

Chapter 10

Performance Evaluation of Reactive Routing in Mobile Grid Environment

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ABSTRACT

Grid computing came into existence as a manner of sharing heavy computational loads among multiple computers to be able to compute highly complex mathematical problems. The grid topology is highly flexible and easily scalable, allowing users to join and leave the grid without the hassle of time and resource-hungry identification procedures, having to adjust their devices or install additional software. The goal of grid computing is described as “to provide flexible, secure and coordinated resource sharing among dynamic collections of individuals, institutions and resources”. AODV is an on-demand (reactive) algorithm capable of both unicast and multicast routing. In this paper, AODV has been modified by varying some of the configuration parameters used in this algorithm to improve its performance. This modified protocol i.e. A-AODV (advanced ad hoc on demand distance vector) has been compared with AODV in grid environment. The simulations have shown that A-AODV is able to achieve high throughput and packet delivery ratio and average end-to-end delay is reduced.

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1. INTRODUCTION

Wireless grids are wireless computer networks (Anastasi, Borgia, Conti, & Gregori, 2003; Murthy & Manoj, 2004) consisting of different types of electronic devices with the ability to share their resources with any other device in the network in an ad-hoc manner. A definition of the wireless grid can be given as: “Ad-hoc, distributed resource-sharing networks between heterogeneous wireless devices” The following key characteristics further clarify this concept:

- No centralized control
- Small, low powered devices
- Heterogeneous applications and interfaces
- New types of resources like cameras, GPS trackers and sensors
- Dynamic and unstable users / resources

Mobile Grid, in relevance to both Grid and Mobile Computing, is a full inheritor of Grid with the additional feature of supporting mobile users and resources in a seamless, transparent, secure and efficient way (Nilsson, 2005). It has the ability to deploy underlying ad-hoc networks and provide a self-configuring Grid system of mobile resources (hosts and users) connected by wireless links and forming arbitrary and unpredictable Mobile Grid enables both the mobility of the users requesting access to a fixed Grid and the resources that are themselves part of the Grid. Both cases have their own limitations and constraints that should be handled. In the first case the devices of the mobile users act as interfaces to the Grid to monitor and manages the activities in ‘anytime, anywhere’ mode, while the Grid provides them with a high reliability, performance and cost-efficiency. Physical limitations of the mobile devices make necessary the adaptation of the services that Grid can provide to the users’ mobile devices. In the second case of having mobile Grid resources, we should underline that the performances of current mobile devices are significantly increased. Laptops and

PDA’s can provide aggregated computational capability when gathered in hotspots, forming a Grid on site (Abdullah, Ramly, Muhammed, & Derahman, 2008; Usop, Abdullah, & Abidin, 2009). This capability can advantage the usage of Grid applications even in places where this would be imaginary.

In this paper, an Advanced AODV (A-AODV) has been proposed in which some of the configuration parameters of AODV (Perkins, Royer, & Das, 2003) have been modified. These parameters are net diameter, node traversal time, active route timeout, hello interval, allowed hello loss and rreq retries. This new protocol A-AODV has been compared with AODV in grid environment. The comparison is made using the performance metric such as throughput, packet delivery ratio, average end-to-end delay and average jitter.

The remainder of this paper is organized as follows: II part describes AODV, III part develops proposed routing protocol i.e. A-AODV, IV part describes simulation scenarios and performance parameter, IV part describes the scenarios result and V part describes the conclusion and future work.

2. AD HOC ON DEMAND DISTANCE VECTOR (AODV)

AODV (Ad hoc On-demand Distance Vector routing) (Perkins, Royer, & Das, 2003) is a distance vector routing protocol, i.e. routes are advertised as a vector of direction and distance. To avoid the Bellman-Ford “counting to infinity” problem and routing loops, sequence numbers are utilized for control messages. Operation of the protocol here is also divided in two functions – route discovery and route maintenance. At first all the nodes send Hello message on its interface and receive Hello messages from its neighbors. This process repeats periodically to determine neighbor connectivity. When a route is needed to some destination, the protocol starts route discovery. The source node

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