

Comparative Study of EIGRP and OSPF Protocols based on Network Convergence

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Abstract—Dynamic routing protocols are one of the fastest growing routing protocols in networking technologies because of their characteristics such as high throughput, flexibility, low overhead, scalability, easy configuration, bandwidth, and CPU utilization. Albeit convergence time is a critical problem in any of these routing protocols. Convergence time describes summary of the updated, complete, and accurate information of the network. Several studies have investigated EIGRP and OSPF on the internet; however, only a few of these studies have considered link failure and addition of new links using different network scenarios. This research contributes to this area. This comparative study uses a network simulator GNS3 to simulate different network topologies. The results are validated using Cisco hardware equipment in the laboratory. The network topology implemented in this research are star and mesh topology. The results are validated using Cisco hardware equipment in the laboratory. Wireshark is effectively used in capturing and analyzing the packets in the network. This helps in monitoring accurate time response for the various packets. The results obtained from Wireshark suggest the EIGRP has a higher performance in terms of convergence duration with a link failure or new link added to the network than the OSPF routing protocol. Following this study EIGRP is recommended for most heterogeneous network implementations over OSPF routing protocol.

Keywords—OSPF (Open Shortest Path First); EIGRP (Enhanced Interior Gateway Routing Protocol); routing; protocol; network; convergence; topology; routers; packets; Wireshark

I. INTRODUCTION

Computer networking is now a fundamental part of life, especially the use of the internet. As new technologies emerge, the demand for wireless mobile computing is growing fast, thus the need for efficient routing protocols [1]. These protocols define the mechanism by which routers acquire information about the performance of the network topology, verify and identify the optimal route that a packet will take to arrive at its destination. Hence, routing algorithms are crucial because they select the best path for communication in a heterogeneous network. Routing is the entire process of selecting the optimal route for the transmission of data packets from source to destination [2]. The process includes routers advertising their known IP networks, the administrative cost to its neighbor or adjacent routers, in this way the neighbor's routers gain knowledge of the characteristics and the topology of the network, then update the routing table. The administrative cost is the number of hops, link speed and latency [3].

There has been different research about routing protocols, especially on EIGRP and OSPF routing protocol in terms of convergence time. This research in routing protocols has been predominant because of the increasing demand of data transmission over a reliable network connection amongst enterprise companies, therefore network resilience/redundancy has been the key in curbing link failures. If there is a link failure in the network, the routing protocols are expected to identify the failure and converge to form a new topology for the continuous flow of packets in the network. Despite the wide research and interest made, many problems about routing protocols are yet to be solved in terms of convergence rate, which can yield optimal routing to deliver high throughput in heterogeneous networks. Hence, this work focuses on analyzing several scenarios of link failures, measuring their convergence rate, and identifying changes in the network topology when using EIGRP and OSPF routing protocol [4]. The rate of convergence occurs when all the routers in the network have an updated, complete, and accurate information on the network. The convergence rate includes the total time required by all the routers to calculate the optimal path, update their routing tables, and share the routing information with neighboring routers in the network.

The remainder of this study is planned as follows. In Section II, present a brief literature of recent work and background knowledge of Routing Information Protocol (RIP), OSPF and EIGRP. Section III describes the methodology, where the network topology such as star and mesh are designed. Section IV presents the design parameters and metrics, which includes the Hello interval, hop count and interface cost. Section V are the Wireshark results and Section VI is the presentation and analyses of the results. Finally, the work is concluded in Section VII.

II. BACKGROUND

Dynamic routing protocols allow changes in the network topology because of the update in routing tables. Dynamic routing protocol is divided into distance vector routing protocols and link state routing protocols. Distance vector routing protocols calculate the administrative cost of a packet arriving at a destination based on the number of routers the packet passes through, these include Routing Information Protocol (RIP) and EIGRP [5]. Whilst, Link state routing protocol is building a complete topology of the network and calculates the optimal path from the topology for all interconnected networks, these include Intermediate System to

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Mohammad S. Obaidat, Tuncer Ören, Janusz Kacprzyk, Joaquim Filipe, 2016-01-14 The present book includes a set of selected extended papers from the 4th International Conference on Simulation and Modeling Methodologies Technologies and Applications SIMULTECH 2014 held in Vienna Austria from 28 to 30 August 2014 The conference brought together researchers engineers and practitioners interested in methodologies and applications of modeling and simulation New and innovative solutions are reported in this book SIMULTECH 2014 received 167 submissions from 45 countries in all continents After a double blind paper review performed by the Program Committee 23% were accepted as full papers and thus selected for oral presentation Additional papers were accepted as short papers and posters A further selection was made after the Conference based also on the assessment of presentation quality and audience interest so that this book includes the extended and revised versions of the very best papers of SIMULTECH 2014 Commitment to high quality standards is a major concern of SIMULTECH that will be maintained in the next editions considering not only the stringent paper acceptance ratios but also the quality of the program committee keynote lectures participation level and logistics

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Advances in Intelligent Systems, Computer Science and Digital Economics IV Zhengbing Hu,Yong Wang,Matthew He,2023-01-28 This book comprises high quality peer reviewed research papers presented at the 4th International Symposium on Computer Science Digital Economy and Intelligent Systems CSDEIS2022 held in Wuhan China from November 11 13 2022 organized jointly by the Wuhan University of Technology Hubei University of Technology Wuhan University of Science and Technology the Polish Operational and Systems Society and the International Center of Informatics and Computer Science ICICS The topics discussed in the book include state of the art papers in computer science and their technological applications intelligent systems and intellectual approaches digital economics and educational approaches It is an excellent source of references for researchers graduate students engineers management practitioners and undergraduate students interested in computer science and its applications in engineering and management

Reinforcement Learning Cornelius Weber,Mark Elshaw,N. Michael Mayer,2008-01-01 Brains rule the world and brain like computation is increasingly used in computers and electronic devices Brain like computation is about processing and interpreting data or directly putting forward and performing actions Learning is a very important aspect This book is on reinforcement learning which involves performing actions to achieve a goal The first 11 chapters of this book describe and extend the scope of reinforcement learning The remaining 11 chapters show that there is already wide usage in numerous fields Reinforcement learning can tackle control tasks that are too complex for traditional hand designed non learning controllers As learning computers can deal with technical complexities the tasks of human operators remain to specify goals on increasingly higher levels This book shows that reinforcement learning is a very dynamic area in terms of theory and applications and it shall stimulate and encourage new research in this field

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