Lightweight Service Advertisement and Discovery in Mobile Ad hoc Networks

Dr. Liang Cheng
Director, Laboratory Of Networking Group
Department of Computer Science and Engineering
P.C. Rossin College of Engineering & Applied Science
Lehigh University

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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]

### Packet Format for ORMRP

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Reserved</th>
<th>TTL</th>
<th>HOP count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multicast Group IP address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequence number</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source IP address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous hop IP address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous Hop X coordinate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous Hop Y coordinate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous hop moving speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Previous hop moving direction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum link expiration time</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Service Awareness Header

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Option field</th>
<th>TTL</th>
<th>Service port</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Server address</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Service name</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protocol type</td>
<td>reserved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optional fields</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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