Chapter 6

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ABSTRACT
The main applications of delay tolerant network lie in space research, military, tactical and other security sensitive operations. In these and other applications, secure and energy efficient routing is an important issue in homogeneous and heterogeneous network. This chapter contributes a research work that demonstrates the design, simulation, testing and evaluation of secure, energy efficient and environment independent routing protocol for delay tolerant network. The proposed protocol not only proposed secure approach but also energy efficient approach in homogeneous and heterogeneous environment. The proposed approach utilize sectorization technique to achieve its goals of security, energy efficiency and environment independence. Described in this chapter is a detailed architecture, design, simulation, testing and evaluation of the proposed protocol. Having evaluated these protocols in various simulators, it is concluded that the proposed routing protocol utilized minimum energy and bandwidth and also provided secure transmission.

INTRODUCTION
As the Mobile Operating Systems evaluation is variant and competent for vendors, such as iPhone OS, Android, and Windows Phone OS, nature of mobile phones got changed from simple voice communication means into powerful devices, providing service on demand such as transfer the videos or music in a peer-to-peer (P2P) way through the short range communication technologies (Blue- tooth, WiFi, DOI: 10.4018/978-1-5225-2342-0.ch006
Direction-Aware Routing Protocol for Delay-Tolerant Network

etc.) in them. Limited communication range or mobility nature makes hard to maintain the continuous end-to-end path between them as far as classic Internet P2P applications are considered. Delay tolerant network (DTN) is opportunistic network where every node searches best opportunity to deliver the message called bundle to the destination. Mobile ad hoc network supposed to be the origin of DTN. In traditional MaNet, source node requires end-to-end connectivity to transfer messages. This almost produces the high possibility of data transmission even in a short span of time with minimum delay. In DTN, end-to-end connectivity is never ensured between source and destination which becomes main cause of increasing delay. The source node is always searching the best opportunity to route messages to the destination through some sympathetic and trustworthy relay nodes. Support and trust are wished as a source has to believe and work in cooperation on intermediate nodes. Therefore, DTN transmission is also called as Opportunistic Cooperative Transmission. DTN uses store and forward switching technique of intended messaged by introducing a new protocol layer called the Bundle Layer on top of the transport layer. The bundle layer is responsible for storing and forwarding entire bundles between a source and destination. Nodes wish to send data must have the bundle layer support on top of the TCP layer. The transport layer protocol, either TCP or UDP below the bundle layer is selected based upon the reachability and accessibility properties estimated about each region in and around the intended node in the network.

DTN is concerned with highly challenged network in which application layer sessions commonly lack contemporaneous end-to-end connectivity. In networking context, DTN is also called opportunistic network where every node searches best opportunity to deliver the message called bundle to the destination. The design of routing protocol for DTN is fundamentally determined by how efficiently the packets are being transferred from source to destination using available network resources.

In traditional mobile adhoc network (MaNet), source node requires end-to-end connectivity to transfer messages. This almost produces the high possibility of data transmission even in a short span of time resulting in minimizing delay. In DTN, end-to-end connectivity is never ensured between source and destination which increase the delay. Therefore, a source node is always searching the best opportunity to route messages to the destination through some sympathetic and trustworthy relay nodes. To achieve support and trust, the source has to believe and work in liaison along with intermediate nodes.

A considerable amount of research has been reported in providing shortest approach to deliver the packets to the destination in DTN. Early work in DTN focused on real-time aspects to increase the contract schedule. Researchers have attempted to implement ferry node approach to increase the contacts between various nodes along the trajectory. This eventually increases the amount of traffic and also increases energy consumption. Nevertheless, it remains an open problem as how to decrease energy and bandwidth consumption in DTN as desired.

This chapter is concerned with the decision making required to define the sequence of processes in finding an optimum trajectory in DTN; the principal objective is to develop a novel routing protocol for DTN. The issue with which authors deal range from the node selection on an optimum trajectory to complexity and time constraints of the DTN in both homogeneous and heterogeneous environments.

Although a lot of research efforts are directed towards the advancement of optimizing the packet delivery ratio, many remains are to be investigated. Some of the most challenging issues faced by the current research on DNT with respect to routing protocols are security, energy efficiency and environment independence. This research is motivated by an attempt to address these issues of security, energy efficiency and environment independent routing in DTN.