Querying in mobile environments

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Overview

- Motivation
- Architecture
- Location Updates and Queries
- New Challenges

Motivation

Mobile users ask queries addressed to databases describing the local area :

- Where is X ?
- Find me the best route to the hospital with the best traffic conditions.

Goal:

To present a number of new data management problems that arise due to the *mobility* of both data sources and data consumers.

- Provide preliminary solutions to :
  1. Control of the update volume
  2. Integration of querying processing and data acquisition
- Demonstrate new challenges to the database field

General Architecture

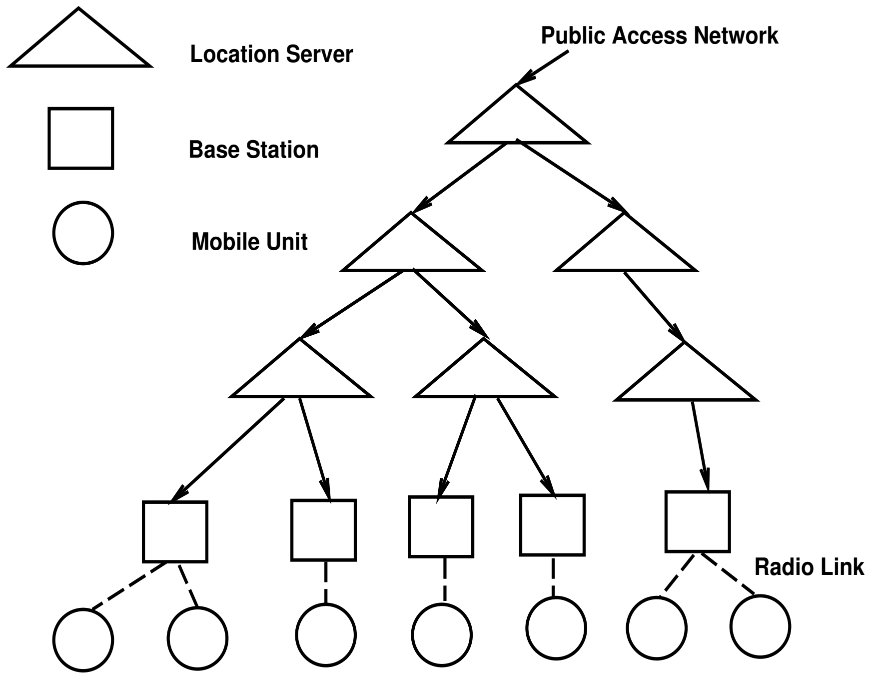

Figure: Architecture of Cellular Network

Managing Location Updates

Bounded ignorance - Users do not have to inform location server about every change of their location.

- *Partition* - Glue together cells between which the user relocates very often, Separate cells between which the user relocates infrequently.

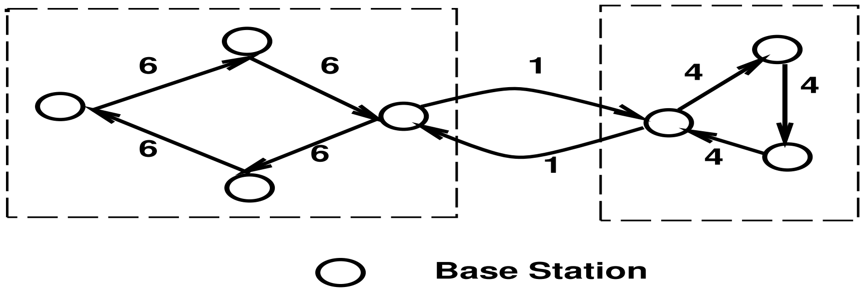

Figure: Partitions

- Locating users within a partition
  - ◇ Broadcast
  - ◇ List based on likelihood
  - ◇ Pointer

Queries

- *Idea:* In the presence of imprecise knowledge about locations of users, minimize the communication cost to answer the query.
- *Definition:*
  - loc_{DB} - the location of a user in the database
  - $partition$ - the partition containing loc_{DB}
  - loc - the actual location of a user
- *Example :*

  SELECT $x_1.loc,\ ...,\ x_n.loc$

  FROM Users

  WHERE $(x_1.loc = l_1 \wedge\ ...\ x_n.loc = l_n) \wedge C(l_1, .., l_n)$
- *A brute force approach:* Determine exact locations $x_1.loc, ..., x_n.loc$ of each $x_1, ..., x_n$ by paging for each $i(1 \leq i \leq n)$ the partition $x_i.partition$.

Queries - Optimization

- *Idea: avoid or reduce paging*
- *Example :* Give the names of doctors located near John's current location

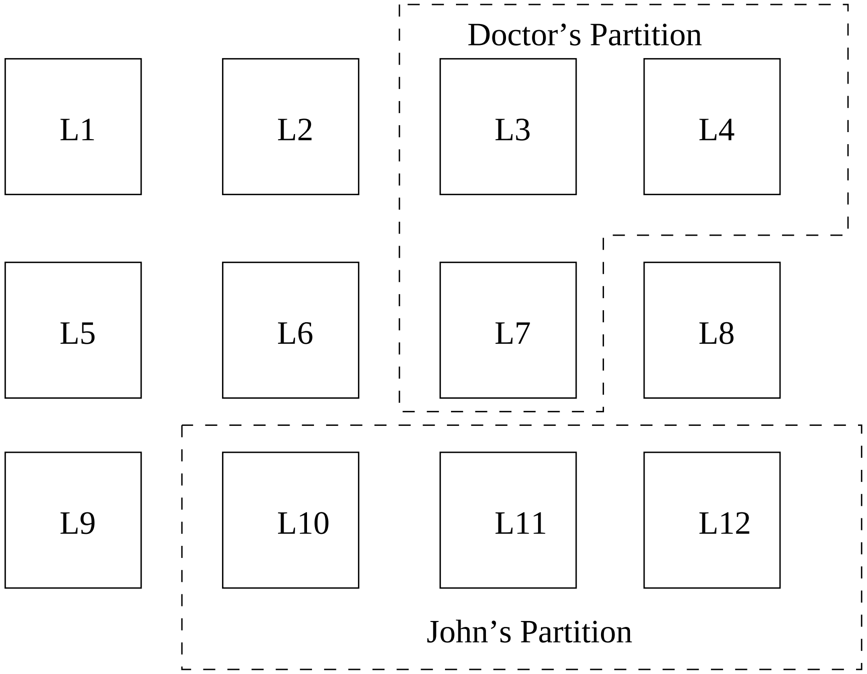

Figure: Near By Locations

Queries - Optimization Continued

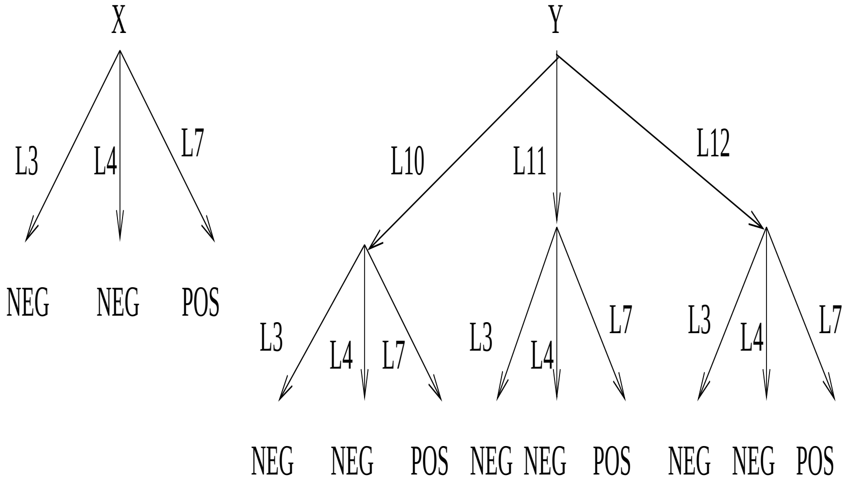

Figure: Classification Tree

New Challenges

- Incorporating data acquisition into query processing
- New types of queries
- Querying transient data