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A REVIEW OF RP-CDMA AND RP-TDMA FOR MULTIPLE ROUTING AD HOC WIRELESS NETWORKS

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Abstract: An Ad Hoc Wireless Network is decentralized type of wireless network which has self-configuring, dynamic networks in which nodes are free to move. A variety of ad hoc networks have been proposed by many of the researchers. RP-CDMA is a wireless multiple access protocol which uses multiple spreading codes and multiple packet receivers to increase performance and link reliability. In this research proposal we propose an enhancement to RP-CDMA by choosing TDMA over CDMA technique. Ad hoc wireless networks consists of a collection the wireless nodes that communicate over a common wireless medium. The existing protocol is not using the neighbouring nodes or any intermediate node for data transmission, neither any acknowledgement is sent. So, in the proposed protocol consideration of neighbouring nodes and acknowledgement will also be taken into account. The complexity of the nodes is very high and nodes have own ability to solve all kind of network problems. The routing protocols are basically considered for the security of the nodes and operation with implicit nodes is trusted with the other neighbouring nodes. The research proposal tends to decrease packet loss, low latency, high throughput and high bandwidth and the comparative analysis of the existing protocol and the proposed protocol will also be shown.

Key Words: Introduction, cellular networks, architecture, applications, components, challenges, advantages and disadvantages, conclusions, references.

1. INTRODUCTION

Ad hoc wireless networks consists of a collection the wireless nodes that communicate over a common wireless medium. Ad hoc wireless network is an approach to wireless communication with the different application in the dynamic environment. The complexity of the nodes is very high and nodes have their own ability to solve all kind of network problems and network errors (Martinus Dipobagio). The security in the ad hoc wireless networks is more promising than the other traditional networks. The securing networks have no centrally administrated secure routers, but use strict policies for data security. The ad hoc wireless network has no access point, no base stations, it all communicate directly over a common wireless channel.

The wireless applications are used in the ad hoc wireless network and other different areas like multimedia, military, rescue mission team, personal areas network, Bluetooth, mesh networks and sensor networks etc. In ad hoc networks we use different nodes in one cell (Martinus Dipobagio). Many different types of protocols have been implemented in ad hoc networks. The routing protocols are basically considered for the security of the nodes and operation with implicit nodes is

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trusted with the other neighbouring nodes. Different types of applications, challenges, components, advantages and disadvantages are used in the ad hoc wireless network. [1]

2. AD HOC NETWORK OVERVIEW

The word ad hoc is a Latin word and means "for this (only)". The ad hoc networks mean wireless network without infrastructure. In the infrastructure based wireless network a node can only send a packet to a destination node via access point. The access point creates a network area and the nodes belonging to this area only can use access point services. There are some unknown events, which cause access point malfunction. The nodes lose their network and they are quasi not working. It is the biggest infrastructure's disadvantage. There are also some reasons to sacrifice or not to use access point services. These can be cost factor, impossibility to install access point in short time, etc. In this case the nodes have to build its own network. This network is called wireless ad hoc network.

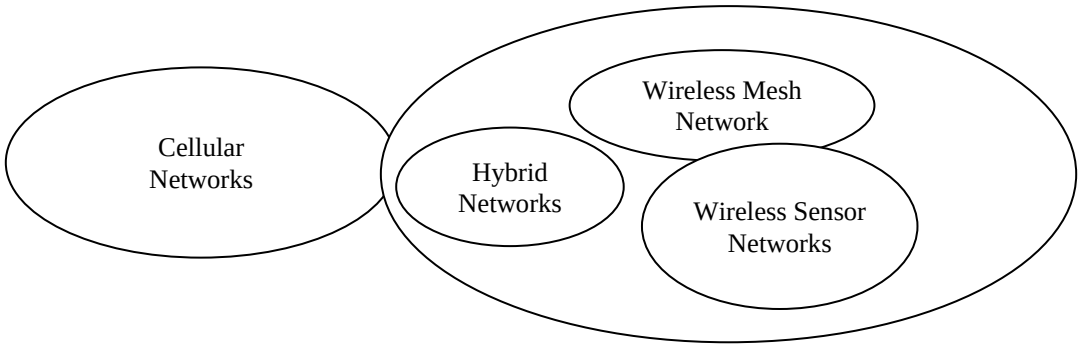
The ad hoc networks contain the nodes that are equipped with transceiver. The network created should be independent from an infrastructure. A node in this network can communicate only with other nodes in its transmission range. In the infrastructure based wireless network, the nodes can communicate with other node belonging to different network, by transmitting data to destination access point and this access point then sends the data to the desired node. It seems like, that the ad hoc networks are not powerful enough. Each node has its own transmission range, if these small transmission areas are combined, they will form a much bigger transmission area. The nodes transmitted their data with single or multiple hopping techniques. Now a suitable routing algorithm must be implemented, so the process of transmitting data will be more effective.

1.2 Cellular Networks Vs. Ad HOC Wireless Networks

Different between cellular networks and ad hoc wireless network are following as:

Table: 1
The Table Shows A Representation of Different Wireless Networks

Cellular Networks	*Ad hoc wireless Network*
Fixed infrastructure based	Infrastructure less
Guaranteed bandwidth (designed for voice traffic)	Shared radio channel (more suitable for best effort data traffic)
Centralized routing	Distributed routing
Circuit switch (evolving toward packet switching)	Packet switched (evolving trusted emulation of circuit switching)
Seamless connectivity (low call drops during handoff)	Frequent path breaks due to mobility
High cost and time of deployment	Quick and cost-effective deployment
Reuse of frequency spectrum through geographical channel reuse	Dynamic frequency reuse based on the carrier sense mechanism
Easier to employ bandwidth reservation	Bandwidth reservation required complex medium access control protocols
Easier to achieve time synchronization	Time synchronization is different and consumes bandwidth
Single hop wireless links	Multi hop wireless links



Infrastructure dependent Ad hoc wireless networks
(Single-hop wireless network) (Multiple-hop wireless network)

Figure: 1.2 cellular and ad hoc wireless networks [2]

1.3 Architecture

The wireless network is basically dependent upon mainly two versions that are:

- Infrastructure
- Ad hoc networks

The difference in both of them is that the infrastructure networks are basically consisting of access point and nodes. In the infrastructure version a node can't be communicated directly with the other nodes in the same cell or other terminal. In the other hand, ad hoc wireless networks have a different method to send or distribute packets.

LLC	STATION
PMD	MAC
PLCP	
MAC	PHY

Figure: 1.3: The standard IEEE 802.11 protocol architecture

1.4 Application

Ad hoc networks are very well suited for many situations, in which a infrastructure's network can't be built or it is impossible to build an infrastructure. The interest of ad hoc networks increases rapidly in recent year, because ad hoc supports mobility and freedom in the networks. Data can be exchanged without cable, access point, or portable memory space. Nowadays computers and phones manufacturers implement ad hoc technology to their products.

(a) **Military use:** It is perhaps regrettable that, ad hoc networks were first used in the military department. If a large number of soldiers spread out in a large battlefield and they have to communicate with each other. Installing an infrastructure in the battlefield or equip each soldier with cable is out of the question. An alternative would be to equip each soldier in the battlefield with a transmitter that can reach all other soldiers in the battlefield at all times. However, this method is not suited for military use. The enemy can intercept communication easily and there would be at most one person using the channel at any given time. Ad hoc networks are very well suited for this case. Each soldier is equipped with transmitter.

However the transmitter has smaller transmission area than the transmitter from the example above, so that each soldier can only reach a few other soldiers. However, the transmitter is designed, so that they can relay messages over a hop or multiple hops. These soldiers would

form an ad hoc network. This kind of network is obviously more robust, harder to intercept, and suitable to military scenario.

(b) **Rescue mission and emergency:** Imagine the situation after an earthquake when the communication infrastructure doesn't work anymore. A substitution of the infrastructure has been to be installed a-s-a-p to support rescue operation. It is obvious that the installed network has to be simple to configure, easy to set up and maintain, and it has to adapt to dynamics topology in order to support changes in numbers and density of participants. Ad hoc networks especially MANETs can support this scenario. Ad hoc networks can be set up easily and quickly. They are designed so they are can install a network without fixed infrastructure. Ad hoc networks are temporal. As soon as a new infrastructure established in this area, the ad hoc networks can be removed easily.

(c) **Personal area network and Bluetooth:** The Idea of a personal area network (PAN) is to create a localized network populated by some network nodes that are closely associated with a single person. The Bluetooth technology supports this scenario. Bluetooth is a wireless local network, which has only small range area transmission (typically smaller than 10m or 100m and called piconet), operates in the unlicensed 2.4 GHz spectrum and doesn't need infrastructure or cable to connect the end terminals. A piconet is an ad hoc network that consists of one master device and several active slave devices. The piconets can also perform a bigger network like figure 2 described, but a master device can't act as master of two or more piconets.

(d) **Wireless sensor networks:** As the term implies, Wireless Sensor Networks (WSNs) are on the intersection of three different technologies: wireless communications, sensing, and networking. The WSNs consist of a large number of sensor nodes, each equipped with a wireless transceiver. The transceiver has two main roles: The sensors use it to measure and / or sense activities. And the network is used to relay the gathered information to data sinks. Therefore, the hop-count may be high. The applications of WSNs are like monitoring animal or very dangerous area.

(e) **Wireless mesh networks:** Wireless mesh Networks (WMNs) consist of two types of nodes: mesh clients and mesh routers. Mesh routers are typically equipped with power supply, so they can't move. The main role of mesh routers.

1.5 Ad Hoc Wireless Network Components

The most ad hoc networks' applications are to replace infrastructure in some difficult situations. The ad hoc networks must less complicate than infrastructure. Obviously the ad hoc networks end devices will be more complicated than the infrastructures one. The following subsections are the important ad hoc network components.

A. Hardware: The ad hoc networks don't have any infrastructure, except they are combined with other networks' type. Only end devices are needed to establish ad hoc. Firstly the devices must be equipped with transceiver, so they can catch the incoming signal and send a signal. Secondly the devices must be implemented after the standard IEEE 802.11.

The devices like laptops, Personal Digital Assistant (PDA), smart phone are mostly implemented with the standard IEEE 802.11 so they can join a infrastructure network or ad hoc network.

B. Software: The most important software components of the ad hoc network are routing algorithm. The following are some of most famous routing algorithms.

1.6 Challenges in Ad hoc wireless network

The applications are in Ad hoc wireless network to replace infrastructure in some difficult situations. It must have less deployment, and performances of an ad hoc wireless system are following as:

- Medium Access Scheme
- Routing
- Multicasting
- Transport Layer Protocol (TLP)
- Pricing Scheme
- QOS Provisioning
- Self-Organization
- Security
- Energy Management
- Addressing and service Discovery
- Scalability
- Deployment Consideration

(a) **Medium Access Scheme:** It is used in the distributing operation with the transfer the packets with the help of MAC layer. Such as the delay of the packets send and node delay also be defined in it. Fairness of the nodes is based upon the flow of the transactions. That also is used in the real time traffic to consider delay, jitter and bandwidth delay etc.

(b) **Routing:** It is a very big challenge in the ad hoc wireless network. It is exchanging the information finding the easier path of source to destination. It is also gathering all information about the breakup path or nodes and quick route configuration also is defined. In ad hoc network routing also be consider the scalability of the connected nodes which are communicated.

(c) **Multicasting:** It is very important rule in the typical application of ad hoc wireless network. It use the different operations likewise namely, emergency research-and-rescue operations and military communication. Multicasting is basically used in ad hoc wireless network to point-to-multipoint voice and data communication. The multiple nodes are communicating of nodes changes the topology dynamically in manner. In broken links are solved with the tree-based solution. [1]

(d) **Transport layer protocol(TLP):** The main objective of the TLP have setup and maintaining end-to end connections, reliable end-to-end delivery of data packets flow control and congestion control. To sending the data source to destination using UDP and TCP protocols as well. It also notifies sender about the frequency of path break presences of high routing information.

(e) **Pricing Scheme:** An ad hoc wireless network is using that scheme, have used the different intermediate nodes. Such as the sending the messages to source to destination using the different nodes and different intermediated nodes. Assume that an optimal route from nodes A to node B passes through node C and C is not powered on. The node A will have to setup a

costlier and non-optimal route to B. The non-optimal path consumes mare resources and affects the throughput of the system.

(f) **QOS provisioning:** It provides the different levels of services to the network users. QOS provisioning are requirement different parameters which used in the different areas. Military areas used it for the reliability and security of the information. In the emergency situation that is used in some available resources. On the other hand, that is used in the defence for trust in the intermediated nodes and delay packets. QOC frameworks also are considering the requirements of the user.

(g) **Self-Organization:** It is very important property that an ad hoc wireless network should be organizing and maintaining the network itself. The activities of an ad hoc wireless network required perform for self-organization are neighbour discovery, topology organization and topology all information. Every node is gathering all information about the neighbouring node and maintains that information in data structure. It should be able to best perform self-organization quickly.

(h) **Security:** The security of communication in ad hoc wireless network is very important especially in military applications.

The security of the data has dependent upon the two types:

- active attack
- passive attack

Passive attacks refer to the attempts made by malicious nodes to perceive the nature of activities and to obtain information transacted in the network without disrupting the operation. Active attacks disrupt the operation of the network nodes that perform internal attacks are compromised nodes.

(a) **Addressing and Service Discovery:** In ad hoc wireless network due to the absence of any centralized co-ordination in addressing and service discovery. In communication to connected part of the ad hoc wireless network is required. To providing the non-duplicate address to the nodes that required in auto-configuration. To assigned the some IP addresses and subnet parts also be used.

(b) **Energy Management:** Energy management is used to the process of the managing all resources and consume of energy in a node or enhanced the life time of the network. To charging and discharging the battery power also is used in it. Sometime energy management control all devices power processor power, device power, energy power and different other factors are used. [1]

(c) **Scalability:** It is depend on the different time of the applications and consider the different ways or operations in the ad hoc wireless network. Some of the applications like military, emergency operations and crowed control mat not lead to such a big ad hoc network. Hybrid architecture is used the multichip routing to improve its scalability. It does depend on the table driven and on demand routing.

(d) **Deployment Consideration:** The deployment of the ad hoc wireless network is different from the wired or infrastructure networks. It is required a good planning of work and control the all future traffic growth over any link in the network. Deployment mainly used the time consume stage is followed the network. It difficult to reconfigure ant partial deployment that has already been done. It has many good features are used in the ad hoc wireless network than the wired networks. [1]

1.7 Advantages of Ad Hoc Wireless Networks

The different advantages of ad hoc wireless network these are:

(a) **Infrastructure less and simple cost:** In the military area networks it basically used it. The main applications in infrastructure can be more expensive than infrastructure less network. In desert, mountain and isolated areas are very low density areas, which are not possible to make or establish on infrastructure. It depends to the services that how many packets are send and how many cost of installation, maintain and repair.

(b) **MANET only:** In the coming next years the mobile users are very high quality used the wireless communication, to use some specific mobile applications. The main important areas like military networks, emergency operation and different others.

(c) **Decentralized and robust:** In this case, if the base stations are not working the all user which one using that some network that lost their connectivity with the other networks. In the ad hoc wireless networks if the users want to communicate with the other nodes then they should find out some nearest node to send the data to the destination.

(d) **Easily build:** Some of the logical errors or the other different errors are sometime not available. It is obviously to change the malfunction (errors solution) are maintained all time existence in the networks in low time infrastructure.

1.8 Disadvantages of Ad Hoc Wireless Network

The main disadvantages of ad hoc wireless network that are:

(a) **High Rate:** If the malfunctions are not change in the correct time then error rate may be higher. The electronic waves also defined its frequency by the error rates. In that case, the packets are destroyed when the receiver side has some errors.

(b) **Low Data Rate:** It is a main problem in the ad hoc wireless network. The nodes are very important because it transmitted the data sender to receiver side. In transmission of the packet in the high frequency and it is change in low time.

(c) **Dynamic Topology and Scalability:** In the ad hoc wireless network it is able to evaluate and compares the network. The node numbers and node mobility has increased in the scalability. It is important thing to that how many nodes are communicated and how many control messages are required. Then user can decide to increase or decreased the bandwidth.

(d) **Security:** In the military application it is very important part. The shortage of the central coordination and share some medium that make it more vulnerable attack then wired network. The security of network is less than the other resources**.**

(e) **Energy Limitation (MANET only):** The energy efficiency is depending upon the ratio of data delivered to the total energy expended. More energy efficiency implies that highest number of packet are transmitted by the connected nodes with given amount of energy reserve.

9. CONCLUSION

The existing protocol RP-CDMA uses multiple spreading codes to separate individual packet channel, where the channel is defined by its spreading code. This protocol randomly assigns private channels without any co-ordination request between sending and receiving packets. In the research proposal given by us, we will try to make the communication between sender and receiver more reliable by adding TDMA technique and by co-ordinating among various sending and receiving packets.

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