Ubiquity of Mobile Computing In Wireless Networks

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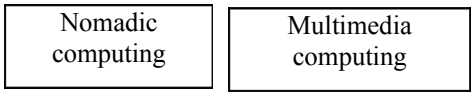
***Abstract*—Mobile computing embraces a host of portable technologies that makes Internet access on the go not only possible, but integral to every day life. From notebook computers to personal digital assistants (PDAs), like the i-Phone and Blackberry to standard cell phones, mobile computing has become an indispensable way of life. Ad Hoc mode of Wireless networks is a method for wireless devices to directly communicate with each other, because the meaning of Ad Hoc is peer to peer, that is two systems that see to each other and communicate directly. General forms for ubiquitous system may be Tabs: wearable centimeter sized device, Pads: hand-held decimeter-sized devices, Boards: meter sized interactive display devices. There should be a Secure Key Setup between Ubiquitous Devices to communicate through wireless Ad Hoc Network. By 2000, mobile computing has reached to touch the issues that we now identify as the purview of pervasive computing. But Uniform penetration of pervasive computing technology into the wireless network is many decades away.**

***Index Terms*—Mobility, Routing Protocol, Wireless Networks, Tabs, Pads, Boards**

I. Introduction

A Wireless Network is a collection of two or more devices or nodes with wireless communications and networking capability that communicate with each other without the help of any centralized node also the wireless nodes that can dynamically form a network to exchange information without using any existing fixed network Topology [1]. Mobile computing is still a very active and evolving field of research, whose body of knowledge is waiting for codification. Mobile, ubiquitous, nomadic, pervasive and any time, any where, any person computing are used by researchers to refer to computing that uses small portable devices and wireless communication network. Nomadic computing refers to limited migration (Migration is within a building at a pedestrian speed).



Relationship: Nomadic-Mobile

II. Wireless Ad hoc networks

A Wireless Network is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes them selves, i.e., routing functionality will be incorporated into mobile nodes [3]. Wireless Ad Hoc network is one of the types of wireless network and this mode of wireless network is created for a particular purpose and there is no access points passing information between participants [4]. Ad hoc routing requires that nodes cooperate to forward each others' packets through the network [5]. All nodes in a wireless ad hoc network act as a router and host as well as the network topology is in dynamically, because the connectivity between the nodes may vary with time due to some of the node departures and new node arrivals. To set up an ad-hoc wireless network, each wireless adapter must be configured for ad-hoc mode versus the alternative infrastructure mode.

A. Types of Ad Hoc networks

The Ad Hoc Network divided into two main types [1, 2], firstly Mobile Ad Hoc Network (MANET) and secondly, Mobile Sensor Ad Hoc Network.

Mobile Ad Hoc Network (MANET): An ad-hoc mobile network is the network of two or more mobile devices connected to each other without the help of intervening infrastructure. In contrast to a fixed wireless network [2], an ad-hoc mobile network can be deployed in remote locations and needs minimum setup and administration costs. The network topologies are dynamic and may vary from time to time. Each device must act as a router for transferring any traffic among each other. This network can operate by itself or incorporate into large area network (LAN). Conventional routing algorithms are not sufficient in this distributed environment because the network topology can change time to time. That's why we need some special routing algorithms.

Mobile Ad Hoc Sensor Network: Unlike sensor networks, which communicate directly with the centralized controller, a mobile Ad Hoc senor network follows a sequence of operational scenarios, thus demanding a less complex setup procedure. A mobile ad-hoc sensor consists of a number of sensor spreads in a geographical area. Each sensor is capable of mobile communication and has some intelligence for processing. This type of networks is very beneficial in different scenarios [8]. These networks advance operational efficiency of certain civilian applications. This makes a mobile ad-hoc sensor network highly adaptable so that it can be deployed in almost all environments. There are many benefits of this network, it includes:

- Use to build a large-scale networks
- Implementing sophisticated protocols.
- Reduce the amount of communication (wireless) required to perform tasks by distributed and/or local precipitations.

B. Types of Protocols for Ad Hoc Networks

Ad Hoc Network routing protocols are broadly categorized in two type of routing protocols.

Pro-active (Table-driven) routing protocols: In Table-driven routing protocols each node maintains one or more tables containing routing information to every other node in the network. All nodes update these tables so as to maintain a consistent and up-to-date view of the network. When the network topology changes the nodes propagate update messages throughout the network in order to maintain consistent and up-to-date routing information about the whole network [6]. That means this type of protocols maintains fresh lists of destinations and their routes by periodically distributing routing tables throughout the network. Name of some table-driven protocols are DSDV, CGSR and WRP. The main disadvantages of such algorithms are:

- Respective amount of data for maintenance.
- Slow reaction on restructuring and failures.

Reactive (On-Demand) Routing Protocols: This type of protocols finds a route on demand by flooding the network with Route Request packets. These protocols take a lazy approach to routing. In contrast to table-driven routing protocols all up-to-date routes are not maintained at every node, instead the routes are created as and when required. When a source wants to send to a destination, it invokes the route discovery mechanisms to find the path to the destination [6, 1]. The route remains valid till the destination is reachable or until the route is no longer needed. Name of some on-demand protocols are AODV, DSR, TORA, ABR, SSR, CEDAR. The main disadvantages of such algorithms are:

- High latency time in route finding.
- Excessive flooding can lead to network clogging.

Hybrid (both pro-active and reactive) routing: This type of protocols combines the advantages of proactive and of reactive routing. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. The choice for one or the other method requires predetermination for typical cases. ZRP is a hybrid type of protocol. The main disadvantages of such algorithms are [7]:

- Advantage depends on amount of nodes activated.
- Reaction to traffic demand depends on gradient of traffic volume.

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III. AD HOC PROTOCOLS FOR WIRELESS NETWORK

For the Ad Hoc network there are more than 13 kinds of the routing protocol have been proposed. These are listed below:

A. Destination-Sequenced Distance-Vector Routing (DSDV)

The Destination-Sequenced Distance-Vector (DSDV) Routing Algorithm is based on the idea of the classical Bellman-Ford Routing Algorithm with certain improvements. Every mobile node in the network maintains a routing Table, which records all of the possible destinations within the network and the number of hops to each destination [7]. Each entry in the routing table contains a sequence number, the sequence numbers are generally even if a link is present; else, an odd number is used. The number is generated by the destination, and the emitter needs to send out the next update with this number. Routing information is distributed between nodes by sending full dumps infrequently and smaller incremental updates more frequently. Selection of route depends on the information received by router, i.e., if a router receives new information, then it uses the latest sequence number. If the sequence number is the same as the one already in the table, the route with the better metric is used. Stale entries are those entries that have not been updated for a while. Such entries as well as the routes using those nodes as next hops are deleted.

B. Wireless Routing Protocol(WRP)

Wireless Routing Protocol makes use of the routing table at each node in the record to complete the routing, and DSDV with CGSR difference is that, WRP require each node to operate a record four tables, namely Distance table, Routing table, Link-cost table, Message retransmission list table [1].

Routing table entries contain distance to a destination node, the previous and next nodes along the route, and are tagged to identify the route's state: whether it is a simple path, loop or invalid route.

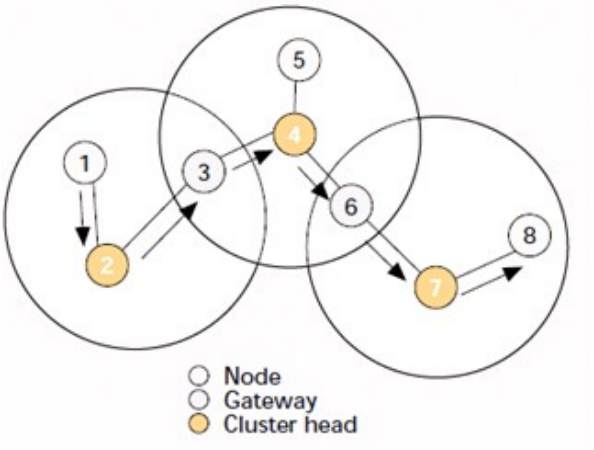
The link cost table maintains the cost of the link to its nearest neighbors (nodes within direct transmission range), and the number of timeouts since successfully receiving a message from the neighbor. Nodes periodically exchange routing tables with their neighbors via update messages, or whenever the link state table changes. The MRL maintains a list of which neighbors are yet to acknowledge an update message, so they can be retransmitted if necessary. Where no change in the routing table, a node is required to transmit a 'hello' message to affirm its connectivity.

When an update message is received, a node updates its distance table and reassesses the best route paths. It also carries out a consistency check with its neighbors, to help eliminate loops and speed up convergence.

C. Cluster head gateway switch routing (CGSR)

Cluster head Gateway (CGSR) uses DSDV as an underlying protocol described in the previous section. The mobile nodes are aggregated into clusters and a cluster-head is elected. All nodes that are in the communication range of the cluster-head belong to its cluster. A node that is in the communication range of two or more cluster heads is called a gateway node.

The general algorithm works in the following manner. The source of the packet transmits the packet to its Cluster-head. From this cluster-head, the packet is sent to the gateway node that connects this cluster-head and the next cluster-head along the route to the destination. The gateway sends it to that cluster-head and so on till the destination cluster-head is reached in this way. The destination Cluster-head then transmits the packet to the destination [1, 6].

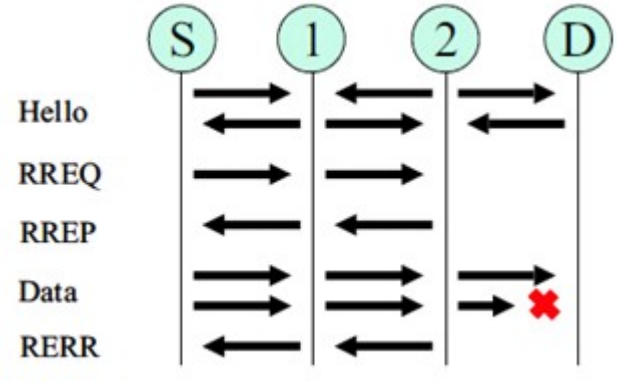


CGSR from Node 1 to Node 8

D. Ad Hoc On-Demand Distance Vector Routing(AODV)

Ad Hoc On-Demand Distance Vector Routing is an improvement on DSDV routing algorithm. When a node wants to send data to another node in the network, the first to broadcast a Route Request (RREQ). The neighbors in turn broadcast the packet to their neighbors till it reaches an intermediate node that has recent route information about the destination or till it reaches the destination. All the Nodes between the source and the destination of the RREQ will be passing a temporary record will be on the last hop of the RREQ via Path of information, when the destination of the RREQ received from different places, choose a shortest path, and to the source sent the direction of Route Reply (RREP).

As the RREP of passing along the nodes on this path will be a record of the relevant information, when the RREP was sent to a sent RREQ the source the beginning, and thereafter source can use this route to send packets to the destination.



Transferring of Messages in AODV Protocols

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