

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. Although 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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Creative Approaches Towards Development of Computing and Multidisciplinary IT Solutions for Society Anchit Bijalwan, Rick Bennett, Jyotsna G. B., Sachi Nandan Mohanty, 2024-10-01 This book containing 33 chapters provides an insightful look at creative approaches toward the accelerated development of computing and multidisciplinary IT solutions for society Technology is advancing on all fronts and is opening new and innovative adaptations to our modern world every single day causing huge shifts in practices and patterns These new technologies allow us opportunities to gain insights into the discoveries of creative and innovative approaches The book covers emerging next generation computing research developments of computing and multidisciplinary ICT solutions in seven themes The first theme concerns the emerging research into next generation computing like cloud computing cyber security and gaming The second theme pertains to information technology in the textile industry The third theme zeroes in on the adoption of ICT for digitalization artificial intelligence and machine learning The fourth theme addresses online collaboration in the creative process The fifth theme covers the development of computing and multidisciplinary ICT solutions for salient disciplines like education governance commerce and business communication The sixth theme provides a security assessment and defense strategies for banking and financial institutions The seventh theme covers creative approaches towards the implementation of the 4th Industrial Revolution Audience The book has a wide audience comprising specialists in artificial intelligence information technology software engineers data and cyber security scientists as well as those in the applied areas such as business finance industry and manufacturing Policymakers and consultants will find this book useful as well **Proceedings of Seventh International Congress on Information and Communication Technology** Xin-She Yang, Simon Sherratt, Nilanjan Dey, Amit Joshi, 2022-08-02 This book gathers selected high quality research papers presented at the Seventh International Congress on Information and Communication Technology held at Brunel University London on February 21 24 2022 It discusses emerging topics pertaining to information and communication technology ICT for managerial applications e

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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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Methods in Intelligent Algorithms Section of the 8th Computer Science On line Conference 2019 CSOC 2019 held on line in April 2019 *Wired/Wireless Internet Communications* Marco Di Felice, Enrico Natalizio, Raffaele Bruno, Andreas Kasser, 2019-09-10 This book constitutes the proceedings of the 17th IFIP WG 6.2 International Conference on Wired Wireless Internet Communications WWIC 2019 held in Bologna Italy in June 2019 The 20 full papers presented were carefully reviewed and selected from 35 submissions The papers address various aspects of next generation data networks such as design and evaluation of protocols dynamics of integration performance tradeoffs the need for new performance metrics and cross layer interactions They are organized in the following topical sections the Internet of Things and WLANs security and network management 5G and beyond 5G networks forwarding and congestion control and distributed applications

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