Digicomms Supervision 1

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1.1

Networks allocate a point to point channel for the duration of each connection only, and allocates a different channel each time. FIxed wiring guarentees you a link, and a secure link because there is only you an the recipient on the line. It is more expensive since a wire must be laid for every 2 points that want to communicate.

1.2

A protocol is a standard for encoding information into a communications channel. It defines how to interpret the signals that are received. The protocol defines message ordering, format & sequences of the messages.

1.3

Layering can provide a logical seperation between the applications the communications channel is used for, and the exact implementation. This allows lower layers to be changed without affecting the higher ones. People programming applications for digital communications channels also don't want to bother about the properties of the physical channel - or any things which are common to all the applications running over the channel. The lower layers export interfaces o the layers above, and encapsulates the data given to it in its own addressing headers. THe receiving end does the reverse, higher layers call recieving interfaces on the lower ones to recieve the information.

The headers contain addressing and sequencing data for each layer - which is independent of other layers, but is needed by the peer structure to route the packets at that layer. With too many layers, the extra headers will reduce throughput, and the time to traverse the stack affects the latency

1.4

Headers and trailers are used to denote the start and end of sequences, and carry meta-data relevent to the current layer, usually embedding all the information from the higher layer within them.

1.5

Adding layers increases the amount of extra meta-data that each layer has to transmit, and also enforces extra processing on the nodes - both of which will decrease network throughput.

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2.1 Advantages

Digital data is more amenable to compression and error correction than analogue, particularly error correction. It also allows the data to be sent over general-purpose networks, and stored in general purpose media, that won't degrade over generations of copies, since error correction can be applied, and exact copies can be made.

2.2 Disadvantages

The fidelity of the signal is reduced by the approximations you take when digitising the signal. Increasing the frequency you sample at, and how finely grained a quantization you take, the less errors from digitisations you get. However, increasing both of these increases the amount of data you have to send / store. Te correct balance of these gives the optimum frequency / quantisation to sample at.

2.3 Real-time transport

A guarenteed minimum capacity and delay between the end points is vital for time-sensitive data. Since a late packet is no use, then you'd rather loose packets than have them delayed. With time-insensitive data, it doesn't matter if some of the data is delayed, but we want to guarentee delivery.

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3.1

Both buffer space, and address space are examples of exclusive resources in communication systems. They cannot be used by other people while allocated to one person.

3.2

The amount of resources can be increased by:

3.2.1 Capacity

Better modulation of the signal, compression of the signal can increase capacity, as can improving the quality of the wires - and hence less noise.

3.2.2 Address space

ipv4 - ipv6, and NAT both increase the available address space.

3.2.3 Buffer space

Buy more ram?!

4 notes

4.1 Modulation

4.1.1 Broadband

FM: the amplitude is constant, but the wave is compressed in time for a 1, and distended for a 0. This alters the frequency at each point.

AM: The frequency of the carrier wave is constant, but the amplitude of it is modulated with the data.

PSK: The amplitude & frequency are constant, but the phase is altered with the data.

4.1.2 Baseband

Voltages are used to indicate data (ie 1 =¿ +nV, 0 =¿ -nV)

4.1.3 Attenuation

FM isn't really affected by attenuation, since the frequency is unchanged. DItto for PSK. However, AM will tend for 1 & 0 to be similar after attenuation.

Baseband has a limit difference between definite 0 & 1 signals. With too much attenuation they will not be outside that limit.

Attenuation has the effect of increasing the signal to noise ration, by decreasing the signal. WIth baseband, because it is digital it is easier to do error correction.

4.2 Delay/Bandwidth Product

The storage capacity of the wire - the maximum amount of data you can put in the wire at one time. This defines how fast your protocol can send data before receiving any acknowledgements.

4.3 Baseband encoding

Using voltage levels to indicate 0 or 1 can make it difficult to discern how many a large number of identical signals corresponds to. The solution is to use edge transitions.

With level-indicators, you have to keep the 2 ends in sync with their clocks. The clocks will drift, so you cannot send much data per start/stop bit synchronisation. Edge transition methods, such as manchester encoding, keeps synchronisation with each bit sent.

4.3.1 Manchester Encoding

The sender XORs his clock with the data. The reciever has to have a similar speed clock, which gets re-synchronised every bit, and XORs that with the signal to get the data. This is cheap to build because it just requires a clock and an XOR gate. The resultant data is a falling edge for a 0, and a rising edge for a 1.