An Enhanced Authentication (EA) for Efficient Handover in 5G Network

Chandrakant Patel (M.Tech)[1]
Department of Electronics and Communication
Technocrats Institute of Technology and Science
Bhopal (M.P.) India

Devkant Sen[2]
Assistance Professor, Department of Electronics and Communication
Dr. Malay Das[3]
HOD, Department of Electronics and communication
Technocrats Institute of Technology and Science
Bhopal (M.P.) India

***Abstract*— In recent time progressively enhancement of people craves faster Internet access on the move, trendier mobiles, and, in general, instant communication with others or access to information. The fifth generation (5G) of wireless communications systems has stringent requirements in terms of data rates, latency and energy efficiency, and will be structured in the form of heterogeneous networks with an increasing number of smart terminals and their emerging applications. The proposed Enhanced Authentication (EA) approach secure the communication of high speed 5G network. The energy consumption of users is reduced and the transmission quality is improved due to the shorter distances between users and some remote antennas arrays. The proper authentication improves the communication and provides the proper channel for forwarding the signals or data packets in network. The high performance wireless network is achieved by combining the existing network with the new network using the core Internet protocol (IP) based network layer, thereby leading to the vision of the 4G and 5G generation. The malicious nodes are forward optimistic reply at the time of routing by that their identification is also a complex procedure. The concept of Micro Base Station and Macro Base station is enhancing the performance by sending data up to end of mobile receiver in 5G wireless network. The performance of and proposed EA scheme is almost equal. The un-authentication degrades the whole routing performance but observed that in presence of malicious actions is identified by EH scheme and improves the data receiving as compare to MECS mechanism.

***Index Terms*— 5G, Routing, EA, MECS, MBS, Wireless Network.**

INTRODUCTION

The anticipated Open Wireless Architecture (OWA) in is targeted to offer open baseband processing modules with open interface parameters. The OWA is related to MAC/PHY layers of future (4G) mobiles [1] [2].The 5G terminals will have software defined radios and modulation scheme and new error-control schemes can be downloaded from the Internet The enhancement is seen towards the consumer terminals as a focus on the 5G mobile networks [3]. The 5G mobile terminals will have access to different wireless technologies at the same time. The 5G mobile terminal should be capable to merge special flows from different technologies. The network will be dependable for managing user-mobility. The 5G terminal will make the ultimate selection among different mobile access network providers for a specified service. The most general way of telling a handover (HO) is when a phone call in progress is redirected from its current cell to a new cell. This normally happens when the mobile equipment making the phone call is moving from one base station area to another and detects that it is losing connection, so it needs to shift to another base station. This method of shifting is known as handover [4]. The 5G technology will reduce the time in getting the data from the antenna by using powerful tools. Large phone memory, more dialing speed, more clarity in audio and video will be provide in the 5G [5]. Multiple Amtenna systems exploits the use of multiple antenna in 3G, 3.5G and 3.75G. Owing to the increased data rate requirement multiple antennas alone may not be fruitful until proper control is not devised. These multiple antenna array is supported by smart processing algorithms which adapt automatically in the interference environment. Smart Array Antenna System does not only makes the system more smarter by selective signal processing but also decreases Inter symbol interference (ISI) and improves Bit error rate. 5G mobile networks (or 5G network) the next generation standard for wireless communications are scheduled to follow (but not replace) current 4G networks with vastly increased capacity, lower latency, and faster speeds. Anticipated between 2019 and 2020, some 5G networks will initially operate in a high-frequency band of the wireless spectrum between 28 GHz and 38 GHz also known as the millimeter wave (mm Wave) spectrum [5]. The new 5G networks will be able to transmit very large amounts of data short distances. However, 5G is also expected to work in low spectrum frequencies such as 600 MHz as well as unlicensed frequencies such as the 3.5 GHz spectrum. Wireless infrastructure today includes many elements macro base stations, metro cells, outdoor and indoor distributed antenna systems (or DAS), small cells and moreover all working together in a heterogeneous network. The location information capturing possible by using the location based approach [6][7]. There are two types of handovers: horizontal (handovers within the same technology) and vertical (handovers between different network access technologies) [8] [9]. Horizontal handovers are Layer-2 handovers (L2HO, also referred to as 'micro-mobility'). Here, only the BS is changed and IP-information is maintained. Typically this causes small latency and low

packet loss. Vertical handovers are Layer-3 handovers (L3HO, also referred to as 'macro-mobility'), it also changes the IP attachment point and so IP information is changed too.

RESOURCE MANAGEMENT

In mobile network, quality of service (QoS) degradation or even call termination may happen frequently when there are insufficient resources to support new call request. Bandwidth is an extremely valuable resource which drives us to design efficient resource reservation scheme for increasing resource utilization [10]. Armed with the prediction information of user mobility, TPs are able to reserve resource for users who are going to attach in advance, which can reduce the resource collision and coordinate the interference between different users. For example, Soh et al. proposed a dynamic resource reservation scheme relying on accurate positioning to achieve efficient call admission control and significant resource efficiency in [11] and [12]. Furthermore, mobility prediction is helpful to estimate the sojourn time of users in specific TPs. If the duration of users staying in specific TPs is known in advance, the energy efficiency in the systems can be improved by managing the available resources more intelligently. However, the 5G wireless networks consisting of multiple dense "small cells" will bring about the challenges to network resource management and security functions. Meanwhile, the handover delays could increase as the number of cells increases, which will reduce service quality. Moreover, the increasing number of deployed small cells causes much more frequent handovers, which will lead to many security issues such as success of dropping attack and user information leakage [13]. Therefore, it is necessary to design a new authentication mechanism for 5G wireless networks, which can facilitate the security of authentication in 5G wireless networks with a high efficiency in terms of a low authentication delay.

LITERATURE SURVEY

The 5G is very much popular recent technology and the work done in this field is also provides the opportunities in future. The research work done in field of 5G with handover mechanism is mentioned in this section.

In this paper [14] they propose a handover authentication mechanism based on the EAP-AKA protocol for 5G wireless networks in order to reduce the handover authentication delay and to meet the security requirements, which is called MEC Server-based (MECS) authentication mechanism. The new authentication architecture for 5G wireless networks using the MEC servers in the original EAPAKA authentication architecture. Comparing with the Authentication, Authorization, Accounting (AAA) server in the core network, the MEC server is much closer to User Equipment (UE). Meanwhile, the MEC server has a powerful storage, so it can store user's identity information for the authentication purpose. The performance evaluation shows that the proposed protocols can improve the authentication efficiency. The formal verification results prove that the proposed protocols can meet the security requirements.

In this paper [15] proposed the basic principles of these two promising schemes, Spatial Modulation (SM) and OFDMIM, which are still waiting to be explored by many experts, and review some of the recent interesting results in Index Modulation (IM) techniques. Furthermore, discuss the implementation scenarios of IM techniques for next generation wireless networks and outline possible future research directions. Particularly, they shift our focus to generalized, enhanced, and quadrature IM schemes and the application of IM techniques for massive multi-user MIMO (MU-MIMO) and cooperative communications systems. The receiver of the SM scheme has two major tasks to accomplish: detection of the active transmit antenna for the demodulation of the index selecting bits and detection of the data symbol transmitted over the activated transmit antenna for the demodulation of the bits mapped to M-ary signal constellation. Unfortunately, the optimum Maximum Likelihood (ML) detector of SM has to make a joint search over all transmit antennas and constellation symbols to perform these two tasks.

In this paper [16], introduced a learning-based graphical model which allows a fine-level prediction of the movements and velocities of mobile users inside a cell. They first divided mobile users into different user groups by velocities and then learned the path patterns and user type transitional probability. The transitional probability of future path and user type at the node were predicted by two steps including the expectation step and maximization step.

In this paper [17], A novel framework for mobility prediction that can accurately predict the traveling trajectory and destination using spatial conceptual maps. Besides, knowledge of user's preferences, goals, and analyzed spatial information without imposing any assumptions about the availability of users' movement history were also employed. The innovation of this scheme is incorporating the notion of combining user context and spatial conceptual maps in the prediction process. The proposed scheme does not require a warm-up period to collect history of previously visited locations. Therefore, the scheme maintains the same degree of accuracy in predicting users' movements independently of the time span. Another two examples of handover management using road topology-based mobility prediction.

In this paper [18], proposed a heterogeneous cellular architecture, we discuss some promising key wireless technologies that can enable 5G wireless networks to fulfill performance requirements. The purpose of developing these technologies is to enable a dramatic capacity increase in the 5G network with efficient utilization of all possible resources.

In this paper [19], proposed an Energy Efficiency (EE) metric that is defined as the ratio of the system throughput to the total power consumed by the system, i.e. the number of successfully received information bits per unit energy. We refer to this metric as TB-EE. Capacity Based (CB-EE) and Throughput Based (TB-EE) separately, and adapt the number of active transmit antennas and transmit power, under a spectral efficiency constraint. Reduced complexity sub-optimal algorithms are also developed.

PROPOSED AUTHENTICATION SCHEME IN 5G

Secure connection has been established between source nodes to destination nodes. The Proposed Enhanced Authentication (EA) algorithm finds out the multiple routes from source to destination using dynamic on demand routing algorithm. After finding multiple routes, all the routes are classified based on the conviction factor of existence of attacker in route. Then it will prefer the best route which is having no existence of malicious attack. In this method the data is secured in presence of propose algorithm. Then it routes the data through best single route of multiple established path in WN. In this research we consider two modules of routing:-

(1) The first module is Mobile Edge Computing Server (MECS) Authentication. The routing is reliable for communication because the malicious actions are block and establish new route then sender delivers data through next possible routes but authentication is required in all the possible paths.

(2) The second is propose Enhanced Hash Authentication. In this module provide security in presence of malicious attack. The attackers are absolutely performing no routing misbehavior and provide reliable routing. The whole procedure of algorithm is mentioned in next point. Centralized administration or micro station and heavy macro station in 5G network is to monitor the routing information and malicious activities.

Proposed Algorithm to Authenticate Routing Procedure

The proposed scheme is improves the routing misbehavior from malicious

Number of wireless nodes = 30

Routing Structure=Wired cum Wireless

Attacker Behavior = Malicious

Security Provider = Use Authentication.

Network Consider=5G // Rate is about 70 Mbps

Step1: Send the request to all intermediate nodes between sources to destination.

Step2: Add the next hop in routing table if we have to destination route, otherwise rebroadcast the request.

Step3: We compare the node (n_i) routing table to next hop routing table if table is matched it means no attack in the 5G network and route is true, and then forward all data packet.

Step4: If next node is false, and routing table is not matched it means no previous data that hop, insert the table new entry which have shortest path to destination.

1. Best paths are selected on the basis of hop counts $h_1, h_2, h_3 \ldots\ldots h_n$, n=1,23…// m1,m2,m3

2. $\sum$ Hn = ($h_1, h_2, h_3 \ldots\ldots h_n$) up to destination is Minimum then select for data sending and next route of hop count $h_1, h_2, h_3 \ldots\ldots h_n \geq$ Min is select for routing.

Step5: If destination is found then select the route of minimum hop count and deliver data through that minimum hop count path h.

Step6: If next hop is true, sending data through that hop is false then send the data packet for checking the reliability.

Step7: If routing table is not matched at (micro node(m_1) or normal mobile node(n_i) it means some misbehavior activity occur in the 5G network through malicious node, then authentication scheme is applied and block that hop and change the path, forward data packet.

Step 8: End

Proper approaches need to be chosen carefully based on the data type, the condition of environment and outputs that we desired. Mobility prediction have been widely exploited in existing works, where different approaches and scenarios are considered. These methods have their own applicable domains and cannot be extended directly to other scenarios and environments.

RESULT DESCRIPTION

The propose EA mechanism perform is better than MECS Authentication. The performance of both the algorithms is measures with different performance metrics.

Signal to Noise Ratio

The SNR of EA is shows the higher value or more than the previous MEC Server-based (MECS) authentication mechanism in 5G wireless network Propose approach is reduces the noise and reaches up to Higher data rate in network is possible to enhance the noise level but better

higher signal strength is maintain connection and reduces the loss of data.

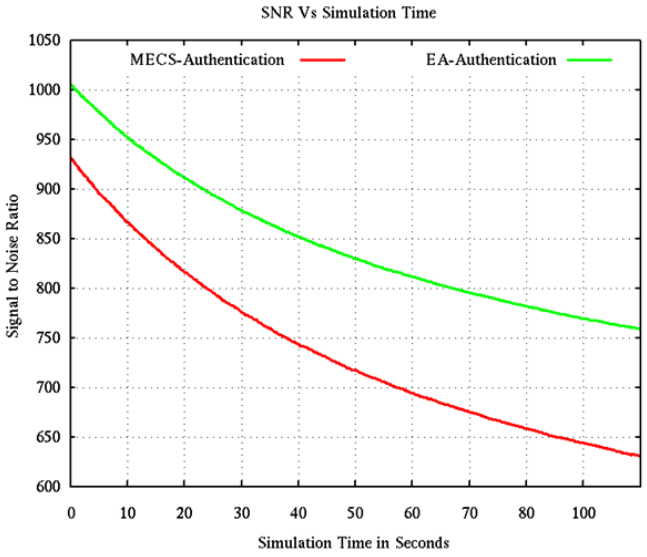

Fig.5.1 SNR Analysis

Packet Delivery Ratio (PDR)

The percentage of successful data receiving is evaluated through PDR performance metrics. The performance of data receiving is better after applying EA. The PDR performance of MEC Server-based (MECS) authentication mechanism is showing better performance of EH is showing better results to handle the available bandwidth and rate of data efficiently.

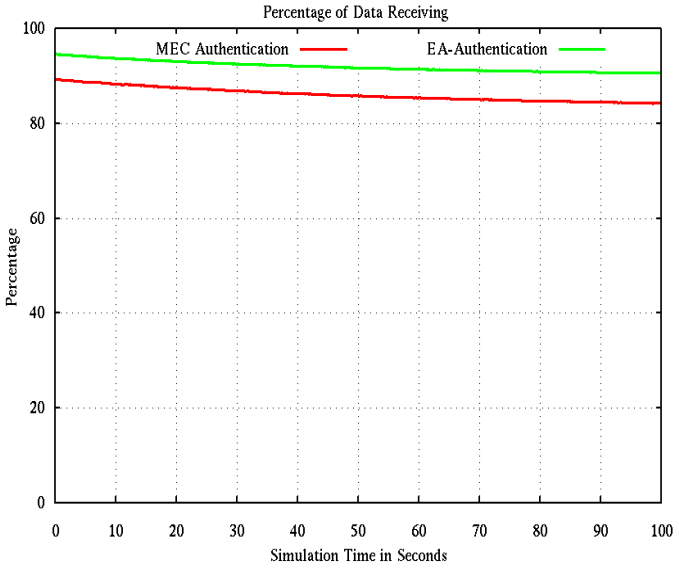

Fig.5.2 PDR Analysis

Overhead Analysis

The delay is the signals receiving is counted in mille seconds in network. The performance is improves and the available channel capacity is utilized efficiently in 5G wireless network. In this graph the delay in previous scheme is more but in EA scheme improves the efficiency of communication. The channel bandwidth utilization is improved and the noise ratio is decreased by that overhead is also reduced.

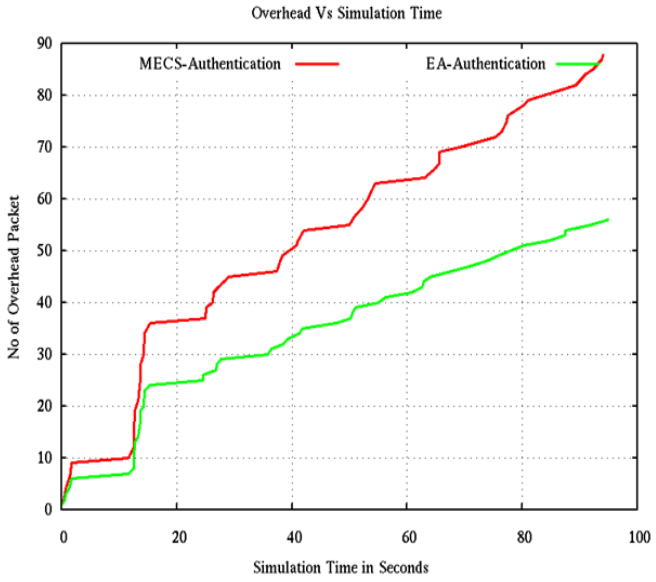

Fig.5.3 Overhead Analysis

Delay Analysis

The delay is the signals receiving is counted in mille seconds in network. In this graph the delay in data receiving is more in previous schemes.The delay is improving the efficiency of communication in 5G wireless network. The channel bandwidth utilization is improved and the noise ratio is decreased by that delay in data delivery is also reduced.

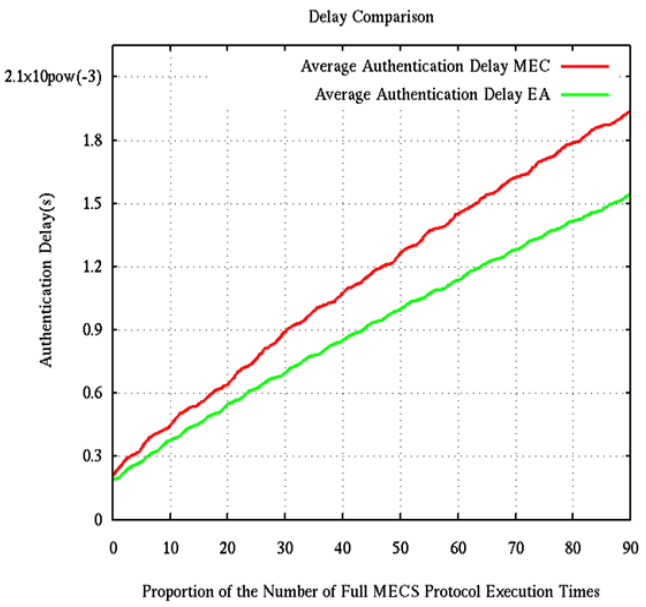

Fig.5.4 Delay Performance

CONCLUSION & FUTURE WORK

The concept of data integrity ensured that the authentication is reliable in 5G wireless network. The malicious action is wedged by propose Enhanced Authentication (EH) mechanism and improves performance in 5G wireless cum wired network. The performance is measured by performance metrics in case of MEC Server-based (MECS) authentication mechanism and proposed EA mechanism. The proposed EH scheme identified the attacker through next hop information of data delivery and also forward the Identification of node ID of attacker in network. If that ID is exist in routing establishment then the alternative route is select for data delivery. the MaBS receive data from sender side MBS and transfers data to other MBS. with more stringent performance and QoS requirements. The PDR performance of MEC Server-based (MECS) authentication mechanism is showing up to better performance but the performance of EH is showing enhancement in performance due to handle the available bandwidth and rate of data efficiently. The delay is the signals receiving is counted in ms in network. In future improves the channel utilization and SNR ratio of proposed scheme that provides better results of packets receiving and minims drop in network.

REFERENCES

[1] P. Demestichas, A. Georgakopoulos, D. Karvounas, K. Tsagkaris, V. Stavroulaki, J. Lu, C. Xiong, and J. Yao, "5G on the Horizon: Key Challenges for the Radio-Access Network," IEEE Vehicular Technology Magazine, vol. 8, no. 3, pp. 47 – 53, September 2013.

[2] Simon, H., 2011, Evolution of Mobile Technology. Available fromhttp://www.brighthub.com/mobile/emergingplatforms/articles/30965.aspx, Retrieved on 1st December, 2011

[3] Devasis Pradhan, "Massive Mimo Technique Used For 5th Generation System With Smart Antenna," International Journal of Electrical, Electronics and Data Communication, Volume-6, Issue-7, Jul.-2018.

[4] C. Jaime, M. Mariano, A. Jose, and F. Alfonso, "Long Term Evolution in High Speed Railway Environments: Feasibility and challenges," Bell Labs Technical Journal, vol. 18, issue:2, pp. 237-253, 2014.

[5] GSMA Intelligence, "Understanding 5G: Perspectives on Future Technological Advancements in Mobile," White paper, 2014.

[6] Gaurav Soni, Mahendra Kumar Jhariya, "Quadrant Base Location Tracking Technique in MANET," The 2nd International Conference on Data, Engineering and Applications 2020 (IDEA-2k20), Feb 2020.

[7] Gaurav Soni and Mahendra Ku. Jhariya "A Multipath Location based Hybrid DMR Protocol in MANET", IEEE International Conference on Emerging Technologies in Computer Engineering (ICETCE). Feb 2020.

[8] M. Zekri, B. Jouaber, and D. Zeghlache, "Context Aware Vertical Handover Decision Making in Heterogeneous Wireless Networks," Proceedings of the 35th IEEE Conference on Local Computer Networks (LCN '10), pp. 764–768, Denver, Colo, USA, October 2010.

[9] A. Ulvan, M. Ulvan, and R. Bestak, "The enhancement of handover strategy by mobility prediction in broadband wireless access," in Proceedings of the networking and electronic commerce research conference (NAEC 2009), American Telecommunications Systems Management Association Inc., pp. 266–276, 2009.

[10] M. Mamman, Z. M. Hanapi, A. Abdullah, and A. Muhammed, "An Adaptive Call Admission Control with Bandwidth Reservation for Downlink LTE Networks," IEEE Access, vol. 5, pp. 10986–10994, 2017.

[11] W.-S. Soh and H. S. Kim, "QoS provisioning in Cellular Networks Based on Mobility Prediction Techniques," IEEE Communication Magzine, Vol. 41, No. 1. Jan. 2003, pp. 86–92.

[12] [11] W. S. Soh and H. S. Kim, "A Predictive Bandwidth Reservation Scheme Using Mobile Positioning And Road Topology Information," IEEE/ACM Transaction of Network, Vol. 14, No. 5, pp. 1078–1091, Oct. 2006.

[13] Gaurav Soni, Dr. R Sudhakar, A L-IDS against Dropping Attack to Secure and Improve RPL Performance in WSN Aided IoT," 7th International Conference on Signal Processing and Integrated Networks (SPIN 2020), (Scopus Indexed)Feb 2020.

[14] Kaihong Han, Maode May, Xiaohong Li, Zhiyong Feng, Jianye Hao, "An Efficient Handover Authentication Mechanism for 5G Wireless Network," IEEE Wireless Communications and Networking Conference (WCNC), 2019.

[15] Ertugrul Basar, "Index Modulation Techniques for 5G Wireless Networks", IEEE Communications Magazine, pp. 1-14, 2016.

[16] H. Li and G. Ascheid, "Mobility prediction based on graphical model learning," in IEEE Vehicular Technology Conference (VTC Fall), pp. 1-5, Sept 2012.

[17] A. Nadembega, A. Hafid, and T. Taleb, "A Destination and Mobility Path Prediction Scheme for Mobile Networks," IEEE Transaction Vehicular Technology, Vol. 64, No. 6, pp. 2577–2590, Jun. 2015.

[18] Mukesh kumar, Satya Prakash Sinha, Jolis Gupta, "MIMO System for a 5G Wireless Communication Networks: A Key to Gigabit Wireless System",

International Journal of Innovative Science, Engineering & Technology (IJISET), May 2015.

[19] E. M. Okumu and M. E. Dlodlo, "Energy Efficient Transmit Antenna Selection for MIMO Systems: A Cross Layer Approach," 7th IEEE Annual Computing and Communication Workshop and Conference (CCWC), pp. 1–6, Jan 2017.