UNIT-5

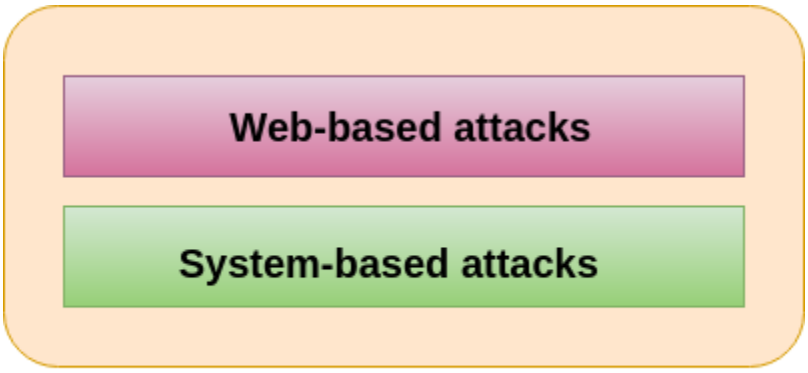
CYBER SECURITY:

Cyber security is the protection of Internet-connected systems, including hardware, software, and data from cyber attacks. It is made up of two words one is cyber and other is security. Cyber is related to the technology which contains systems, network and programs or data.

Whereas security related to the protection which includes systems security, network security and application and information security.

CYBER ATTACKS:

A cyber-attack is an exploitation of computer systems and networks. It uses malicious code to alter computer code, logic or data and lead to cybercrimes, such as information and identity theft.



Classification of Cyber attacks

Web-based attacks:

These are the attacks which occur on a website or web applications. Some of the important web-based attacks are as follows-

1. Injection attacks

It is the attack in which some data will be injected into a web application to manipulate the application and fetch the required information.

Example- SQL Injection, code Injection, log Injection, XML Injection etc.

2. DNS Spoofing

DNS Spoofing is a type of computer security hacking. Whereby a data is introduced into a DNS resolver's cache causing the name server to return an incorrect IP address, diverting traffic to the attacker?s computer or any other computer. The DNS spoofing attacks can go on for a long period of time without being detected and can cause serious security issues.

3. Session Hijacking

It is a security attack on a user session over a protected network. Web applications create cookies to store the state and user sessions. By stealing the cookies, an attacker can have access to all of the user data.

4. Phishing

Phishing is a type of attack which attempts to steal sensitive information like user login credentials and credit card number. It occurs when an attacker is masquerading as a trustworthy entity in electronic communication.

5. Brute force

It is a type of attack which uses a trial and error method. This attack generates a large number of guesses and validates them to obtain actual data like user password and personal identification number. This attack may be used by criminals

to crack encrypted data, or by security, analysts to test an organization's network security.

6. Denial of Service

It is an attack which meant to make a server or network resource unavailable to the users. It accomplishes this by flooding the target with traffic or sending it information that triggers a crash. It uses the single system and single internet connection to attack a server. It can be classified into the following-

Volume-based attacks- Its goal is to saturate the bandwidth of the attacked site, and is measured in bit per second.

Protocol attacks- It consumes actual server resources, and is measured in a packet.

Application layer attacks- Its goal is to crash the web server and is measured in request per second.

7. Dictionary attacks

This type of attack stored the list of a commonly used password and validated them to get original password.

8. URL Interpretation

It is a type of attack where we can change the certain parts of a URL, and one can make a web server to deliver web pages for which he is not authorized to browse.

9. File Inclusion attacks

It is a type of attack that allows an attacker to access unauthorized or essential files which is available on the web server or to execute malicious files on the web server by making use of the include functionality.

10. Man in the middle attacks

It is a type of attack that allows an attacker to intercepts the connection between client and server and acts as a bridge between them. Due to this, an attacker will be able to read, insert and modify the data in the intercepted connection.

System-based attacks:

These are the attacks which are intended to compromise a computer or a computer network. Some of the important system-based attacks are as follows-

1. Virus

It is a type of malicious software program that spread throughout the computer files without the knowledge of a user. It is a self-replicating malicious computer program that replicates by inserting copies of itself into other computer programs when executed. It can also execute instructions that cause harm to the system.

2. Worm

It is a type of malware whose primary function is to replicate itself to spread to uninfected computers. It works same as the computer virus. Worms often originate from email attachments that appear to be from trusted senders.

3. Trojan horse

It is a malicious program that occurs unexpected changes to computer setting and unusual activity, even when the computer should be idle. It misleads the user of its true intent. It appears to be a normal application but when opened/executed some malicious code will run in the background.

4. Backdoors

It is a method that bypasses the normal authentication process. A developer may create a backdoor so that an application or operating system can be accessed for troubleshooting or other purposes.

5. Bots

A bot (short for "robot") is an automated process that interacts with other network services. Some bots program run automatically, while others only execute commands when they receive specific input. Common examples of bots program are the crawler, chatroom bots, and malicious bots.

HACKING:

Hacking is an attempt to exploit a computer system or a private network inside a computer. Simply put, it is the unauthorised access to or control over computer network security systems for some illicit purpose.

SSL:

SSL stands for Secure Sockets Layer and, in short, it's the standard technology for keeping an internet connection secure and safeguarding any sensitive data that is being sent between two systems, preventing criminals from reading and modifying any information transferred, including potential personal details. The two systems can be a server and a client (for example, a shopping

website and browser) or server to server (for example, an application with personal identifiable information or with payroll information).

It does this by making sure that any data transferred between users and sites, or between two systems remain impossible to read. It uses encryption algorithms to scramble data in transit, preventing hackers from reading it as it is sent over the connection. This information could be anything sensitive or personal which can include credit card numbers and other financial information, names and addresses.

Authentication and assurance of data integrity:

Data integrity in the database is the correctness, consistency and completeness of data. Data integrity is enforced using the following three integrity constraints:

- **Entity Integrity -** This is related to the concept of primary keys. All tables should have their own primary keys which should uniquely identify a row and not be NULL.
- **Referential Integrity -** This is related to the concept of foreign keys. A foreign key is a key of a relation that is referred in another relation.
- **Domain Integrity -** This means that there should be a defined domain for all the columns in a database.

Authorization

Authorization is a privilege provided by the Database Administer. Users of the database can only view the contents they are authorized to view. The rest of the database is out of bounds to them.

The different permissions for authorizations available are:

- **Primary Permission -** This is granted to users publicly and directly.
- **Secondary Permission -** This is granted to groups and automatically awarded to a user if he is a member of the group.
- **Public Permission -** This is publicly granted to all the users.
- **Context sensitive permission -** This is related to sensitive content and only granted to a select users.

The categories of authorization that can be given to users are:

- **System Administrator -** This is the highest administrative authorization for a user. Users with this authorization can also execute some database administrator commands such as restore or upgrade a database.
- **System Control -** This is the highest control authorization for a user. This allows maintenance operations on the database but not direct access to data.
- **System Maintenance -** This is the lower level of system control authority. It also allows users to maintain the database but within a database manager instance.
- **System Monitor -** Using this authority, the user can monitor the database and take snapshots of it.

Cryptography based solution

Definition: Cryptography is associated with the process of converting ordinary plain text into unintelligible text and vice-versa. It is a method of storing and transmitting data in a particular form so that only those for whom it is intended can read and process it. Cryptography not only protects data from theft or alteration, but can also be used for user authentication.

There are five primary functions of cryptography:

1. Privacy/confidentiality: Ensuring that no one can read the message except the intended receiver.
2. Authentication: The process of proving one's identity.
3. Integrity: Assuring the receiver that the received message has not been altered in any way from the original.
4. Non-repudiation: A mechanism to prove that the sender really sent this message.
5. Key exchange: The method by which crypto keys are shared between sender and receiver.

In cryptography, we start with the unencrypted data, referred to as *plaintext*. Plaintext is *encrypted* into *ciphertext*, which will in turn (usually) be *decrypted* back into usable plaintext. The encryption and decryption is based upon the type of cryptography scheme being employed and some form of key. For those who like formulas, this process is sometimes written as:

$$C = E_k(P)$$
$$P = D_k(C)$$

where **P** = plaintext, **C** = ciphertext, **E** = the encryption method, **D** = the decryption method, and **k** = the key.