Mobile ad hoc networks Various problems and some solutions

Humayun Bakht
School of Computingand Mathematical Sciences
Liverpool John Mores University
Email:humayunbakht@yahoo.co.uk

Main Focus

- Problems
  - We will see what are some of the important problems in MANET
- Importance
  - We will discuss their importance i.e. why do we need a solution of these problems?
- Solutions
  - I will highlight some of the possible solutions to these problems.
- What I will not discuss is routing

Some problems

- Security
- Routing (will not discuss)
- Hidden terminal problem
- Bandwidth
- Power limitation
- corroboration of mobile devices
  - One final point all of these problems are related to the unique art of network formation of Mobile ad-hoc networks (MANET)

Security

- Protecting data transformation in mobile ad-hoc networks is an important aspect to be seen.
- Parties within the network want their communication to be secure.
- At present MANET do not have any stick security policy.
- This could possibly lead active attackers to easily exploit or possibly disable mobile ad-hoc network.

Security 1

- Mobile ad-hoc networks are highly dynamic i.e. topology changes and link breakage happen quite frequently.
- we need a security solution which is dynamic too.
- Any malicious or misbehaving nodes can create hostile attacks.
- These types of attack can seriously damage basic aspects of security, such as integrity, confidentiality and privacy of the node.

Security 2

- Some of the main security requirements of MANET
  - Certain discovery
    - route should always be found if it exits between two nodes.
  - Isolation misbehaving nodes
    - misbehaving nodes should always be identified and isolated from routing
  - location privacy
    - protection of information about node location and network structure

Security 3

- Types of attacks
- Passive attack
  - Passive attack do not disturb the operation of MANET and attacker tries to steal/discover valuable information by listening to the network traffic.
- Active attack
  - active attack injects arbitrary packets and tries to disrupt the network operation
  - The main aim of such attacks is to limit the availability gain authentication or attract packets destined for other nodes.

Security 4

- At present Security goal in mobile ad-hoc networks are gained through cryptographic mechanisms
- Example of some of the cryptographic mechanisms are public key encryption or digital signature.
- These mechanisms are backed by centralized key management
- Trusted Certificate Authority (CA) provides public key certificate to mobile nodes in order to develop mutual trust between nodes.
- However, Chances are any disturbance with Certificate authority can easily affect the security of the entire network.

Corroboration of mobile devices in mobile ad-hoc networks

- Each nodes in MANET relies on others to forward data packets to the other nodes in the network.
- Some of the reasons why mobile nodes in ad-hoc networks would prefer not to cooperate are
- One important thing
  - In MANET Nodes establish ad hoc structure in one of two cases

Corroboration of mobile devices in mobile ad-hoc networks 1

- Case 1
  - to reach those destinations that would either require a significant amount of transmission energy using single hop communication
- Case 2
  - When transmission flow is not possible without routing the traffic through other nodes.
  - In both cases nodes spend energy without receiving any direct benefit

corroboration of mobile devices in mobile ad-hoc networks 2

- If a node only considers its own short term live period then it may not choose to participate within the network.
- concept of introducing measure for corroboration of mobiles devices into the architecture of MANET becomes one of the important issues.
- Please note here I am not discussing about localization of mobile nodes for

corroboration of mobile devices in mobile ad-hoc networks 3

- This problem is out of the focus of our project, however I have proposed two solution to tackle this issue
- A node can volunteer it self as an administrative node.
- Number of measure could be taken to identify self-fish node.
- Such as we may include a specific header identifies each participating nodes.
- Each of the nodes on the way to the destination require to remove this header before forwarding it to its next hop.
- In this way if any of the link found missing could be treated as a self-fish nodes.
- You may think , this link could also be taken as broken link, then how can we differentiate in between the two.
- Obviously if the node is active and receiving and forwarding only those packet which are of interest to it.
- Could easily be identified.

Corroboration of mobile devices in mobile ad-hoc networks 4

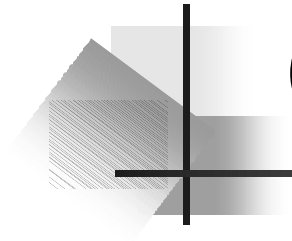
- The system could be reboot and the node could be banned from there.
- Second option is to make use of global positioning systems.
- This GPS system can force small number of mobile devices to be fixed in a small region. Through this type of strategy we can possibly track down self-fish node.

Corroboration of mobile devices in mobile ad-hoc networks 4

- One benefit : GPS enables not only the use of position centric methods of addressing and routing
- One draw back: GPS scheme make use of extra equipments to localize various nodes to route packets across the network.

Finally

- I am stopping here due to time limitation. However, Have intention to cover rest of the problems and discuss their solutions, off-course if time permits.
- Please drop me email at humayunbakht@yahoo.co.uk
- You can also read some of my articles on this subject
- A focus on the challenges of mobile ad hoc networks at
- http://www.computingunplugged.com/issues/issue200408/00001346001.html
- Importance of secure routing in MANET at
- http://www.computingunplugged.com/issues/issue200408/00001327001.html
- Technical aspects of MANET at
- http://www.computingunplugged.com/issues/issue200406/00001310001.html



Questions time

- Questions ?