Gazillions of Gizmos: What are the (location) challenges?

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1 billion gizmos by 200x
(Choose x = 3, 4, 5, ...)

- Gizmos and technology originally developed for one purpose will be used in new and innovative ways for other purposes
  - e.g. Bluetooth was primarily designed as a cable replacement but will be used as a location technology and an ad-hoc networking technology
- Two parallel, contradictory (or complementary) gizmo trends leading to different location needs and capabilities
  - Integration: cell phone as pager, organizer, e-wallet, radio, media player ...
  - Specialization: different functionality, form factors, power requirements, connectivity, processing and storage, fashion niches
- Project MultiLoc: Location management in a comprehensive multi-tier wireless network with seamless gizmo connectivity
Database network architectures

- Centralized

- Distributed

- Mobile wireless database access
  - Database access using a gizmo

- Ad-hoc database networks
  - Database on the gizmo
Location management: It’s not just for gizmos anymore!

- Mobile software will become an increasingly important aspect of next generation networks and applications
  - Mobile agents, active networks, mobile code, programmable networks, etc.
- Mobile software to serve a (mobile) user
  - A user agent for personalized information retrieval, shopping, etc
  - Makes particular sense for information access over a wireless link
    - Jain and Anjum, IEEE WCNC, 2000
- Mobile software to serve the network provider
  - Mobile software in the network to decrease the cost of personalized information delivery to (mobile) users
    - Shah, Jain, Rajagopalan, Anjum, 2001
- Managing the itineraries and location of mobile software modules will be a major challenge
  - Security, cost, and efficiency implications
Database needs: gizmos as blessing (and curse ...)

• Where is my gizmo?
  – Databases for managing the location and mobility of distributed communicating devices

• Where is the user (or object) who has my (or this) gizmo?
  – Databases for using devices and connectivity to identify, authenticate, and locate users -- as well as other devices

• What can my gizmo do for me today?
  – Databases for dynamic service discovery, download, and activation

• Why can’t my one gizmo do everything?
  – Integrating database facilities with other horizontal & vertical applications

• Why can’t I have a special gizmo to do this one thing I need?
  – Application-specific micro-databases and database micro-clients

• Why can’t my gizmo and your gizmo figure things out together?
  – Database transactions across ad-hoc networks
Gizmo risks

• The gizmo divide
  – gizmo haves and have-nots

• Security and privacy
  – especially for micro-databases and mobile databases
  – especially for location and transaction information

• Environment
  – Compare: ~800 million black phones in the world today
  – The half-life of a gizmo will continue to drop
  – Profile databases and location-aware databases of software radio modules

• Serenity and tranquility
• Health and safety

OK, the database folks can’t solve everything, but still ...
Backup slides
Gazillions of gizmos: Database challenges

• Scaling up
  – Gazillions of gizmos, transactions, etc., in real time, across very large distances

• Scaling down
  – Micro-databases and special optimized databases
    • Micro-databases ≠ Embedded databases
    • Zero administration but also dynamic, incremental functionality update
    • Essential to utilize scarce resources efficiently and use across multiple applications

• Query and Update Optimization
  – to conserve wireless bandwidth and power
  – taking into account special network topologies and technologies
    • asymmetry
    • line-of-sight restrictions
    • availability of cheap broadcast facilities