International Journal of Research in Advent Technology, Vol.6, No.3, March 2018
E-ISSN: 2321-9637
Available online at www.ijrat.org

A Reliable Seamless Handoff Scheme based Wireless Networks using TOPSIS and WPM Methods

T. Ajith
M.Phil Research Scholar
Periyar University, Salem
tajith1995@gmail.com

K. Sivakumar
Ph.D Research Scholar
Periyar University, Salem
Siva.phd.1990@gmail.com

Dr. C .Chandrasekar
Professor
Periyar University, Salem
ccsekar@gmail.com

Abstract: Seamless mobility is a full tune supplier of wireless and mobility solutions. Seamless Service is the main goal in fourth generation Wireless networks (FGWNs), to complete this " HANDOVER" technique is used, when a mobile terminal(MT) is in overlapping area for service continuity, Handover mechanism are mostly used. For handoff decision making use Multiple Attribute Decision Making (MADM) method to select the best network. In this paper we have used two different MADM methods such as Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) and Weight Product Method (WPM) for handoff decision and three different networks like Wi-Fi, WiMax, and UMTS. Different parameters such as Bandwidth, Delay, Cast and so on.

Keywords: TOPSIS| WPM‖, ― methods‖ and different parameters‖, ―handoffs‖ and ―MADM methods‖.

1. INTRODUCTION:

Seamless mobility is the ability for users to remain connected while roaming across different networks. This paper analyses the issues involved in general mobility scenario for seamless mobility and presents the challenges, solutions and opportunities in achieving seamless mobility. The Multi criterion Decision-Making (MCDM) are gaining importance as potential tools for analyzing complex real problems due to their inherent ability to judge different alternatives on various criteria for possible selection of the best/suitable alternative(s). These alternatives may be further explored in-depth for their final implementation. In subsequently generation wireless networks service continuity is a major goal i.e., when a MT or mobile node (MN) moving in an overlap region, permanent service must be need so the technique "HANDOFF" is done. The handover technique [1] is mainly used to send the mobile user's service network from existing network to a new network or one base station (BS) to another BS or one access point (AP) to another AP among same technology or between different technologies to reduce the processing delay in the overlapping region. Mobility has become a characteristic feature for the network access. Users wish to access the Internet from different mobile networks and to stay connected while changing into another network. This requires handover procedures to maintain a connection while moving from one network to another. Handover procedures are divided into horizontal and vertical ones. Horizontal handovers are applied for changes between different network cells of the same technology, while vertical handovers are required when changing between networks of different technologies. Vertical handovers are complex because various aspects have to be taken into account, such as different network technologies, provider domains, services [1]. Regarding the latter soft and hard handover are distinguished. A soft handover can be applied when the mobile device is connected with two points of access simultaneously, whereas a hard handover shortly interrupts the connection when moving between different access points. To support a soft handover the handover decision has to be made in time to avoid connection interruptions. This requires that relevant parameters for the handover decision have to be evaluated continuously. The problem is that parameters, such as bandwidth, delay and cost.

2. LITERATURE SURVEY

Ram Kumar Singh, Amit Asthana, Akanksha Balyan, Shyam Ji Gupta, and Pradeep Kumar, proposed[2] "Vertical Handoffs in Fourth Generation Wireless Networks". Vertical handoff methods in the evolving 4G wireless communication networks. Integration architectures for various wireless access networks are described. Then handoff classification, desirable handoff features, the handoff process, and multimode mobile terminals are discussed. A section is devoted to some recently proposed vertical handoff techniques. We propose a vertical handoff decision algorithm that determines whether a vertical handoff should be initiated and dynamically selects the optimum network connection from the available access network technologies to continue with an existing service or begin another service.

Gagan Preet Kaur, Joni Birla, JitenderAhlawat, proposed[3] **"**Generations of Wireless Technology". Various generations of mobile wireless technology along with their significance and advantages of one over the other. An advance implementation of 5G technology which are being made on the development of World Wide Wireless Web (WWW).

3. MULTIPLE ATTRIBUTE DECISION MAKING (MADM):

The MADM method is based on "TOPSIS-WPM" method. Thus, we place the computing processing in the visited networks rather than on the mobile terminal. MADM allows the mobile terminal to choose the "best" network towards which it will be connected.

The MADM consists of the following s

Candidate networks are A1, A2, and A3

Criteria are X1, X2, and X3

Calculates Voice Application

Simulation Parameters:

In this section illustrating the usage of the selected methods and the results are compared.

TABLE 1: Measures of Alternatives Based On Criteria

Network		Bandwidth (mbps)	Delay (ms)	Cost (kbps)
		X1	X2	X3
WIFI	A1	20	60	10
WIMAX	A2	30	62	20
UMTS	A3	15	50	8

User preference for Voice application is also converted to crisp numbers and normalized so that is equal to 1. The normalized preference, i.e. the weighting factors for the voice W_v application is:

W_v= [0.4 0.3 0.3]

TOPSIS METHOD

In this proposed method the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) is taken and it is analyzed. This method considers three types of attributes,

- Qualitative benefit attributes/ criteria
- Quantitative benefit attributes
- Cost attributes

The basic principle of the TOPSIS is that the chosen alternative should have the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution. TOPSIS[8] method is used to select the network that satisfies the given criteria after performing six sequential steps listed below. The net-work with maximum value from the rank order is the one that is close to the positive ideal solution and far away from the negative solution. The criteria for selecting the network are maximum bandwidth, handoff signaling delay, battery and minimum cost.

Input for TOPSIS:

Step 1:

Construction of the decision matrix: the decision matrix is expressed as

$$D=\begin{bmatrix} d_{11} & \cdots & d_{1m} \\ \dots & \dots & \dots \\ d_{n1} & \cdots & d_{nm} \end{bmatrix}$$

Where d_{ii} is the rating of the alternative A_i with respect to the criterion C_i

Step 2:

Construct the normalized decision matrix: each element r_{ii} is obtained by the Euclidean normalization

$$r_{ij} = \frac{d_{ij}}{\sqrt{\sum_{i=1}^{m} d_{ij}^2}} \dots\dots\dots (1)$$

$$r_{ij}=\begin{pmatrix} 0.512 & 0.602 & 0.421 \\ 0.769 & 0.622 & 0.842 \\ 0.384 & 0.502 & 0.337 \end{pmatrix}$$

Step 3:

Construct the weighted normalized decision matrix

- Assume a set of weights for each criteria w_j for j=1....n j w
- Multiply each column of the normalized decision matrix by its associate weight

- The weighted normalized decision matrix is computed as v_{ij} is computed as
  $v_{ij}=w_i*r_{ij}$----------- (2)

$$v_{ij}=\begin{pmatrix} 0.205 & 0.181 & 0.126 \\ 0.307 & 0.187 & 0.253 \\ 0.154 & 0.151 & 0.101 \end{pmatrix}$$

Step 4:

Determine the positive ideal solution and negative ideal solution

Positive ideal solution

$B^+=(u_1^+, u_2^+, \dots, u_n^+)$ ---------------- (3)

And

$B^-=(u_1^-, u_2^-, \dots, u_n^-)$ -------------------- (4)

$B^+ = [0.307 \quad 0.187 \quad 0.253]$

$B^- = [0.154 \quad 0.151 \quad 0.101]$

Step 5:

Calculate the similarity distance measures for each alternative.

Similarity distance from the positive ideal alternative is:

$$S_i^* = \sqrt{\sum_{i=1}^{m} \left(v_{ij} - v_i^*\right)^2} \text{------------ (5)}$$

Similarity distance from the negative ideal alternative is:

$$S_i' = \sqrt{\sum_{i=1}^{m} \left(v_{ij} - v_i'\right)^2} \text{----------- (6)}$$

$$S_i^* = [0.162 \;\; 0 \;\; 0.217]$$

$$S_i' = [0.059 \;\; 0.219 \;\; 0]$$

Step 6:

Ranking: Calculate the relative closeness to the ideal solution $C_i^* = \frac{S_j'}{S_j^*+S_j'}$----- (7)

$$C_i^* = [0.267 \;\; 1 \;\; 0]$$

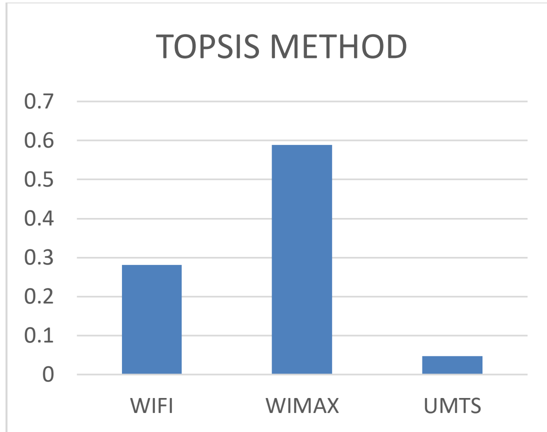

Figure 1: TOPSIS Method

Weighted Product Method:

Weighted Product Method (WPM) [9] is another scoring method wherever the weighted produce of the measure is used to choice the greatest alternate. The score calculating technique in relations of Step 7 and 8 are identical to SAW approach.

Step 7:

For bandwidth attribute, the normalized value of r_{ij} is computed as:

$$r_{ij} = \frac{d_{ij}}{d_{ij}^{max}} \quad --------(8)$$

Step 8:

For delay and cost attribute, the normalized value of r_{ij} is computed as:

$$r_{ij} = \frac{d_{ij}^{min}}{d_{ij}} \quad --------(9)$$

Step 9:

Construct weighted standardized decision

$$v_{ij} = rij^{wij} \quad ------(10)$$

Step 10:

Analyze the score of every alternate

$$S_i = \sum_{j\neq 1}^{m} v_{ij} ---------- (11)$$

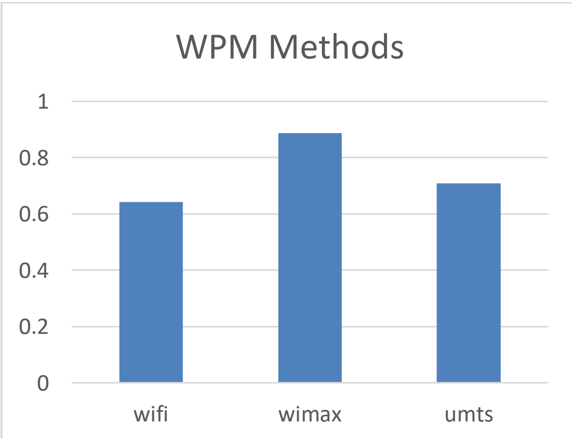

Figure 1: WPM Method

4. SIMULATION AND PERFORMANCE ANALYSIS

In this paper three networks have been considered to design heterogeneous environment. These networks are WLAN, WiMax and UMTS having three attributes as bandwidth, delay and cost. The values of various attributes vary randomly methods in Step6. The weights of various attributes have been assigned using two MADM in TOPSIS and WPM method analysis. When the connection from the current network is becoming weak or if strong signals are being received from the available networks, the multi-mode terminal will make a decision to change its connection to the most suitable network. In this paper the target network selected depending on the application Qos requirement of the parameters. In figure (1) discuss WiMax is the highest value another networks of Wi-Fi and UMTS values are lowest. In figure (2) discuss, Bandwidth is the highest value another parameter of Delay and cost is lowest value. Finally we compared in figure (3) that is TOPSIS and WPM, in this two Bandwidth is the highest value. In the above two TOPSIS and WPM method, WPM is the good result.

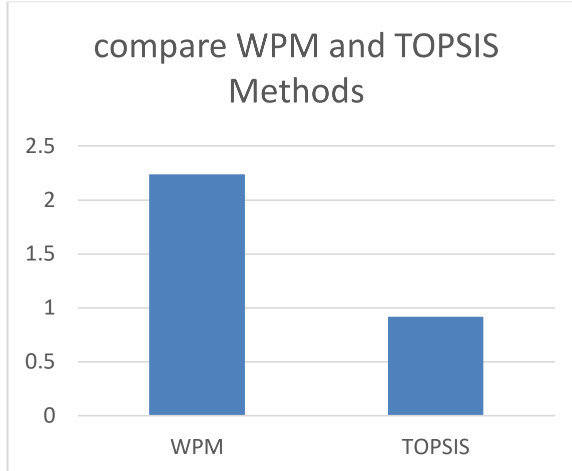

Figure 3: compare TOPSIS and WPM methods

5. CONCLUSION

Multiple Attribute Decision Making (MADM) method distributes the calculation of the network quality with the mobile workstation and considers the bandwidth, delay and cost. Different methods such as TOPSIS and WPM. Finally, both TOPSIS and WPM methods were compared. WPM method provides good result than TOPSIS method. The parameter provides good result than WIMAX metrics. In future, it determination of performance like Throughput, Packet Loss, and Velocity with some other protocols like DSR, DSDV and TORA and so on.

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