Survey of VANET Routing Protocols

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Intro

- Vision of ubiquitous stable connection is a farce.
- Severe challenges:
  - distance
  - topology
  - mobility
- Challenged networks.

MANET

Mobile By definition, nodes within the network will be mobile. Any implemented protocol and algorithm will need to be aware of this fact.

Ad-Hoc MANETs are built to be independent of any infrastructure [1]. This means that there are no nodes that have specific duties in terms of running applications or routing the traffic - nodes will need to perform both roles. In addition, nodes will need to be aware of their surroundings in some form, if only to be able to detect their neighbors.

Multihopping Mobility and/or deployment will make some nodes only reachable by multihopping.

[1] Which is not to say that MANETs can not or are not built to leverage any available infrastructure; MANETs just don't rely on one.

MANET

Energy Constraints Nodes are usually small sensors or other devices. This means that the device has a correspondingly small source for power. They are not normally deployed in such a manner as to be able to receive power from an external source.

Scalbility Applications might grow in scale, nodes may enter and leave a network due to mobility, causing the size of the network to change. A MANET has be able to able to scale and, to borrow a term from peer-to-peer networking, has to be able to tolerate *churn*.

Security As all connections wireless and the devices are limited in resources, nodes are particularly vulnerable to attacks.

VANET

Extremely Mobile Vehicles can move at extremely fast speeds, changing the topology of the network very rapidly. This movement is not random, but predictable, as discussed below.

Variable Topology Due to the aforementioned high speeds, the topology of the network, ie which nodes are connected or can connect, will not remain stable. For example, two vehicles driving $25\frac{m}{sec}$ in opposite directions with a maximum transmission range of $1000m$ will only be able to maintain a connection for 40 second.

VANET

Scale Every vehicle is considered a node, leading to extremely large networks on highways and urban areas.

Partitioned Networks Due to the size of the network, most nodes will not be able to see other nodes. When the density of the network is low enough, the network can become disconnected.

No Energy Constraints VANETs, by definition, able to draw power from their vehicle. Any vehicle with enough power to move at high speeds has more than enough to also power the applications.

Mobility

- Random
- Predictable

DSR

[Johnson and Maltz, 1996]

- Dynamically constructs end to end route at source.
- When sending a message, broadcasts route requests.
- Simple. Not suited for highly mobile networks.

AODV

[Perkins and Royer, 1999]

- Uses routing tables.
- Dynamically constructs the path.

GSR

[Lochert et al., 2003]

- Location based service to get physical location
- Calculates series of junctions along the shortest path.
- Forwards greedily to the nodes by position.

GyTAR

[Jerbi et al., 2006]

- Junctions chose dynamically by traffic density.
- Forwards greedily based on velocity.
- Carry-forward recovery.

HTAR

[Lee et al., 2011]

- Considers both network and physical traffic.
- One node per junction is delegated to collect disseminate traffic info.
- Routing us done much like GyTAR.

Epidemic

[Vahdat et al., 2000]

- Effectively routes through flooding
- "Infect-cure" model.

Spray and Wait

[Spyropoulos et al., 2005]

- Only infects a certain limit.
- Carrier infect only with direct routing.

BBR

[Zhang and Wolff, 2008]

- Infects border nodes - those that share the least number of common neighbors.
- Ideal for rural areas.

PrOPHET

[Lindgren et al., 2004]

- Infects only nodes that have a higher chance of infecting the destination.
- Epidemic level performance with lower overhead.

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