CPS 373 Homework 3

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November 16, 2020

1. Software-defined Networks

(a) The entry points to the network, `R1` and `R6`, using OpenFlow Matching Rules, will drop all incoming packets with a `TCP/UDP` Destination Port of 80 (which will drop all incoming packets with `HTTP` data).

(b) Check, again using OpenFlow Matching Rules, we will check incoming packets' IP addresses to see if its originating from the `44.44\16` subnet. Perhaps we could have two routing queues: one queue for packets coming from the `44.44\16` subnet, and another queue for all other packets, and the router routes packets from the first queue before the second queue. These rules and actions would be applied to every router in the network `R1-R6`.

2. Parity Bits

(a) **7 data bits per parity bit; bit error rate of 1%.**

Assuming an even parity scheme, there is a at least one bit flip. We must compute that chance that the total number of flips (out of the 6 remaining data bits) are even *and* the chance that the parity bit is *not* flipped.

The probability of getting exactly k bit flips in n total data bits is

$$\binom{n}{k} p^k (1-p)^{n-k}$$

Where, k = 0,2,4,6, n = 7, p = 0.01, and

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

For this problem we need to sum together at the various possible (even) values of k,

$$\sum_{k=0,even}^{6} \binom{6}{k} (0.01)^k (1-0.01)^{6-k}$$

This gives us a probability that the parity bit successfully detects the error of 0.934063 or 93.4%.

(b) **15 data bits per parity bit; bit error rate of 0.5%.**

Assuming an even parity scheme, there is a at least one bit flip. We must compute that chance that the total number of flips (out of the 14 remaining data bits) are even *and* the chance that the parity bit is *not* flipped.

The probability of getting exactly k bit flips in n total data bits is given above and we'll take k = 0,2,4,6,8,10,12,14, n = 15, p = 0.005.

For this problem we will again need to sum together at the various possible (even) values of k,

$$\sum_{k=0,even}^{14} \binom{15}{k} (0.005)^k (1 - 0.005)^{14-k}$$

This gives us a probability that the parity bit successfully detects the error of 0.930029 or 93%.