

# Traffic Shaping in ATM Networks

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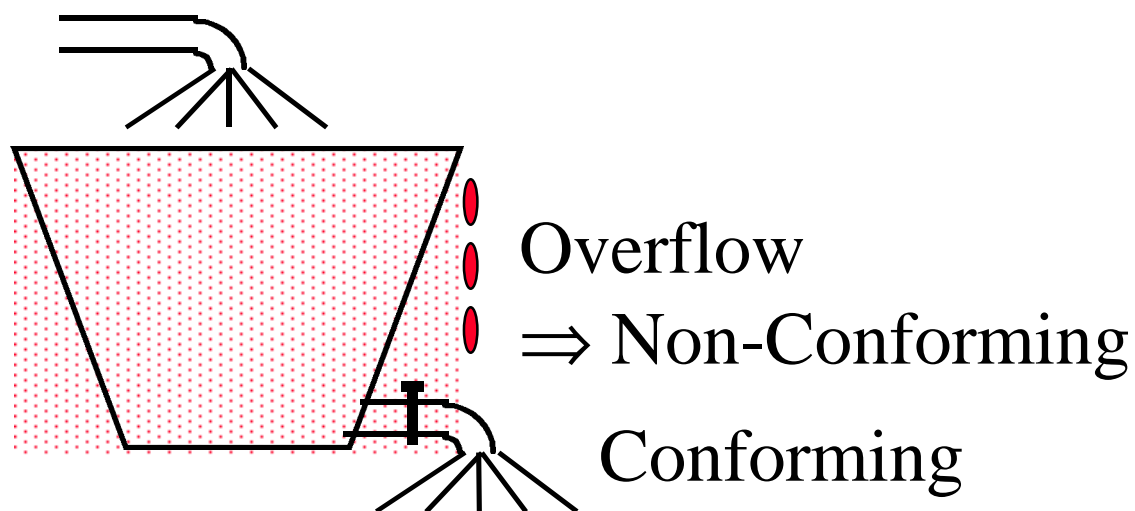
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- ❑ Leaky bucket
- ❑ Generic Cell Rate Algorithm
- ❑ GCRA Implementations:
  - Virtual Scheduling Algorithm
  - Leaky bucket algorithm
- ❑ Examples

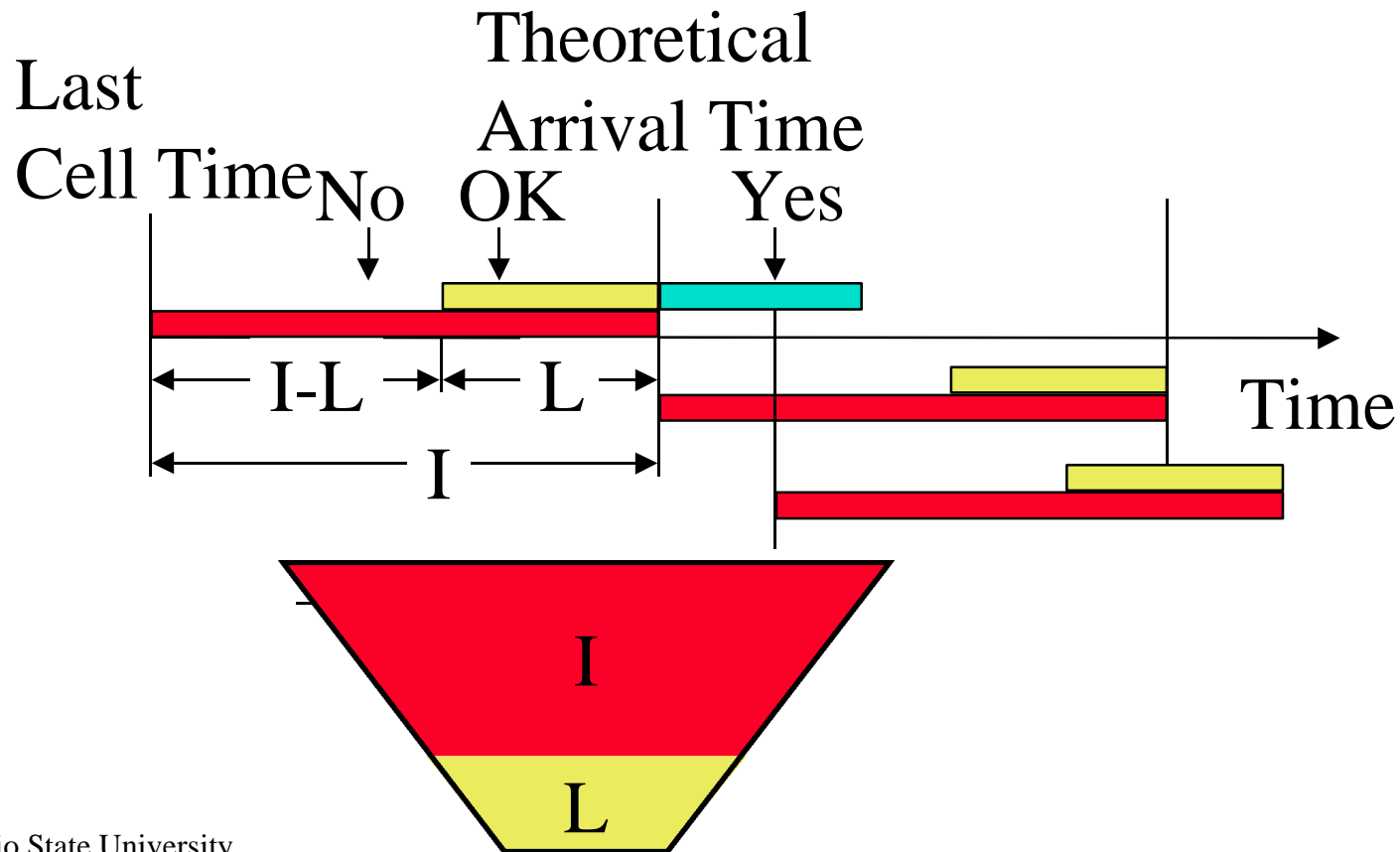
# Leaky Bucket



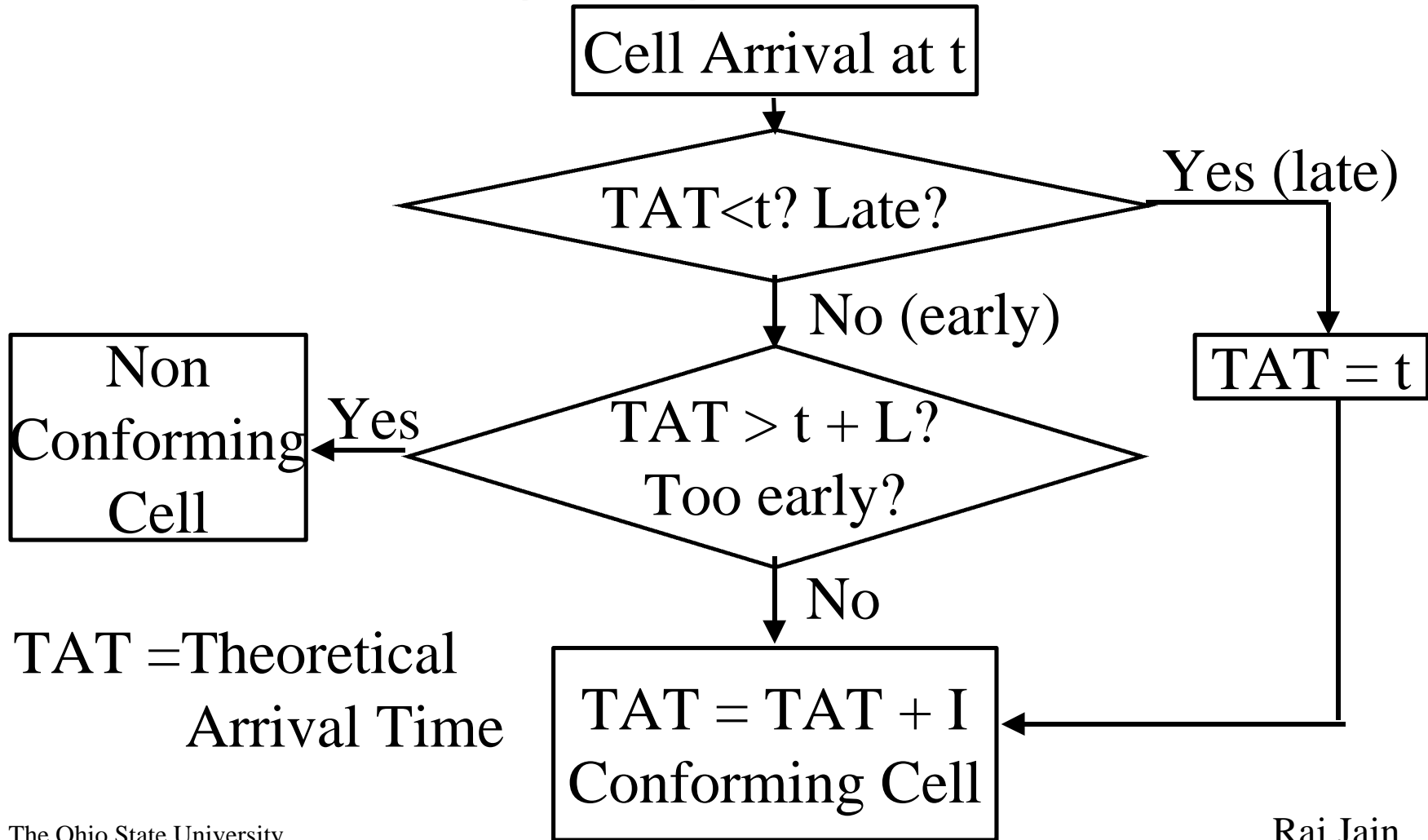
- ❑ Provides traffic shaping:  
Input bursty. Output rate controlled.
- ❑ Provides traffic policing: Ensure that users are sending traffic within specified limits  
Excess traffic discarded or admitted with  $CLP = 1$

# Generic Cell Rate Algorithm: GCRA(I, L)

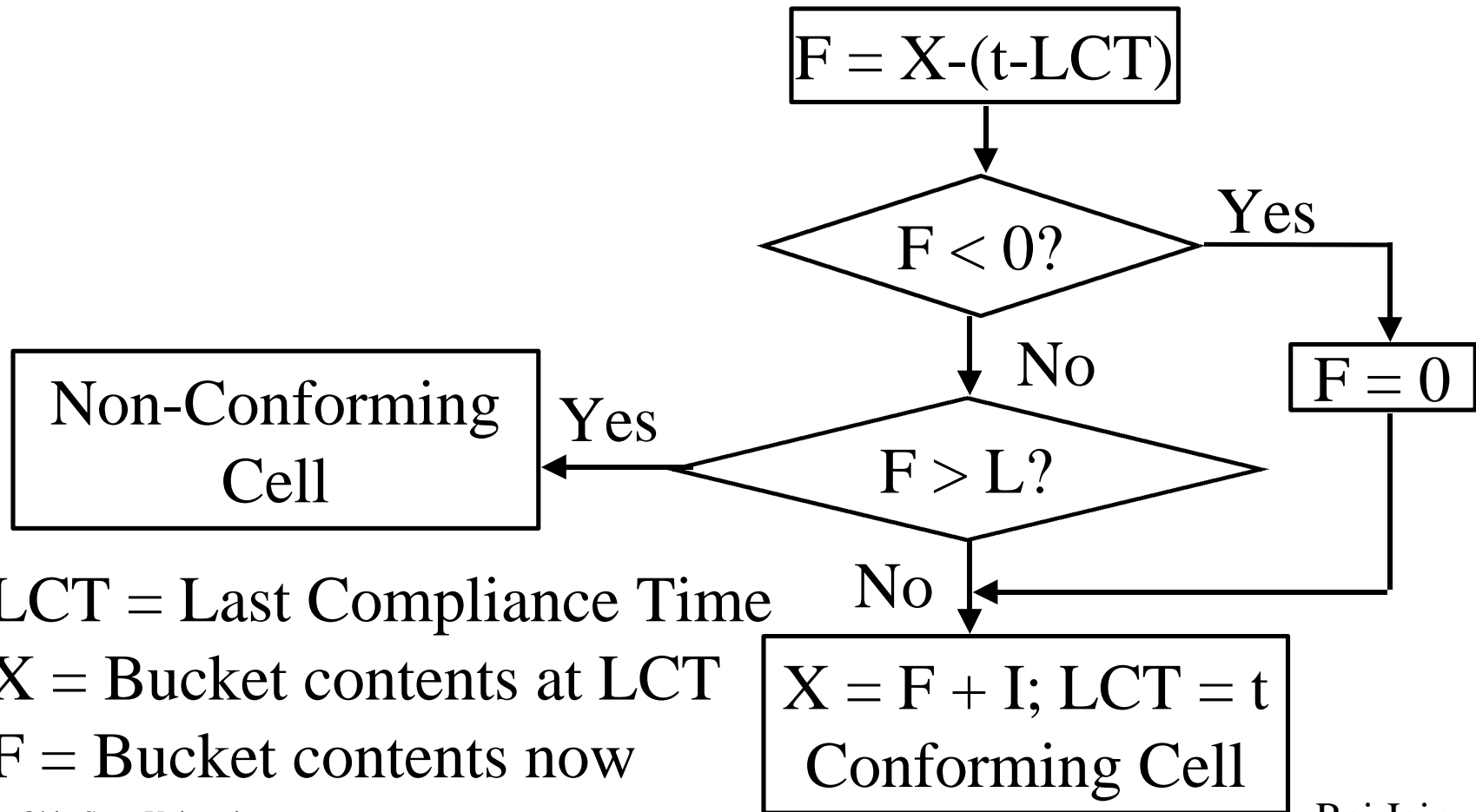
- $I = \text{Increment} = \text{Inter-cell Time} = \text{Cell size}/\text{PCR}$
- $L = \text{Limit} \Rightarrow \text{Leaky bucket of size } I + L \text{ and rate } 1$



# GCRA: Virtual Scheduling Algorithm



# GCRA: Leaky Bucket Algorithm

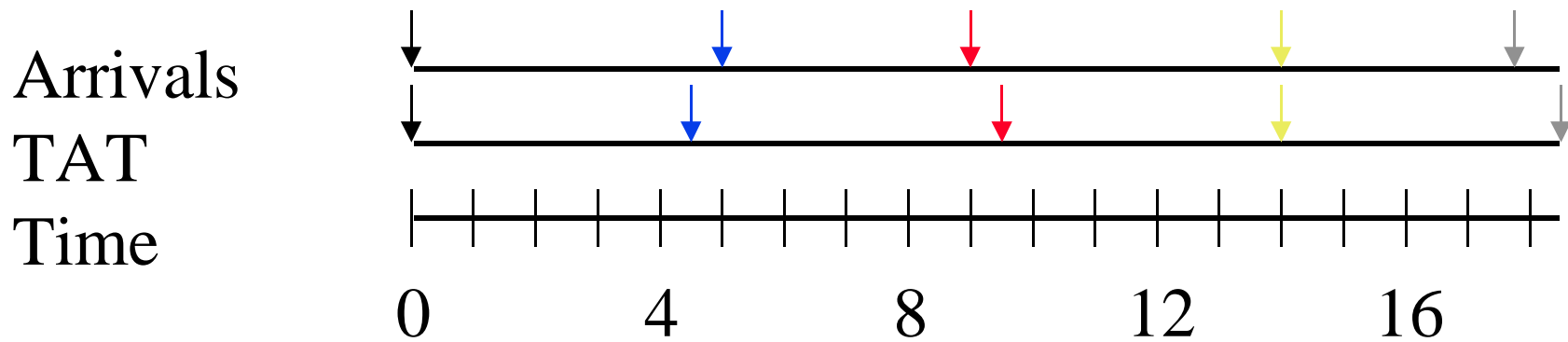


LCT = Last Compliance Time  
 X = Bucket contents at LCT  
 F = Bucket contents now

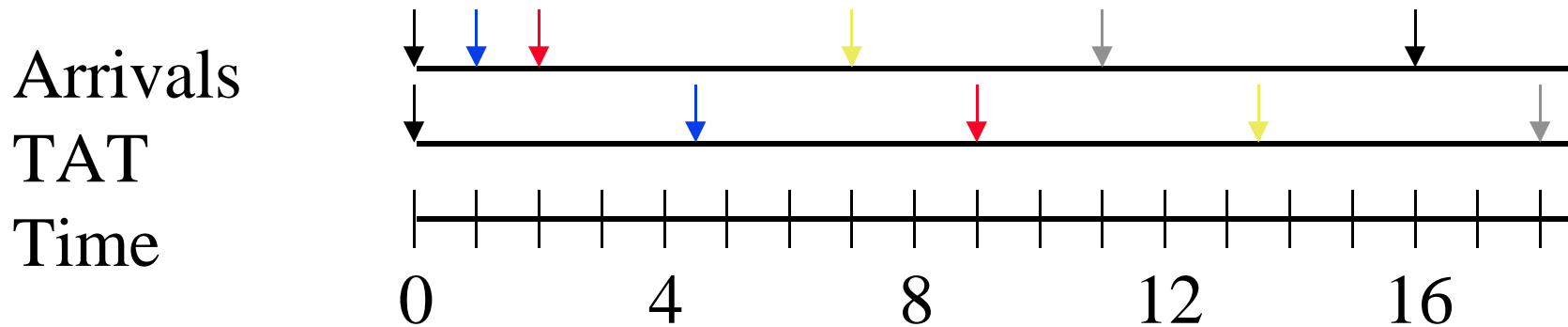
# GCRA Examples

$\delta = \text{cell time} = 2.73 \mu\text{s}$  at 155 Mbps

q GCRA(4.5  $\delta$ , 0.5  $\delta$ ):



q GCRA(4.5  $\delta$ , 7  $\delta$ ):

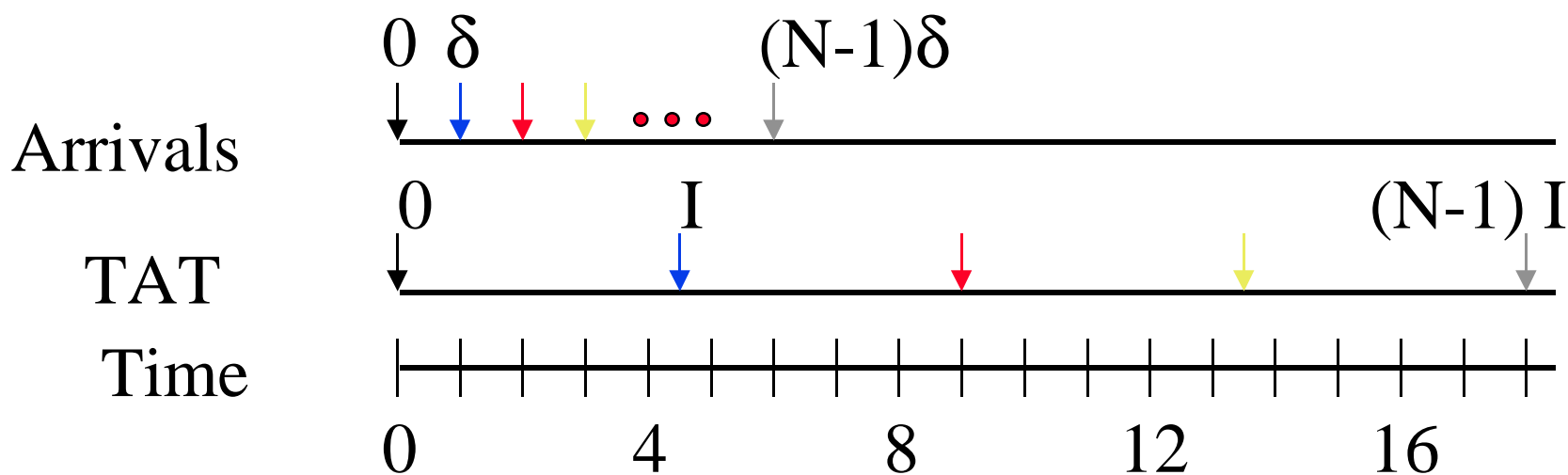


# Maximum Burst Size

$\delta$  = cell time at PCR,  $I$  = cell time at SCR,  $L$ =Limit

$N$  = Maximum burst size

GCRA( $I$ ,  $L$ ):



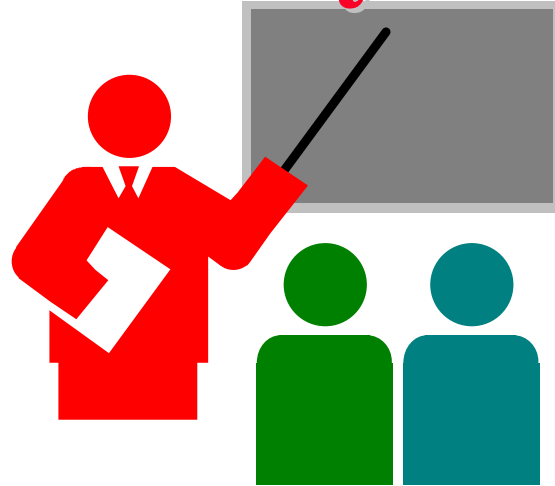
$$(N-1)I - (N-1)\delta < L$$

$$\text{MBS} = N = \text{Int}[1 + L / (I - \delta)]$$

$$L = (\text{MBS} - 1)(I - \delta)$$



# Summary



- ❑ Leaky bucket is used to smooth bursty arrivals
- ❑ GCRA requires increment (inter-cell arrival time) and limit (on earlyness)
- ❑ Two implementations: Virtual scheduling and leaky bucket

# Homework

- ❑ Read pages 505-513 of Stallings' ISDN and Broadband ISDN with Frame Relay and ATM
- ❑ Conduct Lab exercise 1