REVIEW III

REVIEW (Terminology)

- Packet switching
- Datagram
- Gaussian noise
- Internet
- Message switching
- QAM
- Intersymbol interference
- Pulse shaping
- Router
- OSI reference model
- TCP/IP reference model
- Transmission Control Protocol (TCP)
- Internet Protocol (IP)
- Layering

REVIEW (Terminology)

- Connectionless packet switching (datagram packet switching)
- Virtual packet switching

Digital Modulation

- For BPSK signaling over an AWGN channel in which the two binary signals are transmitted with equal likelihood, the probability of bit error is given by

$$P_b = Q\left(\sqrt{\frac{2E_b}{N_0}}\right) \approx e^{-E_b/N_0}$$

where E_b is the signal bit energy and $N_0/2$ is the two-sided noise PSD. Suppose that the ratio E_b/N_0 is 10 dB.

a) Calculate the probability of bit error for BPSK signaling in the AWGN channel.

b) Suppose $N_0/2=0.5\times 10^{-10}$ watts/Hz, $E_b/N_0=10$ dB, and the data rate is $R_b=100$ kbps. Calculate the amplitude of the low-pass rectangular envelope.

c) Calculate E_b/N_0 (approximately) for a target probability of bit error of 10^{-3}

Cellular Communications

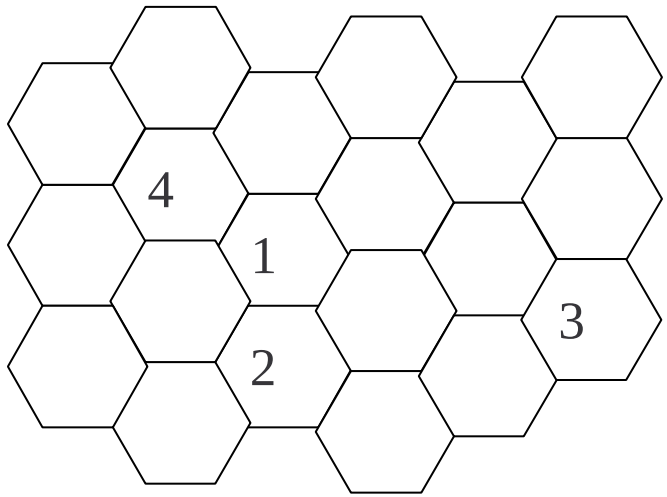
- If the received power at a distance of 2 km is equal to 2μW, find the received powers at 3 km, 6 km, and 15 km for a path loss exponent of 3.8

Cellular Communications

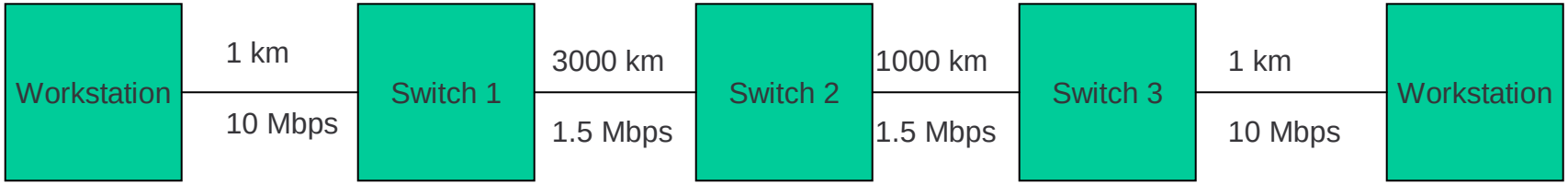
- For acceptable performance, the signal-to-interference (SIR) ratio must be at least 20 dB. What must be the value of the cluster size N? Assume γ to be equal to 3.

Cellular Communications

- Identify the rest of cell numbers in the following 4 cluster cellular layout.



Delay in Packet Switching



- Two choices of packet length are being considered:
  - Option 1: a packet contains 10 miliseconds of speech and audio information
  - Option 2: a packet contains 100 miliseconds of speech and audio information. Each packet has a 40 byte header.

a) For each option find out what percentage of each packet is header overhead.

b) Draw a time diagram and identify all the components of the end-to-end delay. Keep it in mind that a packet cannot be sent until it has been filled and that a packet cannot be relayed until it is completely received (that is, store and forward). Assume no bit errors

Delay in Packet Switching

- Evaluate all the delay components for which you have been given sufficient information. Consider both choices of packet length. Assume that the signal propagates at a speed of 1 km/5 microseconds.
- Solution

→ Number of message bits=10/1000*1Mbps=10Kb

Overhead=40*8/(10000+320)=3.1%

→ Number of message bits=100/1000*1Mbps=100Kb

Overhead=40*8/(100000+320)=0.32%