

Self-adaptive Route Selection for DHT in Wireless Sensor Networks

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1. Background

Overlay network over WSN

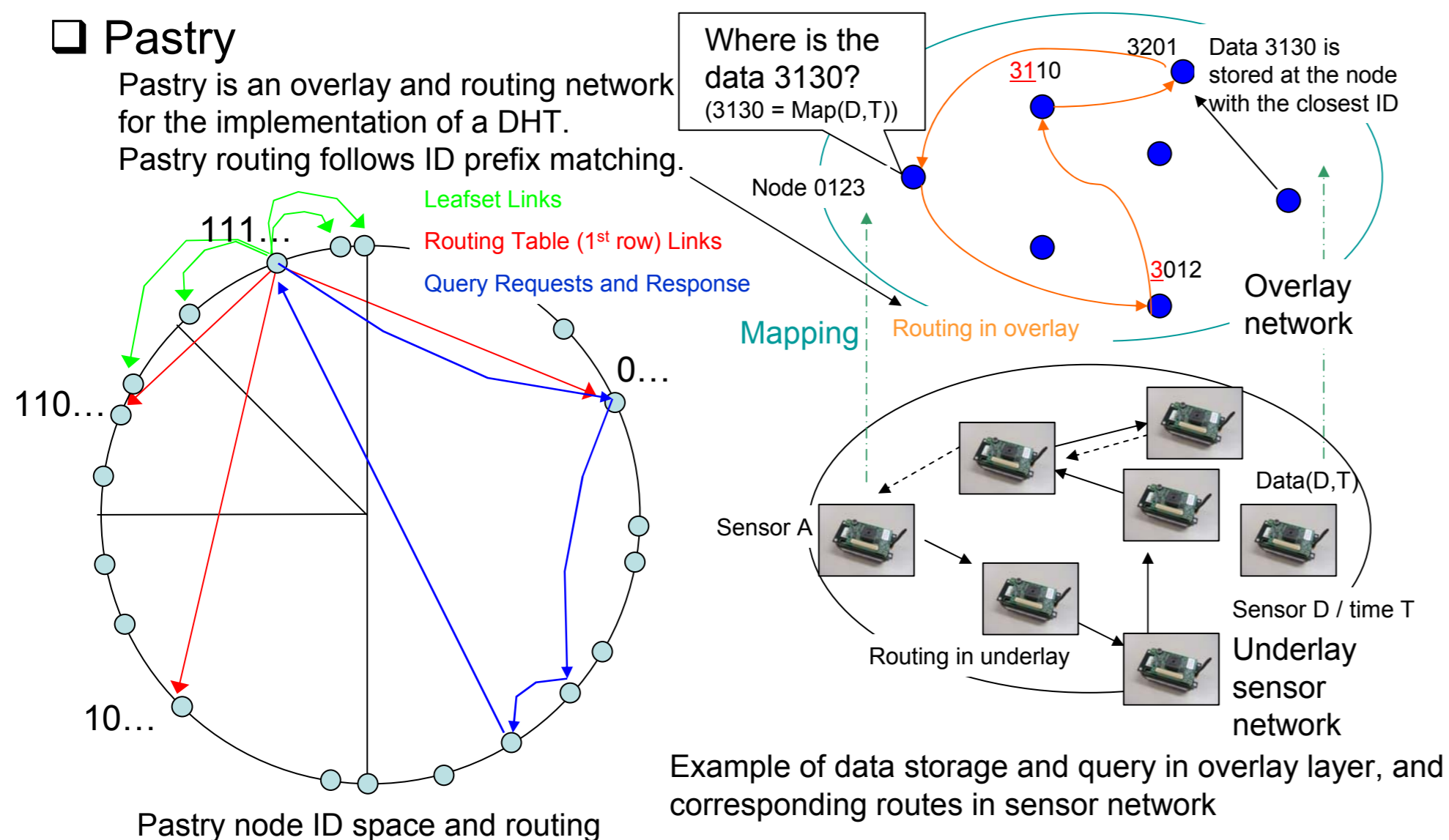
Sensor nodes and data are mapped to node IDs and data keys in overlay network.
Data storage and retrieval are independent with the source nodes, which provides the robustness against area failures.
One hop in overlay corresponds to one or more hops in underlay.
There are many algorithms of topology and routing, such as DHT.

Distributed Hash Table (DHT)

DHTs are a class of decentralized distributed systems that provide a lookup service similar to a hash table.
DHTs emphasize the properties of decentralization, scalability, and fault tolerance.
Typical DHTs are Chord, Pastry, CAN, and so on.

Pastry

Pastry is an overlay and routing network for the implementation of a DHT.
Pastry routing follows ID prefix matching.



2. Problem Statement

How to achieve the routing with low delay and low overhead?

Proximity Neighbor / Route Selection (PNS & PRS)

PNS selects routing state entries for each node among the closest nodes in the underlying topology that satisfy constraints required for overlay routing.

Problems of PNS and PRS

Churn

Churn is a phenomena of frequent joining and leaving.
Churn causes high overhead of topology maintenance and low accuracy of query.

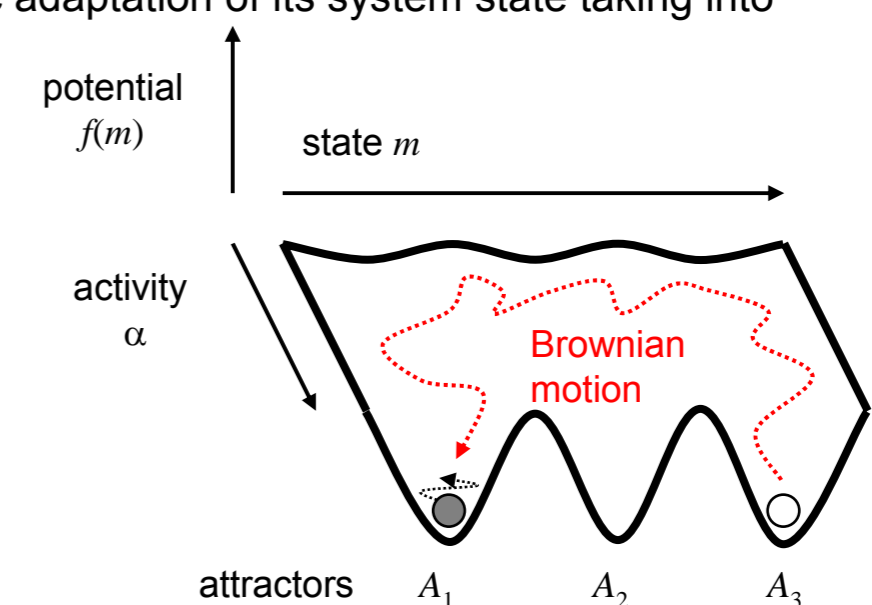
How to select route adaptively?

Attractor Selection

Attractor selection is a biologically inspired model which operates well in ambient and fluctuating environments.
Attractor selection performs a stochastic adaptation of its system state taking into account environmental changes.

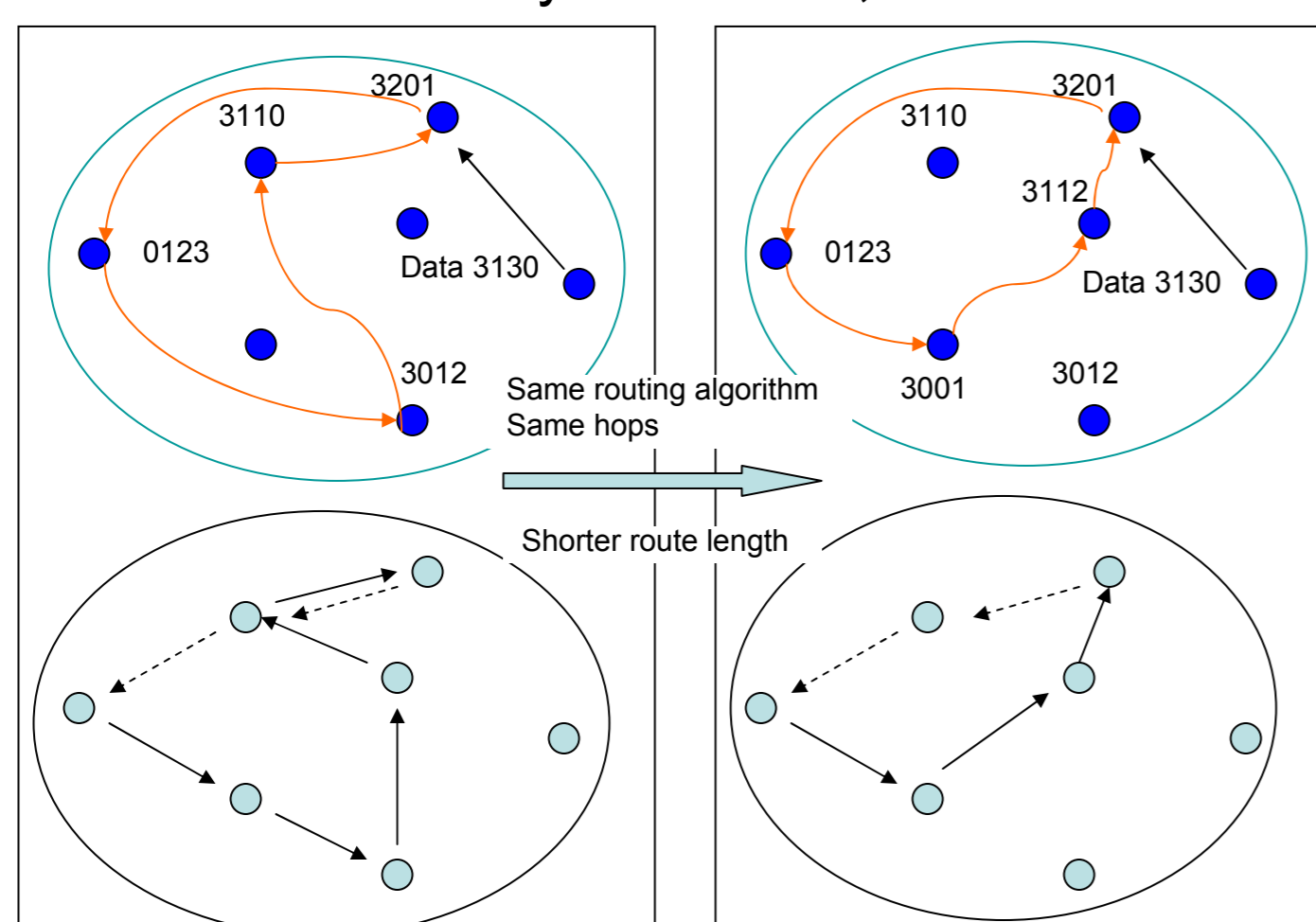
Goal

Self-adaptive route selection in Pastry over WSN



3. PNS in DHT

- Follow the routing algorithm of DHT
- Select the closest neighbors in the neighborhood
- Distance has many definitions, such as RTT



5. Simulation

Expected Simulation Results

- Lower latency
- Less overhead of the routing table maintenance
- Less timeouts under churn

6. Future Work

- Handling mobile nodes with varying distances
- Load balance among nodes with different capabilities

4. Pastry-AS

Contributions

- Redundant routing table
- Self-adaptive route selection

