Dr. SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE

(AUTONOMOUS)

Accredited by NAAC (Cycle- III) with 'A+' Grade

DEPARTMENT OF B.SC CS (GCD)

21UCU407 – COMPUTER NETWORKS AND DATA COMMUNICATIONS

UNIT- II

CHANNEL CAPACITY

Channel Capacity

- Channel Capacity: max possible rate at which data can be transmitted over a given communication path, under given conditions
- Channel capacity is a function of :
  - data rate - in bits per second [bps]
  - bandwidth - in Hertz [Hz]
  - noise - on communication link
  - error rate - the rate at which errors occur, reception of 1 when 0 is transmitted, and visa versa

Transmission Impairments

- signal received may differ from signal transmitted causing:
  - analog - degradation of signal quality
  - digital - bit errors
- most significant impairments are
  - attenuation and attenuation distortion
  - delay distortion
  - noise

Attenuation

- where signal strength falls off with distance
- depends on medium
- received signal strength must be:
  - strong enough to be detected
  - sufficiently higher than noise to receive without error
- so increase strength using amplifiers/repeaters
- is also an increasing function of frequency
- so equalize attenuation across band of frequencies used

Delay distortion

- propagation velocity varies with frequency
- hence various frequency components arrive at different times
- particularly critical for digital data
- since parts of one bit spill over into others
- causing intersymbol interference

Noise

- Additional unwanted signals inserted between transmitter and receiver
  - Thermal
    - due to thermal agitation of electrons
    - uniformly distributed
    - white noise

Noise

- crosstalk
  - a signal from one line is picked up by another
- impulse
  - irregular pulses or spikes
    - eg. external electromagnetic interference
  - short duration
  - high amplitude
  - a minor annoyance for analog signals
  - but a major source of error in digital data
    - a noise spike could corrupt many bits

Noise: example