Title
Hierarchical In-Network Processing

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Introduction: Exploit the heterogeneity

Diversity in Sensor Node Platforms

Why heterogeneous systems?
- Computing Max., Min. and Avg.
- Acoustic Beamforming
- Spectrogram Correlation
- Vision based feature extraction

Proposed Solution: Hierarchical organization of Acoustic Beamforming application

Problem Description: Heterogeneous Sensor Networks

Dense resource constrained Micro-nodes

Sparse powerful Macro-nodes

Peripheral Systems Architecture Design Challenges
- Energy efficient application partitioning and mapping
  - Influenced by the architecture for nodes
  - Complexity of mapped tasks
- Determining the optimal network composition
  - Number of macro-nodes and micro-nodes
  - Latency of data transfer is critical
  - Cost vs. performance trade-offs
- Self-configuration mechanism
  - Cluster micro-nodes based on proximity to macro-node
  - Offload computation onto the macro-node in the cluster

Target Tracking Application

- Parametric, Time-domain Line of Bearing computation
- Sound source located far away from the sensor nodes
- Sensor nodes try estimate the angle of arrival of signal
- Accuracy depends on number of search angles
  - More search angles implies better accuracy

LOB Energy and Latency Measurements

Architecture Comparisons

Node Density Effects