THE ACQUIRE MECHANISM FOR EFFICIENT QUERYING IN SENSOR NETWORKS

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Introduction:

One Shot Queries for Replicated Data

- **Example Query: Is there a location in the network where (Temperature > 80) AND (Wind Speed < 20 mph) AND (Humidity < 70 %)**
- **Example Query: Fetch the calls of the following birds: Nightingale, Blue Jay and Warbler.**

ACQUIRE: An Efficient Mechanism (SNPA'03)

- ***Two Phases***
  - ***Update Phase: An active node requests for information from all nodes within d hops of itself (d is the look-ahead parameter) and tries to resolve the query***
  - ***Forward Phase: If the query is not completely resolved, the node forwards it to some other node (chosen randomly or intelligently) d hops away.***
- ***Spans the entire space from random walk (d=0) to flooding (d= D, the network diameter)***

Problem Description:

Is there an optimal value for the look-ahead parameter d in ACQUIRE, and what does it depend on?

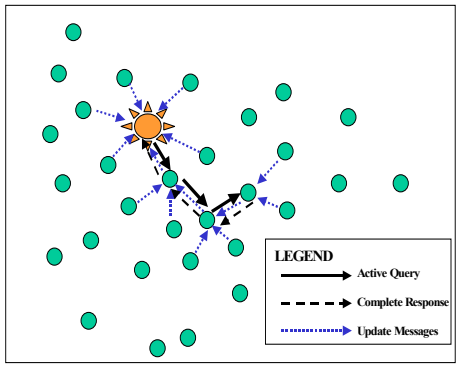
Proposed Solution:

We derive analytical expressions for the average energy usage of ACQUIRE and prove the following:

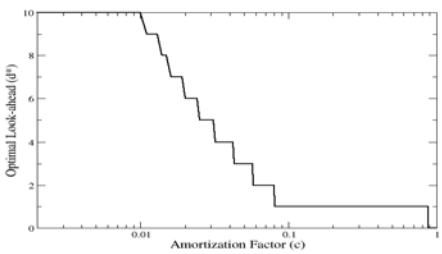
• The Optimal value of d depends only on the querying rate and the data dynamics (c) and is independent of the query Size (M) and the total number of variables tracked by the network (N).

• For a given query rate, lower the data dynamics, the higher the optimal value of d. So flooding is best suited when sensor data rarely changes, while random walks are better suited for highly dynamic scenarios.

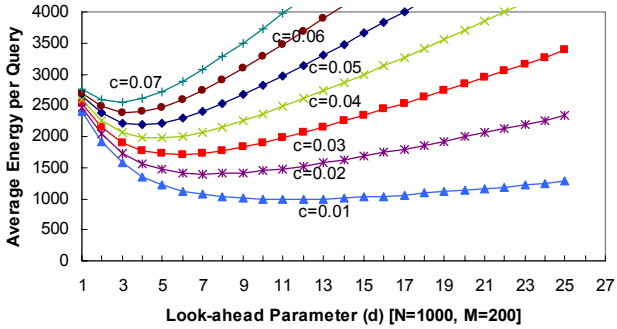
• ACQUIRE can significantly outperform other alternatives such as expanding ring search.



ACQUIRE: Basic Mechanism



Optimal Look-ahead (d*) vs. the data dynamics (c)



Average Energy to Answer a Query vs. d