

OVERVIEW ON MOBILE AD HOC NETWORK AND TCP/IP PROTOCOL ARCHITECTURE

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Abstract— *The wireless ad hoc networks are unique structure of the wireless communication network, where the communication relies on cooperation among the nodes by wireless multi-hop. These networks do not depend on any fixed infrastructure, and can self-organizing and self-managing. The ad hoc network is made up of multiple nodes connected and disconnected by links at any time. The ad hoc network inherits the some traditional problem of mobile communications as well as wireless. Problems are optimization of bandwidth, control over power and enhancing the transmission quality. Ad hoc network has properties of mobile communications and computer networks so it can be seen as a special type of mobile computer communications networks. The MANET is the one of the type of ad hoc network, is an infrastructure less wireless device. This paper explores about ad hoc network as well as their functions and applications.*

Keywords— *Component, Formatting, Style, Styling, Insert (Key Words)*

I. INTRODUCTION

MANET is a type of ad hoc network that can change locations and capable of configuring itself. Because MANETs are mobile, they use wireless connections to connect to various networks. These networks have no static routers; every node can act as router. All nodes are capable of movement and can be connected dynamically in random fashion. The entire network is autonomous, and every terminal is allowed to move freely [1][3].

In this type of networks, some pairs of terminals may not be able to communicate directly with each other and have to rely on some terminals so that the messages are delivered to their destination. So, these networks are often referred to as multi-hop or store-and-forward networks. The nodes within these networks can perform as routers, which is capable of discovering and maintaining routes to other nodes in the networks. The nodes can be on aircrafts, marines, vehicles, perhaps even on public or very small devices. Wireless network mobile devices are connected and communicate with each other not by a perceptible medium, but by emissions of

electromagnetic waves in the air. Wireless network uses high frequency radio waves rather than wires to communicate between nodes. It allows devices to be shared without networking cable which increases mobility but decreases range.

II. WIRELESS NETWORK TYPES

a) Infrastructure based - It is used to connect devices with wireless network adapters to an existing wired network with the help of wireless router or access point.

b) Ad hoc - Ad hoc wireless network can accommodate a number of devices. Each device can communicate with other wireless enable devices. They can share files and printers this way but not be able to access wired LAN resources.

The advantages in using ad hoc networks are,

- Reduced cost when compared to wired networks.
- Scalability.

Table 1 : Difference between wired and wireless

WIRED NETWORK	WIRELESS
Uses network cable	Radio frequency through air.
It allows faster and more secure connection with in a specified distance.	Less secure and transmission speed is suffered due to interference from environments.
Ethernet cables, hubs, switches are very inexpensive.	It involves cost.
Based on the physical location network cables are extended, the connectivity is possible.	It avoids the cost of cabling.
All nodes are inter connected and can hear all other nodes in same network.	On same network the nodes in wireless cannot hear all other nodes.

III. SALIENT CHARACTERISTICS OF WIRELESS NETWORKS

The wireless networks hold the following characteristics [4].

- a) **Decreased signal strength**
Radio signal weakens as it propagates through matter.
- b) **Interference from other sources**
The standardized wireless network frequencies that are shared by other devices (eg. phone), devices (motor) can cause interfere.
- c) **Multipath propagation**
Radio signal gets reflected off by objects arriving to destination at slightly different times.
- d) **SNR- signal to noises ratio**
Larger Signal to Noise Ratio it is easier to extract signal from noise.

3.1 Advantages of Wireless over Wired Technology

- Convenient
- Range
- High life expectancy

The protocol architecture of the ad hoc network was chosen for study along with its characteristics discussed above. The below sections provides a clear picture of the protocol architecture of ad hoc networks.

IV. TCP/IP PROTOCOL ARCHITECTURE

TCP – IP also uses all of the layers of OSI model [3]. The seven layers of the OSI model correspond with the four layers that make up the TCP – IP protocol. The below Figure 1 shows the representation of TCP/IP model layers,

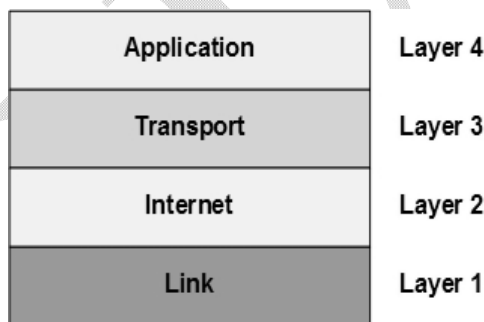


Fig 1: TCP/IP Model

The layers of TCP/IP model includes,

a) The Application Layer

The Application layer is the highest layer and has the same functionalities of session, presentation, and application layers

of OSI model. The Layer 4 has the end to end communication and multiple layers use these functionality. The functions includes session establishing, maintaining and terminating, character code translators, data conversions, compressing and encrypting, remote accessing, managing networks and e-mail, etc.,

b) The Transport Layer

The Transport layer is related directly with the same named layer in the OSI/ISO model. The functions include segmentation of messages, issuing acknowledgement, controlling traffic, session multiplexing, detecting errors and correction (resends), and message reordering. This layer provides quality of service (QoS) functions and ensures the complete data delivery. The reliability of the data is assured at this layer via error correction and similar functions.

c) The Internet Layer

The Internet layer is related to network layer in OSI model and has the same functionalities like traffic routing, traffic control, fragmentation, packet routing via logical addressing and switching functions.

d) The Link Layer

The link layer is a combined function of OSI physical and data link layer. This includes physical network functions like modulation, line code and bit synchronizing, frame synchronizing and detecting errors, and LLC and MAC sub layer functions.

4.1 Difference and Similarities of TCP – IP over OSI

- Both the models have an application, a transport and network / Internet layer.
- The TCP – IP model does not have layer 5(session) and layer 6(presentation) of OSI model.
- Both the models have a lower layer that connects the upper layer to the actual physical network.
- TCP – IP network use the combination of a layer 2 sublayer called the medium access control (MAC) sub layer along with layer1 to provide connectivity over the wireless link.

4.2 Functions of TCP/IP Layer

The functions of TCP/IP protocol are,

a) Logical Addressing

Each device communicates through network with its logical address called layer three addresses.

b) Routing

Moving data across a series of interconnected networks is probably the defining function of a network layer. The job of the devices and software routines in the network layer handles incoming packets from various sources, identifies their final destination, and then figure out the destination they need to be sent.

c) Datagram Encapsulation

The network layer provides encapsulation for messages received from higher layers by placing them into datagram (also called packets) with a network layer header.

d) Fragmentation and Reassembly

The network layer must send messages down to the data link layer for communication. Some data link layer techniques have shortage on the length of message that can be sent. If the packet contained within the network layer needs to send is too large, the network layer splits the packet up and routes each piece to the data link layer, and then reassembles the pieces once they arrive at the network layer on the destination machine.

e) Error Handling and Diagnostics

Some special protocols are made use at the network layer which allows devices that are logically connected, or that are trying to route traffic, for exchanging information about the status of hosts on the network or the devices themselves.

f) Network Layer Connection-Oriented and Connectionless Services

The network layer protocols may either offer connection-oriented or connectionless services for network. Connectionless are common in the network layer. The transport layer provides connectionless and connection oriented services for network layer that is applicable for many protocol suites. For an example of connectionless is IP(Internet Protocol)and connection oriented is Transmission Control Protocol.

V. CONCLUSION

The aim of study is explore the wireless communication mode and the reference model that states the functionality of wireless. This paper includes the characteristics of ad hoc networks along with its underlying protocol architecture for choosing a promising functionality for the future work.

a.

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