

Applications and Design Issues in Mobile Agent based Wireless Sensor Network

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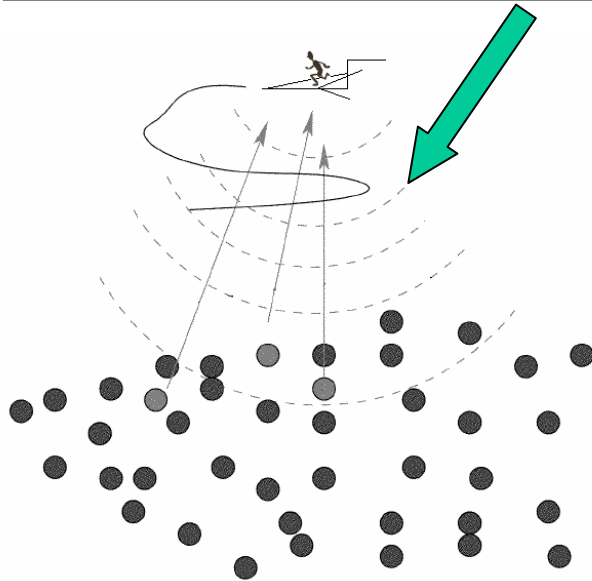
What's Mobile Agent in WSNs

- Agent
 - An entity which can represent the desire of the sink node.
- Mobile
 - The agent can move to the target are autonomously and carry out application-specific task intelligently.

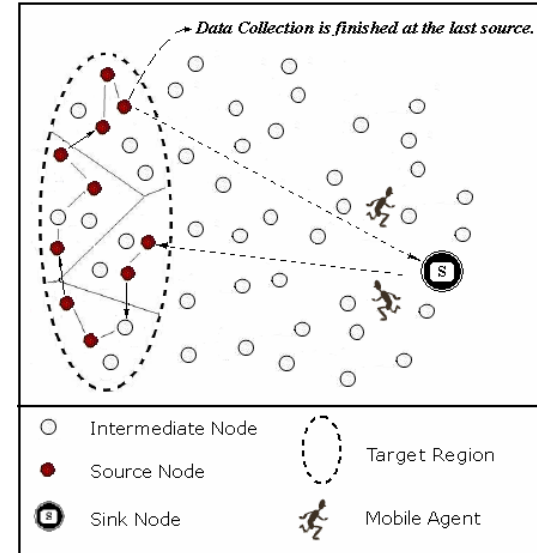


Hardware Agent and Software Agent in WSN

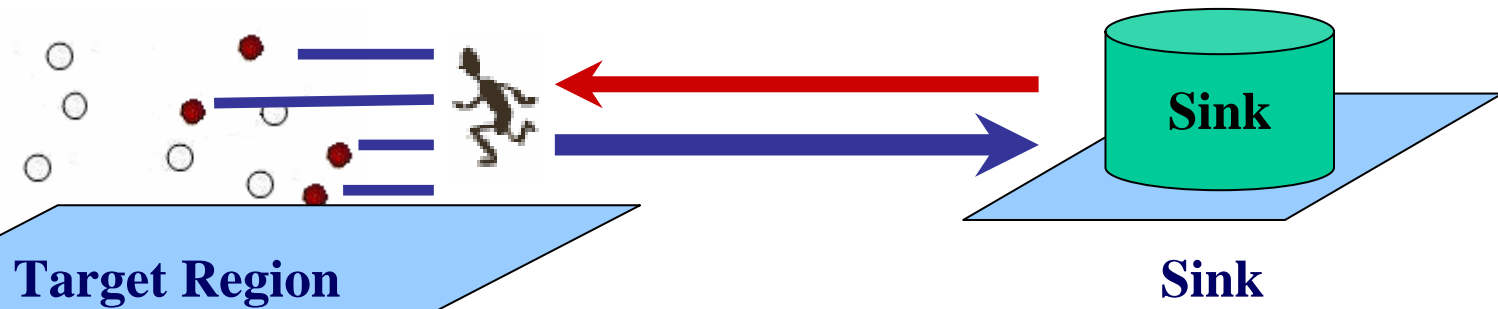
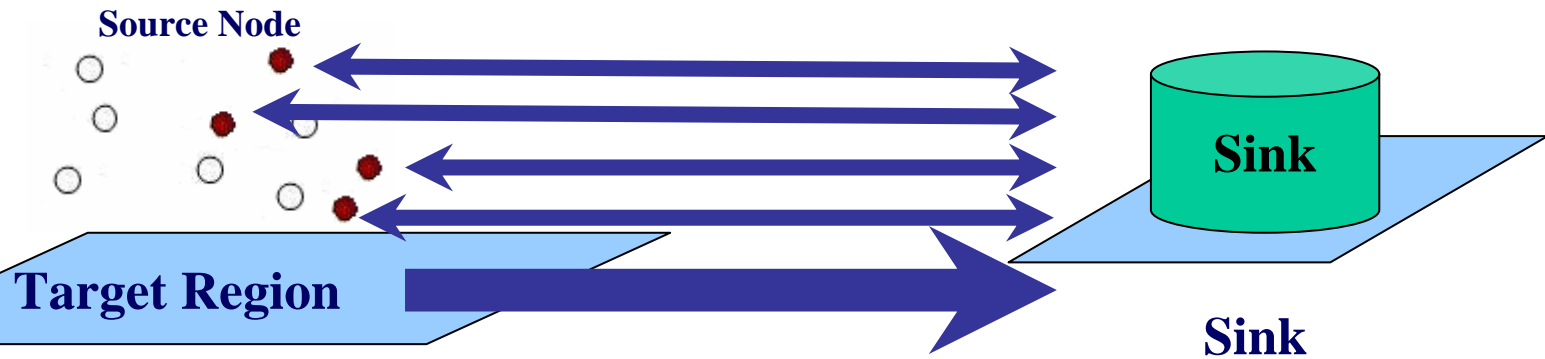
Hardware Mobile Agent?



Software Mobile Agent



Benefit of Mobile Agent for WSNs



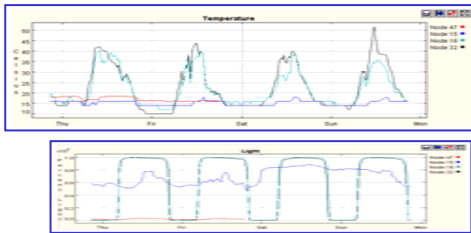
- Energy Efficient
- dynamically deploying a new application
- Progressive accuracy ...



Supporting Re-tasking Sensor Networks



Re-tasking a deployed network



Data Gathering



Bird Localization



Fire Emergency

Requires in-situ re-programming

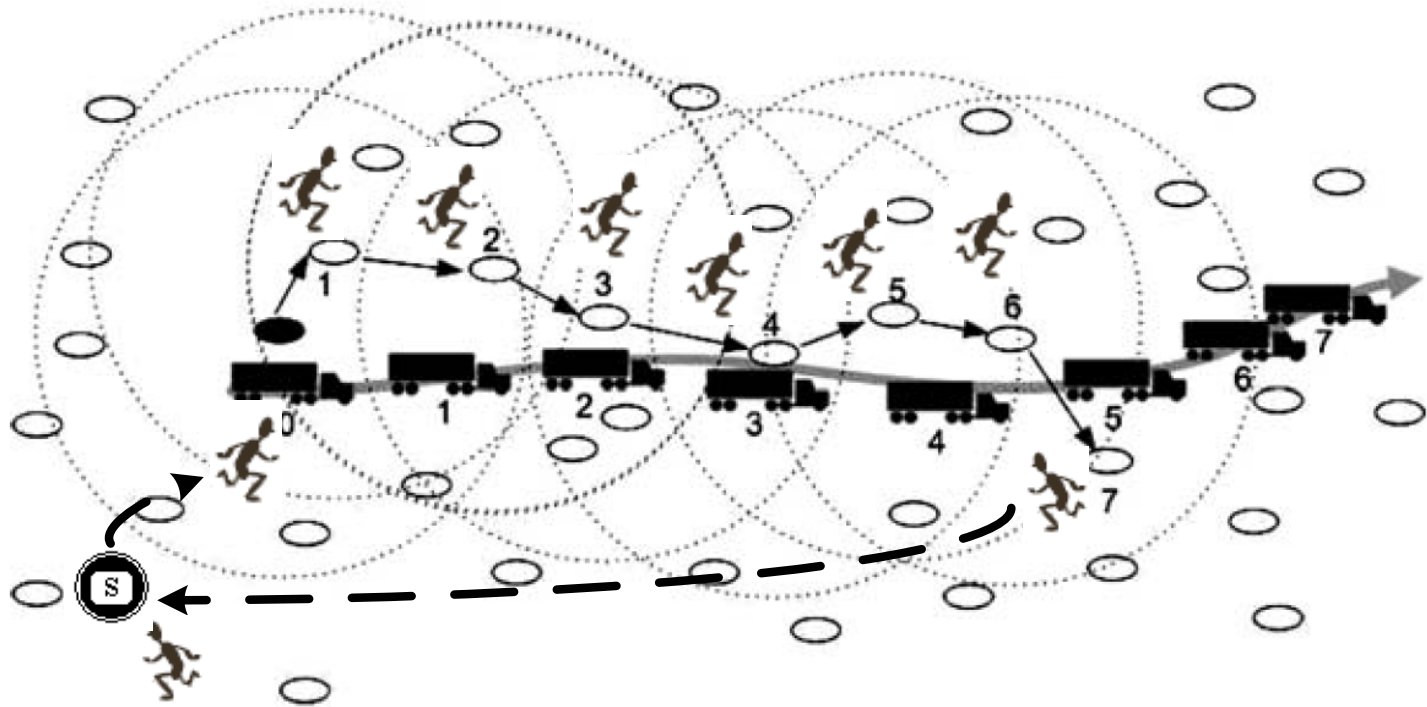


Application in Mobile Agent based WSNs

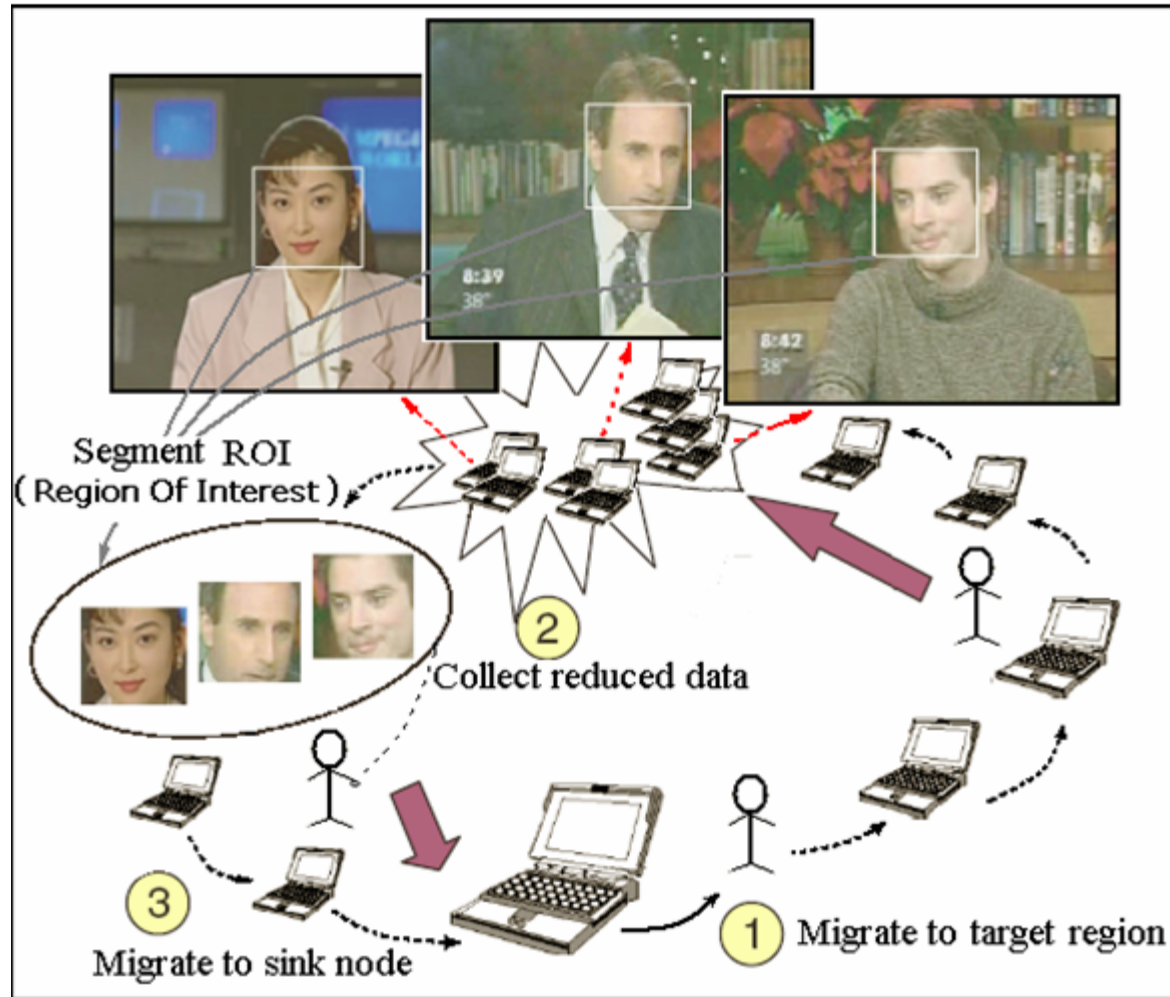
- Target Tracking
- Video Sensor Network
- ...



Target Tracking: Obtain Progressive accuracy



Video Sensor Network



Design Issues in Mobile Agent base WSNs

- Architecture
- Itinerary Planning
- Middleware
- Agent Cooperation
- Reliability
- Security

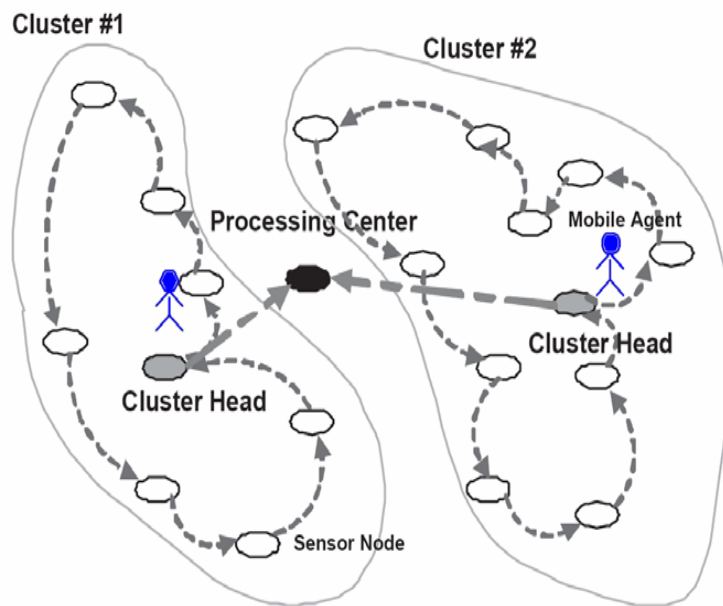


Architecture

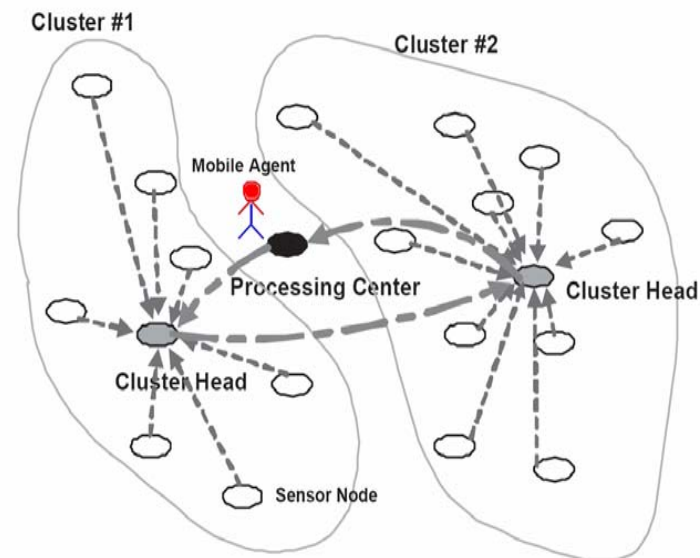
- With Support of Infrastructure
- Without Support of Infrastructure



With Infrastructure (e.g. based on Clustering Sensor Network)



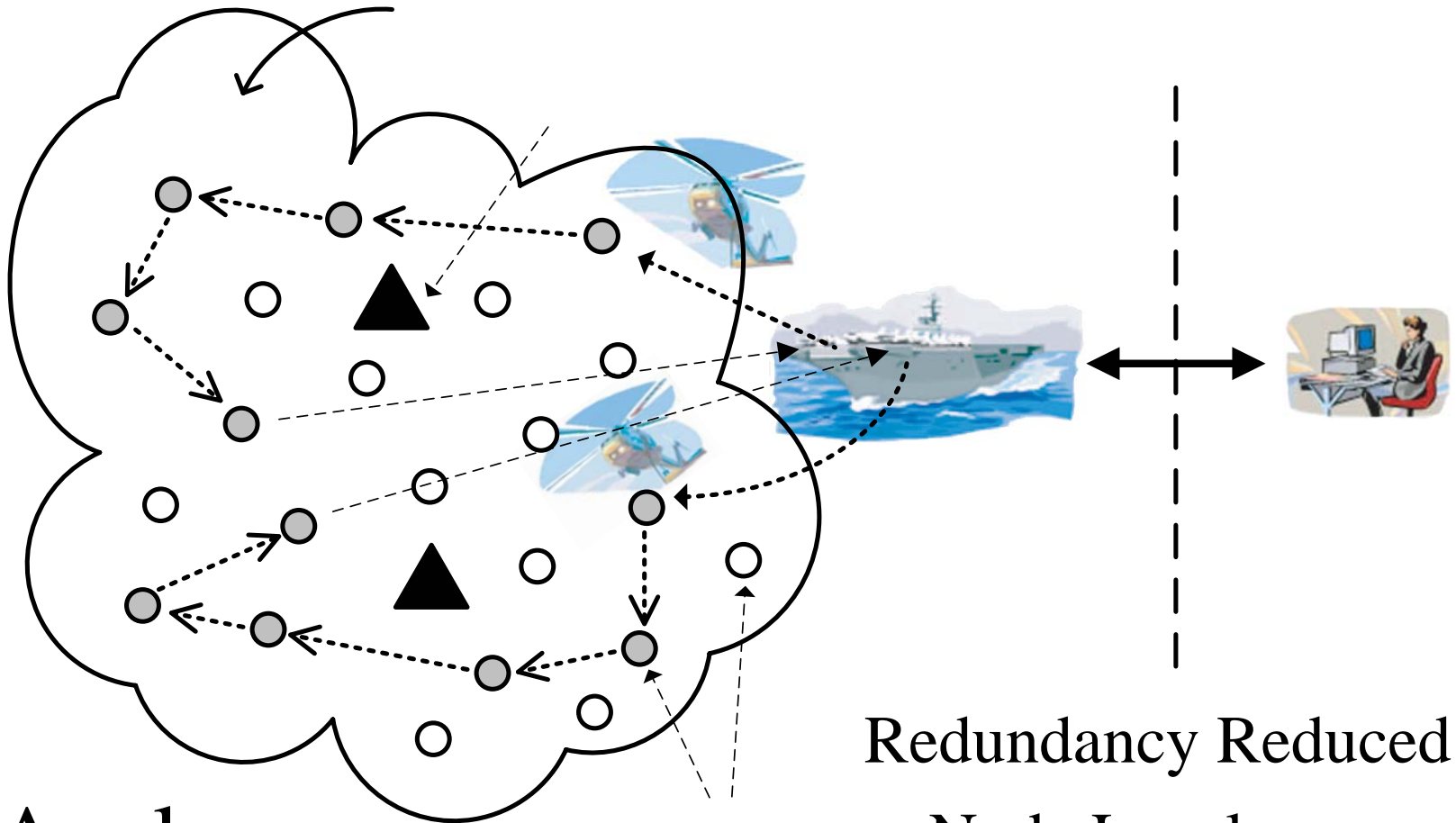
MADSN1



MADSN2



Without Infrastructure



Analog

- Mother MA \leftrightarrow Carrier
- Child MA \leftrightarrow Aircraft

Redundancy Reduced:

- Node Level
- “Aircraft” Level
- “Carrier” Level



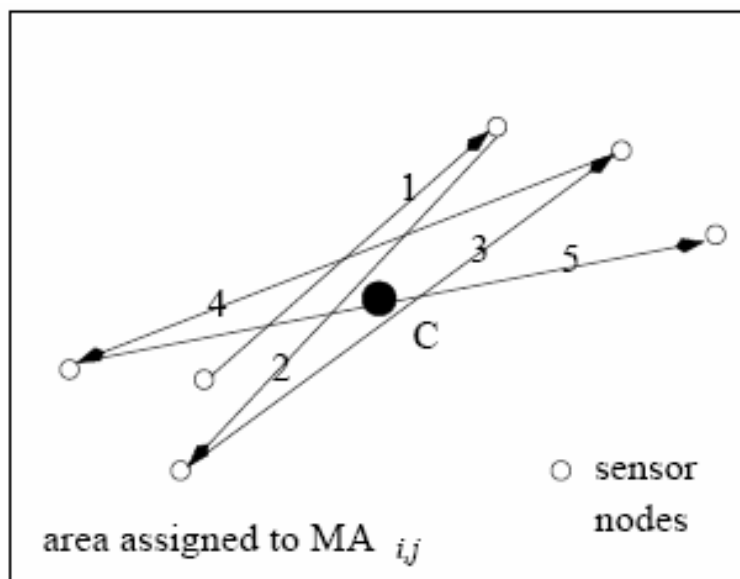
Itinerary Planning

- Static Planning
- Dynamical Planning



Static Planning

- GCP (global closest first)
- GA (genetic algorithm)

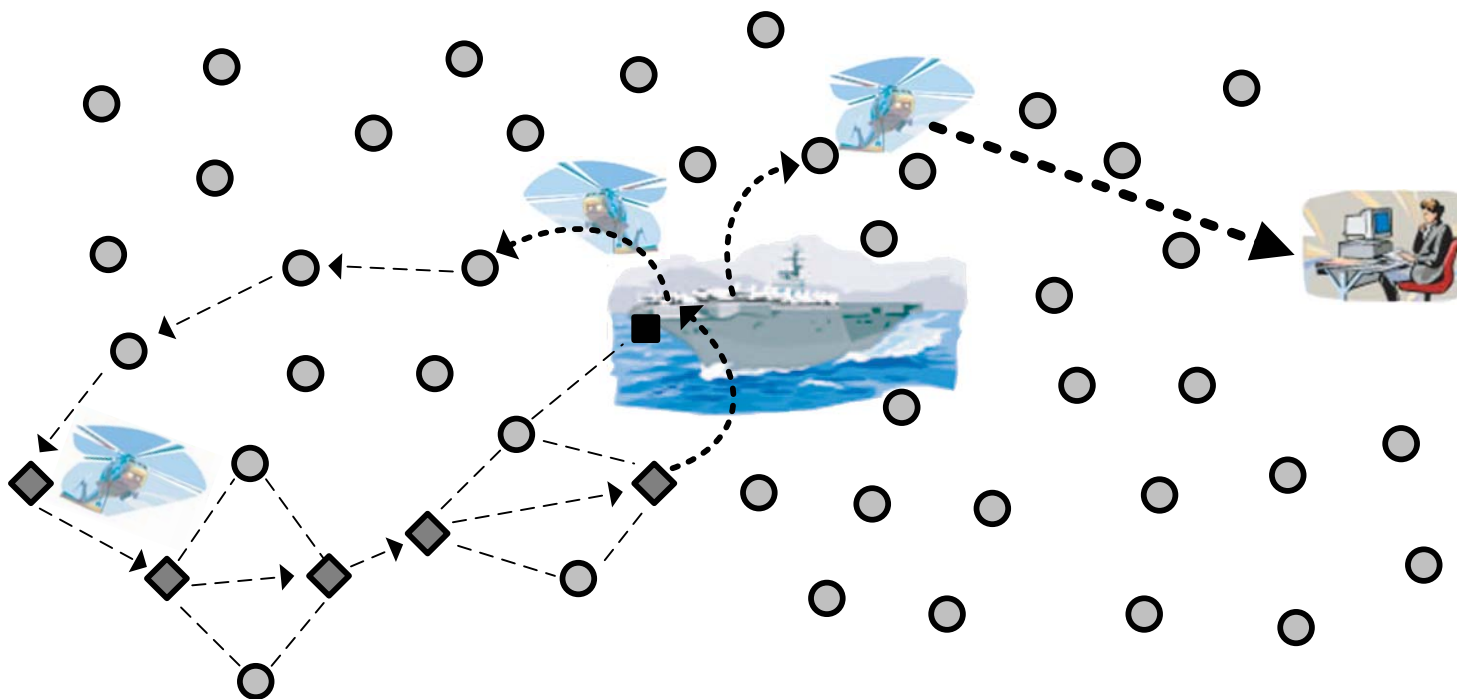


Global information is needed



Dynamical Planning

- MADD (Mobile agent-based directed diffusion)



Other Design Issues

- **Middleware**

- Existed System: (e.g. Agile, WISEMAN, etc.)
- Design Tradeoff: Coarse grained <-> Fined grained

- **Agent Cooperation**

- Existed Multiple Agent Coordination
- Decision making in mobile agent group

- **Reliability**

- Redundancy <-> Reliability

- **Security**



Multiple Agent coordination



- Analogy: a football (soccer) match
 - Players take decisions on their own
 - The team's coach defines strategy
- <-> How to coordinate with other MAs



- Analogy: a Token



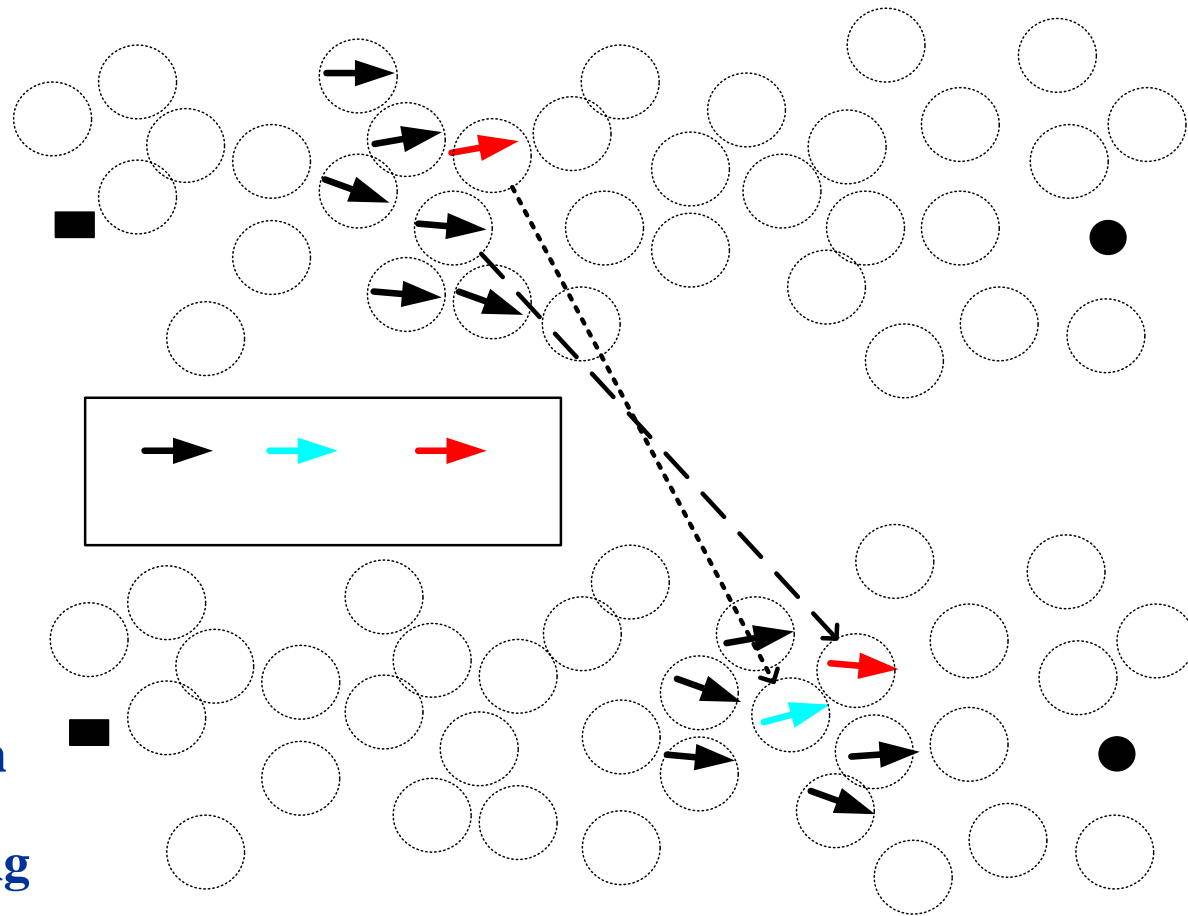
Group Coordination : Leadership and Cooperative routing -> Decision making in mobile agent group

Motivation:

Extend the Ability

Risk Decentralization

Distributed Processing

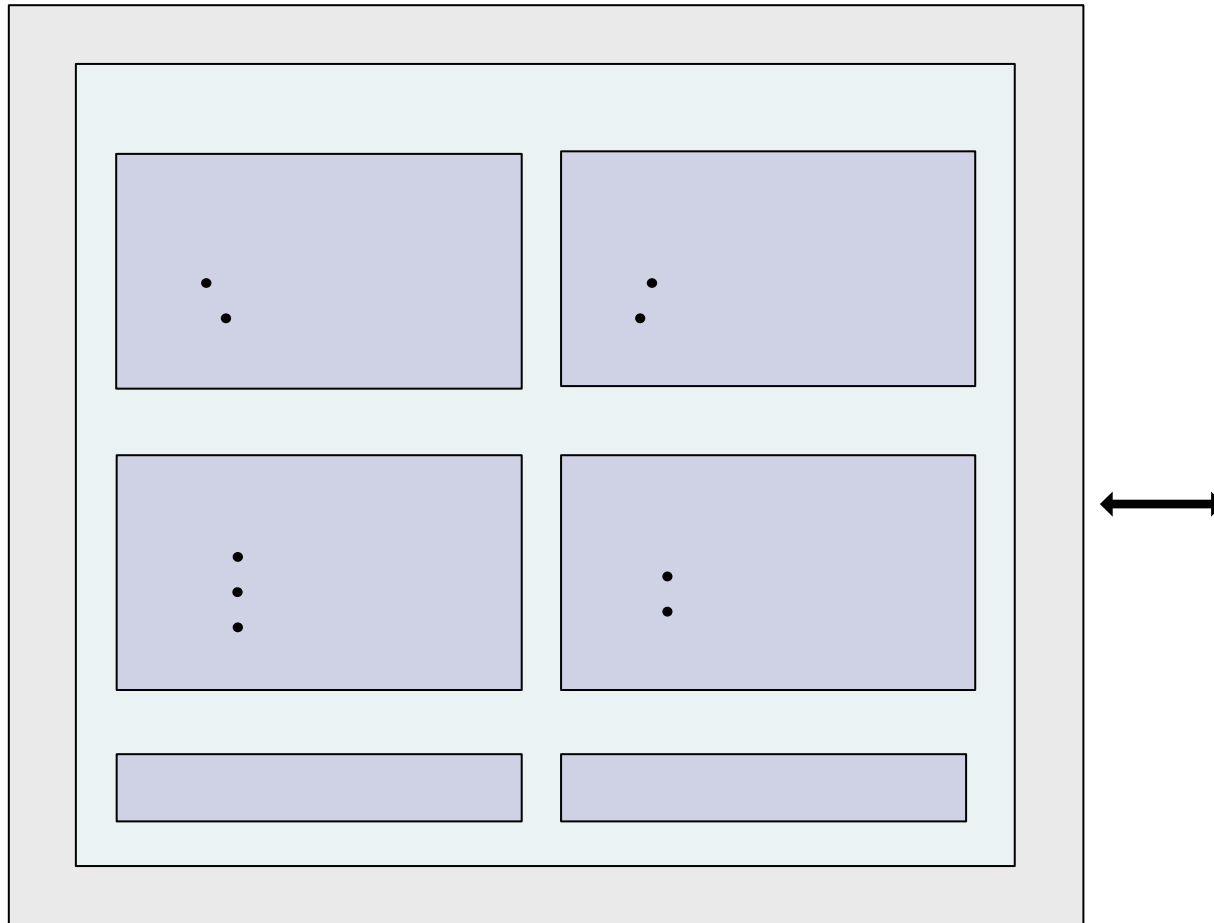


Each Mobile Agent has its own “ Speciality ”.

Different Environments, Different Knowledge



Conclusions



According to specific application requirement, suitable combination of the components should be selected.



Thank you!

