

Enhancing the Quality of Service by Employing Swarm Intelligence in Multi Hop Heterogeneous Networks

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Abstract— Wireless Communication is a quickly developing section of mobile communication systems. The mobile communication system has encountered an exponential development throughout the most recent decade. Furthermore, Wireless Local Network (WLAN) supplant wired system in diverse environment, for example, living arrangements, commercial ventures and so on. The huge development of remote frameworks combined with the multiplication of tablets and PCs demonstrate a splendid future for the wireless network as a component of the layer networking infrastructure. The 3G mobile communication systems give extraordinary scope and subscriber management. Likewise for web access contrasted with 3GPP (third Generation Partnership Project) WIMAX (Wireless Interoperability for Microwave Access) WLANS support hyper information rates at lower expense, because of the correlative way of 3GPP and WLANs-WIMAX the incorporated heterogeneous system network architecture is built up for future creative servers and applications. However, while translating these systems, there happens to be an issue of verification and security. Thus the improvement of Quality of Service parameter, re-authentication delay and signaling cost are considered. In this paper, we propose an advancement based procedure utilizing swarm intelligence for Quality of Service improvements. The simulation is done utilizing NS2 and tested results are obtained for the parameters. Keywords— *WLAN, WIMAX, 3GPP*

I. INTRODUCTION

The Latest improvements in Wireless technologies have extended conceivable applications ranging from straightforward mobile services in early cell systems to new incorporated information systems. Recently, numerous up to date cellular telephones are likewise incorporated with facilities such as FM radio, advanced MP3 player and camera. Hence, the services upheld by cellular communications have extended from basic voice to sight and sound, for example, video calling and portable gaming. All of these new services need a higher quality of service and also more prominent information rate. Moreover, with mobile internet access, the expanding development in information movement will further move the requirement for increasing data transmission. Recent foundations that bolster mostly voice activity are confronting an incredible test in meeting both the transmission capacity and quality of service requests of forthcoming mobile communication clients. For mobile communication, one concept with significant improvement is customary single-hop cell frameworks where a Mobile Station (MS) speaks specifically with a Base Station (BS) [1]. Another idea of mobile communication is Multi Hop Ad hoc Systems, which are infrastructure less, self-sorting out and quickly deployable with no site arranging, and dissimilar to traditional cell systems.

At the point when associations need to move between heterogeneous systems for performance and high-accessibility reasons, Consistent Vertical Handoff (VHO)

is a vital initial step. In [2] they build up a Vertical Hand Off design algorithm for obtaining better battery life of the mobile networks and load balancing between access points. For a Multi Hop Ad hoc system includes exclusively of mobile clients otherwise called Mobile Ad hoc Networks, each node can assume the part of an intermediate station that transfers requests of different nodes to their corresponding destinations that cannot be reached utilizing a single-hop. The current Mobile ad hoc network technologies are part conveyed mostly IEEE 802.11 standard, which gives a high information rate of 54 Mbps for accessing the web and mixed media applications. For giving pervasive network to the mobile clients they have ordered these vertical handover estimation and decision schemes on the premise of their utilized strategies and parameters. In [3] the authors proposed a classification of vertical handover decision schemes in heterogeneous wireless networks which helps in re arranging multiple factors that are critical for making a handover decision. In the multi hop cell network (MCN) construction modelling, all cells utilize the same information and Control Channels.

The Mobile Station and Base Station information transmission force is diminished to a large portion of the cell span to empower different synchronous transmissions utilizing the same channel. To enhance the quality of service particularly signalling cost and the re-authentication delay the essential variable to think is Hand Over between WiMAX-WLAN. A safe Hand Over by

verifying or re-authenticating of the client is dissected in [4]. The examination is performed with five distinctive re-authentication conventions adjusting to the 3rd Generation Partnership Project (3GPP) norms. These have demonstrated a powerful diminishing in signalling traffic and re authentication delay. The power of transmission in the control channel relates to the span of cell, and the Main Stations utilizes this channel to send neighbor's data to the Base Station. To guarantee dependable information about connectivity at the Base Station, the nodes perceive their neighbor's utilizing a contention free protocol. At the point when a MS needs to unite with a desired destination, a route request is sent to the Base Station on the present control channel. Furthermore, the nodes store information of the route to dispose the control overhead. At the point when a node identifies that the adjacent hop is inaccessible, a route error packet is sent to the Base Station and stores the present packet. To the node that generated the route error, the Base Station gives a route reply and also right route packet is sent to the source node.

II. RELATED WORK

The concept of iterative process, for re-authentication of the node within a domain, which is localized in the access point (AP) located in the domain itself is explained in [5]. Since the re-authentication of the terminal happens, within the domain, through the access point; the re-authentication delay is significantly reduced in the heterogeneous network. Also, the iterative process enhances the efficiency of the localized process, which was analyzed using network simulator. To overcome handover authentication is a critical issue in WiMAX area, an efficient group-based handover authentication mechanism for coexisting mobile stations in IEEE 802.16m networks were established. In [6] the scheme that correlates Main Stations who have the similar Signal to Interference-plus-Noise Ratio, history handover information and are categorized into the same handover group.

When the first Main station of the handover group nodes goes from the service base station (BS) to a target Base Station, the service Base Station sends all the handover group members security context to the target Base Station using the Security Context Transfer (SCT) method and then all these Main Stations in the same handover group can easily achieve the handover authentication with the target Base Station. Different from the standard SCT schemes, their scheme uses the Main Stations security context as a symmetric key of Cipher-based message authentication code (CMAC). Furthermore, performance analysis signifies that the proposed scheme is very efficient in reducing average handover latency. The handover decision is a significant problem. This is exacerbated when the Handoff decision is driven by user preferences, and wireless environment constraints. A handoff decision based on user preferences, which consider not only the standard handover decision factor (RSS) but also user preferences, [7] user

profiles and other requirements. The security protocol is responsible for the slight delay in the network access, which may be much longer than the normal delays caused due to mobility management.

An alternative way is to provide an optimistic service before the user gets authenticated [8]. This gives rise to a trade-off between the security offered by the network and the quality of service detected by the user. A protocol is shown for the re-authentication of a mobile node when it frequently connects to different access points or uniting wireless networks. The protocol is based on accreditation which the mobile receives from access points as a proof of past honest behavior and which it presents when associating itself with new access points. The traffic generated due to the signalling of the node is a major problem. The message exchanges for AAA gives rise to heavy signalling overhead and long network latency. In [9] a solution given by adopting the key caching mechanism so that the user gets authenticated locally. By this method they significantly reduced the signalling traffic as it gets locally authenticated. Also, in this paper they have developed the analytic model that describes the key caching behavior in mobile IP networks. To lower both the HCDP and the NCBP while preserving high channel utilization mobility depending on the vehicle mechanism was established. In [10] it was proposed that a mobility-aware call admission control algorithm accompanied by a handoff queue (HQ) in mobile hotspots, where dissimilar admission control policies are exploited. Particularly, when a vehicle is static, a handoff priority scheme with guard channels is calculated to protect vehicular handoff users not to get on the vehicle. In addition, an HQ is investigated during end to further accept handoff users. Besides, for a moving vehicle, no guard channels for handoff users are assigned to maximize channel utilization. Through Markov chains, we estimate MA-CAC with an HQ related to new-call blocking probability (NCBP), handoff-call dropping probability (HCDP), channel utilization and handoff-call waiting time in the Handoff Queue.

3.1 HANDOVER MECHANISM

In the telecommunications field, the handoff signifies the procedure of moving an active call from one channel to another. If the telephone moves from one cell coverage to the other, the call is exchanged to the other cell to avoid termination of the call. There are two different types of handovers one is hard handover and the other is soft handover. Soft handovers may include utilizing connections with more than one cell in the meantime. In such circumstances the connection from which the most extreme signal strength is obtained and chosen for further communication. In the intersystem handoff during an ongoing call, when the mobile unit moves from one cellular system to another, which is maintained by distinctive MTSO, a handoff strategy is utilized to abstain from

dropping of the call, which is said to be Inter System Handoff. When a mobile signal gets to be frail in a given cell and MTSO couldn't locate any other cell inside of its system to transfer the call, then it makes utilization of the Inter System Handoff. Considering the same case of mobile unit movement from one to the other during an ongoing call in the intra system handoff, a handoff method is utilized to abstain from dropping of the call, which is said to be Intra System Handoff. An MTSO takes part in this handoff system. Horizontal handoff is the procedure of giving off of a mobile terminal between base stations supporting the same network technology. Signal quality and channel accessibility are considered in horizontal handoffs. Vertical handoff is the procedure of giving off of a mobile terminal between base stations supporting the diverse system technology. Because of the distinctive terminologies of the network, more than one interface is required during the handoff process.

3.2 QUALITY OF SERVICE

Quality of service refers to the service, which takes care of resource reservation control mechanism. Quality of service is the general execution of a PC or a telephony system, particularly the performance seen by the users of the network. In order to measure quality of service quantitatively several related parts of the network service are regularly viewed, such as, throughput, error rates, accessibility, bandwidth, end-to-end delay, jitter, and so forth. Quality of service is especially essential for the transport of traffic with notable necessities. Specifically, much innovation has been created to permit PC systems to end up as helpful as phone systems for sound discussions, and additionally supporting new applications with considerably firm service requests. Quality of service includes prerequisites on every one of the parts of a connection, for example, service response time signal-to-noise ratio, crosstalk, echo, noise, interrupts, frequency response and many others. Grade of service requirements comes under the subset of telephony, which includes parts of a connection relating to limit and scope of a system. At whatever point a packet is transmitted from the source to the destination, the accompanying issue happens. Low Throughput happens because of the changing burden from different clients having the same system assets, the most extreme throughput which is the throughput that can be given to a certain information stream may be too low for constant mixed media services if the scheduling priority is same for all the data streams. The switches may neglect to convey i.e. drop a few packets if their information is defiled, or they arrive when their queue line is full. Those packets will be dropped packets. With different delays the packets from the source reaches the destination. Delay is the difference of time taken for the packet to reach the receiver from the transmitter. Similarly, the difference of time between the mobile user who sends an authentication

request and receives the authentication is known as authentication delay. The delay of the packet differs with its position in the queue of the switches along the way in the middle of source and destination, and this position can fluctuate unpredictably which is known as Jitter. Hand Over re-authentication and signalling cost records the collective signalling traffic traded in the network because of a Hand Over re-authentication operation. The Hand Over signalling traffic back and forth from the 3GHN is reduced due to the decrease in the re-authentication delay and signalling traffic. There are many issues discussed in this paper and the main issues, which are taken into consideration, are signalling cost and re-authentication delay. In a heterogeneous network, two circumstances are considered. When there is a movement of mobile user from one domain, which is WLAN to another domain (WiMAX), the protocol utilized is INEA and this situation is called Hand Over situation 1. On the other hand, when the user moves in the opposite way EAP-AKA protocol. It is being utilized which is HO situation 2.

III. METHODOLOGY

In computer security, AAA ordinarily stands for Authentication, Authorization, and Accounting. It refers to a security architecture for distributed system, which empowers control over which clients are permitted to access the benefits, and the amount of the assets they have utilized. Authentication refers to the procedure where an element's character is authenticated, commonly by giving confirmation that it holds a particular digital identity, for example, an identifier, and the comparing credentials. Some of such credentials are a password, one-time tokens, digital certificates, digital signatures and phone numbers.

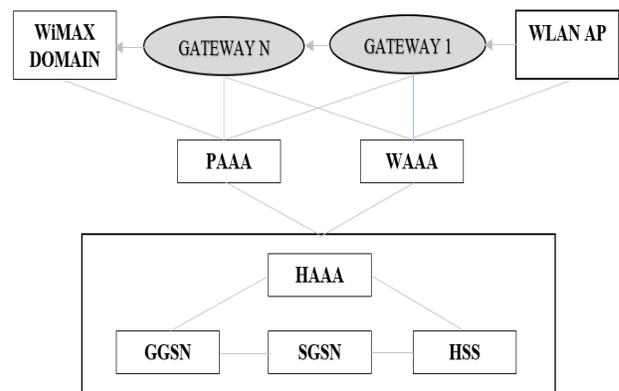


Fig 1 Architecture of the Proposed System

WiMAX – Worldwide Interoperability for Microwave Access

WLAN AP – Wireless Local Area Network Access Point

PAAA – Proxy Authentication Authorization and Accounting server

WAAA – WLAN Authentication Authorization and Accounting server

HAAA – Home Authentication Authorization and Accounting server

GGSN – Gateway GPRS Support Node

SGSN – Serving GPRS Support Node

HSS – Home Subscriber Server

Fig.1 demonstrates the architecture of the proposed mechanism. The approval capacity figures out if a specific element is approved to perform a given movement, commonly acquired from authentication when signing on to an application or service. Authentication may be resolved to take into account a scope of confinements, for example, time-of-day limitations, or physical location restrictions, and limitations against various access by the same client. Typical approval in regular computer life is, for example, conceding read access to a particular document for authenticated client.

Accounting refers to the following of network resource utilization by clients with the end goal of capacity and trend examination, cost designation, and billing. Also, it may record occasions, for example, authentication and authorization failures, which allows checking the accuracy of systems completed in view of accounting data. Real-time accounting refers to accounting information that is conveyed simultaneously with the utilization of the resources. Batch accounting denotes to accounting data that is saved until it is conveyed at a later time. Common information that is accumulated in accounting is the identity of the client, the nature of the service delivered, when the service started, and when it finished, and if there is a status to report. Swarm intelligence is the order that deals with a regular and artificial system made out of numerous people that facilitate utilizing decentralized control and self-organization.

IV. ANALYSIS

Simulation is done using NS2 and the results are obtained. Nodes move towards WiMAX domain. Request and Response, sent and received are known as one cycle.

The simulation is done to see the authentication for the first time and to see the presence of the node in the new domain.

The Graphs are plotted with the help of values obtained and it shows the number of handovers versus re-authentication delay.

RESULTS

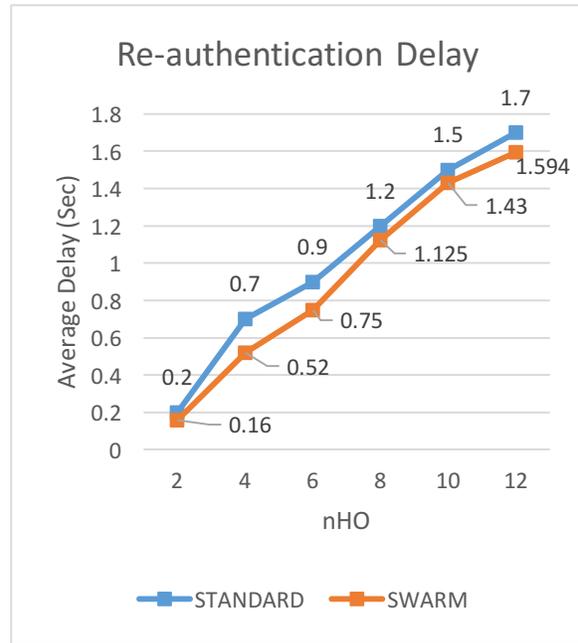


Fig 2. Graph showing comparison of Re-authentication Delay for Standard and swarm technique

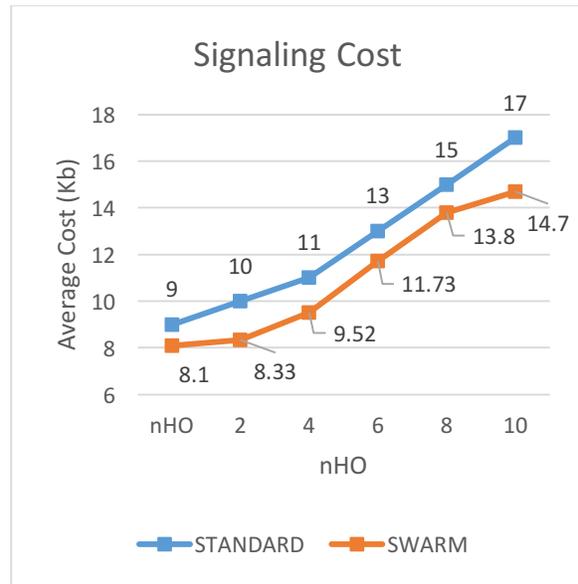


Fig 3. Graph showing comparison of Signalling Cost for standard and swarm technique

V. CONCLUSION

Advances in wireless access technologies, bridges the gap between static and dynamic characteristics of the user. In the aim to reduce the trade-off between the security offered by the network and the quality of service observed by the user, enhancement of the re-authentication protocol is performed in this paper. On analyzing the handover situations in the heterogeneous network, using swarm intelligence the better results are obtained, and compared to the standard scheme. In this paper, the re-authentication delay and the signalling cost during HO was significantly reduced during handover between WLAN and WiMAX. The re-authentication delay is reduced effectively by authenticating the user using WAAA, proxy server, rather than by authenticating through the main server 3GHN. This improves the security as well as seamless handover is achieved. Similarly, the signalling cost is reduced since the proxy server is used in between the mobile station and the main server. Thus the traffic due to signalling is reduced.

VI. REFERENCES

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