COSC 264 – Introduction to Computer Networks and the Internet

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Percentage contribution: 50% each

Questions:

1. A deadlock is a situation where a loop of systems are all waiting on input or output from another system. In the context of networking it could be that a server is waiting for a response packet and the receiver is waiting on a data packet because of packet losses in the system. In our case a deadlock occurs when the final data packet from the sender, the purposely empty packet, is lost. The receiver thinks there is still more data to come so is waiting for an arriving packet, but the sender has finished and is not waiting for an acknowledgement, so will not resend the final packet.
2. The magicNo field is useful for identification of related packets. For example a single sender and receiver could be attempting to send and receiver multiple files simultaneously or close together and the field could be used to differentiate between them. It is also useful as a quick check of packet validity before moving to the checksum.
3. We solved the issue of bit errors by adding a checksum field to the end of the header, which is calculated over only the preceding header fields. This means that either sender or receiver can see if the packet header has changed during transmission, protecting against bit errors.
4. The select function call is a blocking call that waits until one or more of the given file descriptors are ready for input. Blocking means that the call does not use CPU time until there is some input available, this is handled by the OS.
5. After transmission has completed, the diff command was used to check for differences between the sent and received file.

```
[jbe113@cs14142jm ~/Documents/COSC264/Cosc264_Assignment]$ clear
[jbe113@cs14142jm ~/Documents/COSC264/Cosc264_Assignment]$ diff -s in.txt out.txt
Files in.txt and out.txt are identical
```

6. The trend in figure 1 appears linear, with the number of packets sent increasing with the probability of a packet loss. This makes sense as the sender would need to resend more packets in order to account for the increase in packets lost during transmission.

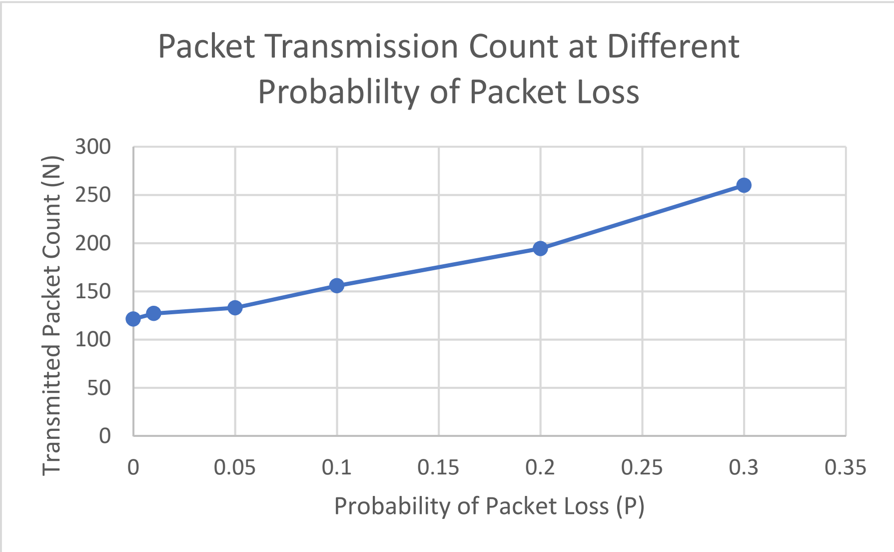

Figure 1

7. The probability that an individual packet is lost when sending in one direction is P(packet lost) = P. Since an individual packet must be sent from the sender to receiver and an acknowledgement packet sent back, this means the probability the sender sending a packet and not receiving an acknowledgement packet back is P(packet not transmitted) = 2P. It follows that the probability of successfully transmitting a packet is therefore P(packet transmitted) = 1 – 2P.
By the use of an inverse binomial distribution, it can be found that the expression for the average amount of transmissions to successfully deliver N packets is:

$$\frac{N}{1-2p}$$

The comparison shown in figure 2 demonstrates the slight impact that the bit errors have on the number of packets that are required to send a file 51,200 bytes long.

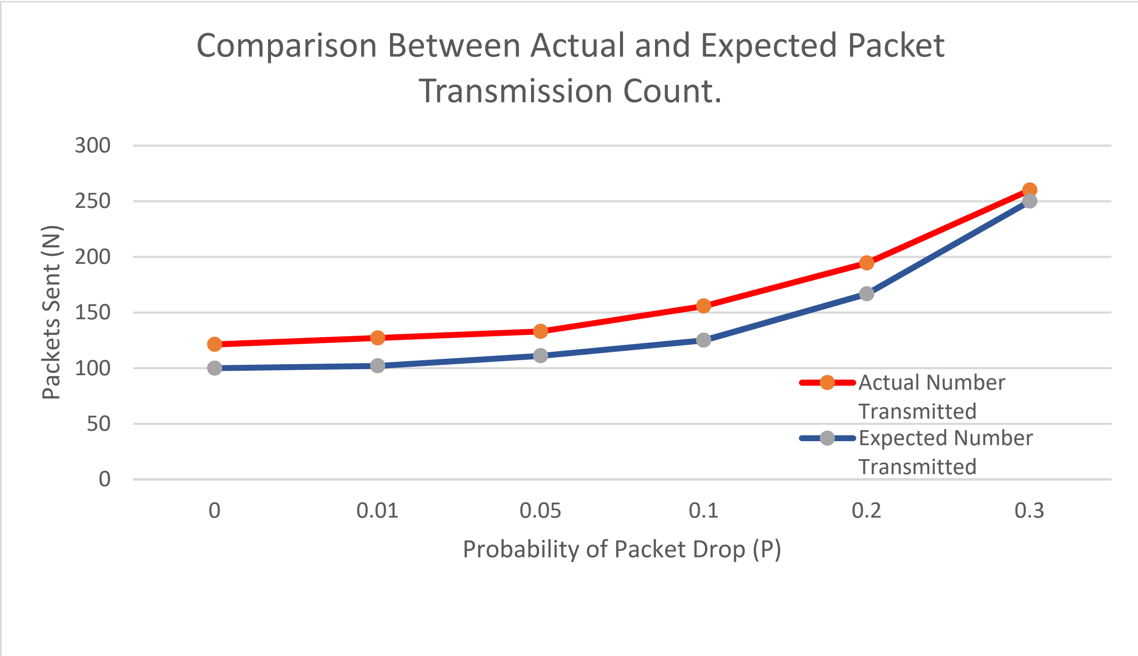

Figure 2