Attributes of Information/Communication Systems

- Speed: “Real-time”?
- Coverage: is more better?
- Reliability: of information? of access?
- Cost: related to speed
- Security: vs. privacy

Recurrent Themes

- Caching: what, when and how
  - o charging the laptop with "local" info
- Delayed writeback and prefetch: use network idle times
  - o increases memory requirements
- Buffering/batching: allows bulk transfers
- Partitioning and replication
  - o triggered by relocation
- Compression: increase effective BW
  - o increases battery power requirements
- ..

▷ Receiving needs less power than sending.

Information Dissemination

Goal: Maximize ***query capacity*** of servers, minimize ***energy per query***

Focus: read-only queries.

1. Network servers broadcast data, PDA's listen

- PDA energy saved by needing receive mode only
  - o index needs to be broadcast too
  - o "self-addressable cache on the air"
  - + listening time" decreases
  - – access time increases

2. PDAs demand, servers respond
3. Combinations

- Servers broadcast "hot" information only
  - o query capacity improved

Query/Transaction Processing

Concern moves from CPU time and network delays to battery power and communication *costs*

- ▷ Updates may take the form of long-running transactions
  - o need new transaction models
  - o nodes may continue in disconnected mode

- ▷ Stable storage for logs, data
  - o stabilize at servers?

- ▷ Move data vs. move query/transaction

- ▷ Context (location) based query responses

Updated system info: Location information, user profiles

Location Information

Mobility of clients $\Rightarrow$ Location Management

- permanent home vs. current location
- searching vs. informing
- always contact home location server
  vs.
  try locally else contact home location server
- choose based on statistical profiles of users?

Mechanisms affected by scale, limited BW

More users
$\Rightarrow$ smaller cells
$\Rightarrow$ more *handoffs*
$\Rightarrow$ more communication

Issues in Information Provision

- tariff
- scalability
  - o massive # users accessing read-only data
- security (of data and user profiles/location)
  - o impersonation, theft, trust
  - o consuming resources in a foreign env.
  - o damage to fixed hosts?
- approximate answers
- consistency, autonomy, recovery
  - o PDAs are unreliable
- prioritization of actions upon reconnection
- providing uniform access in a heterogeneous environment
- design of human-computer interfaces (pen-based computing)

Resource Management

Mobility of clients

$\Rightarrow$ Mobility of resources

$\Rightarrow$ Configuration management

- mobile nodes not equal to static hosts
  - o computation and communication load cannot be distributed equally
- dynamic replication of data
  - o data and services *follow* users.

Groups

- Operating systems

  Sen Gonzalez Fernandez Xuan

- Databases and File systems

  Shan Xiong Nithrakashyap Padhye

- Communication architecture and protocols – 2 groups

  Raut Rubenstein Khan Bhattacharya Awduche Kumar

- Real-Time, multimedia, QoS

  Sahu Agu Firoiu

- Security

  Mccarthy Specker

- Hardware and architecture
- Application requirements and design
- PDA design: Interfaces, Languages