

Individual Assignment

COMP9332 Network Routing and Switching

- (1) Term 2, 2019, Due: 17:00 (5:00pm), 11 August 2019 (Week 10), Weighting: 25%. Note that this is a hard deadline. No late submission will be allowed.**
- (2) There are a total of 2 tasks with varying weights. All tasks must be attempted.**
- (3) Answers must be submitted electronically via give. The only format accepted is Acrobat pdf. The recommended file name is your student number. The submission command (assuming your student number is 1234567) is:**

give cs9332 assignment 1234567.pdf

Analysis of Ad-hoc On Demand (AODV) Routing Algorithms

Introduction

AODV routing is very different from the conventional table-driven routing algorithms and protocols, such as RIP, OSPF and BGP. In AODV routing, hosts are wireless devices that also act as routers to forward packets to each other using wireless communications. Week 7 lecture explains AODV routing algorithms used in Ad Hoc networks. The purpose of this assignment is to analyse these algorithms in more details and propose some extensions to improve their performance.

It is expected that students will discuss any confusions or issues in the Discussion Forum (in Moodle). The Lecturer will then address any major issues in a revised version.

Learning Objectives

By completing this assignment, students will

- Learn AODV routing algorithms in more details.
- Gain experience in analysing new forms of routing that could be significantly different than the mainstream routing protocols.
- Develop abilities to scrutinise important properties of routing from the algorithmic descriptions of the protocols.

TASKs:

(1) [50 marks] Existing AODV routing algorithms are based on hop-count to route packets, which provides low complexity, but may not be optimal, especially when the wireless links are unreliable (some packets may be lost during the wireless transmissions). In this task, you will consider an extension that allows nodes to calculate the communication cost of an unreliable link by exchanging beacons (e.g., HELLO messages). **Hint, for a wireless link with $p = 50\%$ reliability, a sender needs to transmit the packet twice in average to achieve one successful packet delivery. Therefore, the communication cost of the link may be considered as $1/p = 1/0.5 = 2$.**

- a. Propose an extension of the hop-based AODV routing algorithm that calculates the link cost between two neighbouring nodes based on the probability of a successful packet delivery. You may use pseudo-code to specify the algorithms. [25 marks]
- b. Show the benefits of the extended versions compared to the hop-based algorithms using carefully designed topologies. You need to first identify potential benefits that are gained by extending the algorithm to link cost based, followed by showing them using carefully chosen routing scenarios. [25 marks]

(2) [50 marks] To increase end-to-end transmission reliability, wireless communication protocols typically use hop-by-hop packet recovery, i.e., a receiver will send an ACKnowledge (ACK) packet to a sender after the receiver receives a packet successfully, and the sender will retransmit the packet if an ACK hasn't been received for a predefined duration. Therefore, the communication cost needs to take the quality of bi-directional links into account. In this task, you will consider an extension of Task (1) that allows nodes to calculate the BI-DIRECTIONAL unreliable link communication cost, assuming the packet losses in the two links are independent.

- a. Propose an extension of the routing algorithm developed in Task (1) that calculates the BI-DIRECTIONAL link cost between two neighbouring nodes based on the probability of a successful data packet AND ACK delivery. You may use pseudo-code to specify the algorithms. [25 marks]
- b. Show the benefits of the extended versions compared to the routing algorithm developed in Task (1) using carefully designed topologies. You need to first identify potential benefits that are gained by extending the algorithm to bi-directional link cost based, followed by showing them using carefully chosen routing scenarios. [25 marks]

Plagiarism

This is an individual assignment. Your submission will be checked by plagiarism software against other submissions. There are strict penalties for plagiarism. See course overview for plagiarism policy.