Introduction to Computer Networks

Multiplexing(§2.5.3, 2.5.4)

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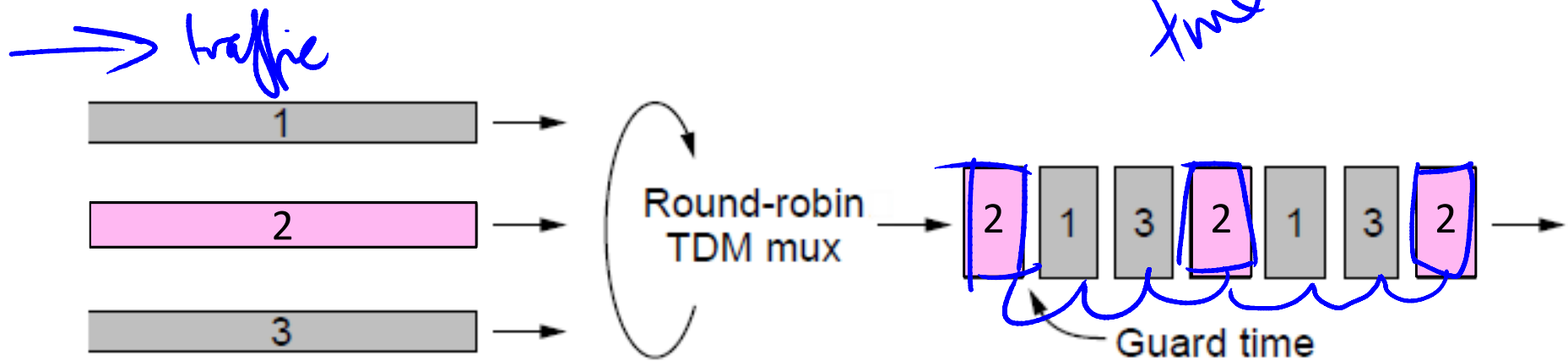
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Topic

- Multiplexing is the network word for the sharing of a resource

- Classic scenario is sharing a link among different users
  - Time Division Multiplexing (TDM) »
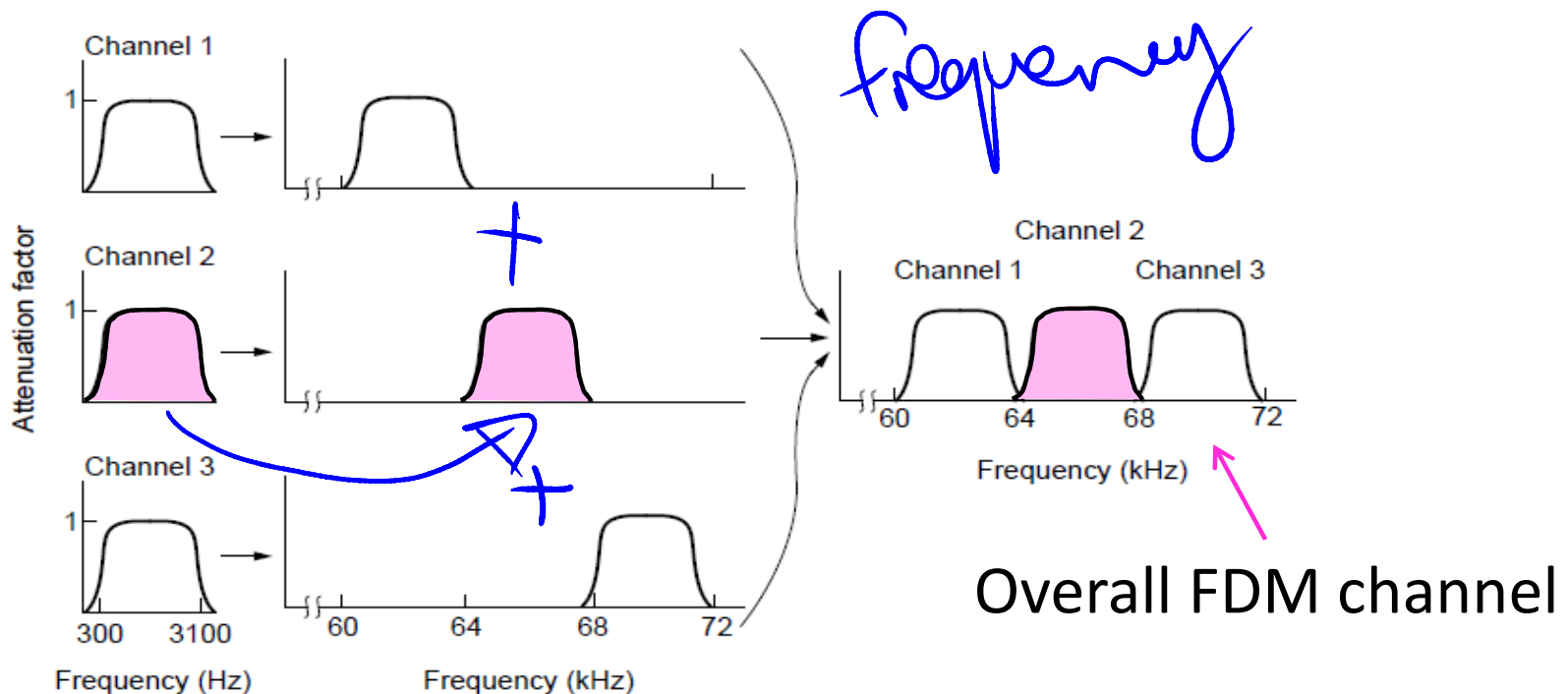 - Frequency Division Multiplexing (FDM) »

Time Division Multiplexing (TDM)
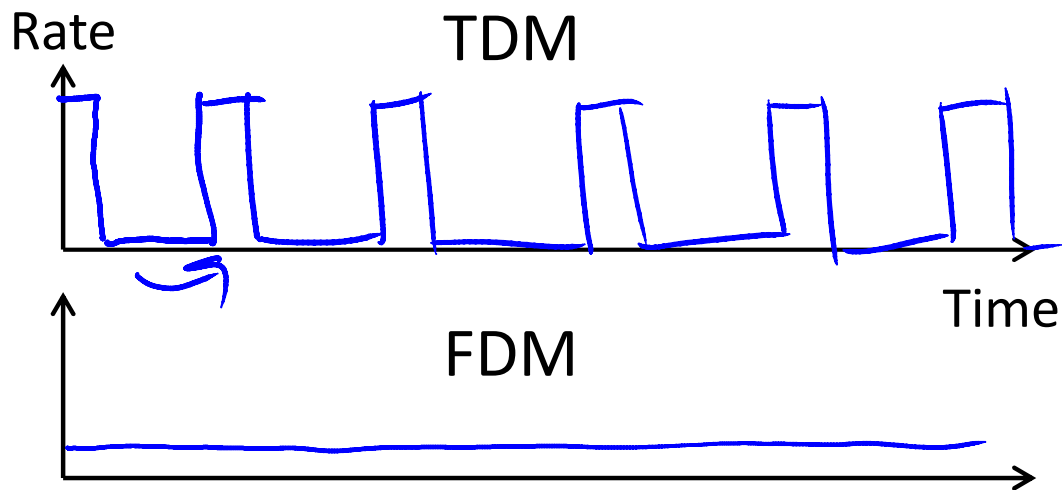
- Users take turns on a fixed schedule

traffic

time

Round-robin TDM mux

| 2 | 1 | 3 | 2 | 1 | 3 | 2 |

Guard time

Frequency Division Multiplexing (FDM)

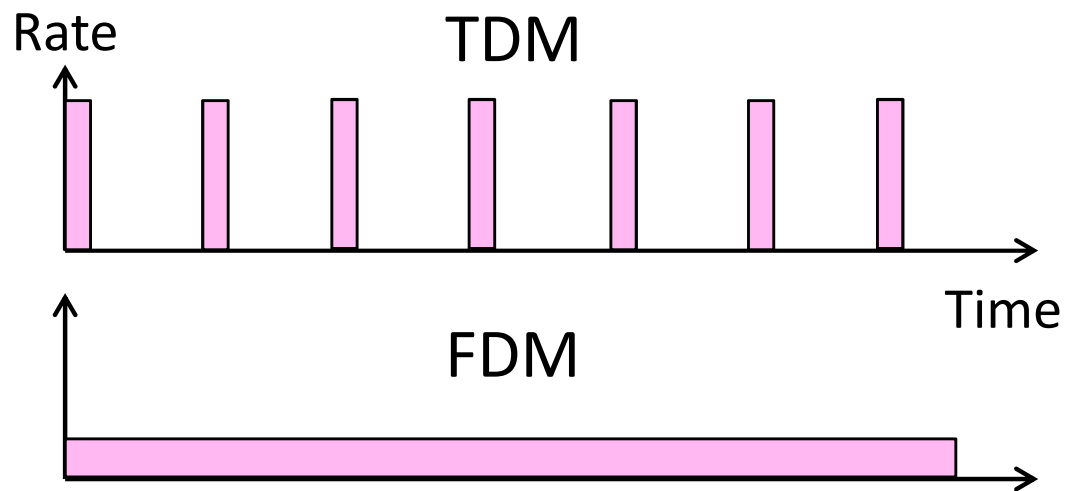- Put different users on different frequency bands

Overall FDM channel

TDM versus FDM

- In TDM a user sends at a high rate a fraction of the time; in FDM, a user sends at a low rate all the time

TDM versus FDM (2)

- In TDM a user sends at a high rate a fraction of the time; in FDM, a user sends at a low rate all the time
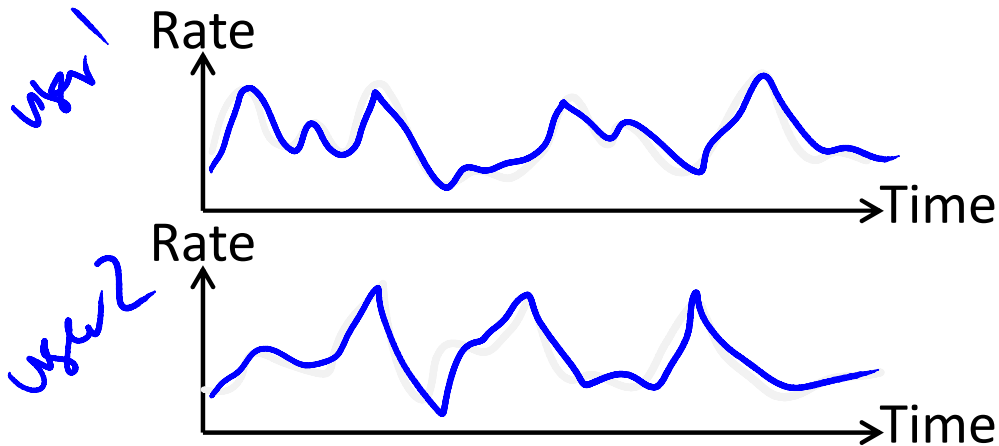
TDM/FDM Usage

- Statically divide a resource
  - Suited for continuous traffic, fixed number of users

- Widely used in telecommunications
  - TV and radio stations (FDM)
  - GSM (2G cellular) allocates calls using TDM within FDM
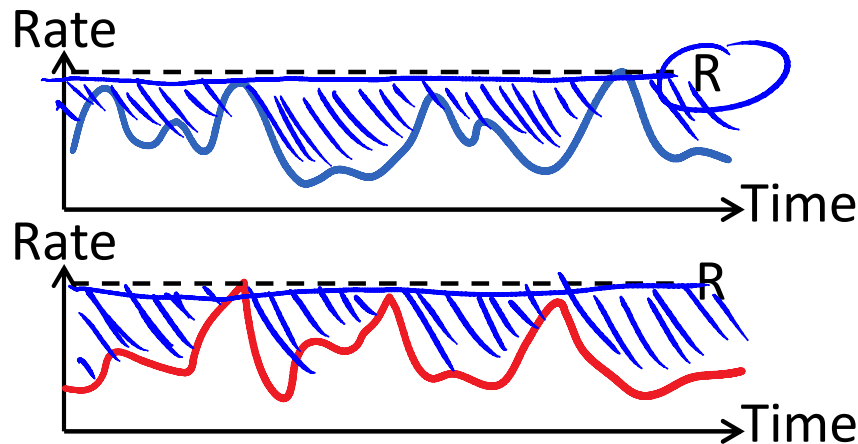
Multiplexing Network Traffic

- ## Network traffic is <u>bursty</u>
  - ON/OFF sources
  - Load varies greatly over time
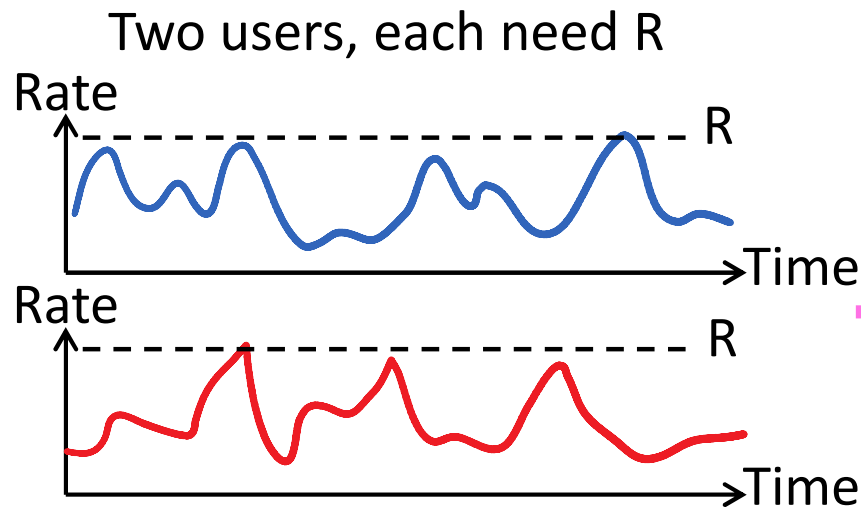
Rate

Time

Rate

Time

Multiplexing Network Traffic (2)

- Network traffic is <u>bursty</u>
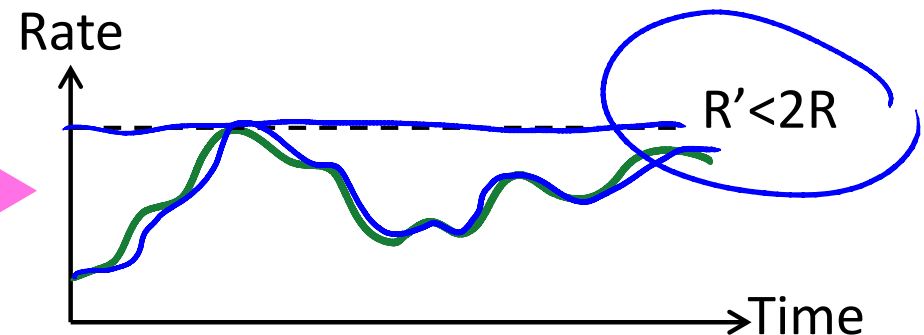 - Inefficient to always allocate user their ON needs with TDM/FDM

Multiplexing Network Traffic (3)

- Multiple access schemes multiplex users according to their demands – for gains of statistical multiplexing
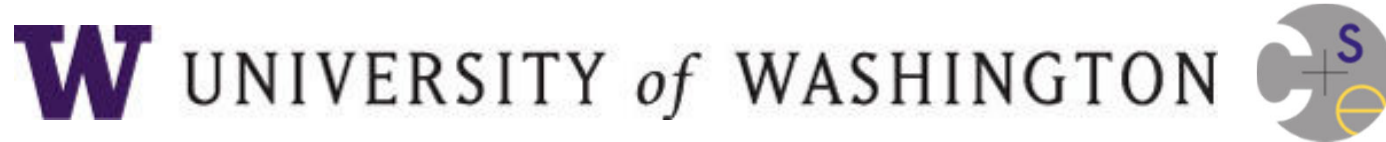
Two users, each need R

Together they need R' < 2R

Multiple Access

- We will look at two kinds of multiple access protocols

1. Randomized. Nodes randomize their resource access attempts
   - Good for low load situations

2. Contention-free. Nodes order their resource access attempts
   - Good for high load or guaranteed quality of service situations

END