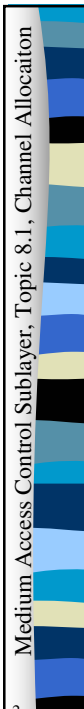


Medium Access Control Sublayer, Topic 8.1, Channel Allocation

Static  
Dynamic

# Channel Allocation Problem

- Static Allocation
- Dynamic Allocation



Medium Access Control Sublayer, Topic 8.1, Channel Allocation

Static  
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# Static Allocation

- Static allocation of bandwidth may be done using TDM or FDM
  - Divide the available bandwidth into some number of channels,
  - Hence there will be no interference between users.
- Problems
  - The division of bandwidth is static.
    - We may have unused channels, when too few users,
    - Or we may have starving users, when more users than channels,
    - As the number of users changes we would like the allocation to change. However, the channel division is static.
  - Traffic is generally not constant. Hence some of the channel capacity may be unused.

## Static Allocation

Static  
Dynamic

- Consider the mean time delay (T) for a channel

$$T = \frac{1}{\mu C - \lambda}$$

- $1/\mu$  mean frame length, bits/frame
- $\lambda$  frame arrival rate, frames/sec
- C channel capacity, bits/sec

- Now consider dividing the channel into N sub-channels

$$T_{\text{FDM}} = \frac{1}{\mu(C/N) - (\lambda/N)} = \frac{N}{\mu C - \lambda}$$

- The mean time delay  $T_{\text{FDM}}$  becomes N times worse,  $N \cdot T$

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## Dynamic Allocation

Static  
Dynamic

Five key concepts of dynamic channel allocation:

1. Station Model.
  - N independent stations each generating frames,
  - Probability of frame being generated in a time interval  $\Delta t$  is  $\lambda \Delta t$
  - Once a frame is generated the station blocks until the frame is transmitted.
2. Single Channel Assumption
  - A single channel is available for all communication and all stations receive from it and transmit to it.
3. Collision Assumption
  - If two stations transmit simultaneously the resulting signal is garbled,
  - All stations can detect the collision.

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## Dynamic Allocation

4. (a) Continuous Time: Frame transmission can start at any time – no master clock,  
or (b) Slotted Time: Frame transmission can start only at the start of a slot. Each slot will either be empty, have a single frame in it or contain a collision.
5. (a) Carrier Sense: Stations can tell if the channel is in use,  
or (b) No Carrier Sense: Stations cannot sense whether the channel is busy.