2/3/05 Mobile Computing

-H1 - Tentative

Ch 1: Question 1, 8, 9, 12
Ch 3: Questions: 1, 4, 5, 8, 11
2/3/03

All data items are of fixed size $S$
Total number of data items $N$
Broadcast channel B/W $B_0$

$D_1 | D_2 | D_3 | \ldots | D_N | D_1 | D_2 | \ldots$

$\uparrow$

$N^2$

Avg data access latency is $\left[ \frac{N}{2} \cdot \frac{S}{B_0} \right]$

- Maximize the number of data items which are provided on the broadcast channel while ensuring that the average access latency is below a tolerable limit.
For \( i = N, 1 \) do

Begin

1. Assign \( D_1, \ldots, D_i \) to broadcast channel

2. Assign \( D_{i+1}, \ldots, D_N \) to on-demand

3. Determine optimal value of \( B_0 \) to minimize avg. access latency time \( T \) as follows:

   a. Compute \( T_0 \) by modeling on-demand channel as M/M/1 queue

   b. Compute \( T_0 \) by using optimal broadcast frequency \( f_1, \ldots, f_i \).
1) Assume that request size is $R$.

2) Assume that there are $M$ mobiles each with request rate $r$. 
Aggregate request rate $= M \cdot r = R$.

Service time for a single request $T_s$.

Queueing System

Poisson process

Exponentially distributed with mean of $\frac{\lambda}{\mu}$

Time a query spends in the system $= \frac{R - \lambda}{\mu}$
\[ f_1 = \frac{\sqrt{P_i}}{\sum_{j=1}^{D_i} \sqrt{P_j}} = \frac{\sqrt{P_i}}{\sqrt{P_1} + \sqrt{P_2}} \]

\[ f_1 + f_2 + f_3 \]

\[ T_b = \sum_{j=1}^{i} \frac{1}{f_j} \frac{S}{B_b} \]

\[ T = P_{\text{LH.N}} \frac{B_0}{T_0} + P_{b_l} \frac{B_b}{T_b} \]

\[ B = B_b + B_0 \]
Cache maintenance for push-based information dissemination.