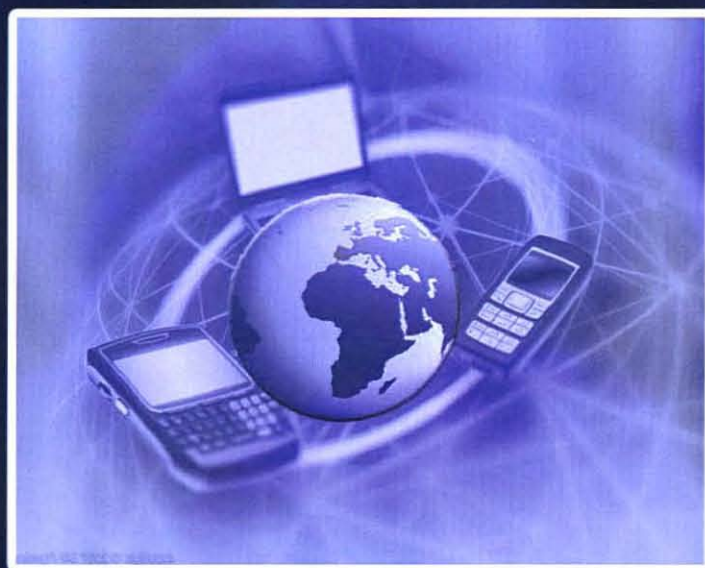


# Research Issues in Wireless

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## Communications and Networking

Farhat Anwar  
Wajdi Al-Khateeb



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INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

# **Research Issues in Wireless Communications Networking**

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## CHAPTER 8

### PERFORMANCE EVALUATION OF SELECTED DHT P2P ROUTING PROTOCOLS

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#### 8.1 INTRODUCTION

Traditional networks, which are based on client-server model often, face a single point of failure problem, which occurs when the server is incapacitated and as a result, the whole network can completely collapse. The P2P model has been introduced to solve this problem. P2P is a transient virtual network which allows a group of users with the same networking program to connect with each other and directly access files without relying on a centralized server. The distributed nature of P2P networks increases robustness in case of failures by replicating data over multiple peers. However, query/data routing in P2P is very problematic because the users leave and join the network dynamically. There is no guarantee of the length of time that the routes established would be valid. The data downloading process can be interrupted when users become unresponsive.

Recent P2P applications such as live broadcasting, high bandwidth content distribution and real-time audio conferencing require a high performance to provide acceptable Quality of Service (QoS) to the users. Thus, the routing protocol should optimize both efficiency and QoS. Efficiency focuses on better utilization of bandwidth, while QoS focuses on user perceived qualities, such as number of correct returned results and response time. The performance of routing protocols can be evaluated based on performance and cost. Consumed network bandwidth can be considered as traffic cost. Bandwidth is important because sometimes a significant fraction of nodes are connected over low bandwidth/high latency links. Sometimes the slower clients might be bottleneck in routing queries. Meanwhile, the performance is measured as the average lookup latency of successful correct lookups. The most popular approach to P2P routing protocol is DHT. DHT protocol works by hashing all data identifiers (ID) to produce keys for the data. A hash function takes a variable length string of bytes and returns a number that is generated from it. Secure Hash Algorithm (SHA-1) is usually used to generate nodes and keys IDs. The location of the keys is stored in a giant hash table, which is distributed across the participating nodes. Each node is assigned the responsibility for storing a certain range of keys portion of the ID space and forwards the request for keys, which does not belong to its key space to the appropriate next-hop node.

In this chapter, three DHT protocols: Kademlia,[1] Tapestry[2] and Chord[3] have been chosen to be evaluated because there are designed with a consideration to reduce latency in the data lookup process, which is one of the important aspects considered for QoS. However, these protocols use different approach in their routing algorithms to achieve reduced data lookup time.

#### 8.2 BACKGROUND

P2P is a network which allows a group of computer users (peers) with the same networking program to connect with each other and directly access files without relying on centralized server[4]. Each peer has both server and client capabilities which mean it requests information from other peers as well as stores data and responds to query requests. The peers form an overlay network which means that they are not connected by physical