Adaptable Approach for P2P over Mobile ad hoc networks

Mohammad Al mojamed
Supervisor: Dr. Mario Kolberg
Second supervisor: Prof. Evan Magill
### Mobile Ad hoc NETwork (MANET)

- Collection of autonomous mobile nodes, which communicate wirelessly with each other without any need to existing network infrastructure.
- does not rely on any centralised control.
- each participated node is an end system and a router.

### P2P

- Allows peers to access any type of distributed resources and services without a need to a centralised server.
- self-organising, adaptable, scalable, and do not depend on a central component.
- The overlay is responsible for storing and locating services.

### Similarities

- Self-organisation
- dynamicity
- Decentralisation
- changing topology

### Common Challenge: maintain connectivity in dynamic and decentralised network.
Deploying P2P over MANET

• Layered design.

• Cross-layer design.

• Integration design.
Existing structured P2P over MANET systems

Structured P2P over MANET

Proactive-based systems
- CrossROAD.
- Chord in mobile ad hoc network.
- MA-SP2P MANET Adaptive structured P2P

Reactive-based systems
- M-CAN
- M-Chord
- EMC Enhanced Mobile Chord
- Ekta
- MA-DPastry
- Backtracking and redundant Chord

Location-based systems
- VRR
- SSR
- ITR
- MPI
- MANETChordGNP
- Kummer et al

Unspecified-Underlay systems

Technical challenges in deploying P2P over MANET

- Bandwidth constraints.
- P2P overlay maintenance.
- Network resiliency.
- Battery power.
- Network size.
- Mobility (speed).
- Awareness of Physical proximity versus routing stretch.
- Near one hop performance.
Routing stretch versus proximity awareness
Simulation

• OMNETPP: an open-source component-based C++ simulation library and framework, primarily for building network simulators.

• INET Framework: an open source communication network simulation package for OMNET++ simulation environment. The INET Framework contains models for several wired and wireless networking protocols.

• OverSim: Oversim is an open source P2P network simulators for OMNET++. It supports different structured P2P protocol and unstructured protocols.
Simulating Chord over AODV and OLSR

<table>
<thead>
<tr>
<th>Simulator</th>
<th>OMNET++</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANET Routing Protocols</td>
<td>AODV, OLSR</td>
</tr>
<tr>
<td>Overlay routing Protocol</td>
<td>Chord</td>
</tr>
<tr>
<td>Topology size</td>
<td>1000 m x 1000 m</td>
</tr>
<tr>
<td>Number of nodes</td>
<td>50, 75, 100</td>
</tr>
<tr>
<td>Mobility Type</td>
<td>Random Way Point</td>
</tr>
<tr>
<td>Mobility wait time</td>
<td>50 s</td>
</tr>
<tr>
<td>Measurement time</td>
<td>600 seconds</td>
</tr>
<tr>
<td>Transition time</td>
<td>120 second</td>
</tr>
<tr>
<td>Lookup interval</td>
<td>60 second</td>
</tr>
<tr>
<td>Node speed</td>
<td>3, 4, 5 mps</td>
</tr>
</tbody>
</table>

![Graph showing the relationship between lookup success ratio and network load for different protocols and speeds](image)
Research goals and future:

• Exploit the synergy between MANET and P2P to deploy P2P system with efficient performance over MANET.

• Reduce overlay management traffic through:
  • Using available information at the underlay (Cross-layering).
  • Piggybacking overlay management traffic to the underlay management traffic.

• Achieve near one hop overlay performance in mobile ad hoc environment.