instructor Version

Objective

- Learn the process of converting binary values to decimal values.

- Practice converting binary values to decimal values.

Background

The following is an example of an IP address in 32-bit binary form and dotted decimal form.

Binary IP Address: **11000000.10101000.00101101.01111001**
Decimal IP Address: **192.168.45.121**

Binary data is made up of ones and zeros. Ones represent on and zeros represent off. Binary data can be grouped in varying increments, 110 or 1011. In TCP/IP binary data is usually grouped in eight digit groups called a Byte.

A Byte, 8 bits, can range from 00000000 to 11111111 creating 256 combinations with decimal values ranging from 0 to 255. IP addressing uses 4 bytes, or 32 bits, to identify both the network and specific device. The specific device can be a node or host. The example at the beginning of this lab is an example of an IP address in both binary decimal formats.

A tool that makes the conversion of binary to decimal values simple is the following table. The first row is created by counting right to left from one to eight for the basic eight bit positions. The tale will work for any size binary value. The value row starts with one and doubles, base 2, for each position to the left.

Position	8	7	6	5	4	3	2	1
Value	128	64	32	16	8	4	2	1

Steps

1. Enter the binary bits in row three. For example 10111001

2. Put the decimal values in row four only for the third row 1s. Technically the row two values are being multiplied by row three.

3. Now just add row four across.

Position	8	7	6	5	4	3	2	1	
Value	128	64	32	16	8	4	2	1	
	1	0	1	1	1	0	0	1	
	128		32	16	8			1	= 185

4. Convert the following binary values to decimals:

a. 1110   <u>14</u>

b. 100110   <u>38</u>

c. 11111111   <u>255</u>

d. 11010011   <u>211</u>

e. 01000001   <u>65</u>

f. 11001110   <u>206</u>

g. 01110101   <u>117</u>

h. 10001111   <u>143</u>

i. 11101001.00011011.10000000.10100100   <u>233.27.128.164</u>

j. 10101010.00110100.11100110.00010111   <u>170.52.230.23</u>