

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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healthy environment The conference also covers the rise of the digital health well being home care and patient centred era for the benefit of patients and healthcare providers in addition to how supporting the development of a platform of smart Dynamic Health Systems and self management *Advances in Communications, Computing, Networks and Security Volume 10* Paul Dowland,Steven Furnell,2013-11-04 This book is the tenth in a series presenting research papers arising from MSc MRes research projects undertaken by students of the School of Computing and Mathematics at Plymouth University The publications in this volume are based upon research projects that were undertaken during the 2011 12 academic year A total of 25 papers are presented covering many aspects of modern networking and communication technology including security mobility coding schemes and quality measurement The expanded topic coverage compared to earlier volumes in this series reflects the broadening of our range of MSc programmes Specifically contributing programmes are Communications Engineering and Signal Processing Computer and Information Security Network Systems Engineering and Robotics

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 governance e agriculture e

education and computing technologies the Internet of Things IoT and e mining Written by respected experts and researchers working on ICT the book offers a valuable asset for young researchers involved in advanced studies The work is presented in four volumes Artificial Intelligence and Sustainable Computing Manjaree Pandit,M. K. Gaur,Sandeep Kumar,2024-04-23 This book presents high quality research papers presented at the 5th International Conference on Sustainable and Innovative Solutions for Current Challenges in Engineering and Technology ICSISCET 2023 held at Madhav Institute of Technology Science MITS Gwalior India during October 21 22 2023 The book extensively covers recent research in artificial intelligence AI that knit together nature inspired algorithms evolutionary computing fuzzy systems computational intelligence machine learning deep learning etc which is very useful while dealing with real problems due to their model free structure learning ability and flexible approach These techniques mimic human thinking and decision making abilities to produce systems that are intelligent efficient cost effective and fast The book provides a friendly and informative treatment of the topics which makes this book an ideal reference for both beginners and experienced researchers **Intelligent Automation and Systems Engineering** Sio-long Ao,Mahyar Amouzegar,Burghard B. Rieger,2011-08-23 Intelligent systems are required to facilitate the use of information provided by the internet and other computer based technologies This book describes the state of the art in Intelligent Automation and Systems Engineering Topics covered include Intelligent decision making Automation Robotics Expert systems Fuzzy systems Knowledge based systems Knowledge extraction Large database management Data analysis tools Computational biology Optimization algorithms Experimental designs Complex system identification Computational modeling Systems simulation Decision modeling and industrial applications **Testbeds and Research Infrastructure: Development of Networks and Communities** Thanasis Korakis,Michael Zink,Maximilian Ott,2012-11-28 This book constitutes the proceedings of the 8th International ICST Conference TridentCom 2012 held in Thessanoliiki Greece in June 2012 Out of numerous submissions the Program Committee finally selected 51 full papers These papers cover topics such as future Internet testbeds wireless testbeds federated and large scale testbeds network and resource virtualization overlay network testbeds management provisioning and tools for networking research and experimentally driven research and user experience evaluation Intelligent Computing Kohei Arai,2024-06-13 Explore the forefront of computing with the proceedings of the Computing Conference 2024 Featuring 165 carefully selected papers from a pool of 457 submissions this collection encapsulates the cutting edge research and innovation presented during the conference Delve into a diverse range of topics insights and methodologies that shape the future of computing Whether you re an academic researcher or enthusiast this concise volume offers a snapshot of the dynamic and collaborative spirit defining the Computing Conference 2024 Artificial Intelligence and Applications Amita Yadav,Amit M. Joshi,Mehmet Ergezer,Valentina Emilia Balas,2025-02-24 The papers in this book are high quality refereed papers presented at ICAIA 2024 the second International conference on Artificial Intelligence and Applications held at Maharaja Surajmal Institute of

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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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