Performance Analysis of Radio Access Technology Selection Mechanisms in Smart Airport Environment for 5G Network

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Abstract— **Ultra-Dense Network (UDN) is the extreme densification of heterogeneous Radio Access Technology (RAT) that is deployed closely in a coordinated or uncoordinated manner. The densification of RAT forms an overlapping zone of signal coverage leading to frequent handovers among the RAT and degrading the system performance. Effective and proper consideration of RAT selection mechanisms is required to avoid the unnecessary handover among the RAT. This study aimed to evaluate the performance of selected multi-attribute decision-making mechanisms for RAT selection in investigating the need to choose a new RAT and further determine the best amongst the available ones. The evaluation of selection mechanisms consisted of three mechanisms which were Simple Additive Weighting (SAW), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), and VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR Method). Subsequently, an Analytic Hierarchy Process (AHP) technique was used to calculate the weighting for each criterion. The implications of the research are significant in providing reliable RAT selection within Dense Network, thus supporting heterogeneous RAT deployment in 5G networks.**

Keywords- Long-Term Evolution, RAT, Analytic Hierarchy Process, Multi-Attribute Decision Making, TOPSIS

I. INTRODUCTION

Wireless data services consumed by mobile devices continue to increase each day. Based on a report released by Cisco [2], global mobile devices and connections have reached 20 billion in 2020. The phenomenon not only shows the growth in the number of subscribers but also an expected increase in mobile data traffic in future networks [2]. Besides, according to researchers [3], the 5G (fifth generation) wireless network needs to have the ability to fulfill the increasing needs of new multimedia and broadband applications such as 3D TV, HDTV, VoIP, mobile gaming, virtual and augmented reality and machine-type communications.

The current technological devices have now become more affordable due to the reduction in prices, hence increasing the number of users. This growth has also prompted the analysis of the 5G network. Of the estimated 29.3 billion mobile devices and connections by 2023 [2], it is expected that around 80 percent of the users will subscribe to mobile broadband service which will be provided mostly by the High-Speed Packet Access (HSPA) and Long-Term Evolution (LTE) networks. This is a robust indication that supports the forecast of the increase in the use of mobile broadband and 5G connections have appeared on the scene started 2019 and will grow over 100-fold from about 13 million in 2019 to 1.4 billion by 2023 [2].
According to Metis [5], 5G network goals are 1000 times data volume, 10-100 times data rate, 10-100 times number of devices, 10 times longer power consumption, and 5 times reduction in end-to-end latency.

The vision of the 5G network architecture considers multiple-base stations (BS) with different transmitted power levels and multi-tier radio coverage such as femtocell and wireless hotspot overlaps and the use of heterogeneous Radio Access Technologies (RATs) such as 802.11n, 802.11ac and LTE-enB [3]. This network description is a Multi-RAT dense network (Dense Net). Fig. 1.1 displays the assumed overview of a dense network for a smart airport.

Fig. 1: Smart airport dense network scenario

Maintaining an optimum user experience in a dense network environment depends on coordinating a RAT selection and management at network and device levels [6]. RAT selection mechanisms should be more alert when users move around or between coverage areas of the different RATs in a smart airport.

This leads to a process of switching between RATs, known as vertical handover. As users move inside and outside of the airport, handovers between RATs in the proximity of the users have to be handled efficiently. The radio link handling including the diversity between the different areas of the airport and the infrastructures of the mobile radio has to be handled efficiently and smoothly without users having to experience interruptions based on the pre-selected criteria of smart airport applications used by the users.

The main challenge in the future network at a smart airport is on how to select the best Radio Access Technology (RAT) among the multiple Radio Access Technologies (RATs) available and to ensure that user connection should not frequently change between one RAT to another RAT; which in other words, there should be a lesser number of handovers.

II. RELATED WORK

The Analytic Hierarchy Process (AHP) algorithm is a computational approach that divides the problem into sub-problem and analyses the initiation and decision making to choose the new RAT [7]. AHP considers multiple criteria with the hierarchical approach to maintaining the importance of each criterion at different levels and hence, enhancing the overall decision making. The Simple Additive Weighting (SAW) approach employs the linear additive function to determine the preferences in decision making.

Hence, a new approach based on the fuzzy VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method is also used to obtain the rankings. This method focuses on ranking and selecting from a set of alternatives and determines compromise solutions for a problem with conflicting criteria [8]. VIKOR is a helpful tool in MADM, particularly in a situation where the decision-maker is not able or does not know how to express a preference at the beginning of system designing. VIKOR ranks alternatives and determines the solution named compromise that is the closest to the ideal.

The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) measures the relative efficiency among the available alternatives, accounts for limited inputs and ranks based on the closeness towards the ideal solution. Depending on the closeness, it calculates the positive and a negative ideal solution towards the decision making. TOPSIS carefully chooses to target the network, which is probably to be the adjoining ideal solution and distant from the worst-case solution among the available alternatives.

Authors [9] proposed SAW and Weighted Product Model (WPM) methods for their research in network selection within a heterogeneous wireless network. The performance of delay processing was evaluated and compared. The results show that SAW performed well in deciding the target network compared to Weighted Product Method (WPM). Authors Mahardhika et al, [10] used TOPSIS as the method for handover decision algorithm in heterogeneous network. They used six criteria to evaluate the performance of handovers.

Meanwhile, authors Silki et al [13] compared five MADM algorithms which were SAW, Multiplicative Exponent Weighting (MEW), TOPSIS, Grey Relational Analysis (GRA) and AHP for handover latency in a heterogeneous network. The results indicated that TOPSIS gave the best target network compared to other algorithms. The researchers [11] employed context aware with AHP to choose among multiple alternatives with predefined objectives considering both network and user context and authors [14] proposed a VIKOR method for vertical handoff decision in 3G wireless network. The performance evaluation was carried out and results were compared with the results of SAW and TOPSIS.

Authors Martinez- Morales et al, [15] compared the MADM algorithms for vertical handoff in 4G wireless network. MADM involved for the performance comparison were SAW, MEW, TOPSIS, VIKOR, ELimination Et Choix Traduisant la REalité (ELimination and Choice Expressing REality) (ELECTRE), GRA and Weighted Markov Chain (WMC). Results showed that SAW, TOPSIS and VIKOR are the best algorithms compared to others in network selection and authors [16] proposed a hybrid fuzzy approach, which assesses each alternative in terms of distance measure calculated by a modified VIKOR method.

According to the related study, we decided to select AHP as the main mechanism for weighting calculation together with Simple Additive Weighting (SAW), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) mechanisms for this research based on several research that was conducted previously in the network selection field; whereby the authors suggested to use these MADM methods to extend the network researches.

A. RAT Selection Overview

RAT selection has been fostered since the integration of the diverse wireless networks to achieve the “Always Best Connected” paradigm with heterogeneity, along with the integration of and interoperability among RATs. Context is a concept in which a system reacts dynamically to trigger an action based on gathered information. In the context of a multi-RAT environment mapping, a user’s device used with the available RATs is of the essence. Researchers Adnan et al. [28] surveyed on the different approaches of decision-making algorithm based on RSS, bandwidth and a combination of both (RSS and bandwidth) and concluded that the current decision algorithms lack deliberation of various network parameters pertaining to the 4G/5G specifications. Thus, the challenge is to formulate various parameters based on the context of a network and user preference for intelligent decision making. RAT selection comprises three phases: system discovery, decision making and execution [29].
System discovery is a process based on the measurement and analysis of the criteria to decide on the need for a new Point of Association (PoA). Information about each network is stored in the information database of the core network of each RAT and is updated periodically to determine RAT

availability to User Equipment (UE) for better service delivery and to trigger a switch from the current serving RAT.

Decision making in the RAT selection decision is also known as a network selection or system selection as it decides on the next target RAT. The mechanism employed to analyze the criteria helps to decide on the best RAT choice. Thus, decision making needs an intelligent mechanism to evaluate and make decisions based on the requirements for attaining the desired seamless communication. This was the main focus of this research.

Execution means the new target PoA is chosen based on the previous two phases (system discovery and decision making). Execution means to be attached to the new RAT while releasing the old RAT.

B. RAT Selection Criteria

Many studies have acknowledged the various techniques for RAT selection based on the availability of a network resource. The conventional approach recognizes Received Signal Strength (RSS) for system discovery and decision making; however, this is inadequate for a heterogeneous network serving multiple RATs. There are a few main criteria related to the network, as described below; however, only RSS, data rate, Delay, Packet Loss and security were proposed as network parameters for this research.

III. PROPOSED MODEL

The applications proposed to be used in a smart airport were measured based on the network parameters and classes of traffic. Below is the description of the smart airport application model that was used in this research as shown in Fig. 2.

A. Airport Personal Assistant

In a 5G network, the personal assistant application will assist users starting from their home to the airport. This application will provide a departure schedule based on users' booking, data analysis on the road between the users' house and the airport, and it will also provide live weather forecast. Once the users have reached the airport, this application will assist and guide users' movements in the airport based on their location. It will also allow users to interact with airport customer services to assist them while they are at the smart airport. In the future, this application will also be able to integrate with virtual and augmented reality advertisements.

B. Transport & Destination (Tourism) Applications

This application will consist of tour information at the smart city which is integrated with virtual and augmented reality advertisements, and will enable users to manage their booking transport (e.g. Bus, Train, Taxi, Uber and Grabcar) and hotel (e.g. Booking.com, and Agoda.com). Furthermore, the application will also be connected to the nearest parking system and be able to report traffic conditions based on users' locations.

TABLE 1: CLASSES OF TRAFFIC

C. Media & Entertainment

This application will provide access to new media entertainment such as YouTube, Netflix and Hulu, and users will be able to create real-time videos. Besides, for future networks, there will be more virtual reality devices and wearable devices available in the market. Thus, more high definition games online and map location-based games are expected to be offered in a 5G network. Media and Entertainment will also provide human to human communications (e.g. video and voice calls).

D. Social Media & Browsing

In this application category, users will use this application to retrieve and browse HTML components of a Web page and social media applications (e.g. Facebook, Twitter and Instagram) apart from e-mail.

E. Banking

Nowadays, banking applications have become a vital application to be installed in users' mobile phones as they allow easy access for online payment and money transfer. In the future, users' mobile devices are expected to make transactions using only the scanning functions of these devices.
The applications can be divided according to the classes of traffic as shown in Table 1. There are four traffic classes according to the 3GPP release 7.0.

Fig. 2: Smart airport applications

	Traffic classes	Description	Requirement	Smart Airport Applications Model
1.	Background	One-dimensional transport. For example, users sending SMS or emails.	Packet Loss Rate (PLR) is a critical aspect. Delay, Jitter and Throughput are relatively less important.	Social Media and Browsing.
2.	Conversational	Two-dimensional transport. For example VOIP and video conferencing.	Delay and Jitter are very important, while PLR and Throughput are relatively less critical.	Media and Entertainment.
3.	Interactive	Two-dimensional transport based on request/response mechanism. For example, chatting and online financial transactions.	Delay and Jitter are very important, while PLR and Throughput are relatively less critical.	Airport Personal Assistant, Transport and Destination (Tourism), Banking.
4.	Streaming	One-dimensional transport. For example, watching a video or live match on the web.	Delay is not important, while Jitter and Throughput play a vital role.	Media and Entertainment.

IV. Performance Evaluation

Performance evaluation was conducted based on three performance metrics: the number of handovers, average bandwidth and average delay. Handover refers to the switch from one RAT to another, and in this research, the RAT selection in UDN mainly focused on the vertical handover in which a RAT was heterogeneous. The handovers executed during the thirty simulation runs were tracked, and the number of handovers hit in each of the MADM approaches was calculated. In general, findings show that the selected TOPSIS had a lower number of handovers compared to the SAW and VIKOR. A number of handovers refer to the quantification of the number of times a user's equipment moves from one RAT to another. The multiple case illustrations presented in this section graphically illustrate the number of handovers in each of the mechanisms i.e. TOPSIS, SAW and VIKOR for each of the applications.

The average bandwidth was calculated by the thirty simulation runs; and the time assumed for a connection from the user equipment (UE) to RAT was randomly generated from one to ten minutes for thirty people. In general, TOPSIS showed an average bandwidth that was higher compared to SAW and VIKOR. When users experience the highest bandwidth, their usage would be more convenient and smoother. The multiple case illustrations presented in this section graphically illustrate the average bandwidth for each of the MADM methods, i.e. TOPSIS, SAW and VIKOR for the applications respectively.

The average delay was summarized based on the thirty simulation runs. The assumed time of the connection from the user equipment (UE) to RAT was randomly generated from one to ten minutes and was expected for thirty UE. In general, TOPSIS showed an average delay that was lower than SAW and VIKOR. When users experience a lower delay, they would be able to receive and send data more efficiently. The multiple case illustrations presented in this section graphically illustrates the average delay in each of the MADM methods, i.e. TOPSIS, SAW and VIKOR for each of the applications in a smart airport network scenario.

A. Simulation Scenario

This network scenario was assumed to be used in a 5G ultra-dense network of a smart airport environment. Based on this network scenario, 30 simulation runs were conducted within 10 minutes for each run by using MATLAB Simulation. The number of handovers, average bandwidth and average delay were measured during the simulations. The best RAT was selected based on the least number of handovers, high bandwidth average and low delay average as detailed in Table 2 and Table 3 which show the network parameters with expected standard values for each network scenario used in this research.

TABLE 2: SIMULATION SCENARIO

Simulations	
#Runs	30
Network Parameters	Received Signal Strength (RSS), Data rate, Delay, Packet Loss and Security
Network Scenario	802.11n, 802.11ac, HeNB, LTE-enB
Performance Metrics	Handover, Average bandwidth, Average Delay

TABLE 3: NETWORK PARAMETERS WITH EXPECTED STANDARD VALUES FOR EACH NETWORK SCENARIO

Criteria Network	RSS (dbm)	Data rate (Mbps)	Delay (ms)	Packet Loss (per 10^6)	Security
802.11n	-72 to -92	7.2 to 72.2	100 to 150	10 to 20	Low (1-3)
802.11ac	-57 to -62	7.2 to 96.3	80 to 100	10 to 15	Low (1-3)
HenB	-75 to -120	75 to 300	80 to 100	10 to 15	High (6-7)
LTE-enB	-75 to -120	75 to 300	80 to 100	10 to 15	High (6-7)

Table 4: Saaty Table

In this research, the priority of each application was set according to Saaty Table as explained in Table 4 and shown in Table 5 to Table 9 as follows:

TABLE 5: AIRPORT PERSONAL APPLICATION

	Data rate	RSS	Delay	Packet Loss	Security
Data rate	1	2	0.25	0.2	1
RSS	0.5	1	0.2	0.16	1
Delay	4	5	1	1	4
Packet Loss	5	6	1	1	5
Security	1	1	0.25	0.2	1

TABLE 6: TRANSPORT AND DESTINATION

	Data rate	RSS	Delay	Packet Loss	Security
Data rate	1	2	0.25	0.2	0.33
RSS	0.5	1	0.2	0.16	0.25
Delay	4	5	1	0.5	0.5
Packet Loss	5	6	2	1	3
Security	3	4	2	0.33	1

TABLE 7: MEDIA AND ENTERTAINMENT

	Data rate	RSS	Delay	Packet Loss	Security
Data rate	1	3	1	0.5	0.33
RSS	0.33	1	0.33	0.25	1
Delay	1	3	1	0.5	3
Packet Loss	2	4	2	1	4
Security	3	1	0.33	0.25	1

TABLE 8: SOCIAL MEDIA AND BROWSING

	Data rate	RSS	Delay	Packet Loss	Security
Data rate	1	2	0.16	0.2	0.5
RSS	2	1	0.25	0.16	0.33
Delay	6	7	1	2	5
Packet Loss	5	6	0.5	1	4
Security	2	3	0.2	0.25	1

TABLE 9: BANKING

	Data rate	RSS	Delay	Packet Loss	Security
Data rate	1	2	0.33	0.25	0.25
RSS	0.5	1	0.25	0.2	0.2
Delay	3	4	1	0.5	0.5
Packet Loss	4	5	2	1	1
Security	4	5	2	1	1

Table 10 shows the final Fig.s for weighting after Consistency Ratio (CR) was calculated. All the values are consistent; which was CR≦0.1. The three weighting methods used to perform the performance metrics analysis were TOPSIS, SAW and VIKOR.

TABLE 10: FINAL WEIGHTING

	Airport Personal Application	Travel and Destination	Media and Entertainment	Social Media and Browsing	Banking
RSS	0.13	0.13	0.07	0.03	0.16
Data rate	0.02	0.13	0.09	0.07	0.06
Delay	0.34	0.34	0.36	0.19	0.16
Packet Loss	0.34	0.34	0.36	0.19	0.16
Security	0.13	0.05	0.06	0.07	0.44

V. Results and Discussion

A. Results on Number of Handover

1) Airport Personal Application

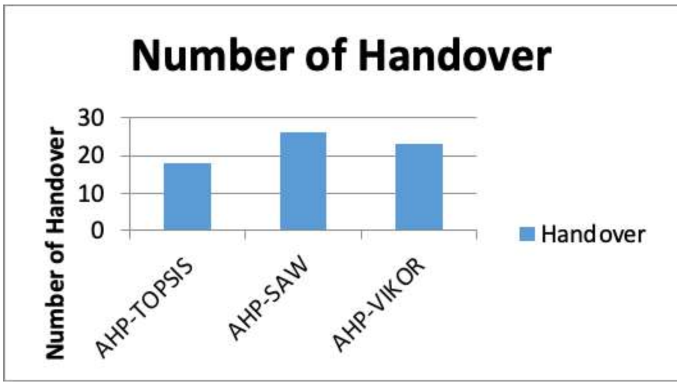

Fig. 3: The number of Handover for Airport Personal Application

2) Banking

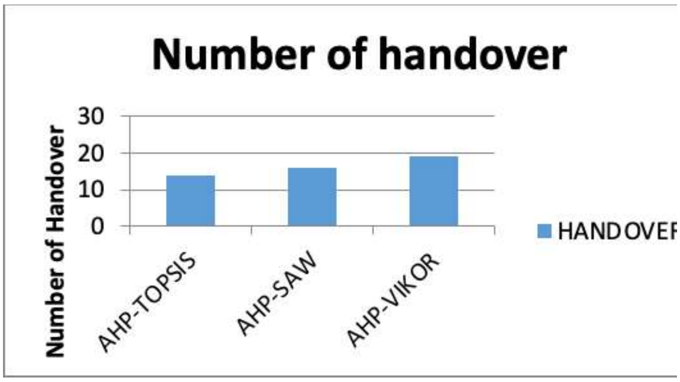

Fig. 4: The number of Handover for Banking

3) Travel and Destination

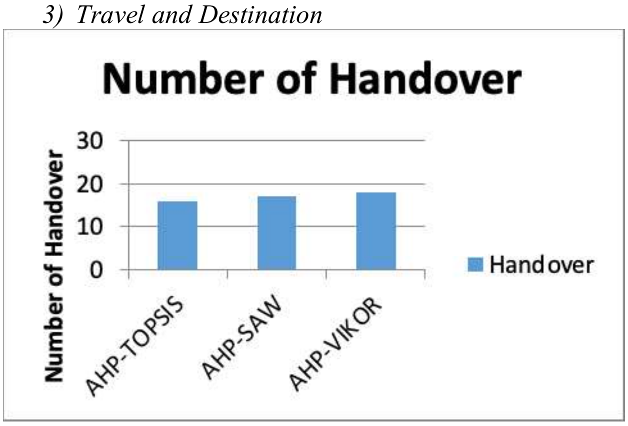

Fig. 5: The number of Handover for Travel and Destination

Since they are in the same class of traffic for Interactive; Fig. 3, Fig. 4 and Fig. 5 are discussed together. Fig. 3, Fig. 4 and Fig. 5 show that the number of handovers is comparatively lesser in TOPSIS compared to SAW and VIKOR. As the priority of users when using this application is interactive, this means that they used the data connection to chat, make online financial transactions and etcetera. Thus, the applications inclined more on the reliability on delay rather than on packet loss and data rate. The handover was tested in the context of differentiating the applications used by users. Fig. 3, Fig. 4 and Fig. 5 show the interpretation of the different approaches employed in the interactive traffic for thirty runs. TOPSIS outperformed other mechanisms as it had the least number of handovers. The applications for these interactive classes of traffic for Airport Personal Application are shown in Fig. 3; whereas Banking Travel and Destination are shown in and Fig. 4 and Fig. 5 respectively.

4) Media and Entertainment

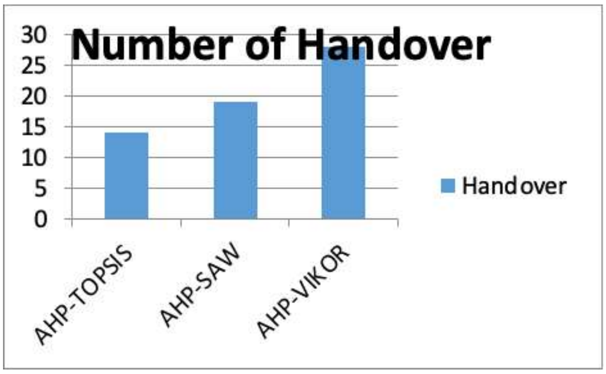

Fig. 6: The number of Handover for Media and Entertainment

Fig. 6 displays the numbers of handovers for streaming and conversation *as* being lesser in TOPSIS compared to SAW and VIKOR. When users' preference is conversational, Delay and Jitter are crucial for the Media and Entertainment application while Packet Loss and Throughput take the back seat. With TOPSIS, the number of handovers for streaming and conversational class of traffic was reduced by 14 when compared against SAW and VIKOR which recorded 19 and 28 handovers, respectively. Since the application was delay sensitive, a contextual decision was implied in accordance with RAT with all the criteria and higher priority to delay criteria than just the signal alone. The contextual decision prioritises the criteria preference for the requested application; however, it does not isolate other criteria. In fact, it harmonises all the shortlisted criteria with the priority to the application sensitivity in determining RAT.

5) Social Media and Browsing

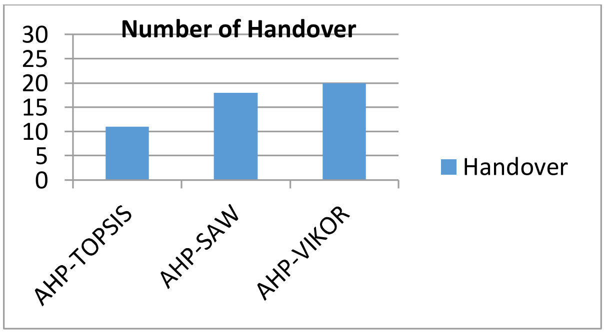

Fig. 7: The number of Handover for Social Media and Browsing

Similarly, Fig. 7 shows that the number of handovers with background for TOPSIS, SAW and VIKOR were at 11, 18 and 20, respectively. For the background, Packet Loss Rate (PLR) is a critical aspect, followed by Delay, Jitter and Throughput which are considered as relatively less important.

The decision in the case of streaming data prefers high data rate, in congruence with other criteria along with the available RAT, whereas for the interactive class applications i.e. Airport Personal Application, Travel and Destination and Banking, the mechanism prioritises Delay and Packet Loss compared to other criteria. Hence, the decision was made with the preference of collaborative criteria, but mainly prioritising the different class of applications. Hence, from the multiple case illustration and experimental results, it can be ascertained that TOPSIS is the mechanism that reduces the number of handovers quantitatively based on the multiple criteria proposed.

B. Results on Average Bandwidth

1) Airport Assistant Application

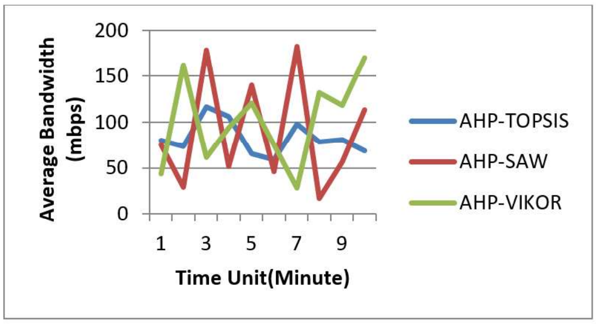

Fig. 8: Average Bandwidth for Airport Personal Application

2) Banking

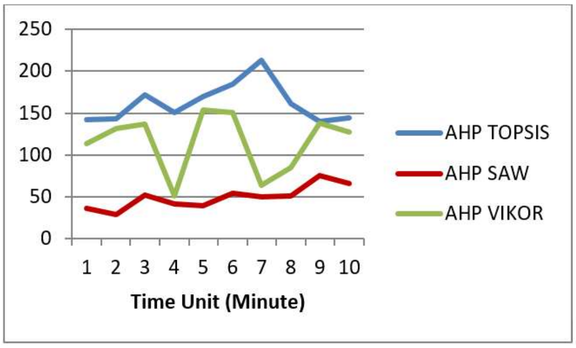

Fig. 9: Average Bandwidth for Banking

3) Travel and Destination

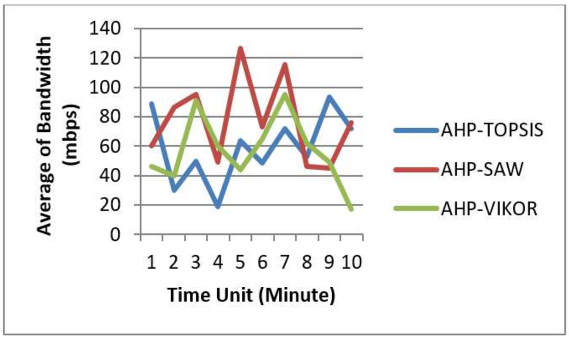

Fig. 10: Average Bandwidth for Travel and Destination

As they belong in the same class of traffic for Interactive, Fig. 8, Fig. 9 and Fig. 10 are discussed together. As for the Interactive applications, Bandwidth and Packet Loss are relatively less important. However, Delay is important in ensuring that data are successfully transferred and received in full packets. Fig. 8 shows that TOPSIS was stable and did not go below 60 Mbps during the simulation process. SAW and VIKOR, on the other hand, show instability as some of the time, bandwidth dropped below 20 Mbps. Nevertheless, SAW achieved the highest bandwidth compared to VIKOR and TOPSIS. For the Banking application which is represented by Fig. 9, it shows that TOPSIS was better than SAW and VIKOR. In most runs of the simulation process, SAW achieved a bandwidth which was mostly below 50 Mbps while VIKOR remained stable between the 50 Mbps and 150 Mbps range, and TOPSIS remained consistent on 120 Mbps and above during the simulation. Fig. 10 which represents the Travel and Destination application shows that SAW performed better than TOPSIS and VIKOR.

4) Media and Entertainment

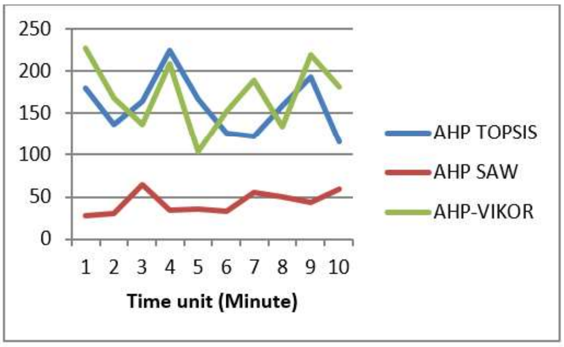

Fig. 11: Average Bandwidth for Media and Entertainment

Media and Entertainment represent conversational and streaming in the traffic classes. Fig. 11 shows that TOPSIS was better than VIKOR and SAW in terms of average bandwidth. As streaming depends on data rate transfer, it requires the highest bandwidth that can give the best experience to users. SAW achieved below 50 Mbps most of the time during the simulation process while VIKOR and

TOPSIS were consistently above 100 Mbps, in general, throughout the simulation.

5) Social Media and Browsing

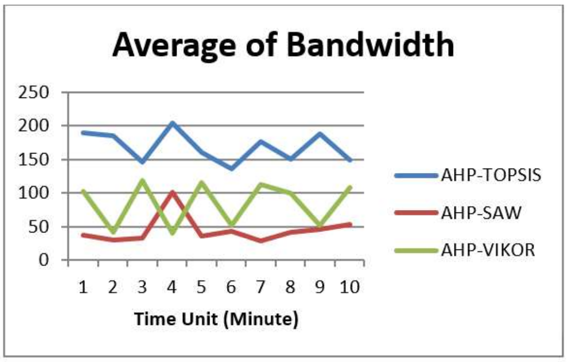

Fig. 12: Average Bandwidth for Social Media and Browsing

Fig. 12 shows that TOPSIS remained consistent above 100 Mbps compared to SAW and VIKOR which were between the 30 Mbps and 100 Mbps range. However, for background traffic, data rate does not play a vital role as long as all the results are positive and meet the requirements of background in this class of traffic.

C. Results on Average Delay

1) Airport Assistant Application

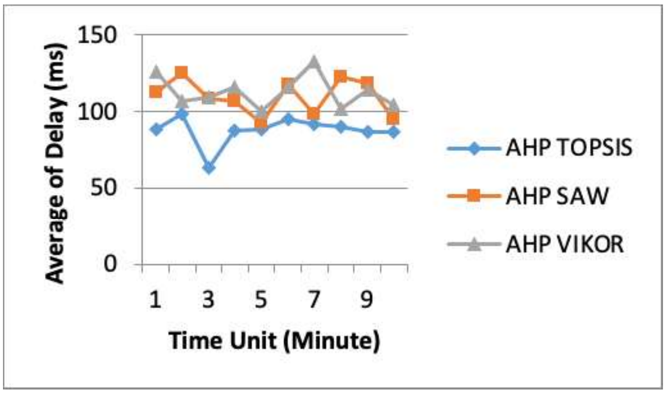

Fig. 13: Average Delay for Airport Personal Application

2) Banking

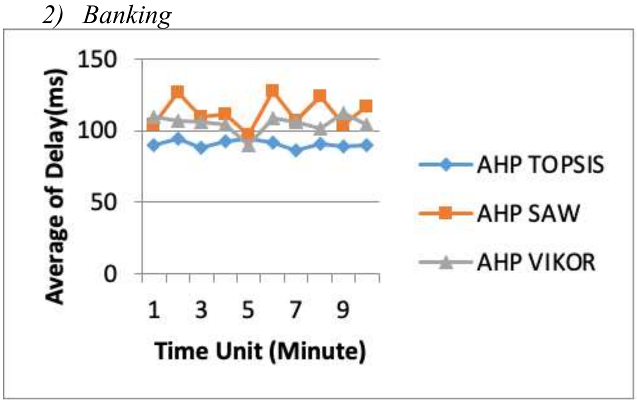

Fig. 14: Average Delay for Banking

3) Travel and Destination

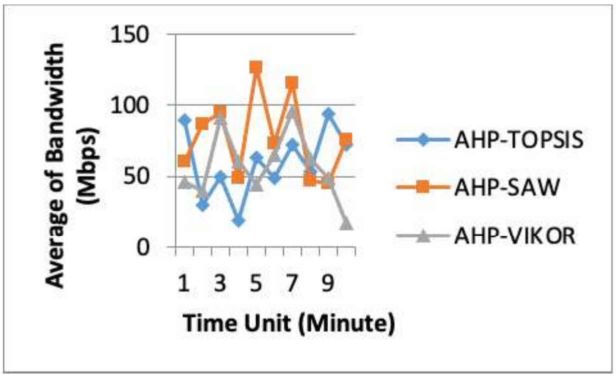

Fig. 15: Average Delay for Travel and Destination

As they are in the same class of traffic for Interactive, Fig. 13, Fig. 14 and Fig. 15 are discussed together. For the Interactive class, Bandwidth and Packet Loss are relatively less important. Delay, however, is very important in ensuring that data are successfully transferred and received in full of packets. Fig. 13 shows that TOPSIS was stable and remained consistent and had the lowest delay value compared to SAW and VIKOR during the simulation process. The results show that SAW and VIKOR were unstable as some of the time, the delay increased to more than 100 Mbps. For the Banking application which is represented by Fig. 14, it shows that TOPSIS was better than SAW and VIKOR. In most runs of the simulation process, SAW and VIKOR showed a delay between 100 Mbps and 120 Mbps while TOPSIS remained consistently below 100 Mbps during the simulation. Similarly, Fig. 15 which represents Travel and Destination shows that TOPSIS was better than SAW and VIKOR in terms of the average delay. TOPSIS remained consistently below 100 Mbps during the simulation process.

4) Media and Entertainment

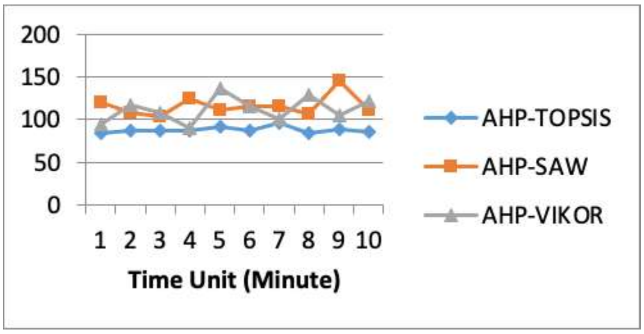

Fig. 16: Average Delay for Media and Entertainment

For the Media and Entertainment class of traffic, Fig. 16 shows that TOPSIS was better than VIKOR and SAW for the average delay. As streaming depends on data rate transfer, the lowest delay can give the best experience to users. In most runs of the time during the simulation process, SAW achieved more than 100 Mbps while VIKOR inconsistently showed an average delay between the 80 Mbps and 100 Mbps range. In general, TOPSIS was consistently below 100 Mbps delay throughout the simulation.

5) *Social Media and Browsing*

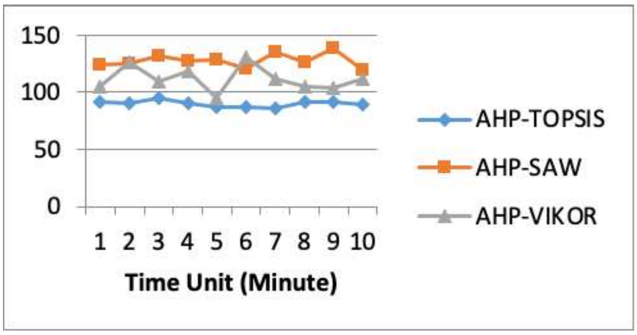

Fig. 17: Average Delay for Social Media and Browsing

Fig. 17 shows that TOPSIS was consistently below 100 Mbps compared to SAW and VIKOR which were between the 100 Mbps and 140 Mbps range. However, for background traffic, Delay does not play a vital role as long as all the results are positive and meet the requirements of background in this class of traffic.

VI. SUMMARY

Based on the results of the experiments conducted, in general, the AHP-TOPSIS method gave the best results compared to the AHP-SAW and AHP-VIKOR methods. The main priority of this research was on the number of handovers; therefore, the best method is expected to produce a fewer number of handovers. The other two performance metrics i.e. average bandwidth and average delay were used to validate the research result as a good result is synonymous with a smaller number of handovers.

In conclusion, the performance analysis done based on the number of handovers shows that AHP-TOPSIS is better than AHP-SAW and AHP-VIKOR. Therefore, it is suggested that AHP-TOPSIS is used as a method for a 5G Radio Access Technology (RAT) selection mechanism for the future network in a smart airport.

A. Limitation

There was a limitation during the implementation of this project.

Criteria. Network parameters selected for this research may no longer be important when the 5G network is finally deployed; thus, important network parameters that would suit the network environment need to be re-selected as it would help in selecting the good or not so good RAT based on their performance.

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