# 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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**Fiber Optics** Patrick Steglich,Fabio De Matteis,2019-09-04 Optical fibers in metrology telecommunications sensors manufacturing and health science have gained massive research interest The number of applications is increasing at a fast pace This book aims to present a collection of recent advances in fiber optics addressing both fundamental and industrial applications It covers the current progress and latest breakthroughs in emergent applications of fiber optics The book includes five chapters on recent developments in optical fiber communications and fiber sensors as well as the design simulation and fabrication of novel fiber concepts **Journal of Communications and Networks** ,2009 **Green Networking and Communications** Shafiullah Khan,Jaime Lloret Mauri,2013-10-29 Although the information and communication technology ICT industry accounted for only 2 percent of global greenhouse gas emissions in 2007 the explosive increase in data traffic brought about by a rapidly growing user base of more than a billion wireless subscribers is expected to nearly double that number by 2020 It is clear that now is the ti **Preformace study of WiMAX Network Security** Ali Raheem,2012-10-02 Research Paper postgraduate from the year 2011 in the subject Computer Science IT Security Middlesex University in London course Telecommunication Engineering language English abstract Undeniably networks have become very important techniques of exchanging information data in fast ways WIMAX World Interoperability for Microwave Access is one of the greatest technologies in the communication area WIMAX has been used widely in telecommunication for long distance communication From this point this paper will explore four important sections related to this technique Firstly it will discuss the performance conduct of the WIMAX as compared to that of Wi Fi Secondly it will critically evaluate the current solutions for the security problems in WIMAX network Thirdly it will attempt to design a new method to improve the security performance of WIMAX network Fourthly it will provide a security system that can be applied

in real life applications to support the security performance of WIMAX network        *CMOS Nanoelectronics: Analog and RF VLSI Circuits* Krzysztof Iniewski,2011-07-19 In depth coverage of integrated circuit design on the nanoscale level Written by international experts in industry and academia CMOS Nanoelectronics addresses the state of the art in integrated circuit design in the context of emerging systems New exciting opportunities in body area networks wireless communications data networking and optical imaging are discussed This cutting edge guide explores emerging design concepts for very low power and describes design approaches for RF transceivers high speed serial links PLL DLL and ADC DAC converters CMOS Nanoelectronics covers Portable high efficiency polar transmitters All digital RF signal generation Frequency multiplier design Tunable CMOS RF filters GaAs HBT linear power amplifier design High speed serial I O design CDMA based crosstalk cancellation Delta sigma fractional N PLL Delay locked loops Digital clock generators Analog design in deep submicron CMOS technologies 1 f noise reduction for linear analog CMOS ICs Broadband high resolution bandpass sigma delta modulators Analog digital conversion specifications for power line communication systems Digital to analog converters for LCDs Sub 1 V CMOS bandgap reference design And much more        **IBM Journal of Research and Development** ,2003
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web mustafa kemal final akademi anadolu lisesi İletİŞİm bİlgİlerİ adres mustafa kemal mah 2120 cad no 17 Çankaya ankara tel 0312 219 82 00 tel 2 0553 175 82 00

**final exam 20 marks ksu 2022 wrbb neu** - Sep 27 2022

web comprehending as well as bargain even more than supplementary will have enough money each success adjacent to the pronouncement as without difficulty as acuteness of this

final exam 20 marks ksu copy assets ceu social - May 24 2022

web final exam 20 marks ksu book review unveiling the power of words in some sort of driven by information and connectivity the energy of words has become more evident

*king saud university academic year g 2019 2020 model* - Apr 03 2023

web model answer of the final exam actu 462 40 january 1 2020 three hours 8 11 am problem 1 9 marks 2374 20 problem 4 9 marks 1 3 marks for a 3 year fully

**fall final exam schedule office of the registrar** - Feb 01 2023

web the final exam will be scheduled on tuesday december 5 from 3 30 to 5 30 pm for all sections of math 1111 the exam location will be provided by your instructor math

**final math help sessions kansas state university** - Feb 18 2022

web spring 2023 final examination prep help date may 10th time 1 00 pm 5 00 pm note the final examination time 6 20 pm 8 10 pm course subjects covered and