CHAPTER 9

CONCLUSIONS

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This work investigated the problem of efficient routing in intermittently connected mobile ad hoc networks and also developed a technique which allows a message delivery in the situation where a connected path from source to destination never exists in mobile ad hoc networks. Some of the approaches that support communication in an intermittently connected network have been studied.

There are a number of applications like disaster recovery scenarios, remote village communications where nodes are disconnected. For delivering packets in such scenarios, a numbers of protocols have been developed such as Epidemic routing protocol, Message ferrying protocol etc.. Epidemic routing protocol delivers a packet only when connectivity occurs between a destination node and any one of the node which carries the source packet. But Message Ferry needs more buffer space to carry the messages between nodes and also needs direct connectivity (i.e., online collaboration) between nodes and the ferry. If a message ferry needs to cover a huge area and if nodes are mobile then the probability of delivering the packet is less. It also takes more time to deliver the packets. Thus, a new protocol namely, Controlled Epidemic Routing with Message Ferry (CMF) is developed which combines both Message Ferry and Epidemic routing Schemes. In this work, packet delivery ratio, end-to-end latency, overhead ratio, average buffer time have
been used to evaluate the performance of a routing protocol. The results illustrate that the performance of a routing protocol varies depending on node density, number of messages transmitted, transmission range, node mobility and buffer space used. The results indicated that the CMF Scheme produces a higher throughput than Epidemic Routing protocol in the long lived disconnected partitioned networks. Both these schemes produce the same result when the network is connected or disconnected partitions with less disconnection time.

In CMF, if message ferry does not visit any node in the destination cluster then the message is not delivered to any nodes in the cluster. This will reduce delivery rate. By using the stationary gateway in each cluster, a new scheme Routing with a Single Message Ferry and Gateways (SMFGW) has been developed in order to improve the delivery rate and delay.

If the nodes within the cluster are also partitioned for a long duration of time, then the message is not delivered in the routing schemes already discussed. Hence Routing with Multiple Message Ferries (MMF) is developed. Using GPS, node locations are identified and the location information is used for LMF’s route calculation which is used to connect most of the nodes to improve the delivery rate. It has been observed that this new scheme produces a higher throughput than Epidemic Routing protocol and also with CMF in long lived disconnected partitioned networks. Both schemes produce the same result when the network is connected or disconnected partitions with very less disconnection time. Here there is a need for online collaboration between the ferries.

The CMF, MMF and SMFGW need either online collaboration between ferries/nodes or connectivity within the cluster. In order to remove all the constraints, both ferries and gateways are used in MMFGWDR (Multiple Message Ferries with Gateway Dynamic Route) and MMFGWFR
(Multiple Message Ferries with Gateway Fixed Route). To reduce the communication delay, Local ferries are employed in each cluster to deliver messages within the cluster. Using GPS, node locations are identified and the location information is used for selecting Way Points and LMF’s route is calculated to connect all the Way Points to improve the delivery rate. The results showed that this new scheme produces higher throughput than all the above routing schemes in the long lived disconnected partitioned networks. In this work, different classes of traffic with simple buffer allocation scheme is also investigated.

9.2 FUTURE RESEARCH

Future researchers would do well by making investigations into the impact of different classes of traffic with efficient buffer allocation schemes in so far as Ferries and Gateways are concerned in the ever expanding field of mobile ad hoc networks.

In the future research, more analytical study with network throughput analysis can be included.

Security is a key issue for ad hoc networks, especially for security-sensitive applications. The underlying radio communication medium for wireless network provides serious exposure to attacks against wireless networks. Security threats and attacks on routing operations can severely disrupt network operations, degrade network performance, and harmfully affect the QoS provisioning in delay tolerant mobile ad hoc networks. Hence in the future work, the security algorithm may also be incorporated in routing approaches discussed in this work.

Multicasting in Delay tolerant mobile ad hoc network can also be investigated in the future.