Abstractions for Shared Sensor Networks

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Shared Sensor Nets

- Macroscopes are expensive:
  - to design
  - to build
  - to deploy
  - to operate and maintain

They will be shared resources:
- across organizations
- across apps w/in organizations

Q: What are the right abstractions to support them?
Traditional Macroscopes

All users/apps see only cleaned data: a.k.a. “TRUTH”

Data Feeds
- Point of Sale
- Inventory
- Etc.

Extract
Transform
Load

Cleaning, Auditing, ...

Data Warehouse

Business Intelligence

Data Mart

Data Mart

Users

Reports

Dashboards

Operational Systems

ad hoc Queries

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VICE - A Virtual Device Layer

Vice API is a natural place to hide much of the complexity arising from physical devices.

“Virtual Device (VICE) API”

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Shelf RFID Test - Ground Truth

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Actual RFID Readings

“Restock every time inventory goes below 5”

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After Vice Processing

“Restock every time inventory goes below 5”
Automated Cleaning [VLDB 06]

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One Truth for Sensor Nets?

• How clean is “clean-enough”?
• How much cleaning is too much?

• Answers are likely to be:
  • domain-specific
  • sensor-specific
  • application-specific
  • user-specific
  • all of the above?
Fuzzy Truth?

Probabilistic Data Management is the key to “Calm Computing”
Tracking Superman @ home?

He walks through walls;
He flies across the room...

Original Data  Cleaned Data

Too much cleaning and you lose detail.

Ubisense tracking data from Ryan Appierspach

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Adding Quality Assessment

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Cleaning is Just One Service

Scheduling  Data Cleaning  Provisioning
Monitoring  Tasking/Programming  Evolution
Actuation

We will need to understand the shared/custom tradeoffs for all of these.

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