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A Learning Algorithm for Maximizing Throughput in Heterogeneous Wireless Network

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Abstract*: The developing science and technology is leading and reshaping our lives. The deployment of smart and ever growing varied wireless networks & the development in the mobile device designs is the main reason for these drastic changes in our lifestyle. Today's upcoming wireless technologies are consisting of varied types of networks, which created many challenges such as mobility management especially switch over, resource management, location management, QoS provisioning, security and monetary pricing. Traversing between (heterogeneous) distinct trait networks demands for sound vertical switch over (handoff). In this innovation work, a dissimilar switch over mechanism/algorithm (SOM/SOA) is suggested to regulate the switch over methodology between UMTS &LTE networks to enhanced throughput(Th).The appraisal of the graphical outcomes is done.*

Keywords*: Heterogeneous wireless networks, parameters, handoff.*

I- INTRODUCTION

Handoff is having a foremost role, in the selection of suitable network, base station, channel or point of attachment amongst the available access network, when the mobile node do not receive proper QoS to continue the ongoing session and there exists a threat of serious disturbance, which could annoy the user or even a call drop which is not at all acceptable.

A switch over mechanism is initiated, as soon as at least of the below mentioned action takes place:
(i) A fresh service is demanded;
(ii) A mobile user modifies his choices;
(iii) MT identifies the obtainability of a different channel or a network;
(iv) The signal deteriorate heavily or there is a entire loss of signal in the existing radio linkage [1].

The judgment for vertical switch over rest on several parameters like bandwidth, quality of service (QoS), RSS, cost, latency, SIR, velocity, security, battery use and consumption, service capacities and user choices of services. The study of existing mechanisms helps to identify important parameters for VHO mechanism. The input parameters can be sorted in to the following [2]

Network concerned parameters: BW, quality of link, RSS, BER, cost, security in the network, etc.
MT concerned parameters: It includes parameters such as bandwidth necessities, portability, screen size, performance (processing power, memory, and storing space), weights, networks supported. The dynamic factors include velocity of the terminal, power left out in the battery of terminal, location information, etc.
User-associated: -- User kind and their preferences, application types as different types of services require different levels of data rate (DR), network related latency, reliability, & security level.

An optimal handoff decision mechanism needs to possess dynamic & non-dynamic parametric. It is vital to think through max. count of parameters, on the contrary, it is challenging to take account of all the parametric in a lone decision model, owing to intricacy of algorithmic program and contradictory concerns related to numerous metrics.
Greater bandwidth confirms lesser call dropping and call blocking possibilities; so it is expected to yield greater throughput. To deliver a good quality telecommunication service for cellular phone users and to upgrade & refine a high traffic-carrying capability, while there are disparities in traffic, network load must be given due attention. Considering maximum throughput or data rate ensures fruitful data or message transfer in the channel which is selected

So far, number of techniques for handover initiation and choosing finest admittance linkages are suggested by researchers in their work, which utilizes diverse parametric and heuristics for execution the switch over. But every suggested approach was incapable to conform to all the necessities associated to purpose and efficiency for required vertical switch overs.

II- REVIEW LITERATURE

In [3], the previous work the author proposed a mechanism to analyze performance & to optimize dependent on non-static formulas for HWNs, which considers the speed &varied parameters in combination. Particularly, the channel occupation state is modeled by dynamic equation. Basically we have compared our work with this work to show the improved value of throughput.

For switch over, to be executed with enhanced features with respect to switch over delay, jitter and perceived throughput (Th), by using a technique which considers RSNI and prepares for a switch over at a early stage is suggested by [4] while [5] planned a switch over judgment algorithmic program for switch over from WLAN to 3G networks depending on the comparison of available network RSS level and a dynamic RSS threshold value. Authors have shown that, change over catastrophic failure possibility rises in cases where, either velocity or switch over signaling delay upsurges, while using a fixed RSS threshold value.

As per authors of [6]switch over is realized, if the MT receives higher value of SINR from the other available network. The SINR associated with one network is reformed into equivalent value of SINR with the intention to compare with the SINR associated with intended network. This schema shows upgraded& refined throughput (Th) and lower switch over failure rates but, the caliber of the schema abases as the velocity increases. Also it has increased latency and more count of unnecessary switch overs.

In [7] & [8] authors have intended and used a new metric i*nterference-to-other-interferences-plus-noise ratio* (IINR) the networks with good value of this parametric quantities are only considered for switch over. According to the authors, if association costs are comparatively lesser than the association gains, then the mean Th can be upgraded& refined. But, this scheme is befitting for cooperative network scenario only.

Authors [9] included the quantities like cost for data transfer, security related to the network, velocity of user & power required by the mobile equipment. These parametric quantities are normalized & allocated weights, so as to evaluate and analyze the current position of available network. This schema showed better Th & user QoE. But, network parametric quantities like security & signal interference are difficult to valuate. Authors [10]planned a mobile agent dependent judgment method , its architecture has below mentioned parts: (1) a context management framework, (which collects & governs context data) (2) a programmable platform (to download& install the required modules, which is used for transfering context related data) and (3)a service deployment schema (which manages& synchronizes the performance of all mobile agents). It uses rule dependent system, for switch over judgments. This reduces the switch over judgment related latency& boosts , but a single failure might degrade the performance of the system, as the data is not shared ever. Also, when a switch over is required, then the intended mobile agents is supposed to be called, downloaded and installed from the service depository unit, which elevates the switch over delay. Above all this, it requires a frequent and constant communication between the MT &network, which again boosts signaling overhead which is undesirable as it also increase communication delay.

Writers in [11] intended to manage the history & past data related to mobility pattern of the MT this helps to make decision to switch over to a previously known network, provided the user takes the same path with a constant velocity whenever a mobile user follows similar path with steady velocity.This method fails if the path followed by the MT is unusual & without constant velocity & or any of the network in it's path is not available. In such case the Th & call blocking rate are affected badly.

Cloud-dependent network choice schema, for vehicular network scenario which utilizes game theory is discussed by authors of [12]. The cloud maintains the information with itself which is helpful for vehicles who are roaming, to appropriately select the elite network or a channel. The schema assists a large size network, as equated to traditional algorithmic program, also gives balanced system Th& also takes care of fair chance to all the networks present, but the biggest disadvantage of this method is the large time it requires.

III-PROPOSED SCHEME

A ML algorithmic program of unsupervised type is proposed here. ML is proved to be a modern & reliable technique which can be used for optimization of complicated and difficult issues. ML when related to wireless networks , can be put as a method that enables the wireless network entities to perceive & to act according to the surrounding &it also helps to increase the intelligence capabilities regarding various facets of wireless communication. ML algorithmic program, explores wireless networks factors so as to built networks with very less or negligible intervention of the network operator or the user.

This algorithm uses artificial intelligence to select the best handoff solution, which can be used for processing future handoff procedures. The whole mechanism is offloaded in cloud, so as to shorten the strain on the network and the node. Firstly, we initialize the parameters for the decision making of handover initiation. Here we have selected parameters such as such as location, DR(data rate), BW,RSSI, velocity, user network preference, network coverage area. Then we initialized, the number of rounds for the algorithm to be run in iteration, to get a optimized output. Each round

has several numbers of solutions. The best solution from each round is then selected to execute further handoffs, if a better solution is obtained then the previous better solution is replaced by the new one. In each solution a learning factor is evaluated which is the combination of value of handoff delay, count of handoff and maximum value of throughput (Th), such that we get the max. value of learning factor. From all values of learning factor, a mean value is decided and then a learning threshold is evaluated by multiplying the mean learning factor, with the learning speed. For all values where learning factor is more than the learning threshold the detailed parameters are stored. For the above algorithm, we have used NS2 simulation tool.

IV- RESULT ANALYSIS

We have compared, the throughput (Th) experienced by the user after handoff. Throughput (Th) received can be defined in to two categories, one is user throughput (Th) , which is the quantity of data being received by a user on an average in a particular network. Further can be stated as , it is amount of packets received by a user in given amount of time. The other category of throughput (Th) is cell throughput (Th) or average cell throughput (Th), which is sum of avg. throughput (Th) of all the users in that network. It can termed as average user throughput (Th)in that cell, multiplied by the no. of users in the network.
For this comparison, we considered handoff between two networks UMTS and LTE, and then we changed the node velocity from 0m/s to 10 m/s with a step size of 5m/s .The throughput (Th) obtained was then noted and equatedwith the literature work. In the previous work the author proposed a methodbased on performance scrutiny& access optimization depending on non-static equations related to HWNs, which considers metrics such as Th, speed of user etc. Particularly, the channel occupation state is modeled by non static equation.

The figure below displays that, as the velocity rises the average throughput (Th) slightly decreases. This is because with the ascending speed of the mobile user, more handoff will occur and this will lead to increase in signaling overhead, which then reduces the throughput (Th).Regards no.of hand offs ,our system performs well, as the reduction in no. of the handoff has been given due importance in our work.

V- CONCLUSION

With the above stated work deployed in various networks, Th , E2E delay, packet delivery ratio can be refined. The results &analysis reveals that, better switch over performance can be achieved. Some more research can be done to upgrade & refine the security issues present in the network. The suggested ML based algorithm shows better throughput (Th) with minimal handoff delay and count of handoff.

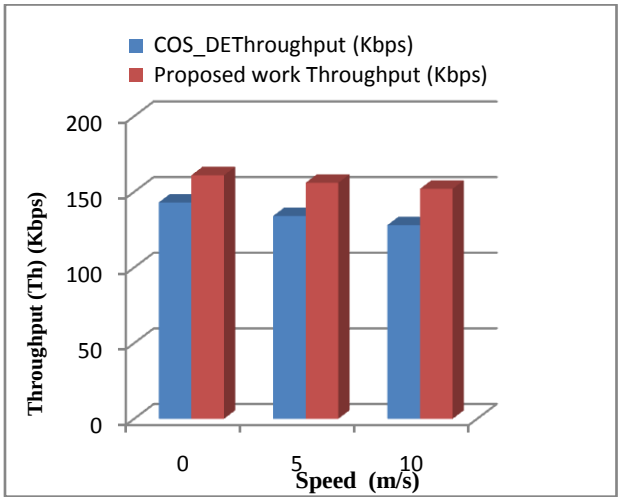

Fig 1: Comparison for Throughput (Th) v/s Speed of node

REFERENCES

[1] *Jayasheela C S, Dr. Gowrishankar "A Comprehensive Parametric Analysis of Vertical Switch over in Next Generation Wireless Networks, IOSR Journal of Computer Engineering (IOSR-JCE), Volume 9, Issue 4, 2013, pp. 10-17.*

[2] *G. U. Mali.," Fuzzy Based Vertical Switch over Decision Controller for Future Networks", International Journal of Advanced Engineering, Management and Science (IJAEMS), Vol-3, Issue-1, 2017, pp. 111-118*

[3] *Zhu Xiaorong, Zhao Ya'nan, Wang Yong," Performance analysis and optimization model based on dynamicsequation for heterogeneous wireless networks", The Journal of China Universities of Posts and Telecommunications June 2015, 22(3),pp. 49–55*

[4] *K. Joseph A., Received Signal to Noise Indicator, US Patent 2006 / 0234660 A1, 2006.*

[5] *S. Mohanty and I. Akyildiz, "A cross-layer (layer 2 + 3) handoff management protocol for next-generation wireless systems," IEEETrans. Mobile Computing, 2006.*

[6] *K. Ayyapan and R. Kumar, "Qos based vertical handoff scheme for heterogeneous wireless networks," International Journal of Research and Reviews in Computer Science (IJRRCS), vol. 1, no. 1, pp. 1–6, 2010.*

[7] *H.-H. Choi, J. B. Lim, H. Hwang, and K. Jang, "Optimal handover decision algorithm for throughput enhancement in cooperative cellular networks," in Vehicular Technology Conference Fall (VTC 2010-Fall), 2010 IEEE 72nd, 2010, pp. 1–5.*

[8] *H.-H. Choi, "An optimal handover decision for throughput enhance-ment," IEEE Commun. Lett., vol. 14, no. 9, pp. 851–853, 2010.*

[9] *A. Hasswa, N. Nasser, and H. Hossanein, "Generic vertical handoff decision function for heterogeneous wireless networks," in 2nd IFIP International Conference on Wireless and Optical Communications Networks. IEEE Computer Society, 2005, pp. 239–243.*

[10] *Q. Wei, K. Farkas, C. Prehofer, P. Mendes, and B. Plattner, "Context-aware handover using active network technology," Comput. Netw., vol. 50, pp. 2855–2872, 2006.*

[11] *B. Wang, X. Wen, W. Zheng, and Y. Sun, "A novel optimising handover method based on user behavior," in Proc. 2010 Asia-Pacific Conference on Wearable Computing Systems. IEEE Computer Society, 2010, pp. 326–329*

[12] *Ke Xu, Student Member, IEEE, Kuang-Ching Wang, "A Fast Cloud-based Network Selection Scheme Using Coalition Formation Games in Vehicular Networks," IEEE TRANSACTIONS ON VEHICULAR TECHNOLOGY, -2014*