Mobile Data Access & Dissemination

- How to exploit the wireless broadcast medium
  - Publish Subscribe Mode.
  - How to Save Energy

Also address the situation wherein mobile devices have only listening capability or want to save energy by not transmitting.

Naïve solution for saving energy.

- read → k-sleep algo → run Sleep
- read index
- determine when in the broadcast the item is going to appear
- sleep for the duration till the data item appears on the channel
- wakeup & read the item & go back to sleep
Use Google Scholar for research.

Fundamental trade-off between energy & latency for an operation (task): techniques for saving energy tend generally to increase the latency to perform the completion of the operation (task).

\[
\frac{\text{Energy}}{\text{Time}} = \text{Power}
\]
Examples of energy-latency tradeoff:
- powering down/up devices adds to state transition time.
- service may not be available when needed.

Ideal Case:
- most energy off
- as well as boot latency

In reality:
- wake up early → waste energy
- wake up late → increased latency
Strategy (which increases latency by fixed delay)
BS caches the response and broadcasts data periodically.
M.D wakes up every 2s and checks whether data has arrived.

Fixed interval

D.S (Database server)

Schedule of broadcast data to clients
This technique of fixed wakeup cycle guarantees that latency does not increase beyond by more than wakeup cycle time \( t \). However, if the data delivery latency is high, the energy overhead of mobile device is linearly proportional to the data delivery latency \( L \).

\[
\text{# of times mobile device wakes up} \approx \frac{L}{t}
\]

Energy overhead for check is \( \frac{L}{t} \)

Guaranteed is data in new latency is \( \leq L + t \)

\[ \leq 1.10 \times L \] \leftarrow \text{bound on latency seen by mobile}
\[ \text{time already waited} \times p \]

\[ \leq (1+p) L \]

**Scheme 2:** Adjust the rate of wakeup cycle in proportion to time already waited passed since time the request was made.

Here energy overhead is reduced \((\alpha \log (L))\) but latency is increased.

So, in case of broadcast indexing to improve energy consumption by mobile device more indexing information will have to be added average to the frame, leading to increase in data access latency.
Mobile Data Caching (Sec 3.3)

In computer system data caching is used to improve data access latency.