

Traffic Shaping in ATM Networks

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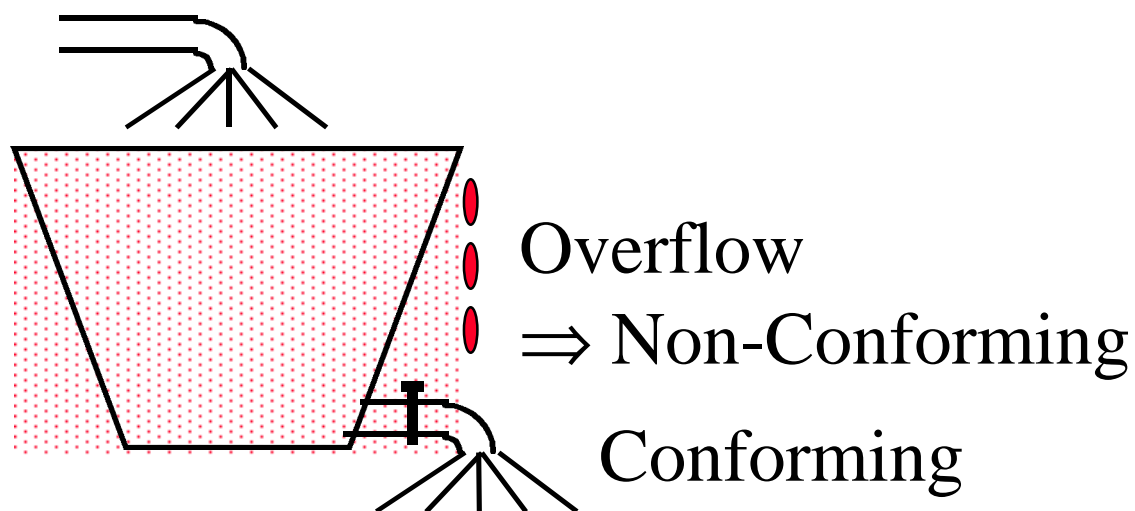
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- ❑ Leaky bucket
- ❑ Generic Cell Rate Algorithm
- ❑ GCRA Implementations:
 - Virtual Scheduling Algorithm
 - Leaky bucket algorithm
- ❑ Examples

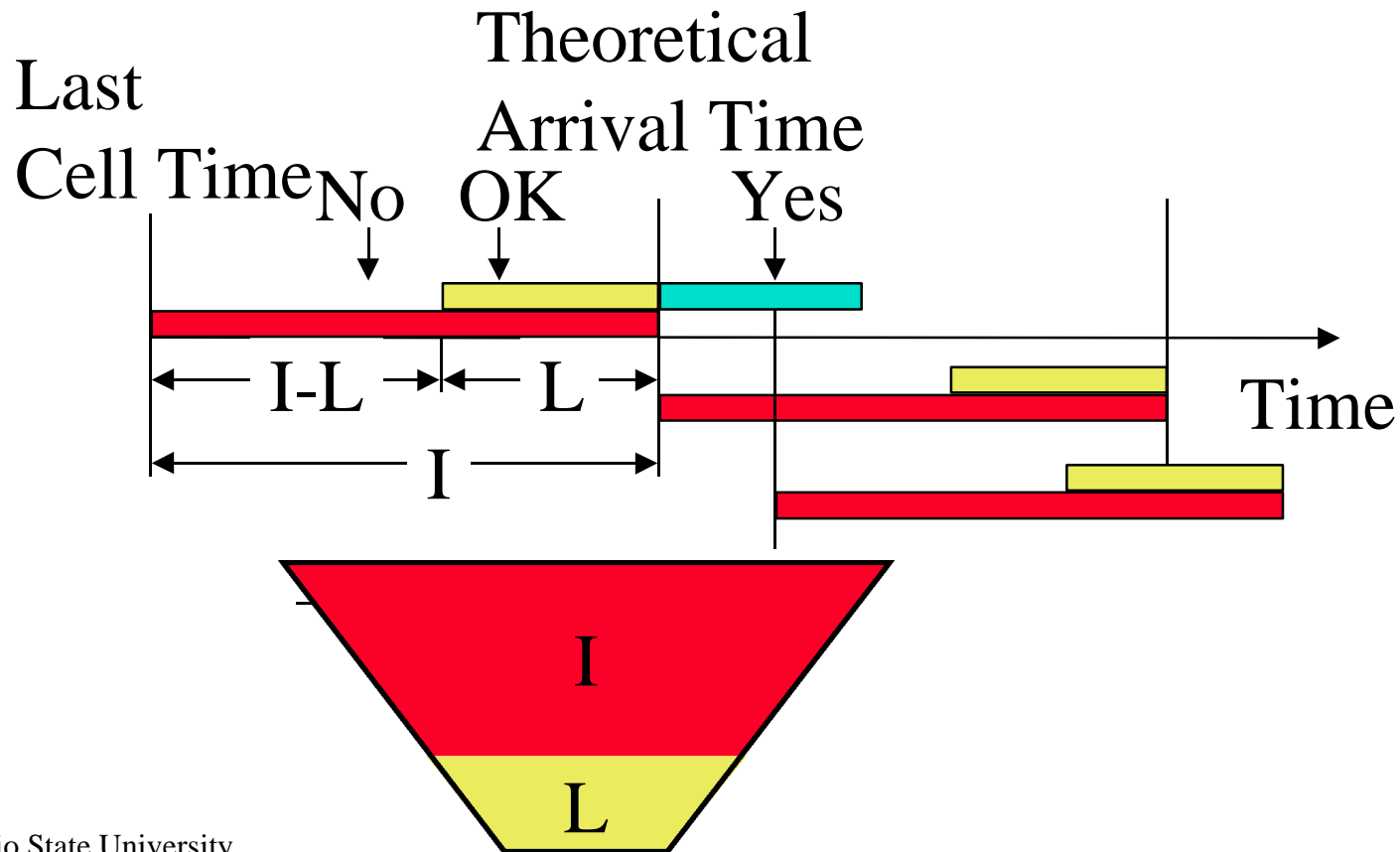
Leaky Bucket



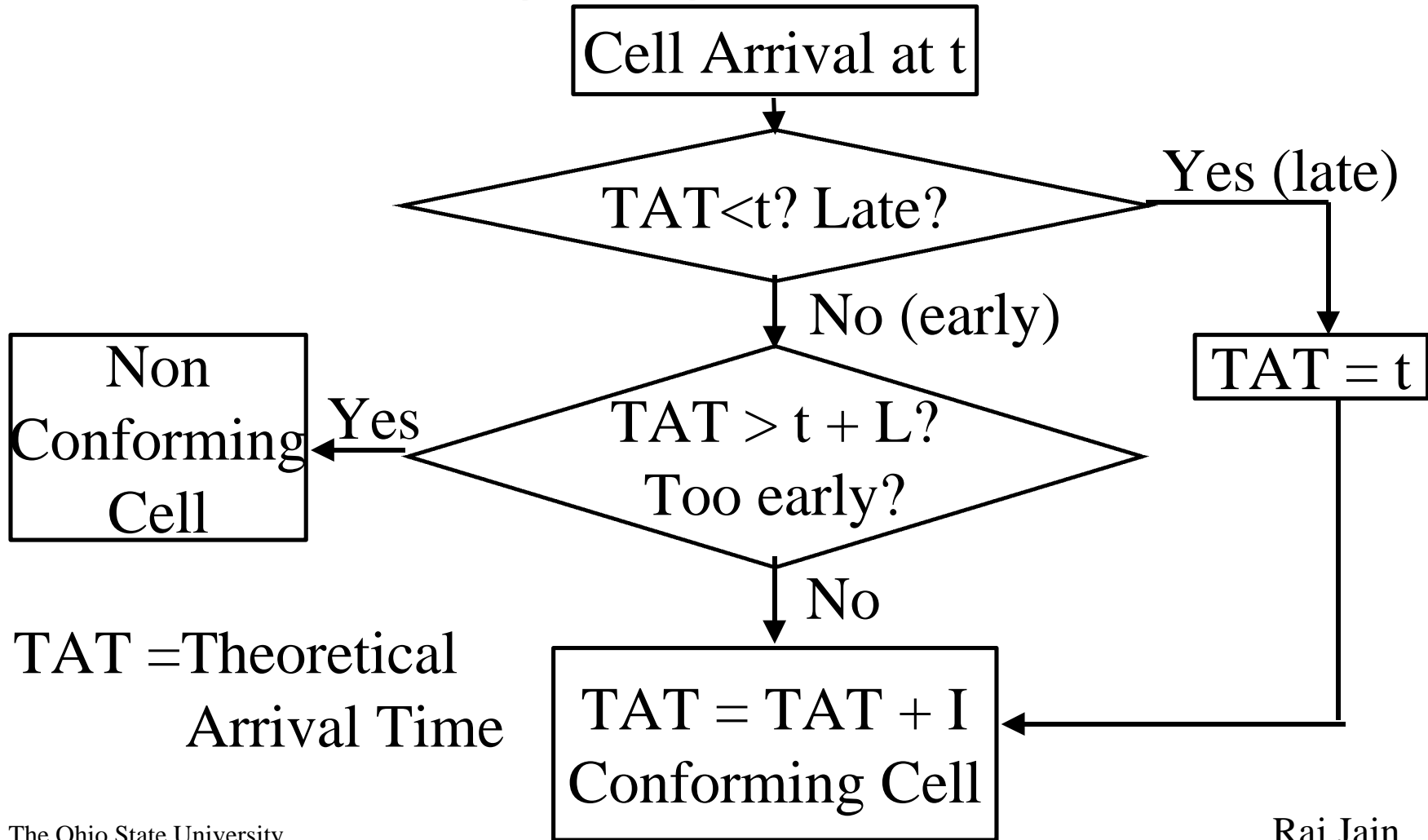
- ❑ Provides traffic shaping:
Input bursty. Output rate controlled.
- ❑ Provides traffic policing: Ensure that users are sending traffic within specified limits
Excess traffic discarded or admitted with $CLP = 1$

Generic Cell Rate Algorithm: GCRA(I, L)

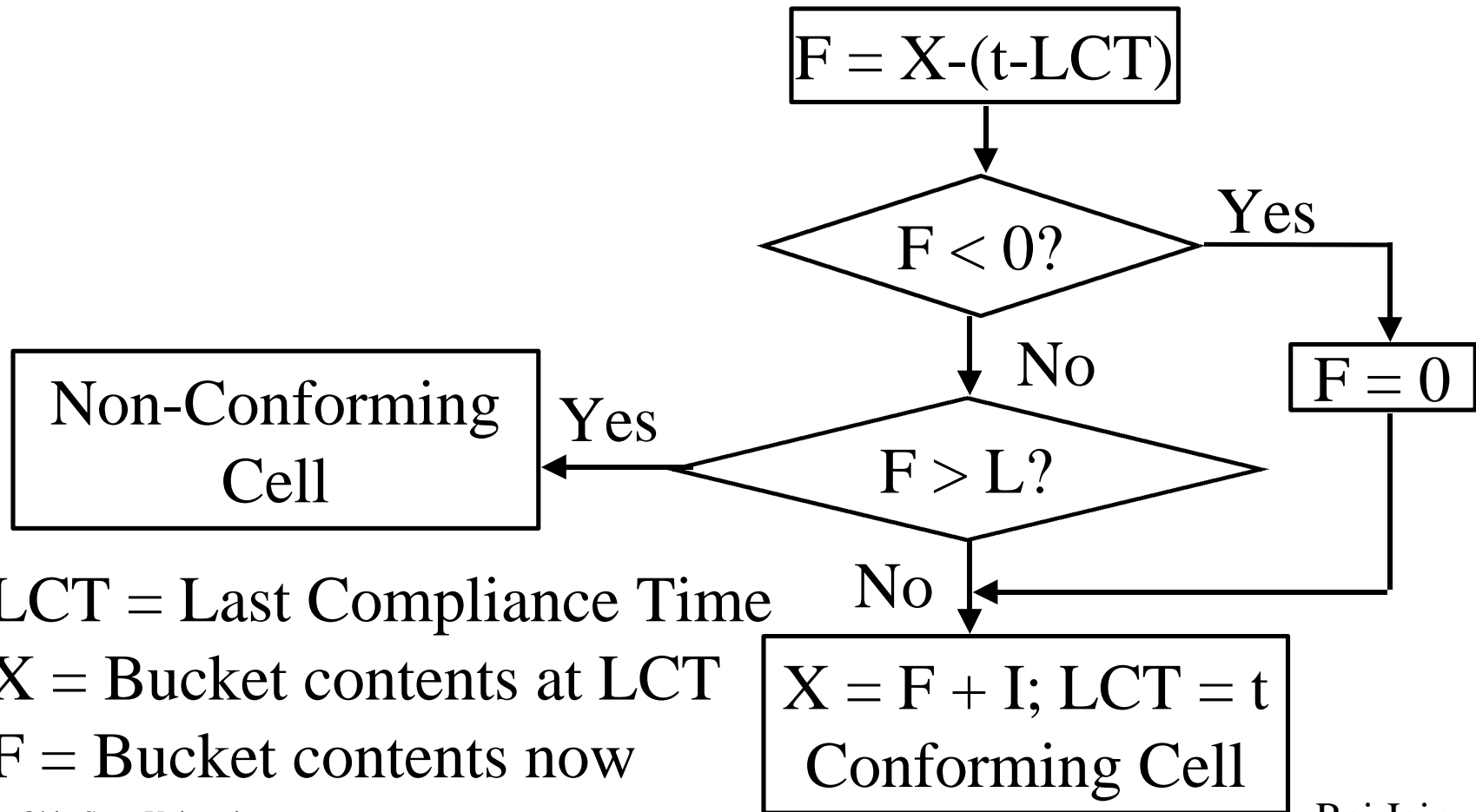
- $I = \text{Increment} = \text{Inter-cell Time} = \text{Cell size}/\text{PCR}$
- $L = \text{Limit} \Rightarrow \text{Leaky bucket of size } I + L \text{ and rate } 1$



GCRA: Virtual Scheduling Algorithm



GCRA: Leaky Bucket Algorithm

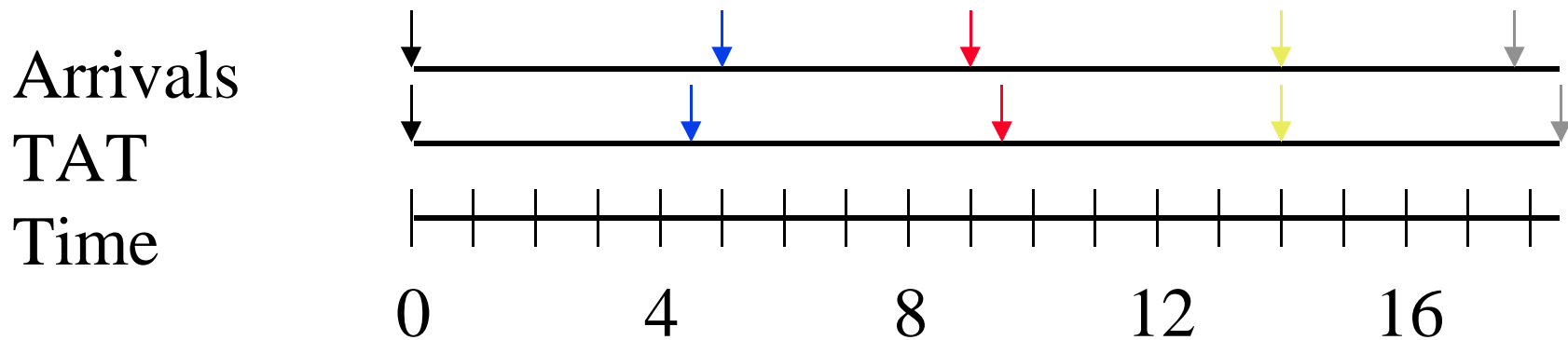


LCT = Last Compliance Time
 X = Bucket contents at LCT
 F = Bucket contents now

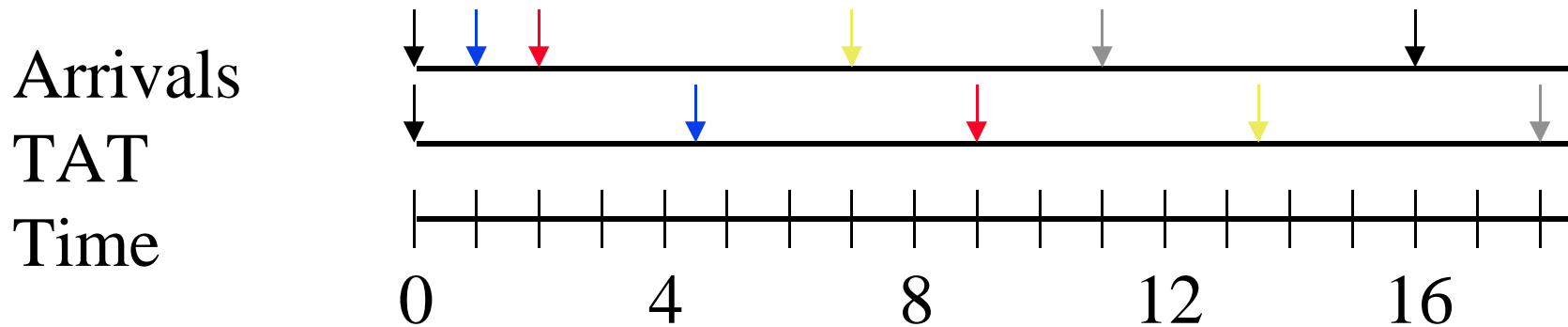
GCRA Examples

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

q GCRA(4.5 δ , 0.5 δ):



q GCRA(4.5 δ , 7 δ):



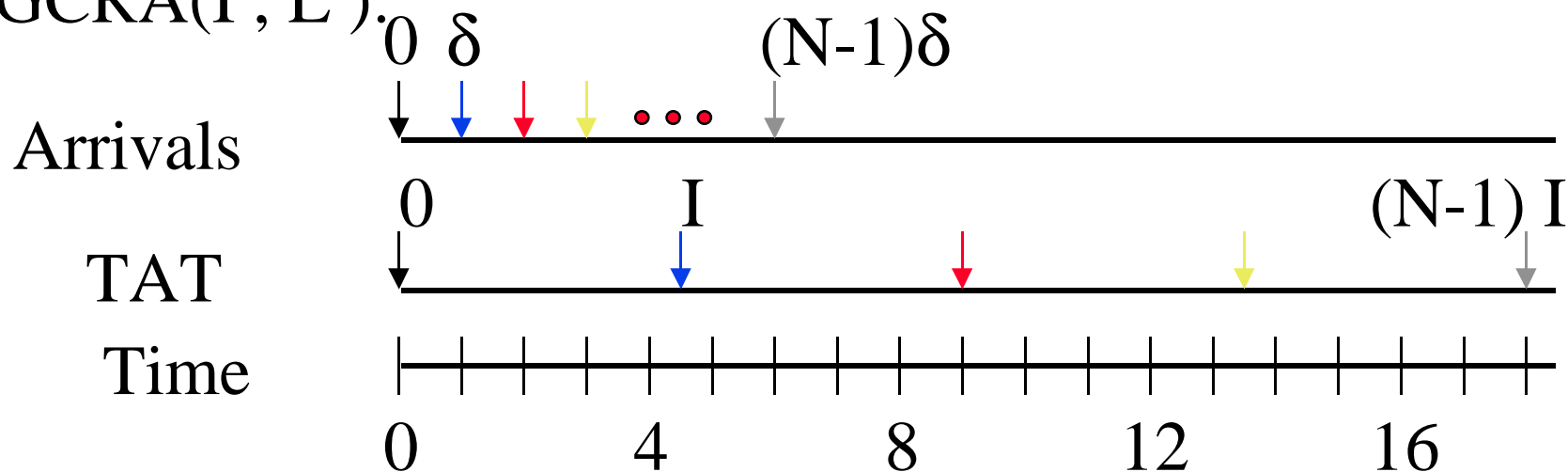
Maximum Burst Size

δ = cell time at Peak Cell Rate (PCR),

I = cell time at Sustained Cell Rate (SCR), L =Limit

N = Maximum burst size (MBS)

GCRA(I, L):

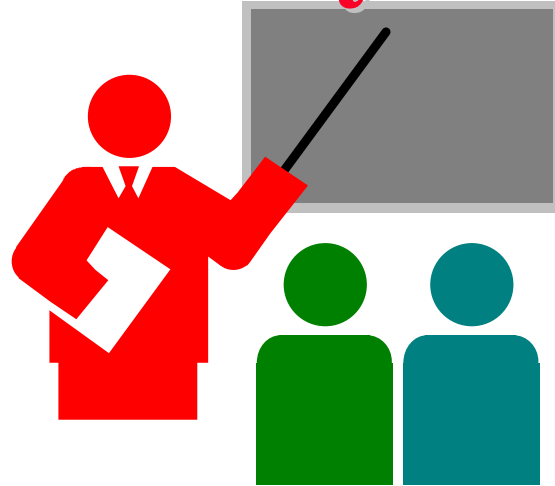


$$(N-1)I - (N-1)\delta < L$$

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

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

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 Section 12.5.2, 22.1, 22.2.1-22.2.3 of McDysan's book.
(Or Read pages 240-243 of Black's Emerging Technologies book 2nd edition.
Or Read pages 505-513 of Stallings' ISDN and Broadband ISDN with Frame Relay and ATM)
- ❑ Conduct Lab exercise 1