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Research Paper on Cyber Security

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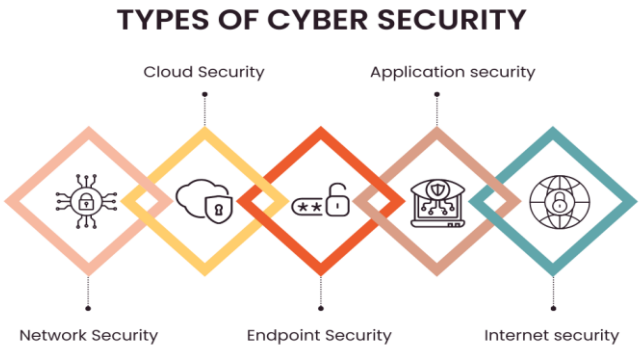
Abstract - Cybersecurity is like our computers and phones' superhero. They help keep our computers and phone safe from sneaky bad guys on the internet. It's all about using genius locks and tricks to keep our digital stuff virus free, hacker proof and away from funny online stunts. Like we cheque if the doors are locked and who leaving keys under the doormat at home, cybersecurity is our online detectives to keep an eye on websites to see they are safe, and be a bit more careful when clicking on links in emails from strangers. Having a shield for your digital world, to enjoy the internet without worries. Our online superhero is cybersecurity, the cybersecurity that allows us to surf the web, play games, and chat with friends securely.

***KeyWords*:**Malware,PenetrationTesting,Web AppTesting,Ddos Attacks,Ransomware Attacks,Phishing Attacks.

1.INTRODUCTION

Now in this digital world, cybersecurity acts as the shield security from the endless list of threats that these digital things face. With a discourse over several multifaceted discipline and a suite of strategies, technologies, and process used to harden computer systems, networks, and data from unauthorised access and malicious exploit combined. Cybersecurity is ever more important in today's increasingly digitalised world. It is aimed at barrier protection of individuals, organisations and government from cyber attacks such as: data breaches, sophisticated malware incursion and all from breaches in data confidentiality, integrity and availability. One of the problems you constantly face in the life of the cybersecurity professional is the ability to see, risk, kill and respond to every cyber threat evolving through the network and endpoint security, identity management and even incident response camera. In a funny way, cybersecurity is the linchpin of digital trust, if only because we can be sure that the massive digital space we share from every corner of the globe will work in a secure and robust manner.

2. Body of Paper



- **Network security –** Network security is the practise of keeping computer networks safe from unauthorised access, theft and damage.. Secure routers, switches, firewalls and other network devices, as well as setting up VPNs and SSL (Secure Sockets Layer) encryption, are all part of it.
- **Cloud Security –** Cloud security therefore refers to measures taken to ensure that data as well as application that are hosted in the cloud are secure. It's just like dead bolting your front door and having cams to monitor your home. In the cloud this implies processes such as encrypting the data i.e. making the data difficult to decode unless by the right parties, controlling access and Violin, constant auditing of activities typically associated with the cloud. Of this all aids in the protection of confidential information and ensures that no one gets to compromise or invade your privacy..
- **Application Security –** application security involves protection of an application from cyber attack like the SQL injection and cross site scripting.. This may be measures such as firewalls, access controls and encryption, vulnerability and penetration testing at different times

- **Information Security** – Information security is the protection of organisational data like personal information, financial data, and organisational intellectual property.. All of the following are part of this: adoption of data classification scheme, identification and control of data access, regulation of data storage and disposal; undertaking periodic risk analysis; and security cheque.
- **Endpoint Security** – Endpoint security has to do with protection of specific computers such as laptop, PC's and other mobile stations from cyber threats.. This includes installing pirate killers, fire walls and any other measures that prevents the incidence of malware and all sorts of attack.
- **Internet of Things (IoT) Security** –IoT security is the method of safeguarding IoT connected devices Internet of Things smart home hubs for example, or medical devices, industrial devices. Because these devices are commonly inter-connected they form a broad and soft-target in the network. For this reason, measures such as encryption (to cover data), access controls (to cover who can get in) and guards (to cover for monitoring) need to be implemented. This way, both the user and the entrepreneur can protect themselves from cyber threats and keep their systems, as well as their networks, up and safe.

Why is its importance in today's world?

1. Increased exposure to attacks in organisations

Since more people nowadays use IoT devices and internet services there is a higher risk to become a victim of a cyberattack. It is noted that the attackers will attempt to gain entry to an organisation's data through employees. These will appear as phishing e-mails or messages that request personal information or the ability to access files. Vulnerability is increasingly becoming easy for hackers to locate and get access to a lot more information they desire. Small and medium enterprises are usually lesser secured as compared to a large organisation or company. Thus, it is quite simple for hackers to penetrate special and invariable passwords during a long period of time. The prevention and detection of theft, fraudulent emails, financial theft, hacking, virus and more, is on the list of tasks that must be handled by cybersecurity professionals in the organisations. Cybersecurity is relevant for everyone. It is not limited to internet and cyberspace but covers the actual physical realm.

2. Increased Cybersecurity threats faced by individuals

Not only do donations and businesses have enemies in hackers but also regular citizens as they are more exposed than ever to cyber threats . Hackers corrupt the data of a person and get them sold for money. Therefore, the data contained in our mobile, computer and other electronic devices are therefore vulnerable. With the high profile identity, people have the opportunity of having more theft cases. Phishing is a type of cyber attack where the attacker creates and sends fake messages on behalf of a genuine and trustworthy organisation through e-mail. It can likewise be employed in other forms of communication can also be a part of. This will capture your important personal information, user ids and password and may even infect your gadget with a virus. Phishing is a rather widespread type of cyber threat.

3. Cybercrime is expensive

Why cybersecurity is an emerging field is that no business can risk losing their data to cybercriminals. Ponemon Institute found that data breaches are costing businesses $3.62 million and that kind of loss is enough to bring many companies to their knees. Further, the cost of cybercrime went up across the globe. As intimated by Forbes publication in the recent past, "the cost of breaches has been consistently rising in the last few years. New vulnerable areas occurred as organisations transitioned to remote working increasing the attack area and many vulnerabilities for hackers away from office environments. Besides, the ability to wreak automated attacks by hackers and the option to farm cryptocurrencies using ransomwears have also contributed to cyberincidents. Most Cybercrimes are expensive hence Cybersecurity is also increasingly becoming more important.

4. Newer hacking methods

Or are we all not certain that hackers have not become smarter? They look for ways of getting the data every day. Apart from breach of access, password sniffing, system infiltration, website defacement, web browser exploits, instant messaging abuse, IP theft or unauthorised access, there is new methodology being implemented by hackers everyday. Hence, it is very important to enlighten people about Cybercrime. In this context, the only way to protect your data is by having adequate knowledge and the implementation of innovation tools. Also, the possibilities of access control

and data protection policies will help you preserve your data.

5. **Hackers are Everywhere**

Every organisation, professional, and even hackers, take advantage of everything and everyone. Even the most conservative entities are not immune to cyber threats – it affects companies in the financial and insurance industry, small businesses, hospitals and clinics, Governments, Energy and higher education. Today it is also hard to talk about protecting aeroplane systems and car alarms. Therefore, regardless of the type of business it maybe, for the top internet security experts to ensure that security threats in business are eliminated for every technological advancement becomes paramount.

Types of common cyber security attacks

Over the last few years, more and more companies and people experienced critical cyber threats and their negative impact. This can lead to the loss of social security numbers, credit card information, bank account information and have information leaks. These attacks have awakened organisations to the need of adopting appropriate cybersecurity measures put in place.

- **Phishing attacks**

Phishing is a trick that Also, phishing is a method for deceiving users into clicking on dangerous attachments or links to help steal customer data, including financial information or login credentials.

- **Malware attacks**

Malware is a term that is used to describe a virus that is a form of parasitic software that principally gains control of host devices, acquires details, and utilise the host to attack other systems

- **Denial-of-service attacks**

A denial-of-service attack is a kind of attack that prevents a user from gaining access to a system or service in question. This is done through making inundant requests or traffic into the system or incarcerating it in an attempt to impune its operations.

- **Ransomware attacks**

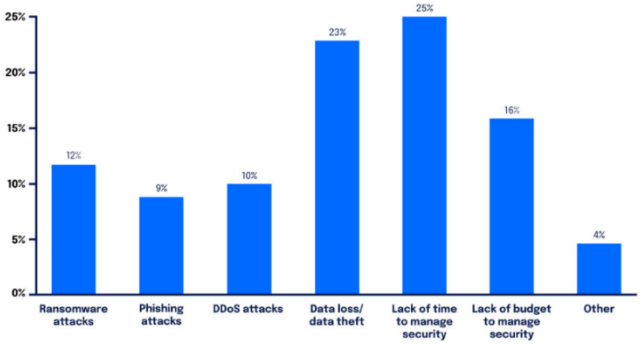
Ransomware is infection that targets the systems or files and then lock them, with the creators of the virus demanding to be paid to unlock them. This may lead to destruction of critical information or complete power outages in the entire organisation.

- **Man-in-the-middle (MitM) attacks**

A MitM attack can be described as an attack in which an attacker eavesdrops and impersonates two parties to each other. Such actions can be performed through sending targets to a fake server or intercepting a connexion string.

- **SQL injection**

A SQL injection attack is the unauthorised introduction of SQL code which is integrated and executed in a Web Application in order to gain unauthorised access to a database. This code can both write to or read from this place in the database or completely remove what is there. SQL injection attacks can also compromise the server or affect the system in other ways with other activities with out proper security.



Goals

Most of the business activities depend on the internet putting many of their data and resources at the mercy of cyber menace. If the data and the system resources are the foundation of the organisation, it derivate lacking maxim that a threat to any of these individuals is a threat to the team. A threat can be as small as a bug in code to as large as liability for cloud hijacking. Foremost, risks and expectations of the cost of reconstruction enable the organisation to keep prepared while anticipating the potential losses. Hence, it is essential for every organisation to know and develop the objectives of

cybersecurity precise to it to safeguard the precious information. Cybersecurity is a technique developed for protection of intricate information on the World Wide Web and in devices protecting it from attack, annihilation or unauthorised access. Cyber security simply aims at creating an environment of no risk to safely store data and to protect the network and converge along with devices from cyber terrorisms.

Goals of Cyber Security?

- ❖ The objective of Cybersecurity is to protect information from being stolen, compromised or attacked. Cybersecurity can be measured by at least one of three goals-

1.Protect the confidentiality of data.
2.Preserve the integrity of data.
3.Promote the availability of data for authorized users.

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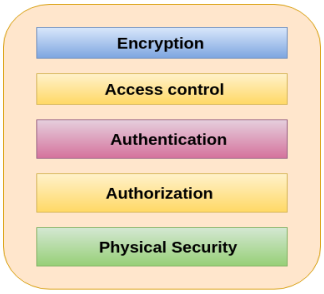
1) Confidentiality

Confidentiality Privacy,unauthorized disclosure of information. Simply put, it is the practice of securing data by allowing access only to those who are authorized while not exposing any information about its contents. It keeps necessary information away from those who should not see it, and provides the people that need to know, an open line of communication. For instance, data encryption is a good example to preserve confidentiality.

- Tools for Confidentiality



Confidentiality Tools

- Encryption

When information is transformed by using such algorithm that it becomes unreadable for unauthorized users. Data can be transformed using a secret key (encryption key), so that the data in its new format can only then be read once it goes through another transformation with yet another secret key(decryption_key). It scrambles and machinizes sensitive pieces of information such as credit card numbers into an unreadable cipher text. Remote workers who are accessing your network through a VPN are using encrypted data, but this encryption only makes that information indecipherable. Both of these are basically Asymmetric-key and symmetric-key.

- Access control

Access control defines rules and policies for limiting access to a system or to physical or virtual resources. It is a process by which users are granted access and certain privileges to systems, resources or information. In access control systems, users need to present credentials before they can be granted access such as a person's name or a computer's serial number. In physical systems, these credentials may come in many forms, but credentials that can't be transferred provide the most security.

Authentication

An authentication is a process that ensures and confirms a user's identity or role that someone has. It can be done in a number of different ways, but it is usually based on a combination of-

- something the person has (like a smart card or a radio key for storing secret keys),
- something the person knows (like a password),
- something the person is (like a human with a fingerprint).

Authentication is the necessity of every organizations because it enables organizations to keep their networks secure by permitting only authenticated users to access its protected resources. These resources may include computer systems, networks, databases, websites and other network-based applications or services.

- Authorization

An authorization is a security mechanism allowing one to do or possess something. Based on an access control policy, which includes computer programs, files, services, data and application features, it is used to ascertain whether someone or system is granted access to resources. Usually, it comes before user identity validation via authentication. Usually, system managers are assigned permission levels spanning all system and user resources. A system checks the access rules of an authenticated user during authorization either allowing or denying resource access.

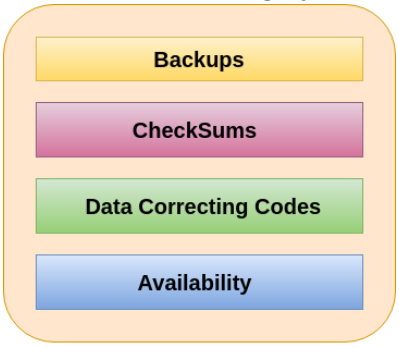
- Physical Security

Physical security describes measures designed to deny the unauthorized access of IT assets like facilities, equipment, personnel, resources and other properties from damage. It protects these assets from physical threats including theft, vandalism, fire and natural disasters.

2)Integrity

Integrity refers to the methods for ensuring that data is real, accurate and safeguarded from unauthorized user modification. It is the property that information has not be altered in an unauthorized way, and that source of the information is genuine.

- Tools for Integrity



Integrity Tools

- Backups

Backup, a process which makes the data be archived to several consecutive points in time.ResponseEntity. In making additional copies of data or a data file, to ensure that the original will not be lost permanently (disasters). It is also used to create copies for historical purposes, such as longitudinal studies or statistics, which are answered in the same way. On Windows, this is particularly common with binaries that produce backup files (like applications). BAK file extension.

- Checksums

Checksum — A checksum is a number derived from the data being transferred and transmitted along with the blocks of files or storage for purpose of error detection. Or, and this is the function of which we are computing — a file? It is mostly used to verify that two sets of data are the same. But a checksum function always base on the whole content of a file. It is so structured that a slight change to the input file (a single bit flip in most use cases) changes the output value outright.

- Data Correcting Codes

This method of data storage allows for the detection of internal minor errors and self-correction of these errors with minimum efforts.

3) Availability

Availability, as the property where information is available and modifiable by those authorised in a timely way, is one of them. This is the promise of proven and predictable access to our sensitive, data, by the right people. Tools for Availability 1.Physical Protections 2.Computational Redundancies 3.Physical Protections-Physical safeguard refers to ways in which information can be physically available, in case something goes wrong physically. What that ensures is putting sensitive information and critical information technology in secure areas. ¬ Computational redundancies It is a fault tolerant against accidental faults. It protects computers and storage devices which act as fallbacks, in the event of failures. The following are few of steps to maintain these goals. 1.To put their possessions into categories according to their location and rank. Back safe through all periods kept are the most important ones. 2.Possible threats held down. 3.Deciding which method of security guards for each threat.Monitoring for breaches, managing data in rest, data in movement data at rest and data in motion.n a timely fashion by those authorized to do so. It is the guarantee of reliable and constant access

to our sensitive data by authorized people. ϖ Tools for Availability o Physical Protections o Computational Redundancies ¬ Physical Protections Physical safeguard means to keep information available even in the event of physical challenges. It ensure sensitive information and critical information technology are housed in secure areas. ¬ Computational redundancies It is applied as fault tolerant against accidental faults. It protects computers and storage devices that serve as fallbacks in the case of failures. Here are few steps to maintain these goals 1.Categorising the possessions based on their position and precedence. The most important ones are kept back safe at all periods. 2.Holding down possible threats. 3.Determining the method of security guards for each threat 4.Monitoring any breaching activities and managing data at rest and data in motion. 5.Involve iterative maintenance and also rapid responding in case of some issues. 6.Using such updated policies to cope with risk that has been assessed previously.

Advantages of Cyber Security

However, there are some definite advantages of cybersecurity and while achieving benefits derived from cybersecurity would be situation and organisation specific, there are many. Some of the advantages are elaborated further: 1.Online threats are protected. The other advantage of cyber security is that it protects you from the cyber attacks. With that information, you see there's a huge explosion of cybercrime, and cyber security is critical to protect against the leakage of personal information, the leakage of intellectual property and financial (information). Firewalls are among the cyber security solutions that can prevent the unauthorised data access into the network of a system. Others include antivirus and intrusion detection systems. 2.Enhances Data Privacy Strengthening of cyber security brings improvement in data privacy. Encryption and other security measures are applied to prevent unauthorised access to sensitive information, and to protect the information. That's good for the companies that have to worry about confidential data such as client information, finance records, trade secrete. 3.Promotes Business Continuity A cyber attack on a firm is potentially disastrous financially, even worse, from a reputational point of view. Sometimes, these attacks can take away business from a firm but fortunately, some cyber security measures can help prevent these attacks and still let the firm do business even if there ever is a security breach. Firms are able to mitigate the blow of a cyber attack by implementing backups and disaster recovery plans, and quick recovery can be made. 4.Increases Customer Trust This might also up client trust, because of cyber security measures. It is believed that organisations that maintain a reputation for protecting personal information of customers, usually have customers who do business with that organisation. Good cyber security that you setup can demonstrate to the public your commitment to protecting client data and it may help you build more trust and loyalty with your customers.

Disadvantages of Cyber Security

After all cyber security something that means, it has many advantages, but it also has disadvantages. These disadvantages include: 1.Cost However, cyber security has a disadvantage, cost. But small businesses with little money to work with couldn't afford to implement robust cyber security measures. The news includes advanced hardware, software, employee training and ongoing maintenance and upgrades. 2.Complexity Cyber security is a very technical and technical aspect and it requires a extremely specialised knowledge and skill. But small businesses have a hard time hiring a dedicated cyber security professional, so they don't have the resources to instal and maintain a strong security measure. 3.False Sense of Security Cyber security measures do their job by offering a layer of protection against many online threats, but this can lead to a false sense of security. Despite these security measures, cybercriminals outdo themselves in finding and inventing ever new and inventive ways and tricks to get around them. 4.Potential for Human Error Human error is one of the biggest cyber security threats. If, for example, employees simply accidentally click a malicious link or download a virus infected file, the entire network can be compromised. Even with heavy security measures there is a huge risk of human error.

Preventaion of cyber threats

The avoidance of cyber threats entails technical solutions, user education and awareness, and organizational policies.Here are some key strategies to help prevent cyber threats:

1. Use Strong Passwords: The actions are: Strong passwords should contain a mixture of letters (small and capital) and numbers, and other symbols, and are recommended. – That is – in addition – a layer of

physical security – and this is multiple factor Authentication (MFA). 2. Keep Software Updated: Given that OS, soft, and applications contain security patches, a firm should regularly make proper updates. – Push of a button updates whenever possible. 3. Install Security Software: Be sure that you have the most excellent software that will defend you against your virus, malware, and firewalls for the various types of threats. - Cheque for viruses and other security threats once per month and more with advanced cheques. 4. Employee Training and Awareness: You can bring a more frequent cybersecurity awareness programme for the employees to attend and allow them to understand the possible risks as well as how best to protect themselves against them. Different types of social engineering and what type of activities can be phishing attempts, explain what employees. 5. Network Security: -Using proper Firewall defence, use of IDPS and wide deployment of network security on WFi. In the Network, perform daily / weekly cheque and analyse the Network traffic for any form of abnormally.6. Data Encryption: - Use encryption to protect sensitive data at rest, and in transit. - Secure communication protocols should be used on web applications e.g. HTTPS. 7. Regular Backups: 2. Regularly make back up for important data and secure it. - Restore data from a cyber incident as back-up restoration processes are tested by you. 8. Access Control: - Follow the principle of least privilege such that a user should have the minimum amount of access to get assigned job functions done. - A frequent way to cheque on and update user access permissions. 9. Incident Response Plan: - Create a list of how to respond to and mitigate the effects of cyber incidents and then developing and regularly updating an incident response plan. - Drill the team such that it is appropriately prepared to treat various real life situations. 10. Monitoring and Auditing: - Because claim can be very persistent, keep an eye on the system logs and network traffic looking for anything weird or nefarious. - Most important, do regular security audits to find and eliminate opportunities for trouble. 11. Vendor Security: Seal third party vendors' cybersecurity practises with a security rating and guarantee that they meet your security standards. - Have a standard contract that protects the written requirements where necessary. 12. Regulatory Compliance: - Keep update on cybersecurity laws and remain on compliance with what's appropriate under the law and industry standards. But cybersecurity is an ongoing process and think holistically. Keep upgrading your security because the threats that can exist in the future are continually changing.

3. CONCLUSIONS

In the final note, cybersecurity field lies at the centre of our digital era, engaging on a constant key mission to protect individuals, organisations and societies from constantly evolving cyber threats. These threats are dynamic, with everything from common malware to the most sophisticated state-sponsored attacks to investigate, and it's something we must continuously improve. Cybersecurity bedrock strategies prevention and detection, where prevention and detection strategies stand on firm base of proactive measures including robust security protocols, regular update and comprehensive employee training. In fact, the need for governments, private entities, and individuals to collaborate and exchange information for building a front against the cyber adversaries is more. With the popularity of data driven technologies on an upswing, the need to protect privacy and maintain the sanctity of personal information is at it's highest. GDPR regulates data protection and other such regulations reaffirm the need of stringent data protection measures. With so many rapidly emerging technologies, like artificial intelligence, machine learning and the Internet of Things, the cybersecurity world has become more complex, and we need innovative solutions, as well as a proactive opportunity to fight against any potential threats. The persistent skills gap is one of the challenges in the cybersecurity domain. Even with soaring demand for professionals, there are still a shortage of qualified people. Bringing education, training, and workforce together to address this gap will be needed. In this ever changing field, it is imperative to continue to learn because here, cybersecurity professionals must be able to learn new attack vectors, new technologies, and new best practises continually. Put simply, cybersecurity has a technological, as well as a human and policy, side to it. A culture of security awareness along with major bets on defence mechanism are essential to build a secure digital environment. Adaptive cybersecurity, characterised by collaboration and a capacity to withstand the pummeling of challenges posed by our dynamic digital world, represents the future of cybersecurity.

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