TinyDB provides the data management functions:
- Query optimization, power efficient execution
- Improve efficiency through the use of aggregates: MAX, SUM, AVG, ...
- Tree based routing for query delivery, data, collection, and in-network aggregation

TinyDB + Heterogeneous Routing
- Enable query processing on a subset of nodes
- Attract packets to query processing nodes
- TinyDB specifies the "value" of query processing to the network layer
- Value depends on data reduction "effectiveness" of query

Shape Detection
- Grid of Mica2 motes detects shape of object placed on top
- Adds to TinyDB
- covered attribute uses light sensor to determine if mote is covered
- SHAPE aggregate merges sensor values on a mote
- SHAPE aggregate calls EmStar shape component on a Stargate
- Heterogeneous Routing is used to designate the Stargate as a more powerful node
- EmStar shape component looks up sensor values in database and returns list of likely matches
- Shape result merged to aggregate data and forwarded

Heterogeneous Routing
- Packet routing should reflect network resources
- E.g. Packet aggregation, filtering
- Transparently adjust routes to attract data to resource-rich nodes
- Balance the value of in-network processing against the cost of packet forwarding
- Proactive attraction and aggregation of data reduces overall forwarding cost
- Implemented on top of DSDV

EmStar
- Distributed debugging and development environment for Linux
- Targeted to sensor network app development
- Offers different degrees of "reality", from simulation to deployment
- Same code in all realities

EmTOS
- EmTOS is the bridge between TinyOS and EmStar
- Emulates TinyOS API
- Runs unmodified NesC code
- TinyOS apps can interact with EmStar components and the entire Linux environment

TinyDB
- Enables queries for desired signature
- Attracts data to resource-rich nodes
- Enable query processing to the network layer
- Value depends on data reduction "effectiveness" of query