CHAPTER 55

TECHNOLOGY
INFORMATION TECHNOLOGY

Doctoral Thesis

01. ARUN KUMAR
Designing Secure Data Forwarding Techniques in Delay Tolerant Opportunistic Networks.
Supervisor : Prof. Sanjay K. Dhurandher
Th 24214

Abstract
(Verified)

Opportunistic networks (OppNets) are a subclass of delay tolerant networks (DTNs) and characterized by intermittent end-to-end connections. In this work, various security related protocols have been designed for OppNets. One altruism-based forwarding mechanism named, ATDTN has been designed to shed the selfishness of a node in the network. ATDTN uses the notion of altruism that has a long history in psychological, sociological and ethical thoughts. In this protocol, each node is associated with a dynamically changing altruism value, which represents the trust of the concerned node in the network. The trace-driven simulations were carried out for ATDTN in ONE simulator. ATDTN was compared against existing protocols Iron Man and SimBet on various network parameters. The performance of ATDTN was found to be satisfactory and on an average it outperformed the SimBet and IronMan by 18% and 48%, respectively. However, it is known that the trust based protocols are incapable in solving the problem of isolating, avoiding and detecting the malicious intent nodes with the provision of security services such as authentication, confidentiality and message integrity through cryptography. The second work thus addresses this aforesaid security concern. In this, a robust and scalable infrastructure based security overlay has been designed over the base trust-based routing for detecting malicious nodes and providing security services through the established cryptographic mechanisms. In the next work, a defense mechanism was proposed against the misbehavior of supernova and hypernova nodes in the network. The simulations were performed using the trace file of Infocom06 conference for defending Epidemic and Prophet routing protocols. The last proposed ETB protocol uses the concept of tit-for-tat and incorporates the verification process through the exchange of claim certificate digitally signed using the public-private key cryptography mechanism.

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02. BORAH (Satya Jyoti)
Efficient Next-Hop Selection Techniques for Routing in Opportunistic Networks.
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Abstract
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Opportunistic Network (OppNet) is one of the latest domain of wireless communication where information is transferred in the network without any infrastructure. Due to the delay-tolerant nature of the network, designing efficient routing protocols is a challenge. In this regard, the work proposes a few novel optimized routing protocols. The initial proposed protocol called Game Theoretic Approach for Context Based Routing (GT-ACR) uses game theory for selecting the best possible next-hop to forward data packets efficiently. In this protocol, the best strategy for the selection of the next hop node is dependent upon a non-zero sum cooperative game of two players. Next, in the design of probabilistic EDR(P-EDR) protocol, the node's context information such as number of encounters, distance and delivery probability are used as routing decision patterns when selecting the best next hop. Similarly, the work proposes a multi-objectives based technique for optimized routing (MOTOR). This technique involves the use of a weighted function to decide on the next hop selection based on a combination of objectives, namely, encounters, delivery probability, and distance to the destination. Using these objectives a non-dominated set of solutions is proposed by applying Naive and Slow algorithm for forwarding the data packets. Next, the work proposed a new routing scheme that relies on node's contact information such as node's present location history. Further the said scheme predicts the node's next location using Markov chain and has been named LPFR-MC. Lastly, the work also emphasies on node's energy which is dependent on the node mobility, route discovery and information exchange. Most of the node's energy is consumed during node discovery and message transmission. So, to conserve and increase the energy or lifetime of a node this scheme proposed a new routing protocol by considering the node's energy and was named as DEEP.

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