Mobile Data Landscape

- Mobile data sources are truly ubiquitous today
- Very heterogeneous landscape:
  - Different hardware platforms
  - Different OS and software environment
  - Mixed communication options
Mobile Data Sharing Requirements

- Ad-hoc
- Device-independent
- Combine own data and that of others
- Share also applications
- Protect privacy
Overview

- Related work
  - System architecture and components
    - Runtime Engine
    - Communication module
    - Query processor
    - Privacy enforcement
  - Prototype and example application
  - Conclusion and outlook
Related Work

- CarNet (Morris et al.): specialized hardware, restricted application, no privacy for shared data
- P2P systems (e.g. CHORD, PIER): usually rely on stable infrastructure and central services; no application sharing
- Sensor database systems, web service platforms, specialized mobile applications platforms: data consolidated in centralized and global repository
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INFINY Architecture

Application

Runtime Engine

Query Engine

Privacy

Communication

Data

Native System
Runtime Engine

- Webservice-like structure: listens for HTTP requests at local port
- Applications are written in HTML and JavaScript and run inside the local web browser
- Provides query and data presentation services to applications
- Applications are accompanied by a machine-readable description (XML)
- Packages and sends applications across devices
- Only allows application to issue the queries specified
Communication Module

- Provides information exchange capabilities
- Resource discovery and monitoring
- Device independent data format
- Choice of communication channel
- Routes data to query or runtime engine
Query Engine

- SQL-like language
- Receives queries from communication module or runtime engine
- Query splitting and routing
- Local execution through privacy layer
- Presentation of results
- Global schema
- Local extensions of the schema
Query Processing

1. Query Analysis

2. Query Rewriting

3a. Local Execution

3b. Routing

4. Remote Query

5. Result Processing

Runtime Engine/Communication Module

Privacy Module

Data
Privacy Enforcement

- Negative base policy: by default nothing is disclosed
- Rewrites queries so that privacy policy is enforced (like HDB)
- Single access point to local data
- Granularity of rules: what data by whom for what purpose under which condition
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Sample Application

- Evacuation
- Building map
- Location detection
- Avoid congested regions
Example (Middleware)
Example (Routing)
Other Applications

- Restaurant recommendation (implemented)
- Traffic routing
- Disaster recovery
- ...
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Conclusion

- Ad-hoc mobile data sharing has many applications
- ÍNFÍNÍTY is a middleware proposal to address:
  - Device-independent
  - Ad-hoc
  - Data and
  - Application sharing in a
  - Privacy-preserving manner
- Prototype implemented, demo available
Future Work

- Metrics for communication channel selection
- Metrics for query routing
- User identification and authentication
- Caching of query results
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