PREFACE

The integration of computers and communications has had an intense influence on the way computer systems are organized. A computer network interconnects independent computer systems called nodes or hosts of the network. Computer networks are almost very much needed in today's world. They have become very essential for day to day life because of their use in wide range of applications. A computer network or data network is basically a telecommunication network that permits computers to interchange data in different geographical locations throughout the world. In computer networks, networked computing devices provide data to each other along data connections. The connections or network links between networked nodes are established using different connecting media such as wired or wireless. The example of well-known computer network is the Internet. Network computer devices that originate, route and terminate the data are called network nodes. Nodes can include hosts such as personal computers, servers and networking hardware. Different devices are said to be networked when they able to exchange information with other devices in the network. Computer networks support applications such as access to the World Wide Web, shared use of applications, storage servers, printers, fax machines, use of electronic mail (e-mail) and instant messaging applications etc.

Computer networks differ in the physical media used to transmit their signals, the communications protocols to organize network traffic, the network size, network topology and organizational intent.Nowadays, computer networks are the core media of contemporary data communication. All modern aspects of the public switched telephone network (PSTN) are computer-controlled. Telephony increasingly runs over the Internet Protocol, although not necessarily the public Internet. The scope of communication has increased significantly in the past decade. This boom in communications would not have been possible without the progressively advancing computer networks. Computer networks and the technologies that make communication between networked computers possible are continued to drive computer hardware, software, and peripherals industries. The expansion of related

industries is mirrored by growth in the numbers and types of people using networks, from the researcher to the home user.Different computer networks are able to connect each other by means of the devices called routers which use routing protocols for their IP address switching. These routing protocols are developed based on various routing algorithms.

The growing usage of computer networks requires improvements in network technologies and management techniques to provide users high quality of service. As more individuals transmit data through a computer network, the quality of service received by the users begins to degrade. A major aspect of computer networks that is vital to quality of service is data routing. A more effective method for routing data through a computer network can assist with the new problems being encountered with today's growing networks. Effective routing algorithms use various techniques to determine the most appropriate route for transmitting data. Determining the best route through a wide area network (WAN) requires the routing algorithm to obtain information concerning all of the nodes, links, and devices present on the network. Wireless networks are playing a key role in the communication field. Deployment of wireless networks in military applications, industrial applications and even in personal area networks is common today. Earlier, the key difference between wireless and wired networks was only communication channel.

Wired networks require physical medium such as optical fibre or copper, whereas wireless networks does not require the physical medium instead they use wireless channels through radio frequencies. Wireless networks became very popular in diverse applications in view of factors like; ease installation, reliability, cost, bandwidth, total required power, security and performance of the network. All the wireless networks however require fixed infrastructures. Most common infrastructure oriented wireless networks are; cordless telephone, cellular networks, Wi-Fi, Microwave communication, Wi-MAX, Satellite communication and RADAR etc. Mobile Ad Hoc Networks (MANETs) are self-forming, self-healing new generation wire-less networks, which are playing a noticeable role in the fast deployment of self-governing mobile users, efficient and dynamic communication for emergency and rescue operations, disaster relief efforts, and military networks.

Mobile ad-hoc networks do not have fixed centralized network infrastructures, every node of these networks acts as host and the router. Nodes in mobile ad-hoc networks assume mobile nature, due to which these networks acquire dynamic topologies. These topologies may change dynamically and randomly. Traditional routing protocols are normally used for internet based wireless networks. These routing protocols cannot be applied directly in to ad-hoc wireless networks; because some common norms are not effective in all cases for such dynamically changing networks and may not be true for mobile nodes. Mobile ad-hoc networks use specialized routing protocols, which ensures path discovery between source and the destination nodes.

In **chapter-1,** some introductory and general aspects of computer networks are discussed in detail which includes basics of computer networks, transmission media, types of various computer networks, wired and wireless networks, ad-hoc networks, routing protocols and media access control protocols in ad-hoc networks, issues and challenges in ad-hoc networks and characteristic of an ideal mobile ad-hoc network routing protocol. This chapter also includes scope of thesis.

Chapter-2 comprises of the key research works in the associated area of mobile ad-hoc networks and routing protocols involved in it. Numerous up-to-date technologies as obtainable in the literature are conversed in brief in this chapter. Recent advances related to progress of various techniques of improving performances of the MANET routing protocols and their applications in different fields have been revised in detail. Security issues associated with the routing in mobile ad hoc networks were also discussed in this chapter. Based on the literature survey carried out, the motivation behind the present study is outlined at the end of this chapter.

In **chapter-3,** investigations of different node density and diverse node pause time effects on standard AODV, DSDV and OLSR (Mobile ad-hoc network protocols) were carried out. Scenario-I comprises the examination of different node density effects and the scenario-II contains experiments on diverse node pause time effects. These scenarios were tested on stable general network parameters and diverse testing factors with 10 numbers of fixed source/sink connections. Node density effects were studied and examined by varying different set of network nodes that is; 30, 40,

50, 60, 70, 80, 90 and 100 numbers of nodes, and the diverse node pause times were; 5, 10, 15, 20, 25 and 30 seconds. Simulation based study of these two effects were studied by the help of network simulator-3. In this chapter, various performance measuring metrics were analyzed and obtained results were discussed.

Chapter-4 deals with the study of node velocity and transmitted power effects on standard AODV, DSDV and OLSR routing protocols. The first case explores the analysis of varied node velocity effects and in the second case, analysis of diverse transmit power were carried out. Various values of node velocities considered were; 10 m/s, 20 m/s and 30 m/s, and values considered for transmitted power were; 3.5dBm, 4.5dBm, 5.5dBm, 6.5dBm, 7.5dBm, 8.5dBm, and 9.5dBm. Different network parameters were set same as in chapter-3 in order to maintain identical test platform. 50 numbers of mobile nodes were placed in a rectangular simulation region of size; 300 x 1500 m with random waypoint mobility. Separate tests were conducted for each value of node velocity and the transmit power. Obtained packet data was used for calculating different performance evaluating metrics. At the end of the chapter, results were tabled and graphs were plotted with suitable comments.

Chapter-5 contains investigations on performances of the standard and attributes revised routing models of AODV, DSDV and OLSR routing protocols. Primary parameters of these protocols were severely studied and many experiments were conducted on their routing attributes. Principal parameters that changes characteristics of the routing protocol were inspected, tested and revised in order to conclude performance improvements in the routing protocols. Performances of the revised routing models were compared with the performances of the standard protocols. Common network parameters used in simulation were fixed identical. Performance investigations on each routing protocol were completed separately in different sections. Comparative performance analysis on revised routing models of AODV, DSDV and OLSR were also studied in the last section of this chapter. Various performance evaluating metrics such as; the throughput, packet delivery ratio, end-to-end delay, packet loss and normalized routing load were used to calculate performances of either routing models. At the end of this chapter, results were discussed in detail with performance graphs.

In Chapter-6, investigations on performances of the standard and attribute revised routing models of DSR routing protocol were conducted in different node population scenarios. Routing attributes of the standard dynamic source routing (DSR) protocol were altered in order to obtain a new DSR protocol design namely, the REV.DSR (Revised DSR). Performances of the REV.DSR was tested and compared with the performances of the STD.DSR (Standard DSR) to check possible performance improvements in different node densities. Suitable network parameters and attributes revised dynamic source routing parameters were set for this analysis. Like in previous chapters, obtained packet data was employed for analyzing various performance evaluating parameters. Results were discussed with suitable comments along with tables and graphs.

Chapter-7 accomplishes the results and over all conclusions of the thesis. The works carried out in the present thesis is expected to be useful for the larger section of the researchers working in the related areas related to routing protocols in Mobile Ad-hoc Networks and their efficient applications. Performance analyses on AODV, DSDV, OLSR and DSR routing protocols dealt in the thesis are likely to encourage scientists, engineers and researchers for further research in these technologies.