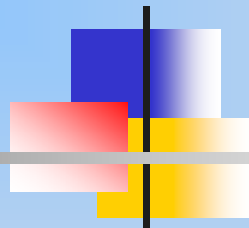
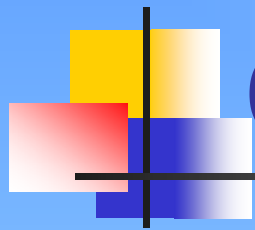


Lightweight Service Advertisement and Discovery in Mobile Ad hoc Networks



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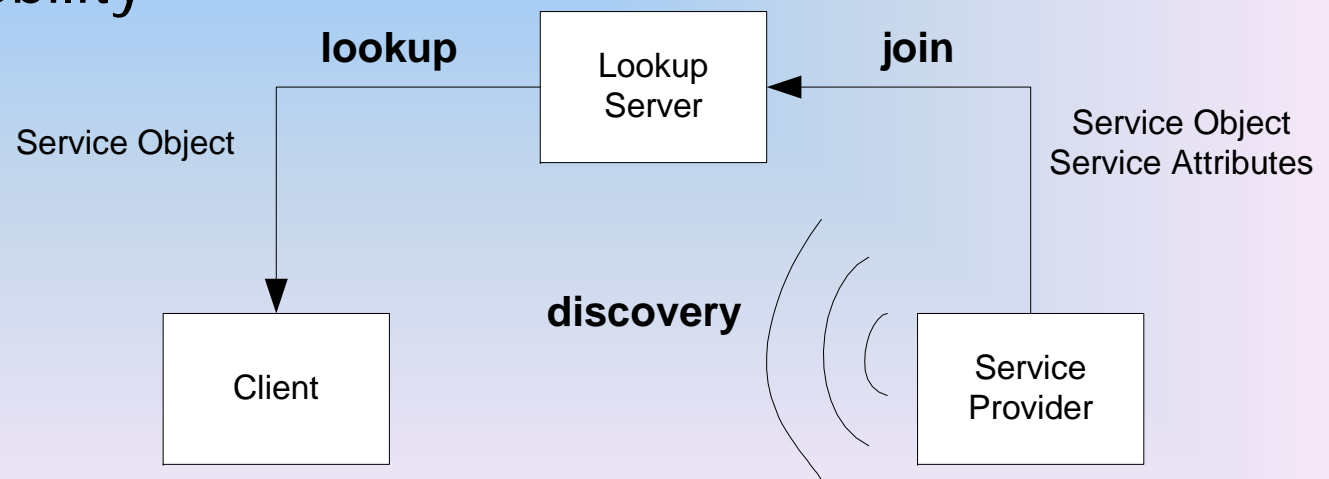


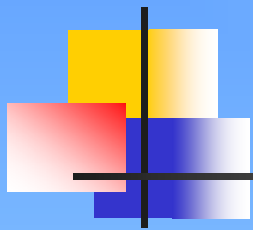
Outline

- Introduction
- Motivation
- Summary

Motivation

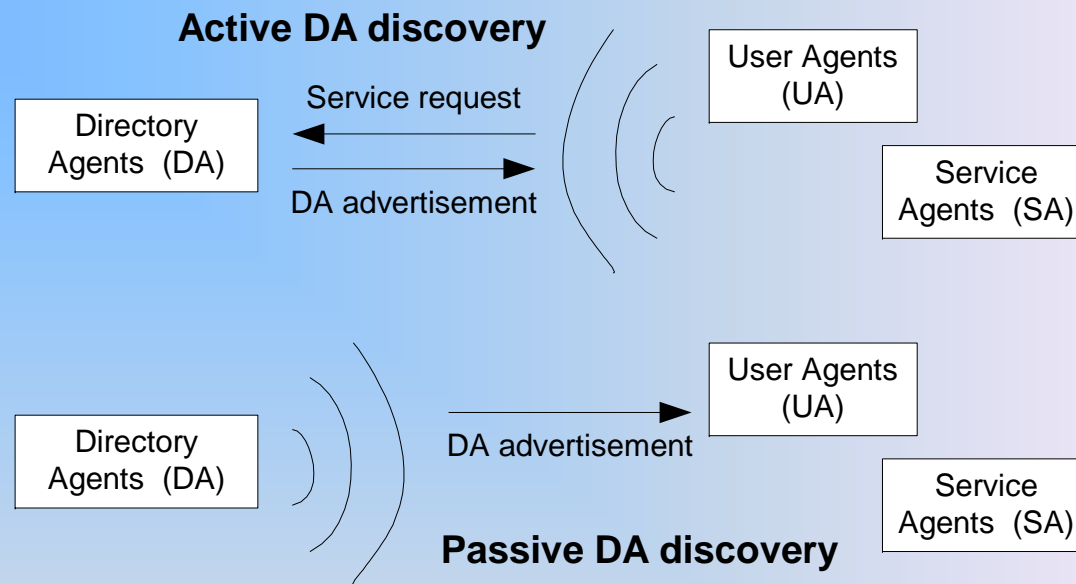
- Existing service discovery approaches are not suitable for mobile ad hoc networks
 - Jini, SLP
 - Lightweight
 - Mobility





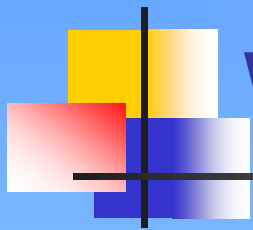
Motivation

■ SLP



■ Solution

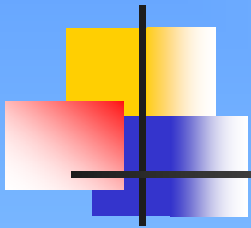
- Extending MANET multicast protocols
 - MobilMesh, ODMRP, etc.



Why ODMRP?

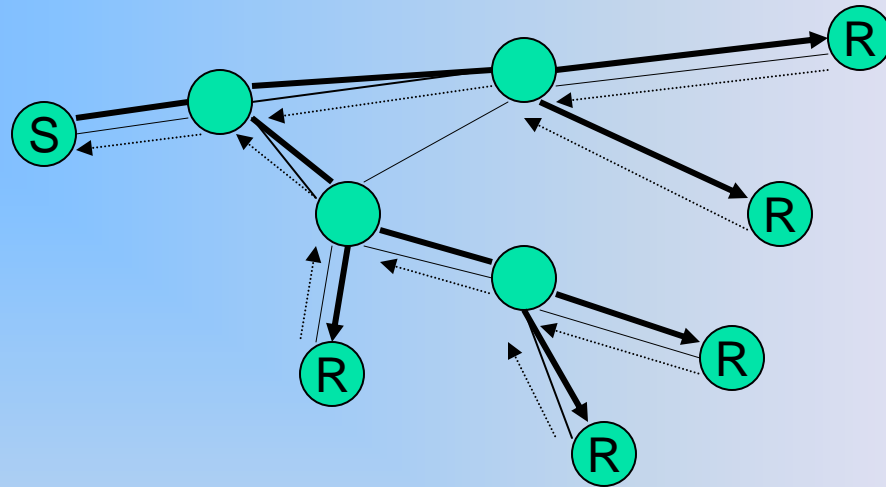
- Simplicity
- Reliable construction of routes and forwarding group
- Low channel and storage overhead
- Stable performance [1]

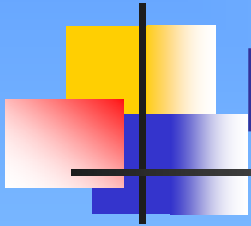
[1] S.-J. Lee *et al.*, "A Performance Comparison Study of Ad Hoc Wireless Multicast Protocols," *INFOCOM 2000*, Mar. 2000, pp. 565–74.



ODMRP

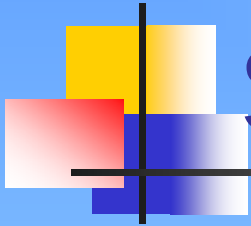
Join Query →
Join Reply ←





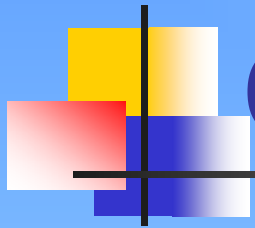
Packet Format for ORMRP

TYPE	Reserved	TTL	HOP count
Multicast Group IP address			
Sequence number			
Source IP address			
Previous hop IP address			
Previous Hop X coordinate			
Previous Hop Y coordinate			
Previous hop moving speed		Previous hop moving direction	
Minimum link expiration time			



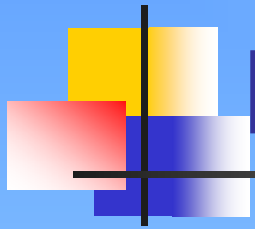
Service Awareness Header

TYPE	Option field	TTL	Service port
Server address			
Service name			
Protocol type		reserved	
Optional fields			



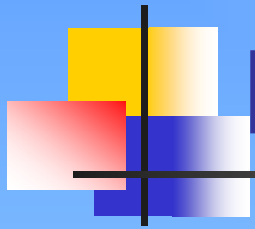
ODMRP in NS-2

- Each node in ns2 binds to an agent. The agent can handle events and send/receive packets.
- ODMRP agent class has been modified
 - To support service provider and normal nodes
 - To handle the service awareness header



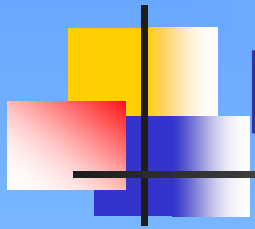
PUSH Mode Implementation

- Agent checks its node type while sending a *JoinQuery* packet.
- If it is a service provider, it will attach an service awareness header.
- The receivers in the multicast group will detect this header by a flag defined in the original ODMRP packet.



PULL Mode Implementation

- Agent attaches a service awareness header to the ODMRP packet and multicast it into the group.
- If service provider in the multicast group receives this query, it will do the same stuff as PUSH mode.



Evaluation Parameters

- Successful delivery ratio
- Overhead ratio
- Delay time
- NS-2 simulations

Simulation Results (Mobility)

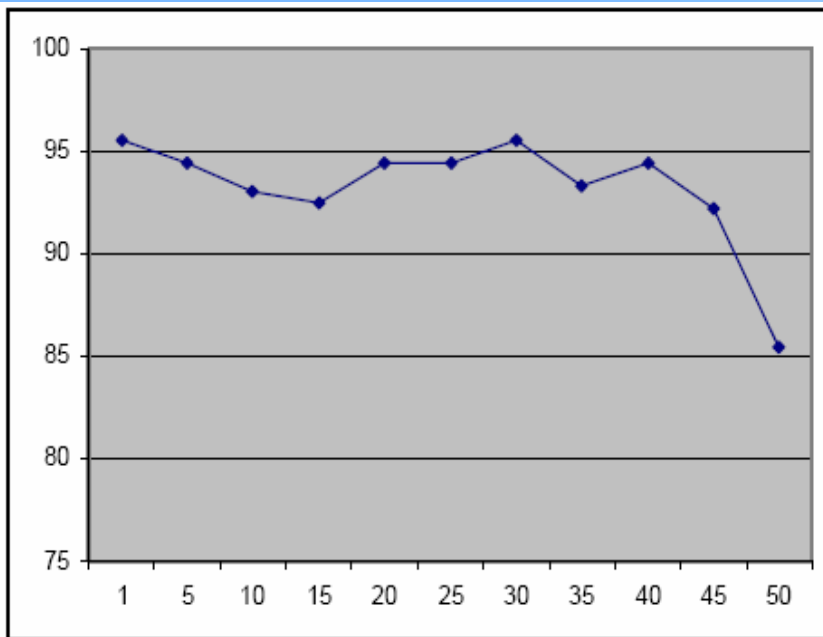


Figure 4. Success delivery ratio as a function of node moving speed (x axis as the node moving speed in m/s and y axis as the success ratio in %).

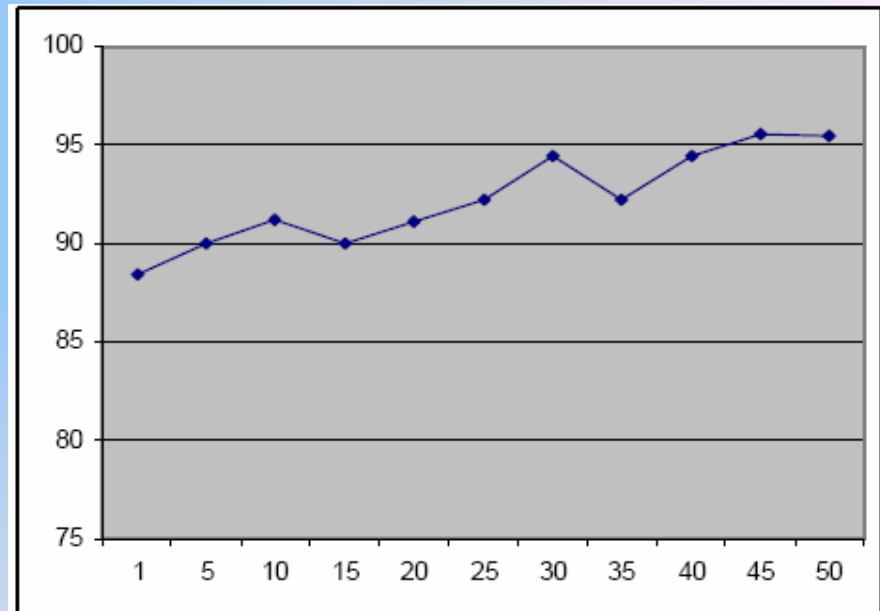


Figure 5. Success delivery ratio as a function of pause time (x axis as the pause time in second and y axis as the success ratio in %).

Simulation Results (Overhead)

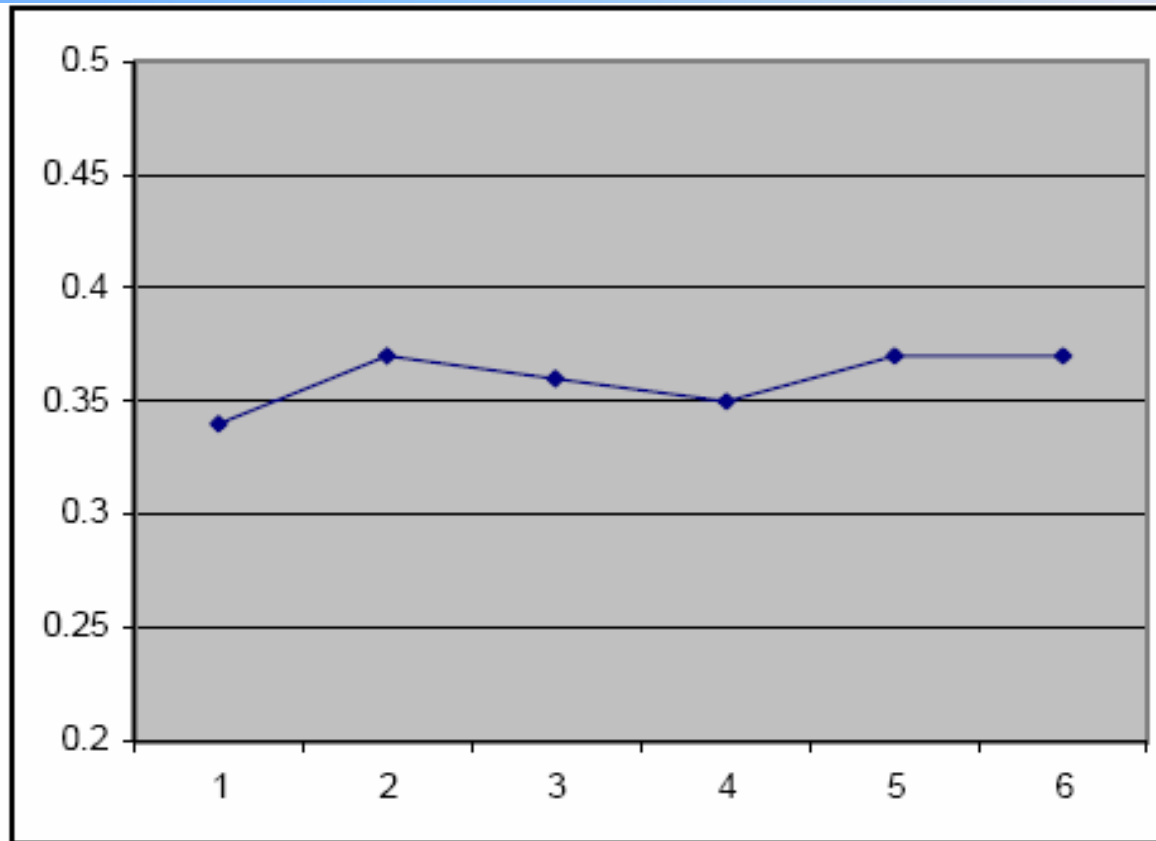


Figure 6. Overhead ratio as a function of the number of service providers (x axis as the number of service providers and y axis as the overhead ratio in %).

Simulation Results (Delay)

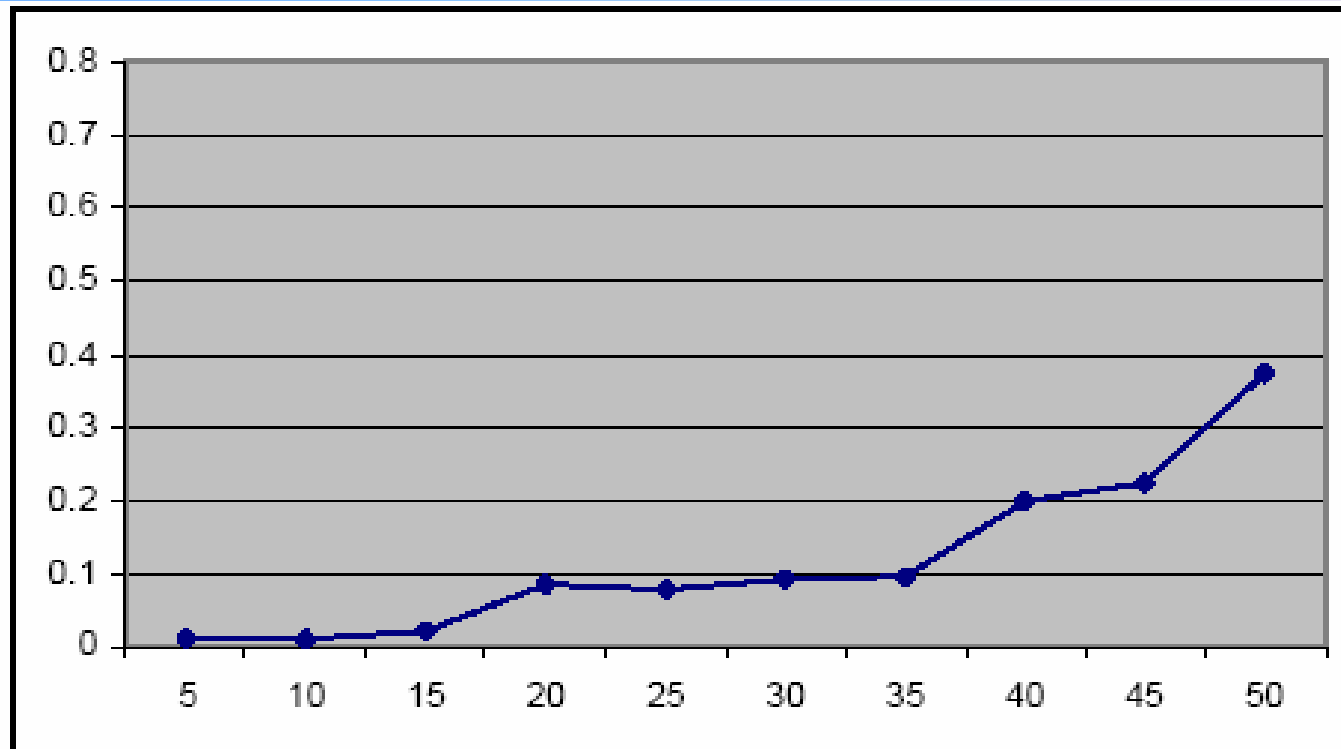
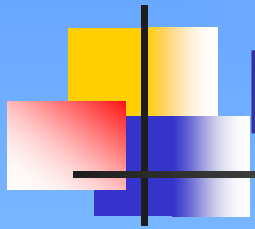


Figure 7. Delay time as a function of the number of nodes (x axis as the number of nodes and y axis as the delay time in second).



Future Work

- Including packet losses into the wireless channels
- Comparing the performance with other service awareness implementation
- Adding service invocation

