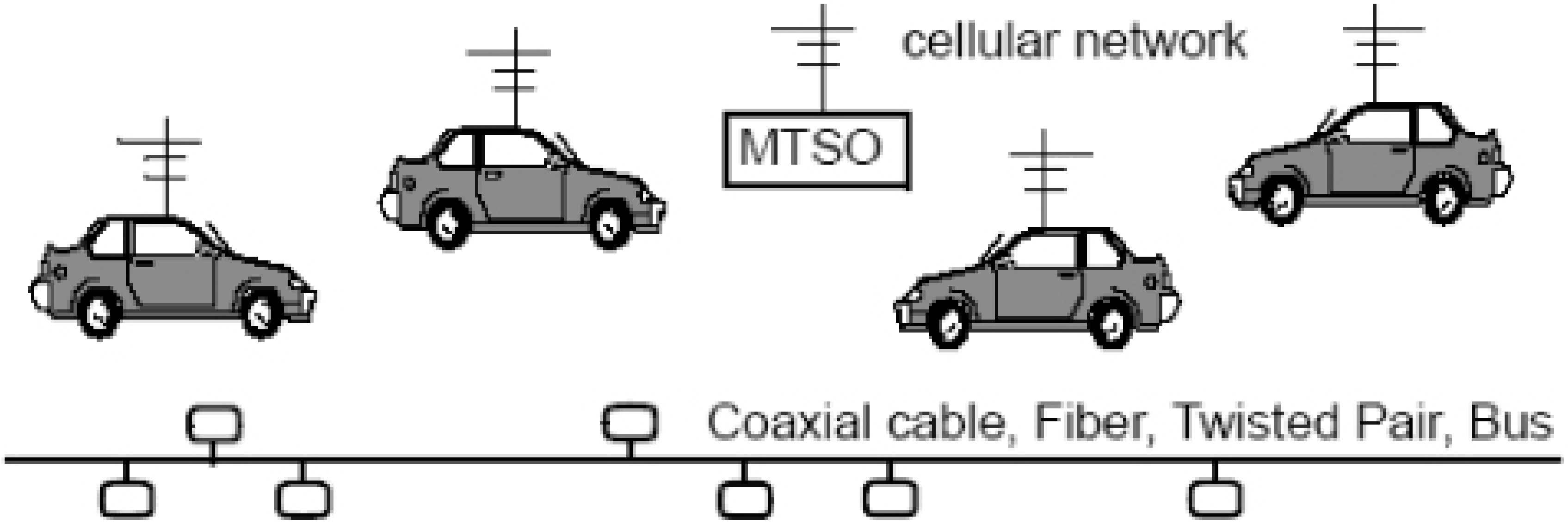
Multiaccess Problem

- How to let distributed users (efficiently) share a single broadcast channel?
  ⇒ How to form a queue for distributed users?
- The protocols we used to solve this multiaccess problem are called multiaccess protocols. They are the lower sublayer of Data Link Control layer in the OSI model.
- The queueing theory studies properties of waiting queues. The mathematical formula of queueing theory can be used to evaluate the efficiency of different queueing system designs. In our applications, the efficiency of various multiaccess protocols.



Queueing Theory

Parameter of interest to queueing analysis:

λ average (avg, or mean) arrival rate (requests/sec) (packets/sec)

μ avg service rate (requests/sec) (packets/sec)

ρ=λ/μ utilization or traffic density, the ratio of system load to system capacity

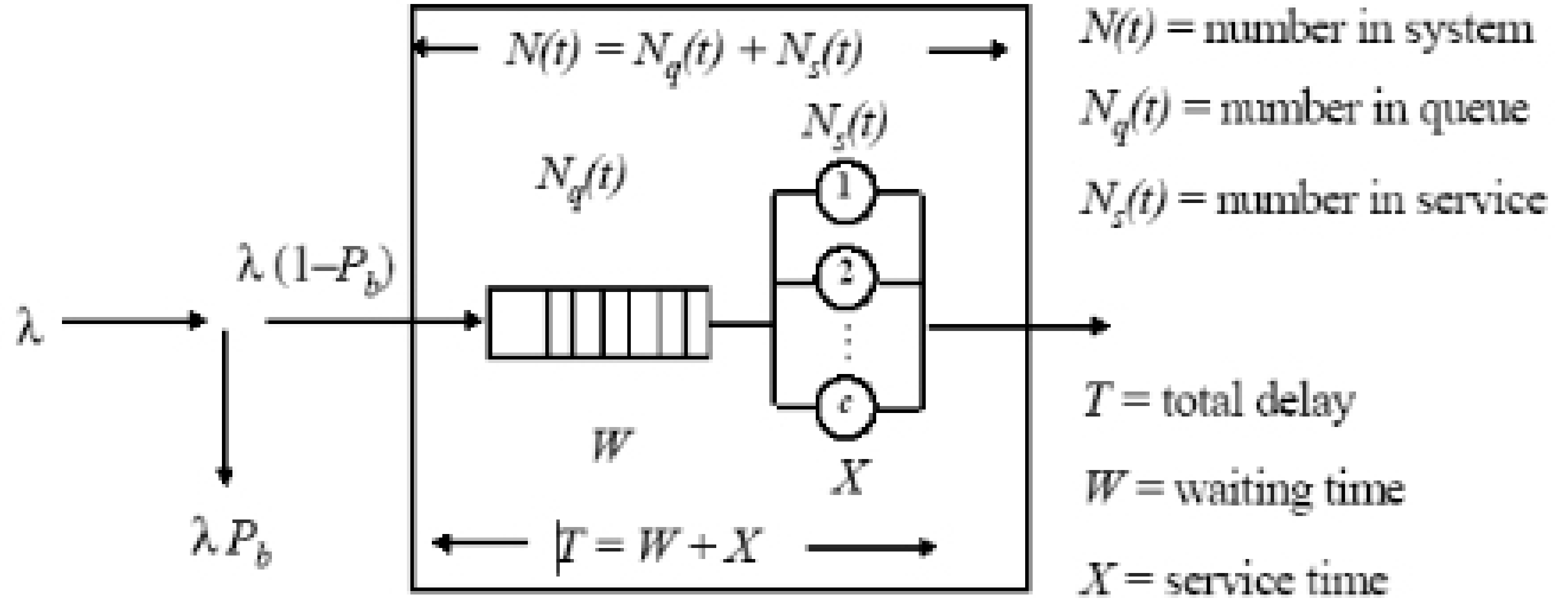
N avg no.of requests in the system, including those in buffers and in servers.

Tw avg waiting time for a request at the buffer

Ts avg service time for a request

T avg delay in the system = Ts +Tw; its inverse is the avg system throughput.

P_B probability of request lost (due to buffer full situation)



Queueing Model Classification

Arrival Process / Service Time / Servers / Max Occupancy

Arrival Process	Service Time	Servers	Max Occupancy
Interarrival times τ	Service times X	1 server	K customers
M = exponential	M = exponential	c servers	unspecified if
D = deterministic	D = deterministic	infinite	unlimited
G = general	G = general		
Arrival Rate:	Service Rate:		
$\lambda = 1/E[\tau]$	$\mu = 1/E[X]$		

Multiplexer Models:	M/M/1/K, M/M/1, M/G/1, M/D/1
Trunking Models:	M/M/c/c, M/G/c/c
User Activity:	M/M/∞, M/G/∞