



# Proposal of Study on Performance Analysis of OSPFV3 and EIGRP Applications in IPV6

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

The internet protocols are increasingly imposed in recent times, there is a need to propose a study on the performance analysis on OSPFV3 and EIGRP in IPV6 application. IP is currently involved in sensitive areas of internet protocols, remote sensing, telepresence, computer networks and so on. The IP exists in two versions (IPv4 and IPv6), the difference between these two protocols is distinguished in terms of features, operation, and performance. In this study, measuring and evaluation on the performance of the two IPv4 and IPv6 protocols in the networks of communicating companies are proposed for further studies based on the literature gaps identified. The study should be performed by varying the routing protocols RIP, RIPnG, OSPF, OSPFv3, IS-IS and ISIS v6. Further studies should conduct simulation on performance analysis of OSPFV3 and EIGRP in IPV6 applications. The gaps identified after reviewing a number of literature on OSPFV3 and EIGRP with IPV6 network needs to be done since it sought to bridge gaps in literature.

**Keywords:** OSPFv3; EIGRP; protocol; routing; network; simulation and packet tracer.

## 1. INTRODUCTION

The IPv6 First routing protocol of Open Shortest Path is OSPFv3. OSPFv3 is an IPv6 and IPv4

routing protocol. It is not a protocol of distance-vector, but rather a protocol of link-state. For example, consider a connection to be a networking device's interface, the links states

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that join the destination and source devices are used by a link-state protocol to make routing decisions. The link's status is the interface description and its affiliation to other networking machines. Also, the network mask, devices used to connect to the network, interface IPv6 prefix, and connected network type, are all included in the interface information. This information is disseminated through various link-state advertisements (LSAs). Furthermore, routing protocol of advanced distance-vector for configuration on a computer network and automating routing decisions is Enhanced Interior Gateway Routing Protocol (EIGRP). It is

a routing protocol that permits routers in similar independent system to share routes is EIGRP. EIGRP only drives incremental updates, distinct from other routing protocols that are well-known like RIP. And reducing the workload of router and data amount that must be transferred. Also, a gateway protocol of interior that can be applied with a variety of media and topologies is Enhanced Interior Gateway Routing Protocol. Scales of EIGRP are effective and provides exceptionally fast convergence times with minimum network traffic in a properly-designed network.

## 2. LITERATURE REVIEW

**Table 1. Literature review**

<b>Author &amp; Year</b>	<b>Findings</b>	<b>Journal</b>
Anveshini, D., & Shetty, S. P. (2016) [1]	When a link fails, it's critical that the dynamic routing protocol detects the failure and converges on a new topology to keep the network segment operational. This work investigates the case of a connection failure and recovery, as well as the duration of convergence. With little network traffic, EIGRP scales converges and well speedily. When a change occurs, EIGRP spreads only table changes of routing rather than the routing table which is complete to reduce network demand. According to the results of the experiments, OSPF has the longest network convergence time while EIGRP has the shortest.	<i>International Journal of Computer Science Trends and Technology (IJCSST)</i>
Asher, P. (2015) [2]	To maintain adequate connectivity, routing systems seek out the optimum path via the network. Individual routing protocol has by itself criteria set for evaluating the quality of a route, for example delay, next hop count, and bandwidth. Special characteristics of routing protocol also include how they prevent routing loops, how they choosedesired routes using hop costs information, how long it takes them to attain routing convergence, their scalability, and other considerations. As a result, the requirements of a networking application would dictate the protocol used for computer communication.	<i>International Journal of Computer Science and Information Technologies</i>
Dangwal, K., & Kumar, V. (2014) [3]	The simulations demonstrated the RIPv2 protocol's key restrictions. The hybrid protocols address the drawbacks of distance vector protocols, particularly those relating to network scalability and adaptability to various topologies. EIGRP contains functions in both link state and distance vector protocols as a result of this. As a result, it delivers superior convergence and delays based on available bandwidth when determining the rate at which updates are transmitted. A thorough simulation study was used to determine which of the two protocols was the best. Because EIGRP networks can learn topological information and updates more quickly than RIP networks, convergence time is faster.	<i>International Journal of Engineering Sciences &amp; Emerging Technologies</i>

<p>Deng, J., Wu, S., &amp; Sun, K. (2014) [4]</p>	<p>According to the findings of the convergence activity, EIGRP is clearly the quickest routing protocol among all tree protocols when it comes to initializing, failing, and recovering. OSPF is the slowest when it comes to initialization (since it has to introduce every router separately), which corresponds to their findings. RIP's performance is comparable to EIGRP on small networks, however when Deng, Wu, &amp; Sun scale out to a larger network, convergence speed of RIP is the slowest. Deng, Wu, &amp; Sun may deduce from the bytes/sec (traffic send) that EIGRP and OSPF profit from bandwidth, whereas RIP floods the network with comprehensive information, wasting capacity. Deng, Wu, &amp; Sun can conclude from all simulation results' examination that EIGRP is the top alternative for networks that are small and large as it efficiently consumes bandwidth and has the fastest convergence. However, according to their research, EIGRP was just recently introduced by enterprises other than CISCO, and the structure is complex. Based on EIGRP's features, OSPF will be large networks' second choice. Because RIP performs poorly on vast networks, it is best suited to small, simple networks.</p>	<p>Communication Networks</p>
<p>Finardi, A. (2018) [5]</p>	<p>IoT migration is also unavoidable, as most current networks will eventually be connected to some form of IoT network, offering up a slew of new opportunities for businesses. Another excellent point made was that IoT technology as a whole necessitates a distinct skill set in the development and support personnel, which poses a challenge to more rigid traditional IT systems. As one student pointed out, connecting many IoT devices would increase the amount of data available, which will open up new opportunities and demands for enterprises to manipulate and make monetary values from it. The Cisco Packet Tracer tool and the IoT exercises were the emphasis of the second section of the feedback form. Five out of seven students gave the tool a good or exceptional rating, while two students gave it a mediocre rating. The ease with which simulation may be set up, the fact that the program is free and quick to use, and the fact that Cisco Packet Tracer offers a large selection of IoT devices and functions to work with were among the benefits mentioned by students when using the technology. The ease with which simulation may be set up, the fact that the program is free and quick to use, and the fact that Cisco Packet Tracer offers a large selection of IoT devices and functions to work with were among the benefits mentioned by students when using the technology. Students also seemed to like the fact that the tool not only allowed them to configure network devices via command line, as they would in real-world scenarios, but also that it included features to make network setup easier, such as automatic cable selection or a simpler user interface for device configuration. Cisco Packet Tracer, according to one student, is an excellent tool for understanding IoT.</p>	<p>Helsinki Metropolia University of Applied Sciences.</p>

<p>Greenberg, A., Hjalmytsson, G., Maltz, D. A., Myers, A., Rexford, J., Xie, G., ... Zhang, H. (2005) [6]</p>	<p>The 4D architecture is a unique mixture of ideas and approaches, with many of its components echoing previous attempts. SS7, the TMN architecture, and the old SNA design with its centralized management and use of Explicit Routes, as pointed out by various reviewers, embody multiple earlier trials and real systems that share several 4D concept qualities. This brings the demand for the reason concepts that initially and unsuccessfully address the fresh environment brought by IP networks have an enhanced opportunity in the 4D environment. Some of these difficulties are addressed in part by the writers, although their opinions are not entirely compelling. This is due in part to the fact that the 4D architecture is still conceptual, specifically, a "research proposal" rather than thoroughly vetted solution through a whole decrease to practice, and a section is devoted by the authors to the drawbacks of 4D architecture and call attention to the remaining much work that needs to be done. However, the finished product falls short of totally resolving the problem.</p>	<p><i>ACM SIGCOMM Computer Communication Review</i></p>
<p>Hanumanthappa, J., &amp; Sridevi, M. D. H. (2010) [7]</p>	<p>The following are some of the cutting-edge research difficulties related to IPv6 threat problems.</p> <p><b>1. IPv4 to IPv6 Migration Mechanisms:</b> The current focus of basic transition mechanisms research is primarily on the scenario of IPv6 over IPv4. IPv4 networks may be separated by IPv6 networks as a result of extensive IPv6 adoption. In this instance, we are simply employing a few types of methods to provide multihoming, mobility, any cast, and multicast.</p> <p><b>2. Security considerations:</b> While all IPv6 tunneling techniques increase security, these issues cannot be resolved or resolved today. Aside from IPv6, firewall technology is a promising new area for future research.</p> <p><b>3. Difficult to identify software and set up:</b> The many initialization protocols of different tunneling concerns, such as automatic tunneling and configuration tunneling security, make selecting and setting up appropriate IPv6 transition mechanisms difficult and complex. For IPv4 and IPv6 interoperation, a standard mechanism to discover and establish software for connecting IPv6 networks over IPv4 only networks and vice versa is required.</p> <p><b>4. Scenario Analysis:</b> A typical scenario analysis is now underway. Some of them are still in draft form, such as enterprise network analysis, but other conceivable scenarios should be considered to accommodate future wireless technologies.</p> <p><b>5. Any cast, multihoming, multicast, and mobility support:</b> The focus of all basic tunneling mechanisms research and analysis of typical tunneling scenarios is usually network connection. To support multihoming, mobility, any cast, and multicast, more work needs to be put into the slow process of IPv6 tunneling.</p>	<p><i>Research Gate Publication</i></p>

<p>Jain, N., &amp; Payal, A. (2020) [8]</p>	<p>IS-ISv6 routing protocol behavior for applications of video/voice is studied using simulations. The throughput for the two applications was calculated, and it was discovered that 84.3 percent was the average maximum throughput acquired for video conferencing, whereas the average maximum throughput acquired for phone application is 56.5 percent. Higher IPv6 traffic released 9.7 second/packets, resulting in reduced throughput in voice applications. In terms of packet delay variations, the phone application outperformed the video conferencing application with 110 milliseconds end-to-end delay and 24 milliseconds value. For voice applications, 184 microseconds jitter is obtained. It is likewise been discovered that increasing the simulation time has no effect on network performance stability.</p>	<p><i>Procedia Computer Science: International Conference on Smart Sustainable Intelligent Computing and Applications under ICITETM2020</i></p>
<p>Jaiswal, R., Lokhande, S., Bakre, A., &amp; Gutte, K. (2015) [9]</p>	<p>In the internet network, packet data communication follows heavy tailed distributions. This behavior can be described as self-similarity. The processed data stream has a lot of tails and hence follows a power law. In comparison to IPv4, IPv6 traffic exhibited more heavy tailed behavior. The Hurst parameter uses a variety of methodologies to provide analytical proof of self-similarity. A higher degree of self-similarity is associated with a larger degree of heavy tailedness. The H values measured for IPv4 and IPv6 data traces demonstrate this. For both inter arrival time and packet length, H values for IPv4 are close to 0.6 and H values for IPv6 are close to 1. As a result, it is clear that IPv6 traffic is more self-similar than IPv4. Power spectral density plots and auto correlation were applied to assess long-range interdependence. This research results matched the self-similarity analysis and heavy tailed distribution perfectly. H levels that are lower suggest less long-range reliance. Auto correlation charts of IPv4 for both inter-arrival time and packet length reflect this. For longer delay, IPv6 packet traffic had higher auto correlation values and declined slowly. Auto correlation graphs, in particular, for the packet length parameter, exhibited extremely high auto co-relation values that decreased slowly over time. In the case of IPv6 traffic, this obviously suggests a higher level of self-similarity. Burstiness is investigated utilizing IDC, PMR, and time series graphs over various time scales. IPv4 packet flow is less bursty and decays over longer time scales, but IPv6 traffic remains bursty over longer time scales. IPv6 is burstier, according to thorough experiments, since it has a higher degree of heavy tailedness. As a result, there is a noticeable rise in self-similarity. Following additional analysis, it was discovered that the auto correlation function had larger values, resulting in a big power spectral density value around the origin. All of this contributed to IPv6 traffic being burstier than IPv4. This analysis is critical, because it can be utilized by internet service providers for network design and administration in the future to ensure that IPv4 and IPv6 traffic flow smoothly</p>	<p><i>ICTACT Journal on Communication Technology</i></p>

<p>Lee, J., Bonnin, J., Member, S., &amp; You, I. (2013) [10]</p>	<p>With regards to packet loss, handover blocking likelihood, and handover delay, the current proposed IPv6 mobility management protocols by the IETF have been compared and examined. The following is confirmed based on the findings of the analysis.</p>	<p><i>IEEE Transactions on Industrial Electronics</i></p>
	<p>1) Using L2 data to increase handover performance: L2 data should be used to improve handover performance. Predictive FPMIPv6 and FMIPv6 overtake other flexibility management protocols, since they permit an MN to make its handover earlier than actually performing it to the novel access network. Handover blockage is less likely as a result of the lower handover latency.</p>	
	<p>2) Using buffering management: Any buffering method should be used to avoid loss of packet throughout the handover. Only quick handover protocols like FPMIPv6 and FMIPv6 avoid data packets sent from the CN from being lost. Every mobility management protocol's handover performance is heavily influenced by the condition of wireless link, specifically, FER over the wireless link. In this regard, mobility management protocols' network-based like FPMIPv6 and PMIPv6 benefit from mobility signaling removal from the MN.</p>	
	<p>4) Latency of DAD: HMIPv6 and MIPv6's handover performance is bad. The process of DAD, which accounts for handover delay's significant percentage, is to blame for this phenomena. Because the DAD process is carried out through a wireless channel, poor wireless link conditions have a negative impact on MIPv6 and HMIPv6 handover performance. The optimistic DAD, which removes the completion time of DAD, is advocated as a viable alternative.</p>	
	<p>5) Topology of network: Because mobility signaling, such as HI/HACK, BU/BACK, PBU/PBACK, LBU/LBACK, and so on, is directed along side with the topology of network, the network topology configuration has an impact on handover performance. The hops number between the necessary ARs/MAGs, for example, has a significant impact on fast handover protocols' handover speed like FPMIPv6 and FMIPv6.</p>	
<p>Panford, J. K., &amp; Kufuor, O. B. (2015) [11]</p>	<p>According to the results of the experiment, the convergence time for RIP and EIGRP is the same regardless of topology. Another intriguing finding with EIGRP was that the time for convergence remained nearly constant as the number of routers increased. Also, based on the results of the various scenarios, it was discovered that between RIP and EIGRP, EIGRP has the fastest convergence time of 7ms, whereas RIP has a convergence time of 14ms.</p>	<p><i>Journal of Computer Science</i></p>
<p>Pavani, M., Lakshmi, M. S., &amp; Kumar, S. P. (2014) [12]</p>	<p>When we compare the results of simulations of several protocols, such as RIP, OSPF, and EIGRP, for convergence, throughput, link usage, and queuing delay, we can conclude that EIGRP has the highest performance of all. After EIGRP, OSPF comes in second with the second greatest link utilization and</p>	<p><i>The International Journal Of Science &amp; Technoledge</i></p>

	throughput. It can be tough to choose between the two protocols, OSPF and EIGRP. As a result, we can infer that EIGRP performs better in the above circumstances, but OSPF can be a viable alternative when additional criteria such as lowest cost of transmission and lower router overhead are taken into account.	
Rakheja, P., Kaur, P., Gupta, A., & Sharma, A. (2012) [13]	After examining the transmission cost, throughput, router overhead, link utilization, and queuing delay of various routing protocols such as OSPF, RIP, EIGRP, and IGRP in a scenario for transmission cost, throughput, router overhead, queuing delay, and link utilization, Rakheja, Kaur, Gupta, & Sharma conclude that OSPF has the top overall performance because it has the lowest transmission cost, the highest throughput among every queuing delay and routing protocol, and the lowest router overhead after RIP. Then EIGRP works well since its transmission costs are just slightly higher than OSPF's, and it has the best router overhead and complete performance with regards to link utilization, queuing latency, and throughput. So, OSPF outperforms competing protocols in terms of throughput, queuing latency, utilization, and overhead for best-effort service, such as data packet transfer.	<i>International Journal of Computer Applications</i>
Sandhu, P. S., Bhatia, K. S., & Kaur, H. (2013) [14]	EIGRP's throughput has been shown to be very good across all protocols. In EIGRP, bandwidth utilization is at its greatest level, as determined by protocols; the least latency is also evaluated in EIGRP.	<i>International Conference on Innovations in Engineering and Technology (ICIET'2013)</i>
Sankar, D., & Lancaster, D. (2020) [15]	When we compared the routing protocols in terms of convergence in both simulation and real time, we discovered that EIGRP had a substantially faster re-convergence time than all other routing protocols. All of the routing protocols depicted in the simulation have a shorter convergence time than those we evaluated using real equipment. The network simulator shows that EIGRP re-converges in milliseconds, however it takes roughly 2 seconds in actual equipment. This is likely due to the simulator failing to count the time it takes to identify and detect a genuine forwarding path's link failure. In comparison to other protocols, RIP takes a lengthy time to meet on real equipment and network simulator. There is a minor difference in the RIP convergence time in real equipment. This could be because RIP routers only deliver triggered updates to the failure interface, and routers will converge at different times depending on when the connection fails. Convergence times will also vary based on the network's size and design. Loss of packet in the network of EIGRP is very low matched with other protocols of routing as re-converge of EIGRP network time is less, in actual equipment and simulation. Loss of packet is a crucial issue in deciding real-time application performance. Sankar & Lancaster transmit diverse traffic with diverse rates of transmission in real time and simulation to see how packet loss varies with different transmission speeds. The study reveals that as the	<i>Advances in Communications, Computing, Networks and Security</i>

	transmission speed is raised, packet loss increases linearly.	
Vetriselvan, V., Patil, P. R., & Mahendran, M. (2014) [16]	EIGRP, IGRP, and RIP all have lower transmission costs than OSPF. IGRP has the most overhead in terms of router overhead, followed by EIGRP, OSPF, and RIP. According to the findings depicted, OSPF followed by IGRP, RIP, and EIGRP has the maximum throughput; for queuing delay, EIGRP followed by RIP, IGRP, and OSPF has the shortest delay; and for link utilization, EIGRP followed by IGRP, RIP, and OSPF has the highest link application.	(IJCSIT) International Journal of Computer Science and Information Technologies
Vissicchio, S., Tilmans, O., Vanbever, L., & Rexford, J. (2015) [17]	With the introduction of SDN, it is evident that network operators want their networks to be more programmable and manageable from a central location. Vissicchio, Tilmans, Vanbever, & Rexford illustrate the way Fibbing can attain those goals by automatically and centrally managing forwarding minus sacrificing dispersed routing systems' benefits in this research. Fibbing is flexible and scalable, and it may be used with current routers. We intend to investigate IGP protocol enhancements (perhaps, for network service header or source-destination routing awareness) in the future to support finer-grained control through Fibbing. Fibbing demonstrates the way centralized and dispersed systems can be blended beneficially.	SIGCOMM
Xu, D., & Trajkovi, L. (2012) [18]	Since it is a simple protocol of routing that depends on methods of distance vector, simulation findings show that RIP accomplishes well with regards to voice packet latency. When compared to EIGRP and OSPF, RIP creates less protocol traffic, specifically in the medium-sized simulated networks in this experiment. In larger networks, shortcoming of RIP is its time of slower convergence. This flaw can lead to erroneous routing entries and, on rare occasions, routing metrics or loops nearing endlessness. In networks with less than 15 hops, RIP is favored. With regards to Ethernet delay, routing traffic, and network convergence, EIGRP outperforms. When compared to OSPF protocol and RIP, EIGRP has the properties of link state protocols and distance vector, as well as less routing protocol traffic, lower RAM and CPU use, and enhanced network convergence. Because just hello packets are sent during regular operation, EIGRP uses extremely little network resources. When a routing table is changed, the time it takes for it to converge is short, which minimizes bandwidth use. Because a Cisco proprietary protocol is EIGRP, it cannot be used on a non-Cisco router network. OSPF executes well for video conferencing, with regards to packet end-to-end delay and response time of HTTP page. When updating the routing table, OSPF has a significant protocol overhead. OSPF consumes extremely little bandwidth if the network does not change. OSPF is a widely used open standard protocol that can handle massive networks. Its disadvantage is that, in comparison to RIP and EIGRP, it uses a more sophisticated algorithm that takes longer to converge	Research Gate Publication



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when generating the routing table, resulting in more protocol traffic. OSPF requires increased processing and memory in a medium-sized simulated network, as well as a substantial bandwidth amount for the packet flooding of first link-state.

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## 2.1 Gap in Existing Literature

After reviewing a number of literature on OSPFV3 and EIGRP with IPV6 network, nineteen (19) of the reviewed papers has been presented in Table 1. Out of the 19 articles reviewed, three research gaps were found. The first was a study by Jain & Payal [8], who analyzed the IS-ISv6 performance comparison with IPv6 network and proposed that performance comparison with other routing protocols should be completed for the IPv6. To bridge the gap in literature, the study sought to analyze performance comparison of OSPFV3 with IPv6 network and analyze performance comparison of EIGRP with IPv6 network. The second resulted from a study by [6] who believed that there are numerous chances for the research community to take additional revolutionary, start-from-scratch method to network management and control. To bridge the gap in literature, the study sought to analyze the effectiveness of EIGRP for routing traffic generated by some applications in IPV6 networks and the effectiveness of OSPFV3 for routing traffic generated by some applications in IPV6 networks. The last gap in literature was found in a study by [4] who recommended that future work should be done on security analysis for OSPF and EIGRP. Hence, they examined for EIGRP and OSPFv2 in the environment based of IPv4 on OPNET. To bridge the gap in literature, the study sought to examine security analysis for OSPFV3 in IPV6 network and examine security analysis for EIGRP in IPV6 network [19].

## 2.2 Objectives / Hypothesis

1. To analyze performance comparison of OSPFV3 with IPV6 network.
2. To analyze performance comparison of EIGRP with IPV6 network.
3. To analyze the effectiveness of EIGRP for routing traffic generated by some applications in IPV6 networks.
4. To analyze the effectiveness of OSPFV3 for routing traffic generated by some applications in IPV6 networks.
5. To compare the suitability of OSPFV3 and EIGRP routing protocol for routing

traffic generated by some applications in IPV6 networks.

6. To examine security analysis for OSPFV3 in IPV6 network.
7. To examine security analysis for EIGRP in IPV6 network.
8. To compare security analysis for OSPFV3 and EIGRP in IPV6 network.

## 2.3 Significance of the Study

In bridging gaps in literature, it adds to the knowledge in literature. It also confirms or contrast with theories, evidence and existing results of a study. However, literature gaps identified in this study will help students, academia and researchers in their research.

## 3. METHODOLOGY / RESEARCH DESIGN

Modeling and simulation using packet tracer will be design of the study. Modeling and simulation method using packet tracer was used because with packet tracer, the networking devices appears real to users and it is easy to work with.

### 3.1 Methodology / Research Process

The results of simulation will be analyzed in the study.

## 4. CONCLUSION

The gaps identified after reviewing a number of literature on OSPFV3 and EIGRP with IPV6 network needs to be done since it sought bridge gaps in literature. To bridge the gap in literature, future studies should look to analyze performance comparison of OSPFV3 with IPV6 network and analyze performance comparison of EIGRP with IPV6 network. Moreover, to bridge the gap in literature, future studies should look to analyze the effectiveness of EIGRP for routing traffic generated by some applications in IPV6 networks and the effectiveness of OSPFV3 for routing traffic generated by some applications in IPV6 networks. Thirdly, to bridge the gap in literature, future studies should look to examine security analysis for OSPFV3 in IPV6 network

and examine security analysis for EIGRP in IPV6 network.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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