Security Sublayer: A Required Evolution of Wireless Security IEEE 802.16j

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Abstract—This paper investigates the fundamental and security issues of security sublayer reside at MAC layer of Wimax networks. Initially healthy overview of Wimax technology is documented followed by the weakness to the MAC layer and problems associated to the Wimax 802.16j .The risks and impacts are assessed according to a systematic approach. Several articles have been published to address the flaws in IEEE 802.16j Security even then enhanced version of this protocol cannot settle all the problems and additional flaws emerge. Here in particular vulnerabilities leading to the denial of service attacks on standard like regarding Reset-Command message, key sharing mechanism, water torture attacks, black hat threat etc are discussed in a precise and concise manner.

Keywords— Security Sublayer, Wimax, Dos Attacks, IEEE 802.16j, Authentication, Encryption

I. INTRODUCTION

In Wimax, The base station and subscriber station face most of the same security threats and attacks as their wired counterparts, including eavesdropping, masquerading session, hijacking, middle in man attacks, replay attacks etc. Moreover wireless network regardless of whether they belong to which family are inherently less secure then wired networks because they lack the physical infrastructure. [1]. Wireless networks represent an important example of such scenarios where capturing and forging packets are relatively easy .Attacks against networked systems are becoming more complex and powerful. IEEE 802.16j task group works on incorporating multihop relay capabilities into mobile Wimax ,the change mode is highly agree with 802.16e mobile and subscriber stations , but a base station specific to 802.16j will be required for relays to operate . Standard launched a new product called Relay stations which is high cost efficient and less complex then base station with relay capabilities .RS is used to collect all traffics from different sources and relay it to a base station, there is no processing at relay station. As it's easy to install, cheaper and less complex nature, chances of introducing Rogue RS or hijacking of the session, or any sorts of attacks are much easier.

IEEE 802.16j security specifications can mainly be found within the MAC layer, security parameters within the MAC layer can be embedded in a separate layer called security sublayer .The goal is to provide access control and confidentiality of the authentication, secure key exchange and encryption so when two parties establish a link, they are protected via a set of protocol that ensure confidentiality and unique access of the authorized parties. The unique hand shaking between the two entities, namely base stations and subscriber station is done at the MAC layer through security sublayer. [1]. MAC layer consists of three sub-layer, the first sub-layer is the service specific convergence sub-layer for mapping services to and from 802.16 Mse connections, the synchronous transfer mode (ATM) convergence layer is dedicated to ATM facilities whereas the packet convergence layer is accountable of for mapping conventions and protocols[2].the second sublayer is common part sub-layer which is the core of the standard and is tightly integrated with security sub-layer .the last sublayer is security sub-layer which lies between the MAC CPS and the PHY layer, addressing the authentication ,key establishment and exchange etc between the MAC and PHY layer.[3].This paper will address the security issues, vulnerabilities ,threats and risks of IEEE 802.16j standard in a very precise and sequential manner.

II. SECURITY SUBLAYER THREATS AND SOLUTIONS

Most of the experts and professionals claiming that broadband data delivered over 3G cellular networks will choke the hope of the WiMAX industry for the standard to become worldwide significant. There are too many factors involved in weakening WiMax security, stability, Quality of service etc. A WiMax wireless access network consists of base stations and mobile stations (MSs). The base stations provide network add-on to the mobile stations. As a serving base station, a mobile station selects the one which offers the strongest signal. At this point, the subscriber plays the role of the user while a base station and a collection of served mobile stations play the role of system.in wimax most of the security issues are addressed and handled in the MAC security sub-layer as described in the figure below: After MAC common part sublayer ,security sublayer starts,in common part sublayer MAC protocol data units (PDUs) are constructed,connections are established and bandwidth is managed.the common part exchanges MAC serivice data units(SDUs) with the convergence layer.The common part is tightly integrated with the security sublayer.the security sublayer addresses

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behaviour by large complex systems especially in mission critical domains is intended to be the catalyst and the aggregation stimulus for the overall event After a thorough peer review process the CISIS 2020 International Program Committee selected 43 papers which are published in these conference proceedings achieving an acceptance rate of 28% Due to the COVID 19 outbreak the CISIS 2020 edition was blended combining on site and on line participation In this relevant edition a special emphasis was put on the organization of five special sessions related to relevant topics as Fake News Detection and Prevention Mathematical Methods and Models in Cybersecurity Measurements for a Dynamic Cyber Risk Assessment Cybersecurity in a Hybrid Quantum World Anomaly Intrusion Detection and From the least to the least cryptographic and data analytics solutions to fulfil least minimum privilege and endorse least minimum effort in information systems The selection of papers was extremely rigorous in order to maintain the high quality of the conference and we would like to thank the members of the Program Committees for their hard work in the reviewing process This is a crucial process to the creation of a high standard conference and the CISIS conference would not exist without their help   Active and Programmable Networks for Adaptive Architectures and Services Syed Asad Hussain,2006-12-15 Most conventional networks are passive with only basic traffic monitoring management routing and congestion control At best they can be called reactive Deploying new functions and integrating new standards into these architectures is difficult due to the rigid embedding of software and hardware into the network components Active and Program   *Scientific and Technical Information Output of the Langley Research Center for Calendar Year 1985* ,1986   **Index of Conference Proceedings** British Library. Document Supply Centre,2003   *Information Highways for a Smaller World and Better Living* Seon Jong Chung,1996 This work discusses the issues among people creating computer communication technology the people using computer communication the people impacted by it and the regulators responsible for balancing the interest of these multiple groups   **A Practical Approach to Operating Systems** Malcolm G. Lane,James D. Mooney,1988   Computers in Education Journal ,1996   Machine Learning and Optimization Models for Optimization in Cloud Punit Gupta,Mayank Kumar Goyal,Sudeshna Chakraborty,Ahmed A Elngar,2022-02-27 Machine Learning and Models for Optimization in Cloud s main aim is to meet the user requirement with high quality of service least time for computation and high reliability With increase in services migrating over cloud providers the load over the cloud increases resulting in fault and various security failure in the system results in decreasing reliability To fulfill this requirement cloud system uses intelligent metaheuristic and prediction algorithm to provide resources to the user in an efficient manner to manage the performance of the system and plan for upcoming requests Intelligent algorithm helps the system to predict and find a suitable resource for a cloud environment in real time with least computational complexity taking into mind the system performance in under loaded and over loaded condition This book discusses the future improvements and possible intelligent optimization models using artificial intelligence deep learning techniques and other hybrid models to improve the performance of cloud Various

methods to enhance the directivity of cloud services have been presented which would enable cloud to provide better services performance and quality of service to user It talks about the next generation intelligent optimization and fault model to improve security and reliability of cloud Key Features Comprehensive introduction to cloud architecture and its service models Vulnerability and issues in cloud SAAS PAAS and IAAS Fundamental issues related to optimizing the performance in Cloud Computing using meta heuristic AI and ML models Detailed study of optimization techniques and fault management techniques in multi layered cloud Methods to improve reliability and fault in cloud using nature inspired algorithms and artificial neural network Advanced study of algorithms using artificial intelligence for optimization in cloud Method for power efficient virtual machine placement using neural network in cloud Method for task scheduling using metaheuristic algorithms A study of machine learning and deep learning inspired resource allocation algorithm for cloud in fault aware environment This book aims to create a research interest motivation for graduates degree or post graduates It aims to present a study on optimization algorithms in cloud for researchers to provide them with a glimpse of future of cloud computing in the era of artificial intelligence *Mobile OS Vulnerabilities* Shivi Garg,Niyati Baliyan,2023-08-17 This is book offers in depth analysis of security vulnerabilities in different mobile operating systems It provides methodology and solutions for handling Android malware and vulnerabilities and transfers the latest knowledge in machine learning and deep learning models towards this end Further it presents a comprehensive analysis of software vulnerabilities based on different technical parameters such as causes severity techniques and software systems type Moreover the book also presents the current state of the art in the domain of software threats and vulnerabilities This would help analyze various threats that a system could face and subsequently it could guide the securityengineer to take proactive and cost effective countermeasures Security threats are escalating exponentially thus posing a serious challenge to mobile platforms Android and iOS are prominent due to their enhanced capabilities and popularity among users Therefore it is important to compare these two mobile platforms based on security aspects Android proved to be more vulnerable compared to iOS The malicious apps can cause severe repercussions such as privacy leaks app crashes financial losses caused by malware triggered premium rate SMSs arbitrary code installation etc Hence Android security is a major concern amongst researchers as seen in the last few years This book provides an exhaustive review of all the existing approaches in a structured format The book also focuses on the detection of malicious applications that compromise users security and privacy the detection performance of the different program analysis approach and the influence of different input generators during static and dynamic analysis on detection performance This book presents a novel method using an ensemble classifier scheme for detecting malicious applications which is less susceptible to the evolution of the Android ecosystem and malware compared to previous methods The book also introduces an ensemble multi class classifier scheme to classify malware into known families Furthermore we propose a novel framework of mapping malware to vulnerabilities exploited using Android malware s behavior reports leveraging pre

trained language models and deep learning techniques The mapped vulnerabilities can then be assessed on confidentiality integrity and availability on different Android components and sub systems and different layers   **Index of Conference Proceedings Received** British Library. Lending Division,1984   *The International Journal of Microcircuits and Electronic Packaging* ,1996   The Software Encyclopedia ,1986   **IBM Journal of Research and Development** ,2001   **IBM Systems Journal** International Business Machines Corporation,2006   *13th National Computer Security Conference* ,1990   *Current Technical Papers* ,1974   *Bell Laboratories Talks and Papers* Bell Telephone Laboratories. Libraries and Information Systems Center,1983   *Systems and Computer Technology* Yunfei Chen,Xiaodong Liu,Lipo Wang,Chunlei Ji,Qiang Sun,Yuan Ren,Xin Wang,2015-09-17 This volume consists of papers presented at the 2014 International Symposium on Systems and Computer Technology ISSCT 2014 Shanghai China 15 17 November 2014 The demand for systems and informatics have been constantly increasing as more and more computer applications have been built Great efforts have been made to improve the state of the a   日本経済新聞縮刷版目次総合政策研究所 日本経済新聞社 (Japan),1900

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