"The contributed chapters in the book written by the faculties of science stream in the light of the recent thinking and developments in the field of science and education.- Science& Technology is now dominates almost every field of our activities.In summary, The faculties (Science stream) of GEMS Arts & Science college have made an excellent attempt to bring about this book Homo Scientia", covering almost all the important areas from biological sciences to artificial intelligence. Every article has its own merits in both academic and research fronts..I record my grateful appreciation and thanks to the contributors of this book for their untiring efforts."

Dr. Balagopalan Unni

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GEMS ₹ 570

Layout and design Subin Abraham

ISBN 978-81-967332-6-3

9 788196 713263

HOMO SCIENTIA

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Dr. K Gopalakrishnan,
Smitha Pramod V

GEMS

HOMO SCIENTIA

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ENGLISH LANGUAGE
Book of Gems Science Association
Science/Articles
By Dr.B.G.Unni, Dr.Naveen Mohan,
Dr.K.Gopalakrishnan, Smitha Pramod V

First Published September 2023
PUBLISHER
GEMS ARTS AND SCIENCE COLLEGE
An ISO 9001:2015 Certified Institution
(Affiliated to University of Calicut and UGC Recognized
Under Section 2(F) of UGC Act 1956)Registration No:
Kl/2019/0242803(NGO-DARPAN) NITI AAYOG,
GOVERNMENT OF INDIA)
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Brief Biography

Dr. B.G.Unni, (Balagopalan Unni) Ph.D
(Allahabad central University)
FRES (London), FIANSc , FISAgBc, FICCE

Former Chief Scientist and Area Coordinator (Biotechnology & Biological Sciences) DADD and Fulbright Fellow retired from CSIR service in 2015 after 38 years of research career at CSIR North East Institute of Science & Technology Jorhat Assam. Appointed at Assam down town University as Director-Research in March 2015 and continued up to June 2019 and then re-designated as Adviser Research in August 2019). Back in Kerala, Dr.Unni is appointed as Director Academic & Research at GEMS College of Arts & Science affiliated to University of Calicut from August 2019. Both the positions are on honorary basis to strengthen the institutions in research areas. He did his BSc Biology (1972-74, Ewing Christian College, Alld University), MSc in Biochemistry(1974-76)(Second Rank) and Ph.D in Biochemistry from Allahabad University(1976-80) and PDF in Molecular Biology from Texas A&M University, USA(1988-91). Dr. Unni is specialized in Biochemistry, Molecular Biology, and Biotechnology and well established in his area of research and completed more than 40 years of research in both basic and applied fields of research. Dr.Unni got more than 130 research papers, 190 abstracts, 35 papers in proceedings, 7 patents,1 technology.18 chapters in books, edited 3 books and 29 students

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received PhD degrees under his guidance and supervision. Dr. Unni had completed more than 20 projects sponsored by Commonwealth Science Council, London, Ministry of Non conventional Energy Sources, Department of Non conventional Energy Sources Govt of India, North Eastern Council Govt of India, Department of Science &Technology, Department of Biotechnology, Central Silk Board,GB Pant Institute of Himalayan Environment and Development, CSIR and DRDO, Ministry of Defense, Govt of India during his scientific tenure at CSIR NEIST. Dr Unni received- Fulbright Travel Award/ Fellowship (USA) Dr. B.M. Das Memorial Science award, Hebrew University Award , H.R. Cama Memorial Travel Award,COSTED Travel Award,. DAAD- fellowship-Germany, Well Mark International Scholarship (USA) & Technology award in life sciences by CSIR,Govt of India . Best Fulbright Alumni Chapter Leader-South Asia Selected by the United States Education Foundation In India (USIEF), New Delhi .Nominated to represent India at the International Fulbright Scholars meet at Marrakech, Morocco- Nominated by United States Education Foundation In India, New Delhi . Dr. Unni is in the editorial board of more than eight indexed journal in the country .Dr.Unni was nominated to various state and central committees such as High power committee for development of sericulture activities Muga, Eri,Tassar and Mulberry in Assam nominated by Governor of Assam, .Expert in the area of non mulberry sericulture, Ministry of Textiles, Advisory Board, Post graduate Biotechnology programme, Academic Council, Assam Agricultural University, Research Council, Central Silk Board, Ministry of Textiles , DBT's Nominee for Biosafety Committee ,Vice President SBC (India) Indian Institute of Science Bangalore, Vice President Indian Academy of Neuro-sciences, Member Fulbright Academy of Science & Technology, USA, Board of studies- Botany Nagaland University and Biotechnology Saugar University Madhya Pradesh., Fellow, Indian Academy of Neurosciences & Indian Society of Agricultural Biochemists, Fellow Royal Entomological Society, London UK and Scientific

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Advisor International Foundation of Science, Sweden, Member, Board of Studies Raiganj University (2017----), Member Research Review committee Tea Board of India (2016-2019), Member Advisory Committee Cancer Research Advisory Board, North East Cancer Hospital & Research Institute (2017--) President, Tea Improvement Consortium, Ltd, Tocklai Assam (2018-2020) .

Dr.Unni visited USA, Germany, Israel, Jordan, France, Morocco ,UK, Thailand ,Jordan, Singapore , China and UAE under various exchange program.

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Preface

I am very happy to learn that, the GEMS Arts & Science College is bringing out a series of books written by the faculty in this academic year. The college is occupying a very important position among the colleges in Kerala, the same way the college is having unique standing in both academic and research fronts too. This is because of the excellent management, faculties and the best performances of the students.. I have full confident that in the course of time, and with the sincere commitment and dedication of the faculties , students and with management , the college will attain high level perfection and excellence and became a model college in the state of Kerala

This book entitled " Homo Scientia" had comprehensive research topics in various aspects in the topics of cyber security, biotechnology, microbiology and geology.A brief description about the cybersecurity, the protection of computer set up such as hardware, software data from several threats have been described in the chapter The best practices for deploying and managing IPS network security tools have been explored. The integration of intrusion prevention system (IPS) solutions, adherence to security policies, regular updates, monitoring and the implementation of incident response procedures are considered to be the essential components of a comprehensive network security framework. The risk management in cyber security, various cyber-attack kinds, malware, and some strategies to tackle these attacks are also explained by the authors. A comprehensive overview of the evolution of computer graphics, exploring the advancements in hardware, software, algorithms, and techniques that have propelled the field from its early pixel-based beginnings to the current state of realism etc also described. Optical character recognition has been extensively investigated in the past few years, and has been proven that high recognition rates can be achieved in specific

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application scenarios using some standard and well-studied methods such as neural network, support vector machine (SVM), etc. The possibility of learning an appropriate set of features for designing optical character recognition (OCR) has been investigated

Biotechnology is an interdisciplinary science using modern technologies to construct biological processes in research, agriculture, formulation of pharmaceutical products and other related fields. The better understanding of advances in plant genetic resources, genome modifications, omics technologies to generate new solutions for food security under changing environmental scenarios etc have been discussed in this chapter. The increasing demand for food had a great impact on the agriculture sector to address the various challenges associated with crop productivity. The tremendous advancement in plant research helps in understanding plant biology for sustainable food security, functional ecosystems, crop improvement and human health. One of the sustainable farming techniques is the use of fertilizer at nano level. Nanomaterials that enhance plant nutrition could be considered as an alternative to the conventional chemical fertilizers. one chapter covered the importance of nano fertilizer to enhance metabolic processes in plants and reviewed the concerns in developing nanotechnological methods in the future. Metabolomics has now emerged as a powerful tool for the comprehensive analysis of metabolites within biological systems. One of the chapters provides a review on metabolomics, encompassing its methodologies, applications, potential impact on personalized medicine ,and discusses further the need for advancements in analytical technologies. The antifungal activity of mangroves, particularly Rhizophora species are one of the main sources for fungicidal compounds due to the presence of high concentration of phenols. The antifungal activity of Rhizophora species has been elucidated, and could be further utilized as biocontrol agents for fungal disease in agricultural crops. One of the chapters discussed the species identification and its impact on economical and ecological level in the species like Nutmeg, one of the important medicinal plants that had a greater attention ,however, it was very difficult to differentiate the sexual identity

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in the seedling stages. But the protein content screening among the studied plantlets had differentiated the sexes in the species as explained by the author.

AI (Artificial Intelligence) or machine intelligence enables farmers to enhance the quality and ensure a quick go-to market strategy for crops, and adoption of these algorithms to improve food industries. Artificial intelligence (AI) has also the potential to revolutionize education, from personalized learning to assessment and grading. Additionally, AI-powered tools can provide greater accessibility to students with disabilities, while also enabling more engaging and interactive content. AI continues to develop and become more prevalent in education, towards responsible and equitable implementation. However the negative and positive part of the AI may also be looked into.

The chapters related to microbiological aspects have also been incorporated in this book . Carbapenem-resistant A. baumannii (CRAb), bacteria that cause multi-infections in humans and resistant to multiple drugs too. The study attempted to isolate and characterize the bacterial species from the clinical specimens using biochemical techniques. The enzyme, carbapenemase produced by the bacteria was isolated and determined by different assays. Another study identified the antibacterial, antioxidant and anticancer activities of Ganoderma lucidum by various chromatographic techniques. Anticancer activity was also assessed on HeLa cell lines using MTT assay and DPPH assay. In one of the chapters,the author discussed L-asparaginase, one of the widely exploited enzymes for the treatment of acute lymphoblastic leukemia (ALL). Also attempted to isolate and characterize the enzyme from soil samples collected from different locations at Kerala. The study indicated that soils can provide a rich source for L-asparaginase which has got ample application in pharmaceutical industries.

The studies on various geological aspects with respect to different geographical areas in Kerala soil has been included in the book. The vertical geochemical variation and elemental mobility of the lateritic terrain in the Makkaraparamba of Malappuram District, Kerala has been very well investigated. Under extremely oxidizing and leaching conditions, laterite

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soil transformed into a variety of rocks and further developed into stable secondary product in the existing humid tropical and subtropical environments. The hydrogeological conditions in Kumbala- Kaliyar river basin, Kasaragod district, Kerala was assessed by means of Vertical Electrical Sounding (VES). The digital spatial data output of the present study would be much helpful for planning and management of surface and sub-surface water resources of Kasaragod River basin in which the Kasaragod township is centrally located

The contributed chapters in the book written by the faculties of science stream in the light of the recent thinking and developments in the field of science and education.Science& Technology is now dominates almost every field of our activities. In summary , The faculties (Science stream) of GEMS Arts & Science college have made a n excellent attempt to bring about this book Homo Scientia".covering almost all the important areas from biological sciences to artificial intelligence. Every article has its own merits in both academic and research fronts..I record my grateful appreciation and thanks to the contributors of this book for their untiring efforts.

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RISK MANAGEMENT IN NETWORK SECURITY ATTACKS DEPENDS ON CYBERSECURITY WITH DIFFERENT MALWARE

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Department of Computer Science

ABSTRACT

Cybersecurity was developed to protect computers and networks from outside threats. Businesses frequently employ cybersecurity experts to protect their personal information, maintain worker productivity, and increase consumer confidence in their products and services. Data breaches are increasing annually, and the global cyber threat is continually evolving. The risk management in cyber security, various cyber-attack kinds, malware, and some strategies to thwart these attacks are all covered in this paper. Additionally, you will discover how cyber security functions, why it is required, what cyber security professionals undertake to safeguard data, how to become one, etc.

INTRODUCTION

The method of preventing damaging intrusions on computers, servers, mobile devices, electronic systems, networks, and data is known as cybersecurity. It goes under the terms information technology security and electronic information security. The phrase is used in many contexts, including business and mobile computing, and is relevant to topics like business continuity, end-user education, network security, information security, application security, and operational security.

Data integrity indicates that only authorised users can add

to, change, or remove information, while privacy means that only allowed parties can view the data. Specialists in cyber security are in greater demand than ever. The most important aspect of cyber security is using authentication processes. It is a continuous process that requires modifications in later rounds to increase sustainability and usability. Only if a Cyber Security Awareness programme is examined and assessed is this feasible. Having knowledge of the organization's audience and demographics is always helpful for improving the programme.

The National Cyber Security Centre of the United Kingdom government's "10 Steps to Cyber Security" manual emphasizes the value of system monitoring .The Australian Cyber Security Centre in Australia frequently releases advice on how businesses can address the most recent cyber-security risks. These items demonstrate how important it is to stop this cyberattack.

LITERATURE STUDIES

Protecting your networks from intrusion is a common issue when investing in cybersecurity. But what occurs if the worst does occur? Do you know what will happen if your networks are breached? What information would be specifically at risk in a breach? What data would be jeopardized? Which documents would be revealed? How quickly would you be able to detect a breach in your network? Last but not least, how would you react if an attack were to occur? Are you certain that your network can resist a breach? You should spend time on risk management for your network security if you don't know the answers to any of the aforementioned issues. Regardless of how strong your cyber protections are, you will always be at risk. Most businesses don't realise how real their risk is until after a cybercriminal has already struck them.

Although risk cannot be eliminated, it can be diminished. By recognising the dangers that already exist, evaluating their impact, and preparing a response, risk management is a process that aims to reduce risk. Identifying, analysing, evaluating, and resolving the cyber security hazards to your company is known as cyber risk management. Replicated risk assessment is the

initial step in the cyber security risk management process. This risk assessment will give you a quick overview of the threats to the cyber security of your company and their potential severity. Your cyber risk management programme then decides how to prioritise and address those threats based on your organization's tolerance for risk.

Risk management, information security policies, processes, standards, guidelines, baselines, and security education are all parts of the broad topic of security management. To apply effective control, management methods like information classification, risk analysis, and asset classification are used to identify risks, categorise assets, and evaluate system vulnerabilities. An organization's cybersecurity dangers are continuously identified, examined, evaluated, and dealt with through cybersecurity risk management. Discover how to create and put into action your security processes. One is that malevolent users and hackers are coming up with new ways to attack a network. As a result, managers must keep up with the most recent attack techniques for each kind of network equipment. When they become aware of a new hacking or attack strategy, they must immediately upgrade their defences.

Identification, analysis, assessment, and mitigation of cybersecurity risks are all ongoing processes in cybersecurity risk management. Learn to plan and carry out your security

procedures. For starters, unscrupulous users and hackers continue to devise new ways to assault networks. To protect any sort of network equipment, managers must stay current on attack techniques. As soon as they become aware of a new hacking or assault technique, they must then upgrade their defenses.

The network is likely an overlapping infrastructure of cloud systems, wireless systems, and other systems, platforms, and networks if it is anything like the networks of many other businesses. Employees, clients, and outside parties like suppliers and vendors all have access to it. There is undoubtedly a lot of risk to handle, and you must understand where that risk is. A risk management plan recognises that a company cannot completely eradicate all system flaws or completely thwart all online threats. Developing a cybersecurity risk management strategy aids firms in being the first to respond to the most serious vulnerabilities, threat patterns, and assaults.

Types of Cyber Crimes

Any unauthorised use of a computer, device, or network is cybercrime. The three categories are computer-assisted crimes, crimes where computers themselves are targets, and crimes where computers are just incidental—as opposed to being actively involved—in the crime. Cybercriminals typically employ a range of strategies, including:

Denial of Service, or DOS: - A denial-of-service attack is where cybercriminals prevent a computer system from fulfilling legitimate requests by overwhelming the networks and servers with traffic.

Romance Scams: - Cybercriminals commit using dating sites, chat rooms and apps. By fooling singles looking for love into divulging personal information, criminals profit from their situation.

Man in the Middle: - where a hacker places themselves in front of a router and a victim's computer to sniff data packets.

Phishing: - A hacker sends a seemingly legitimate-looking email asking users to disclose personal information.

Emotet Malware: - A clever trojan called Emotet can load other software in addition to stealing data.

Dridex Malware: -Dridex is a financial trojan capable of stealing passwords, banking details and personal data.

SQL Injection: - An SQL (structured language query) injection used to take control of and steal data from a database.

Ransomware: - This software infects an organization's systems and restricts access to encrypted data or systems until a ransom is paid to the perpetrator.

Malware: - Malware means malicious software. Malware is computer software created by cybercriminals or hackers to disrupt or damage a legitimate user's machine. One of the most common cyber risks is it. Malware is frequently sent by an unauthorized email attachment or a download that appears legitimate. Cybercriminals might employ it to commit financial crimes or conduct cyberattacks with political objectives.

Types of Malware

There are several different types of malware, including:

» **Virus:** A self-replicating program that attaches itself to a clean file and spreads throughout a computer system, infecting files with malicious code.

» **Trojans:** A type of malware that is disguised as legitimate software. Cybercriminals trick users into uploading Trojans onto their computers where they cause damage or collect data.

» **Spyware:** A program that secretly records what a user does, so that cybercriminals can make use of this information. For example, spyware could capture credit card details.

» **Adware:** Advertising software which can be used to spread malware.

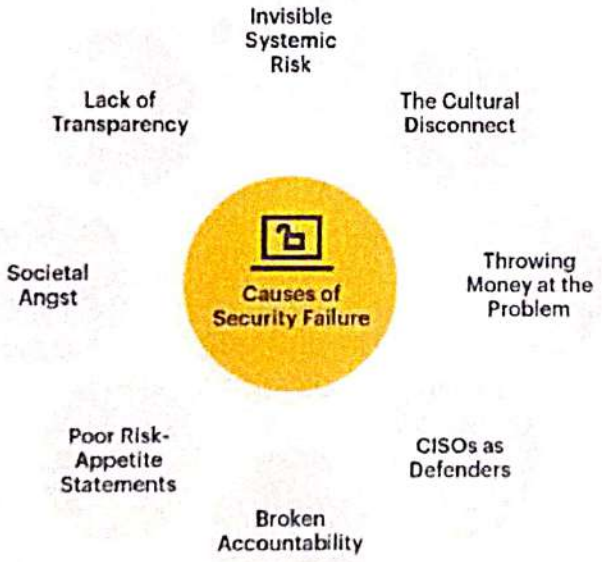
» **Botnets:** Networks of malware-infected computers which cybercriminals use to perform tasks online without the user's permission.

Cyber Threat

Any method that can be used to compromise security, harm the organisation, or exfiltrate data is generally referred to as a cyber threat. Adversarial threats, natural disasters, system failure, and human errors are some of the common threat categories that modern enterprises must deal with. Unauthorized access, authorised individuals misusing information, data leaks, data loss, and service disruption are the main danger vectors that plague most enterprises.

Cyber Security Experts

Companies are increasingly turning to cyber security experts to spot possible threats and safeguard sensitive data



as data breaches, hacking, and cybercrime reach new heights. Experts in cyber security do the following tasks:

» Identifying, testing, and repairing a company's infrastructure's vulnerabilities

» Monitor systems for malicious content

» Identify network breaches.

» Frequently update your software and secure yourself with firewalls and antivirus software.

» Strengthen areas where attacks may have occurred.

Motivations of Cyber Criminals

The primary goal of cybercrime is to interfere with essential infrastructure and routine corporate operations. Cybercriminals frequently modify stolen data to gain financial gain, inflict financial loss, harm someone's reputation, further military goals, or spread ideologies. Some people simply hack for fun or to demonstrate their skills; they don't even require justification. Cybercriminals can be classified as Black-Hat, Gray-Hat, White-Hat, Suicide, Script, Cyber Terrorist, State-Sponsored, and Hacktivist types.

METHODOLOGY

In this paper, the methodologies used in Cybersecurity are different stages. Despite different techniques, a risk management programme usually includes the following steps:

» Recognize the dangers that could jeopardise your cyber security. This often entails determining your system's cyber security flaws and the dangers that could exploit them.

» Determine the likelihood that each risk will materialise and the potential impact on the project if it does by analysing the risk's severity.

» Evaluate how each risk fits within your risk appetite (your the predetermined level of acceptable risk).

Prioritise the risks

Decide how to respond to each risk. There are generally four options:

Treat – modify the risk's likelihood and/or impact typically by implementing security controls.

Tolerate means to consciously decide to keep the danger (e.g., it falls within the established risk acceptance criteria).

Terminate - fully avoid the risk by stopping or altering the action that is posing it.

Transfer – share the risk with another party, typically by contracting out or purchasing insurance.

As a continuous process, cyber risk management, evaluates your risks to make sure they are still acceptable, assesses your controls to make sure they are still effective and makes changes as necessary. Keep in mind that when your systems and activities change and the cyber threat landscape changes, your risks will also alter.

Cyber security Risk Management process

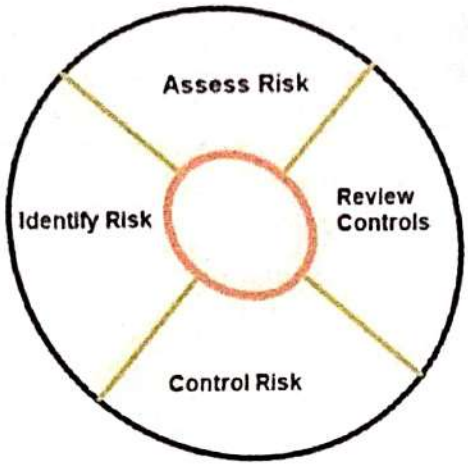
In general, there are four steps in the risk management process for cybersecurity:

Identifying risk- involves assessing the environment around the organisation to find any present or potential dangers that might have an impact on daily operations.

Assessing risks- involves determining their likelihood of having an impact on the organisation and the potential severity of that impact.

Control risk- through defining strategies, practises, tools, or other actions that can assist the organisation in reducing the risks.

Review controls- continuously assessing the effectiveness of controls in reducing risks, and adding or changing controls as necessary.



Risk management process

Cybersecurity Failure

Simply put, inadequate controls are the reason why cybersecurity fails. No company is completely secure, and bad actors or dangers are outside of their control. Only investments and priorities in security preparation are under the control of organisations.

Notably, cybersecurity concerns heavily involve the human aspect. Cybercriminals have mastered the art of manipulating people, and they deploy ever-more-advanced methods to get staff members to click on harmful links . It is crucial to guarantee that personnel have the knowledge and skills necessary to more effectively defend against these attacks.

Solutions for Risk Management

Cybercrime doesn't need to be unstoppable. And creating a risk management strategy does not necessarily include building a modest dam to block a wall of water. Governments and other corporations are gaining despite the expenditures. Among these benefits are:

» Understanding how to successfully analyze and evaluate risk factors

» Learning how to avoid or reduce risks

» Problem-solving to prevent or resolve cybercrime

Collaborating with other groups to recognise, rank, and stop risks. Experience with cybercrime has revealed several approaches that are truly efficient. Most firms have access to tools like the ISO guidelines, statistical data, and risk management software . Software for risk management is created by N ableTM to assist MSPs in reducing cybercrime and creating proactive IT policies.

Keys to Successful Risk Management

Continuous internal audits: Cybercriminals can strike weak points at any time, thus keeping an eye on the network of a company minimises the likelihood that they will infiltrate a system extremely deeply. Network segregation between data and other business functions: Once a cybercriminal has gained access to a system, they will look for data nodes or ways to transfer money from a corporation into their accounts. Separating systems makes it simpler to identify crooks and rapidly apprehend them. Collaboration with other businesses and organisations: Because cybercriminals target all kinds of companies and organisations, it's important to work together to build a community that monitors for intrusions, reports assaults, and tracks down the sources of those attacks .

Cyber safety tips - protect yourself against cyberattacks

How can individuals and businesses defend themselves from cyber threats? Here are our top pieces of advice for staying safe online:

1. Update your operating system and software to get the most recent security updates.

2. Antivirus software should be used to identify and remove threats. This is done by security programmes like Kaspersky Total Security. Maintaining software updates will give you the highest level of security.

3. Use secure passwords: Make sure your passwords are

difficult to decipher.

4. Avoid opening email attachments from unfamiliar senders since they can contain viruses.

5. Avoid clicking on links in emails from unknown senders or unfamiliar websites since malware frequently spreads this way.

6. Keep away from utilising public Wi-Fi networks that aren't secure: Man-in-the-middle attacks can take advantage of insecure networks.

CONCLUSION

Network security is the most important thing in the computer network. Every connected device or network will affect any type of attack at any time. We should be alert every time that's the only thing to prevent them. The environment itself is changing in several significant ways: An increase in the quantity and type of connections that can be the target of cyber-attacks is caused by growing.

Network, infrastructure, and architectural complexity. It is challenging to stay on top of the expanding list of information security controls, needs, and dangers since attacks are becoming more sophisticated and threat sensing is getting worse.

Organizations will continue to struggle to develop adequate but effective third-party controls, especially given that the majority of vendors, particularly cloud vendors, rely on third parties themselves (which become your fourth parties and so on). As new digital initiatives, typically based in the public cloud, are implemented before the security issues are addressed, cybersecurity debt has reached previously unheard-of heights. To interact with the physical environment, cyber-physical systems are designed to coordinate sensing, computing, control, networking, and analytics (including humans). Smart buildings are an example of how connecting the digital and physical worlds creates a special and expanding area of vulnerability.