Introduction to Cyber Security

Secure Enterprise Architecture and Component

Learning Objectives

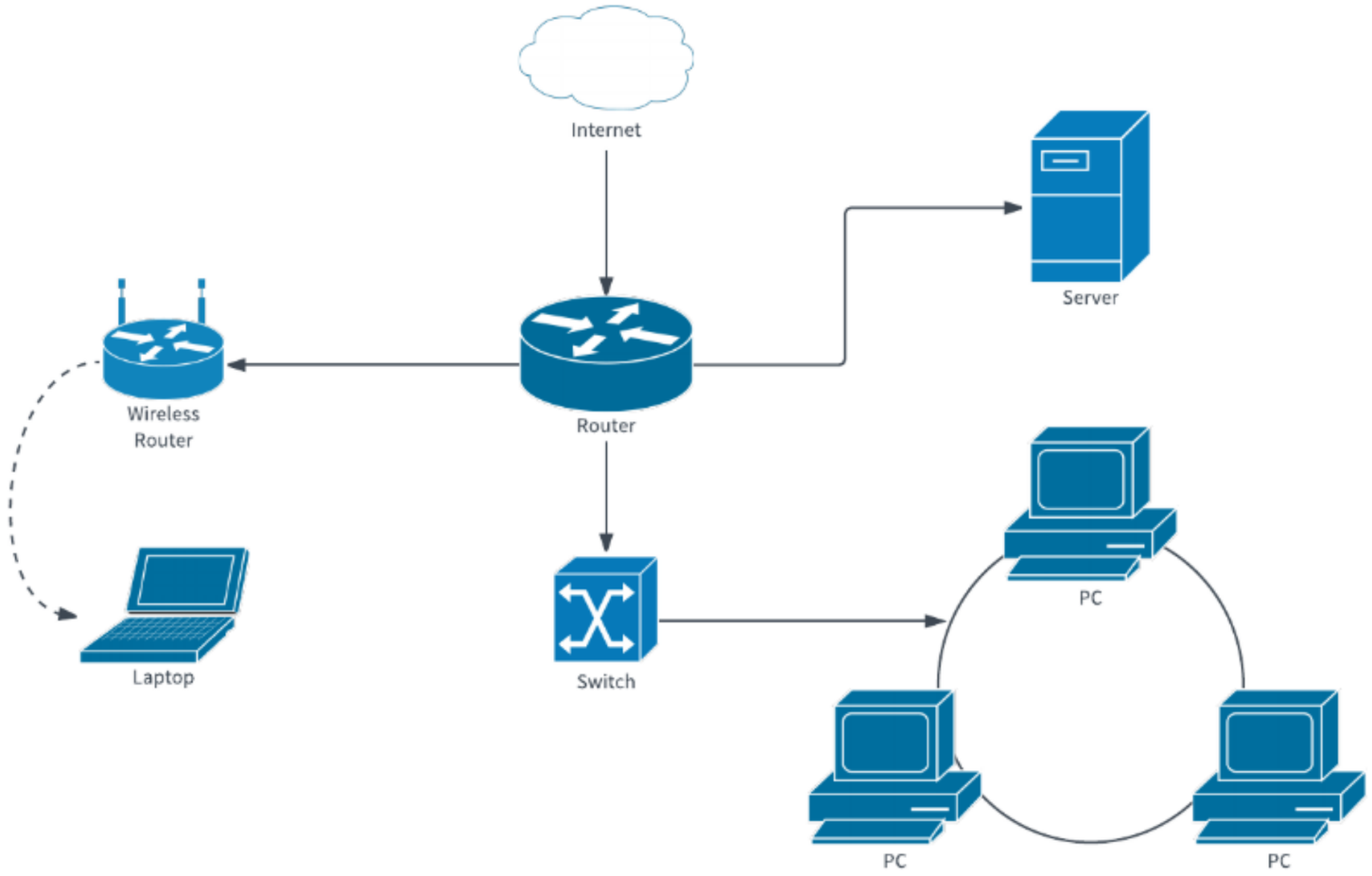
By the end of this lesson, you will be able to:

- Describe network architecture
- Explain wireless networks
- List the network security controls
- Explain security testing

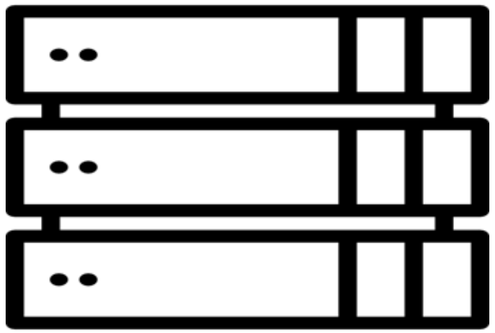
Network Architecture

Enterprise Network Architecture

Networks are part of a large, centrally managed, and internetworked architecture solutions.



Enterprise Network Architecture



Web-based front-end application servers

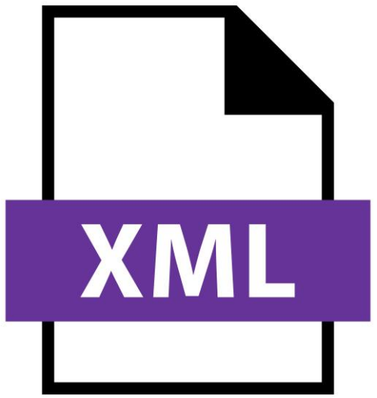
Application and database servers

Mainframe servers

Enterprise Network Architecture

Organizations implement service-oriented architectures (SOA) with web software components.

Simple Object Access Protocol (SOAP)



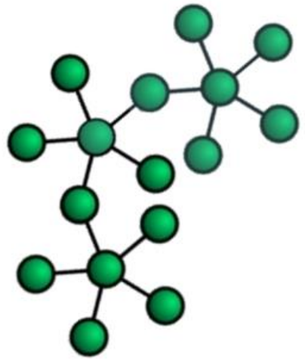
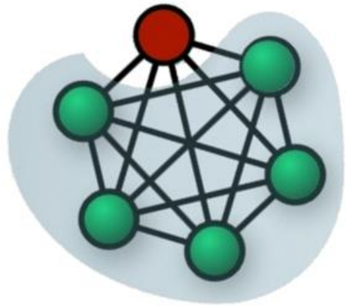
Extensible Markup Language (XML)

Basics of Network Architecture

Telecommunications:
Electromagnetic transmission of data

Protocol:
A standard set of rules

Types of Network Architecture

Open Network Architecture	Closed Network Architecture
	
Not Proprietary	Proprietary
Integrates vendor implementations	Not integrated with vendors

Open System Interconnection (OSI) Model

Open System Interconnection (OSI) Model

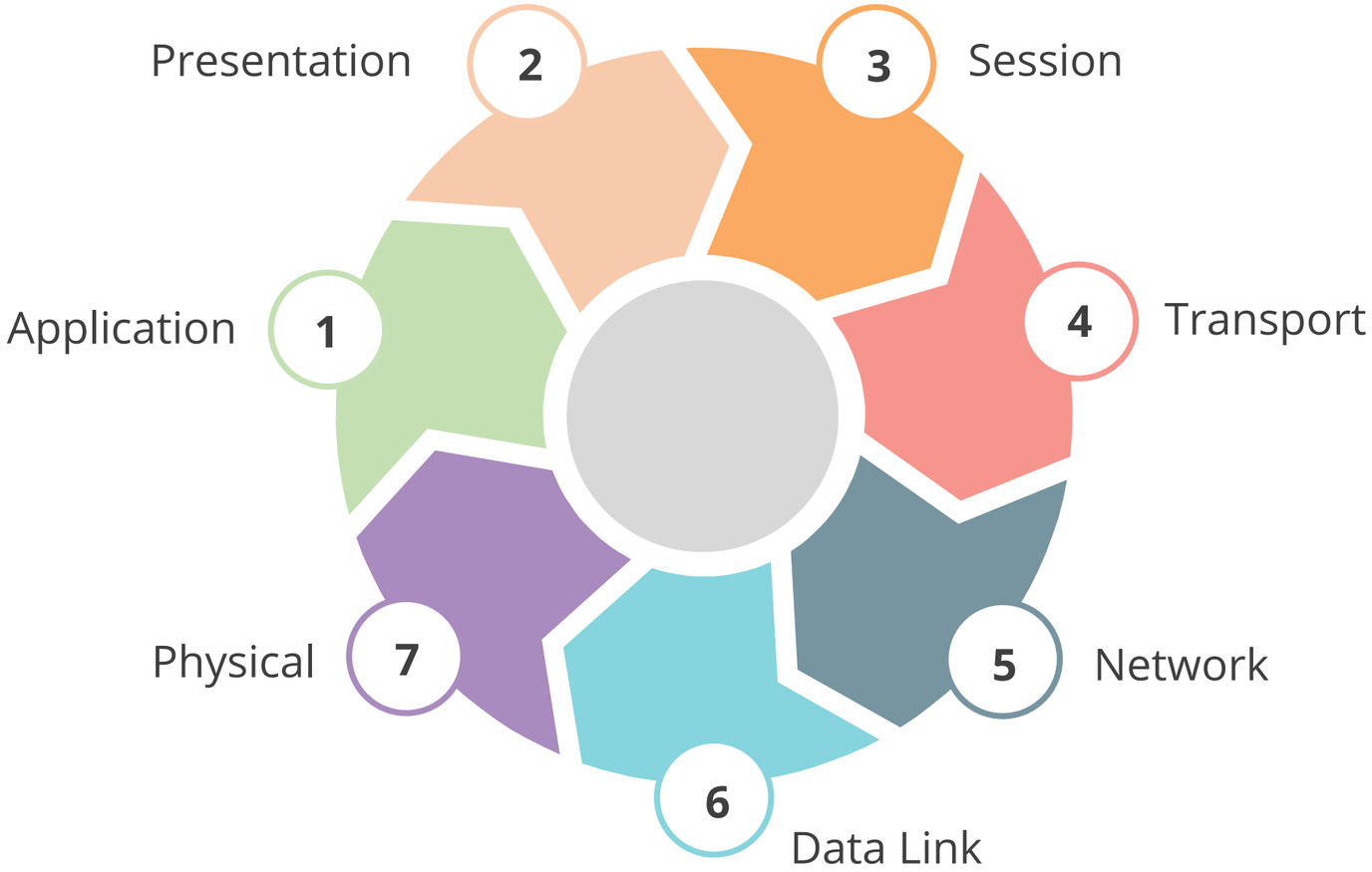
OSI is a layered architecture.

Simplifies the network design

Helps in easier network management

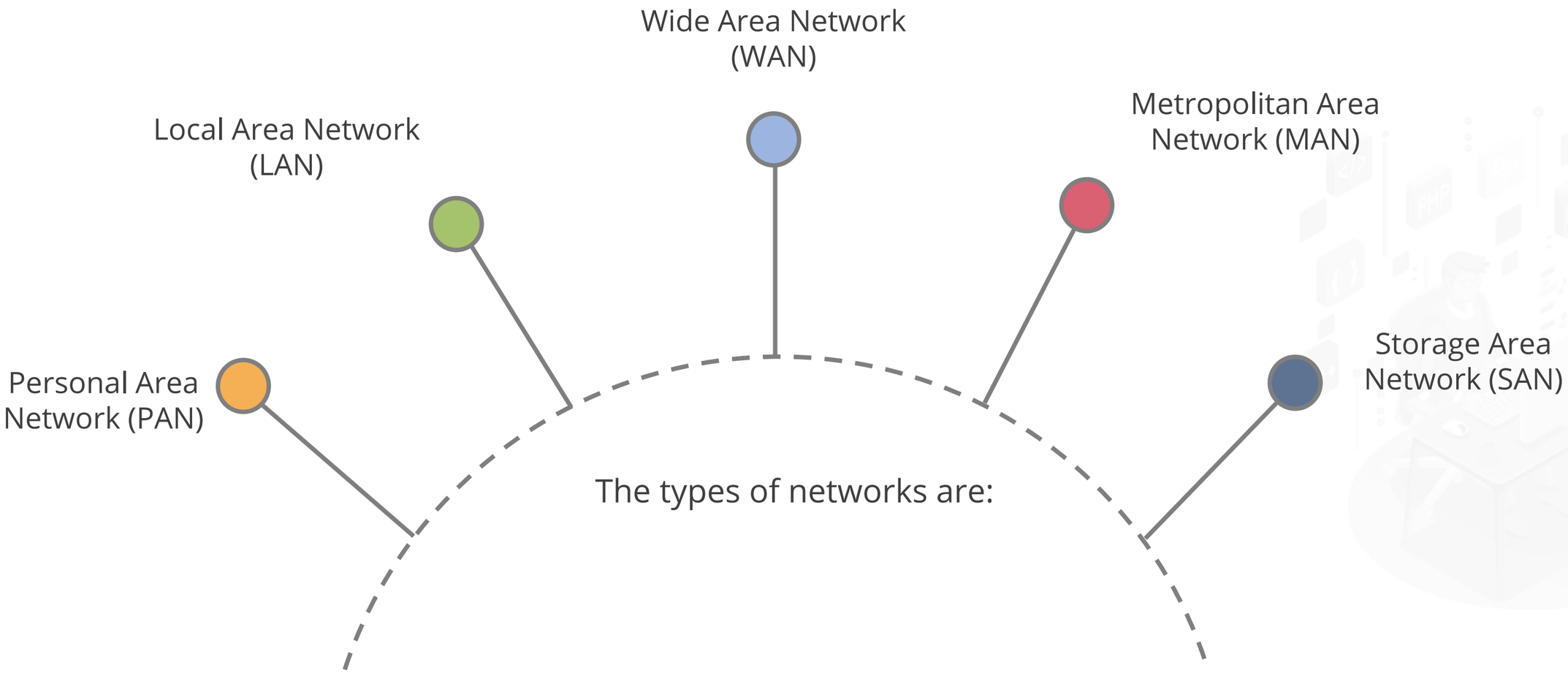
Helps in debugging network applications

Seven Layers of OSI Model



Types of Networks

Types of Networks



Data Communication Systems

Data Communication Systems

A process of using computing technology to transfer data from one point to another.

Data Communication Systems:
Transfers digital data between nodes
Uses ASCII, EBCDIC, and Unicode for conversion

Data Communication Software Components

The components of communication software are:

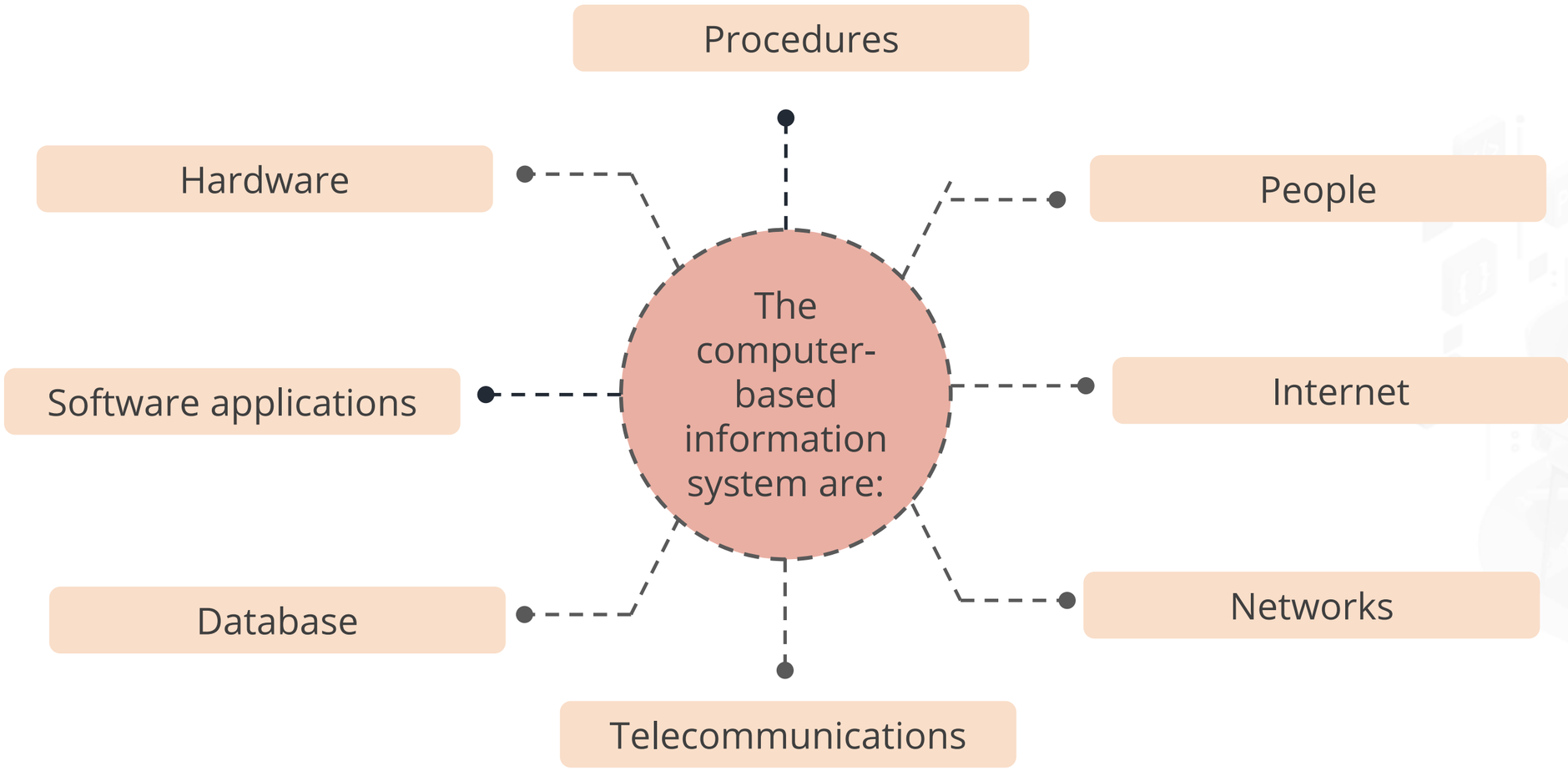
Information to be communicated

Sender and receiver

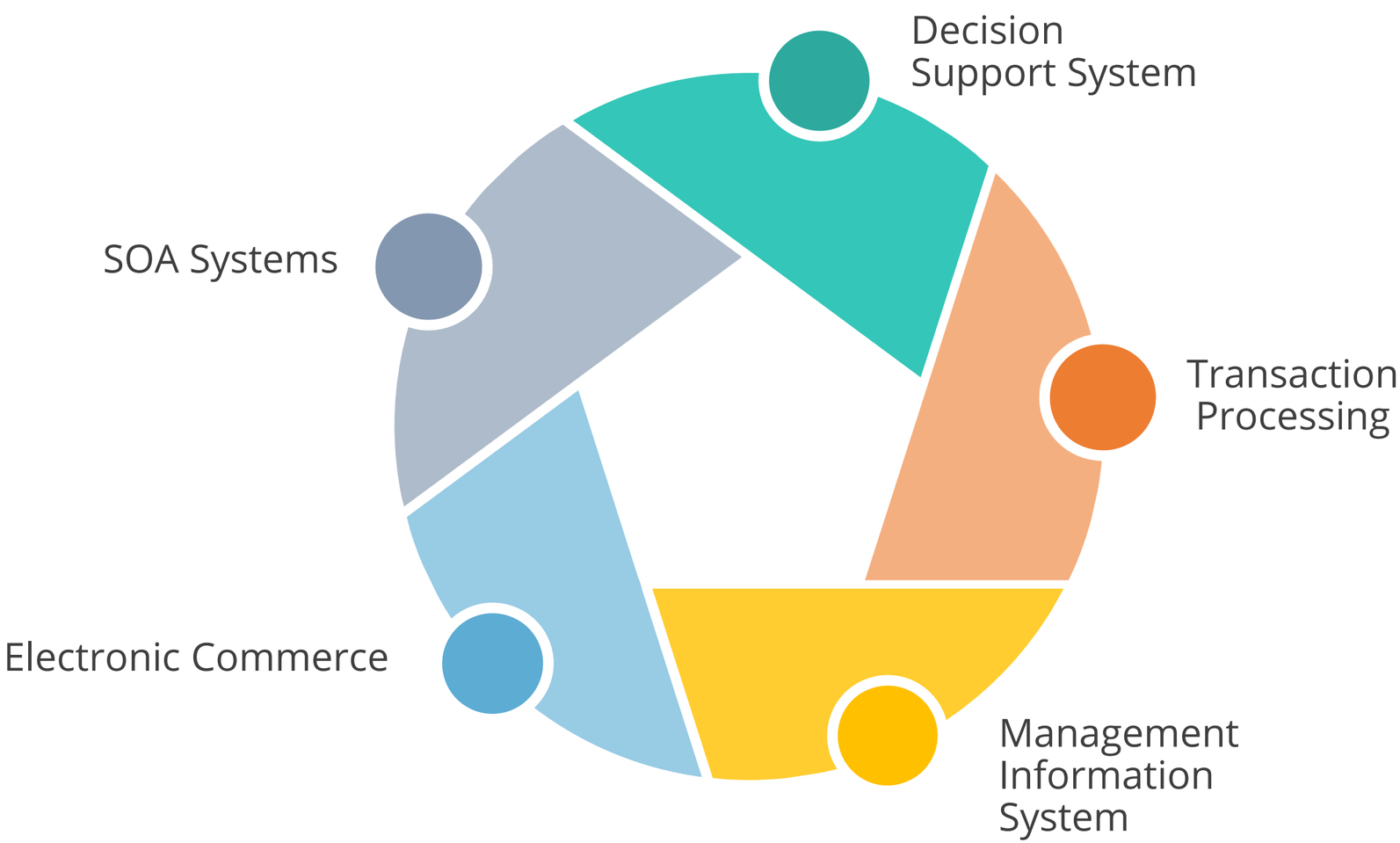
Medium or channel

Computer-Based and Business Information Systems

Computer-Based Information System



Business Information Systems



Hardware Failure

Hardware Failure

It is a malfunction within the electronic circuits or electromechanical components

Hardware Failure

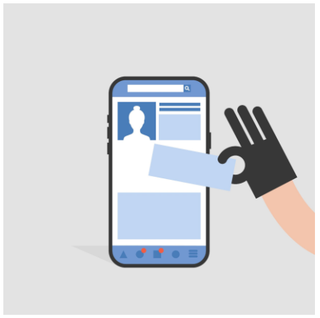
Hardware Failure

- Exposed Data
- Lost Hardware

Data Loss

Malicious Code

- Virus
- Spyware



Physical Theft

- Storage Media
- Computers

Data Corruption

- Damaged Drive
- Corrupted Drive

Hardware Failure

Error reports	Availability reports	Utilization reports (automated)	Asset management reports
Detect failures and provide corrective actions	Check downtime caused by inadequate facilities and excessive maintenance	Document the utilization of machine and peripherals	List the network inventory tools and their connected equipment

Host-Based Security

Host-Based Security

Host security refers to securing the operating system from unauthorized access.

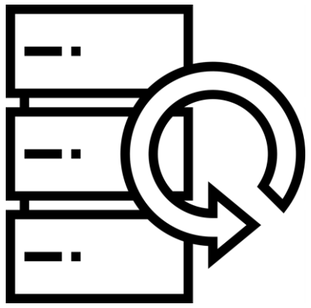
Host-Based Security Controls

Host-Based Firewalls

Intrusion Detection System

Antivirus

Disk Encryption



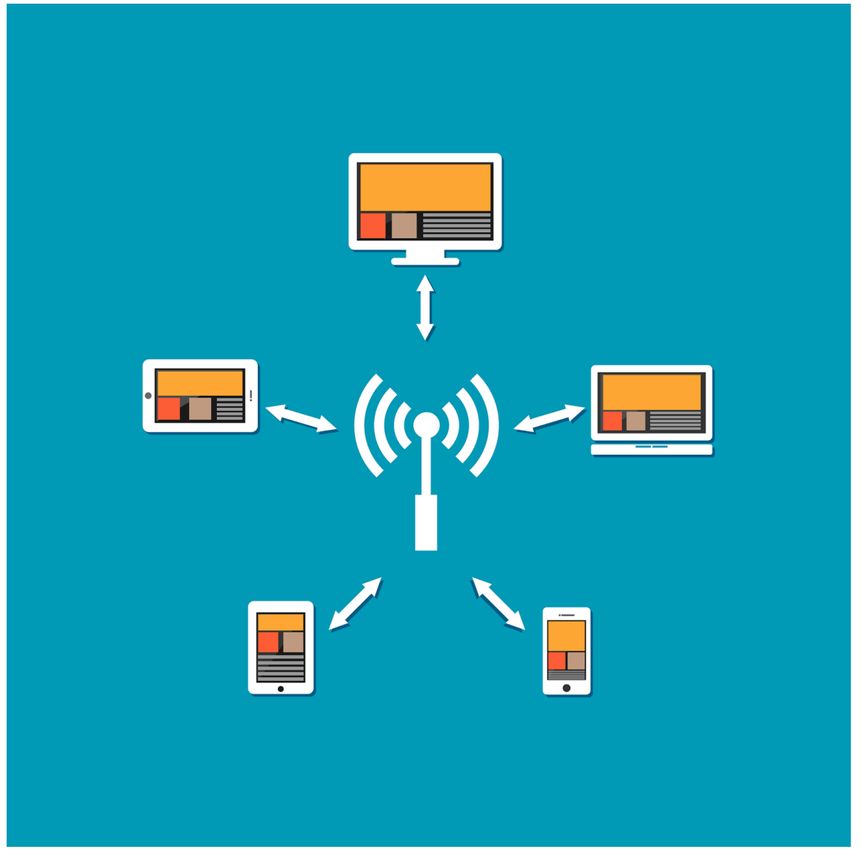
Regular Backups

Access Control

Wireless Networks and Virtual Private Network

Wireless Networks

Wireless networks are computer networks that are not connected by cables of any kind.



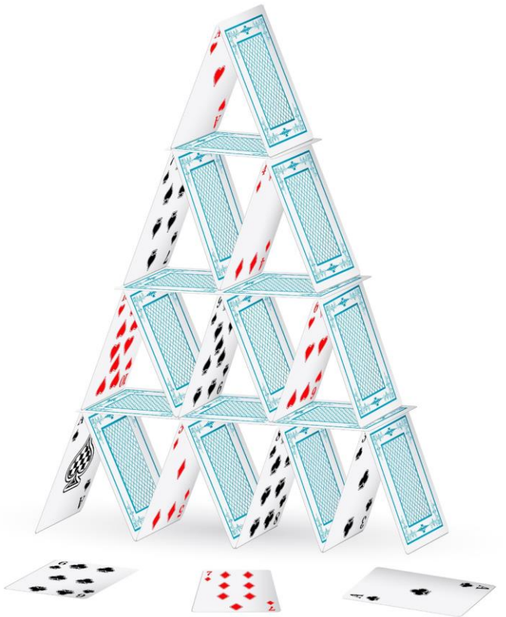
Wireless Networks

Benefit:	Drawback:
Mobility	Speed
Network Reach	Security
Flexibility/Scalability	

Wireless Attacks

Pose challenges to security professionals

Easy setup at the cost of security



Wireless Countermeasures

Use WPA3 authentication

Use encryption

Turn off SSID

Use Antivirus

Change the password

Case Study: Wireless Attack

Tel Aviv free Wi-Fi network was hacked. One notable example of how easy it can be for a hacker to take over a Wi-Fi network comes from Tel Aviv.

Case Study: Wireless Attack

The free Wi-Fi network of Tel Aviv was hacked.

It incorporates basic security controls to keep users secure in the network.

Case Study: Wireless Attack

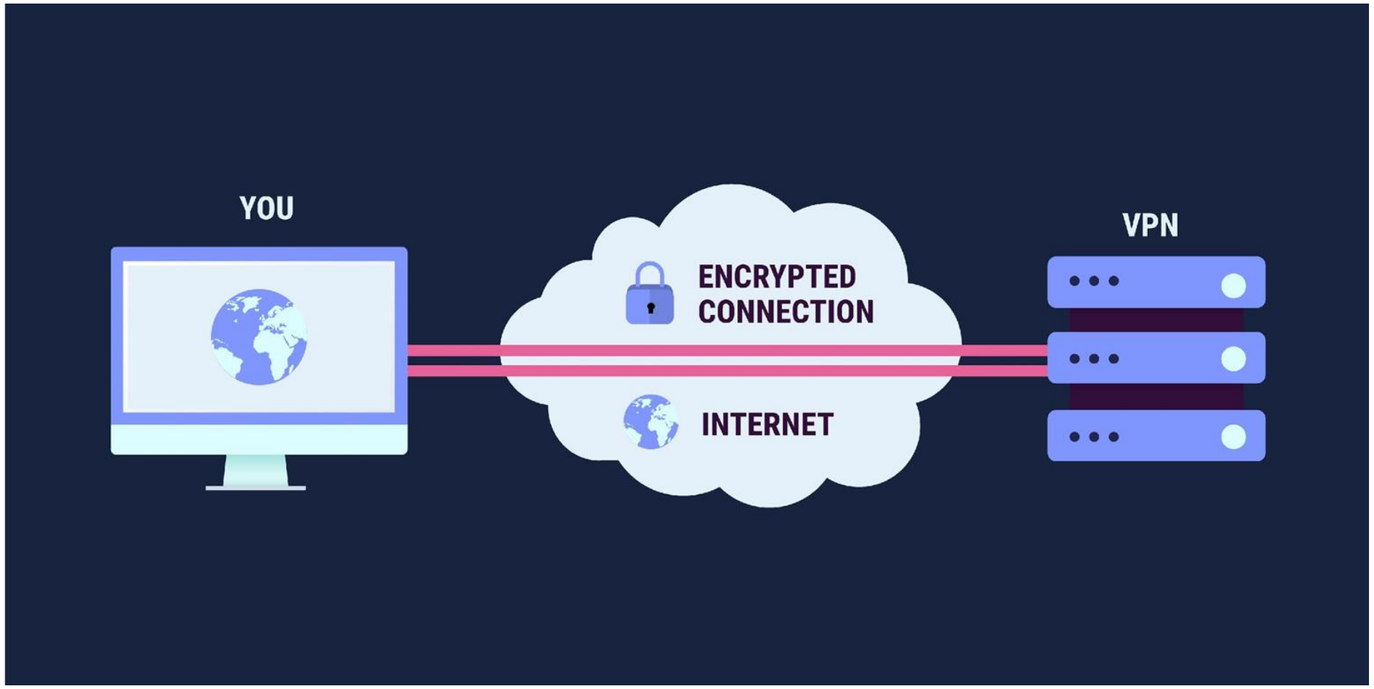
Tested its security controls

Noticed a new Wi-Fi access point

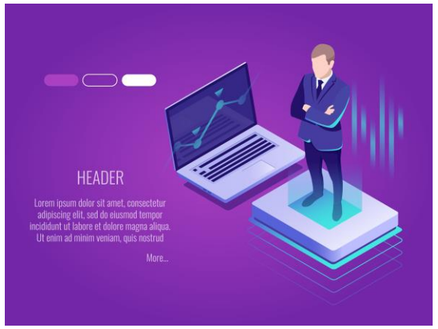
Discovered an HTTPS port 443

Virtual Private Network

VPN extends the corporate network securely via encrypted packets sent out via virtual connections over the public internet to distant offices, home workers, salespeople, and business partners.



Virtual Private Network



Increases the network span

Accesses their corporate enterprise

Communicates with business partners

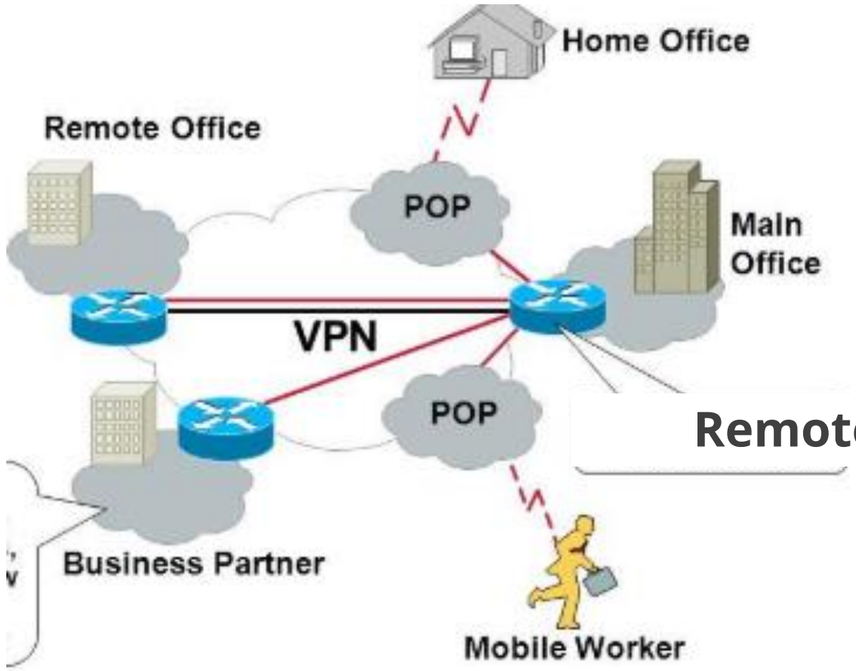
Helps in being efficient and effective

Helps grow their business

Types of Virtual Private Network

Intranet VPN

Extranet VPN



Remote access VPN

Virtual Private Network

Lack of required host security software

Physical access

Endpoints

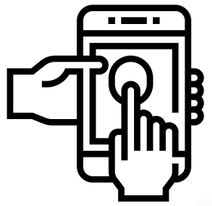
Man-in-the-middle attacks

Hardware limitations

VPN Risks

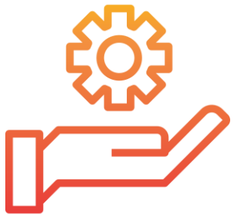
Strong user authentication

Host identity verification



Security posture validation

Secure desktop

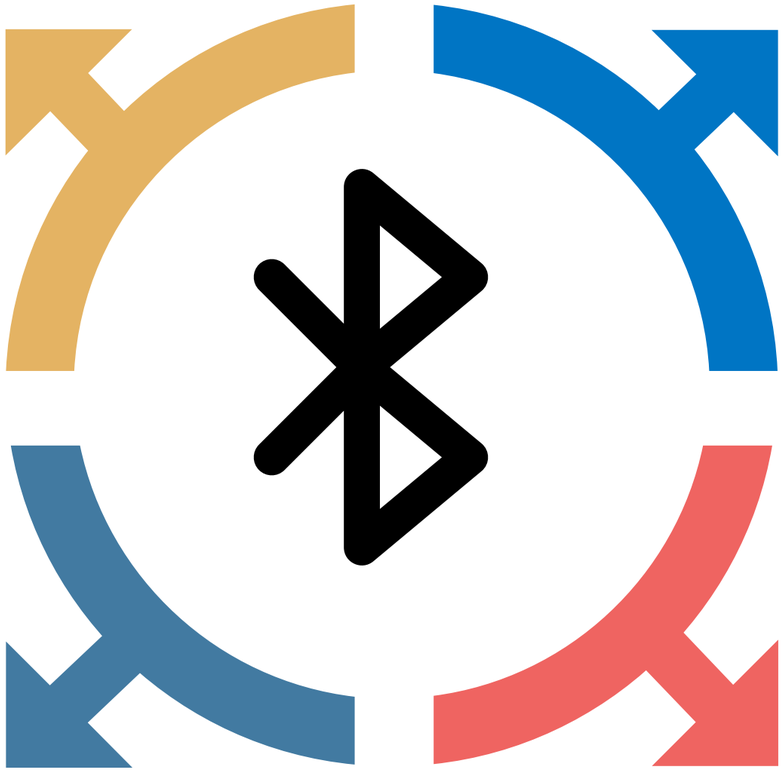


Configuration considerations

Education and awareness

Wireless Network Example: Bluetooth

Speed is 2.4 GHZ and range is between 10 to 30m



Introduced in 1994

Uses radio waves for communication

Short-range wireless communications technology

Bluetooth Attack Example

Bluejacking is the unauthorized sending of text messages to a nearby Bluetooth device.

Bluetooth Countermeasures

Use Bluetooth for confidential information

Change the default PINs on your devices

Do not leave your devices in discovery mode

Turn off Bluetooth when it’s not in active use

Bluetooth Vulnerability: BlueBorne

It is a set of nine exploitable Bluetooth vulnerabilities.

It affects every laptop and mobile device.

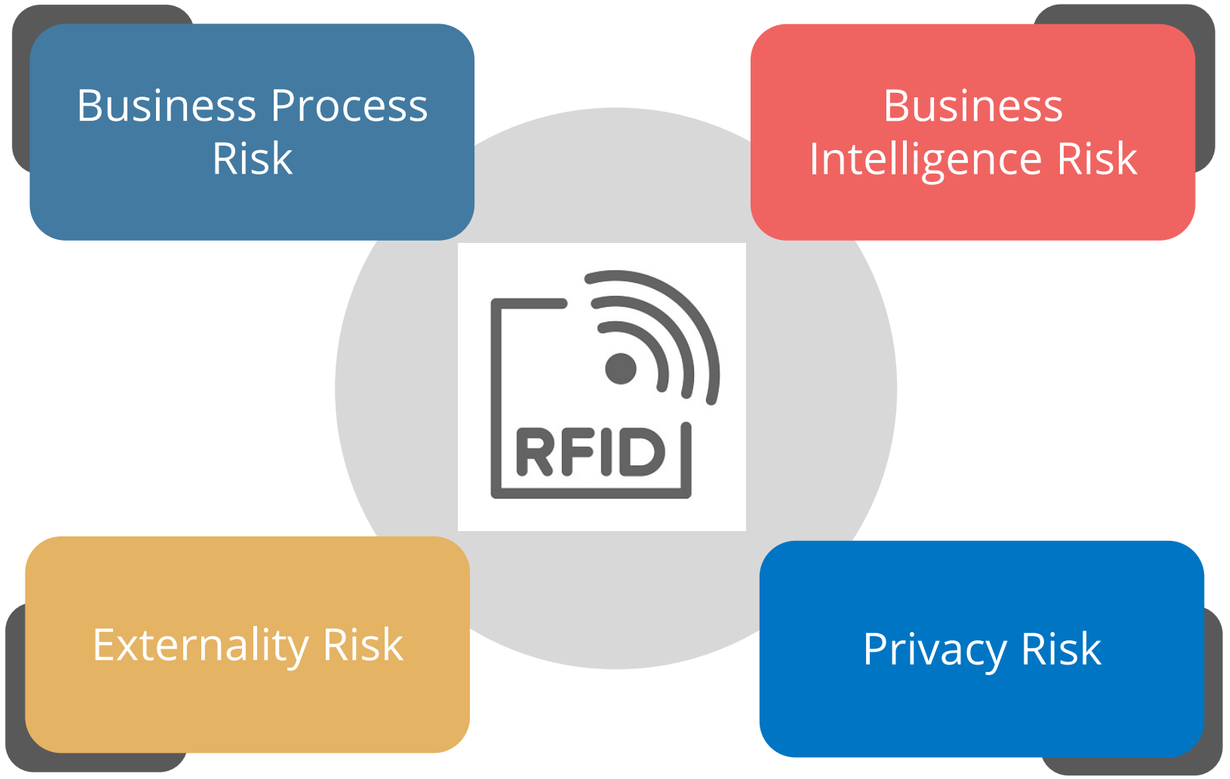
The airborne attack is difficult to protect.

Radio-Frequency Identification (RFID)

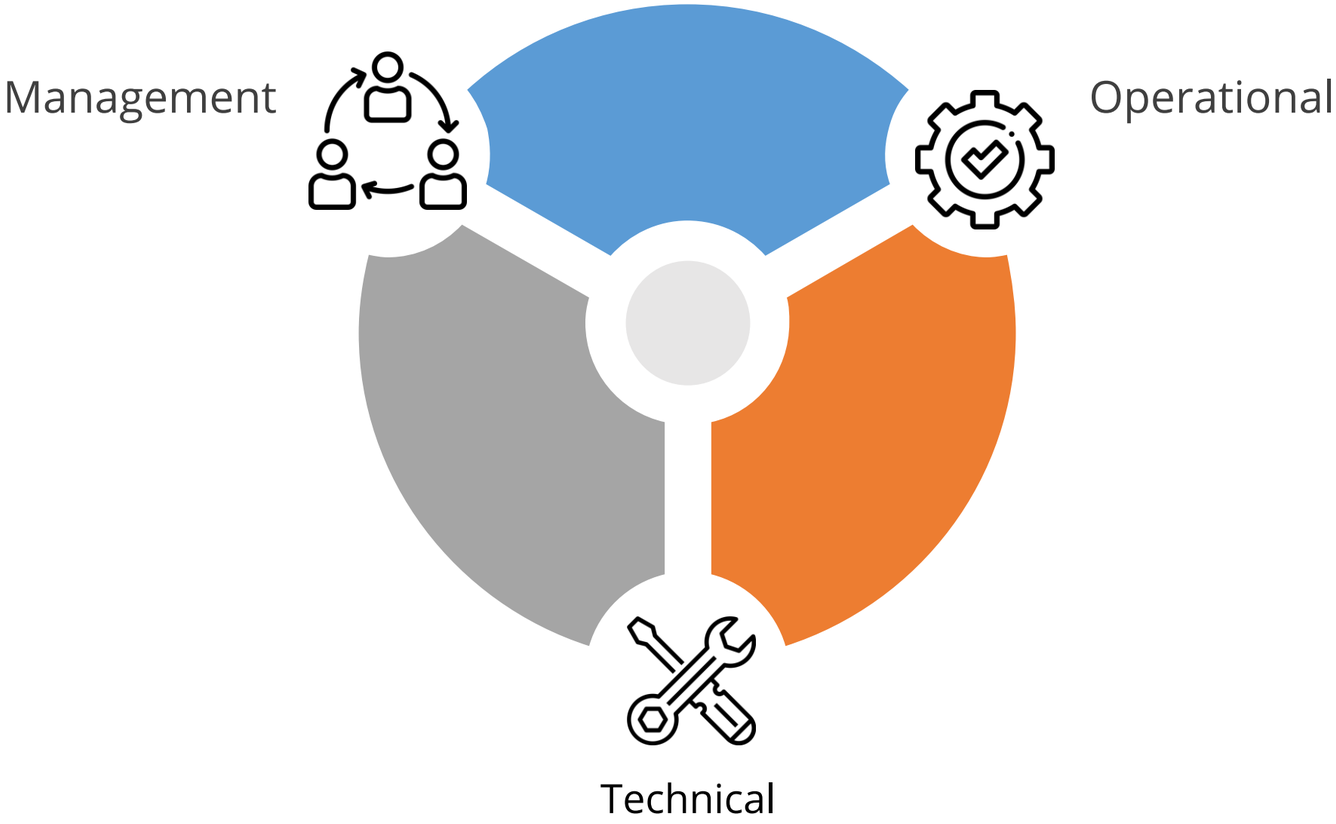
Radio-Frequency Identification (RFID)

RFID uses radio waves to read and capture information stored on a tag attached to an object.

RFID Risks



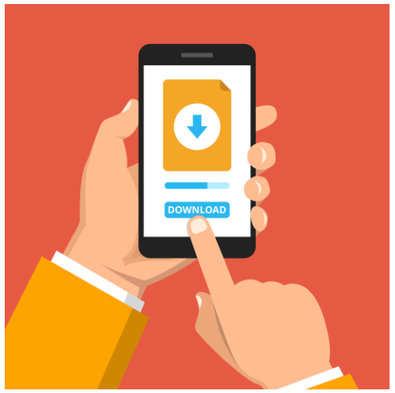
RFID Security Controls



Case Study: RFID Hack

Mobile Keys and Bluetooth

Uses near-field communication (NFC)

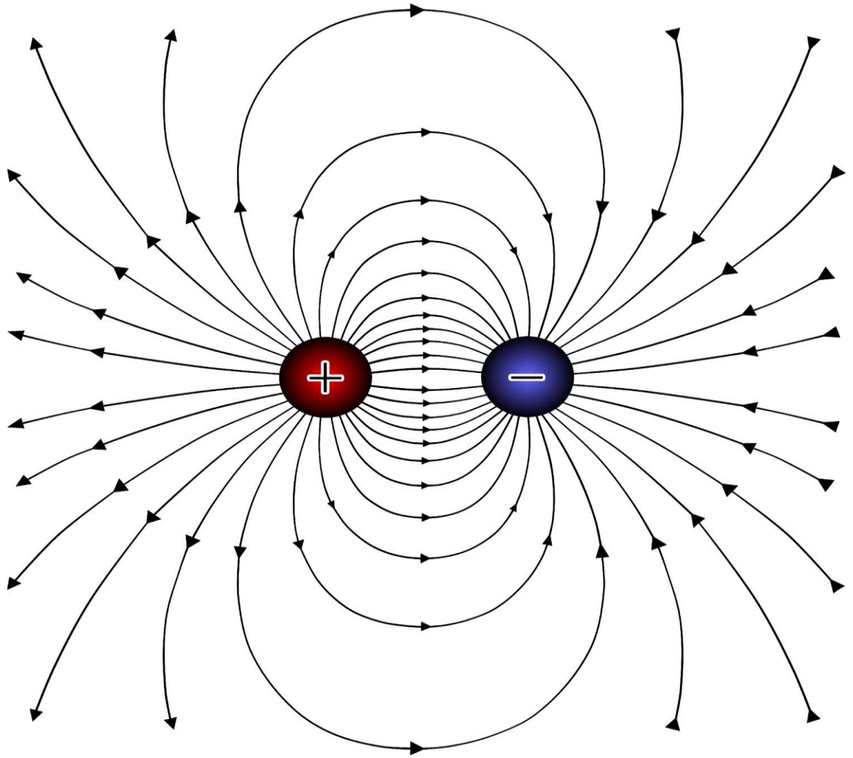


Guests download an app to their phones

Opens the door with signals

Emanation Security

It is a hardware or electronic device that emits electromagnetic radiation.



Controls Against Electronics

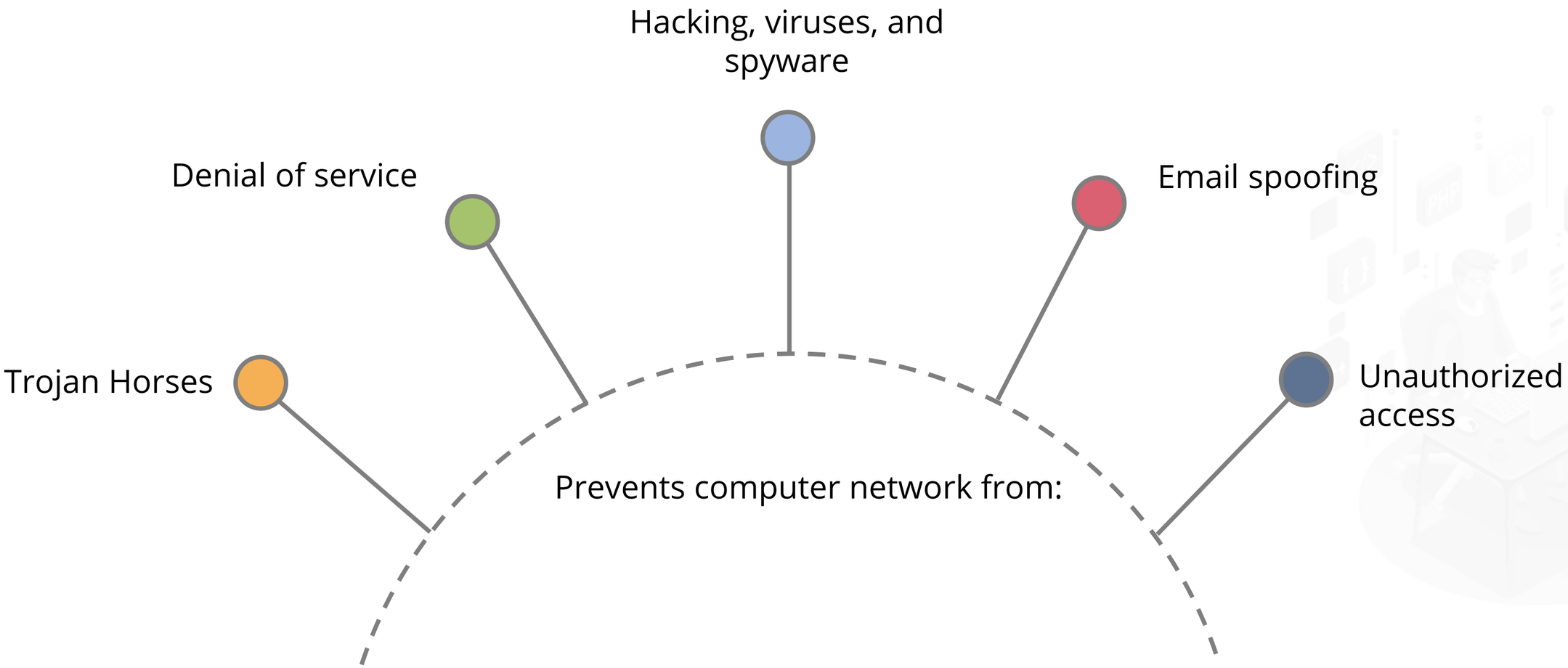
Faraday Cage

White Noise

Control Zones

Network Security Controls

Network-Based Security



Network Attack Categories

Active attack

An intruder initiates commands to disrupt the network's normal operation.

Passive attack

An intruder intercepts data traveling through the network.

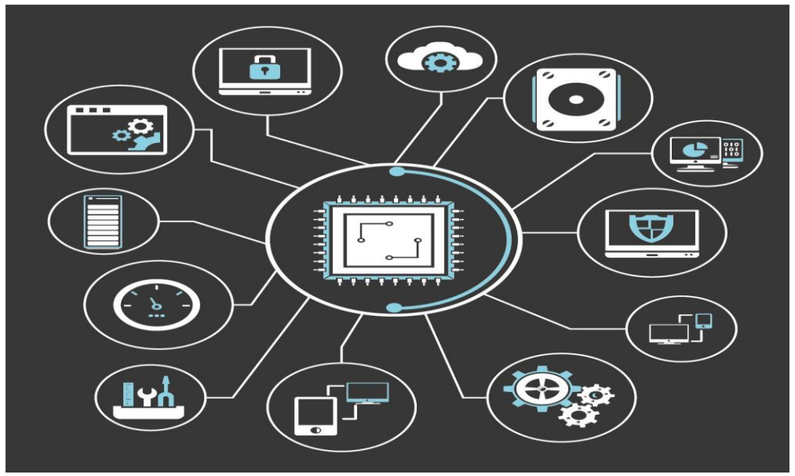
Firewall

Stops hackers from accessing network

Controls network traffic

Allows users to access the internet

Firewall Features



Is a combination of hardware and software

Controls the vulnerable point between a corporate network and the internet

Unified Threat Management (UTM)

UTM combines several key elements of network security to offer a comprehensive security package to buyers.

Unified Threat Management (UTM)

Goals

- Simplicity
- Streamlined installation and maintenance
- Centralized control

Issues

- Single point of failure
- Single point of compromise
- Performance issues

Web Application Firewall

Filters, monitors, and blocks HTTP traffic

Filters the content of specific web applications

Prevents attacks from web application security flaws

Intrusion Detection System (IDS)

Intrusion Detection System otherwise known as IDS is monitored network usage anomaly.

- Works together with firewalls and routers
- Operates in the background
- Alerts when intrusions are detected
- Protects external and internal misuse

Intrusion Detection System Components

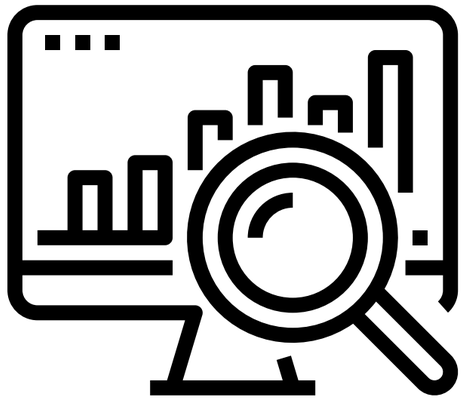
Sensor

Analyzer

User Interface

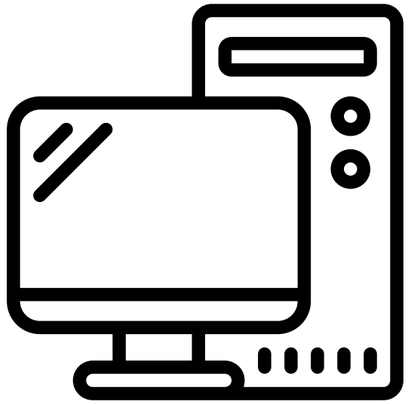
Admin Console

Intrusion Detection System Categories



Network-based IDS (NIDS)

An intruder initiates commands to disrupt the network's normal operation.



Host-based IDS (HIDS)

An intruder intercepts data traveling through the network.

Intrusion Prevention System (IPS)

- Closely related to IDS
- Designed to detect and prevent attacks
- Must be properly configured and tuned to be effective

Network Admission Control

It is a concept of controlling access to an environment through strict adherence and implementation of security policy.

Network Admission Control Goals

Prevent/reduce zero-day attacks

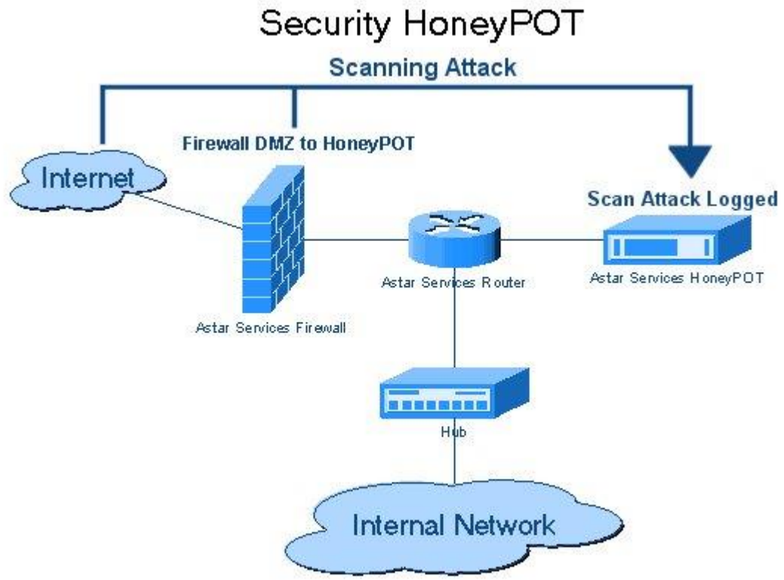
Enforce security policy throughout the network

Use identities to perform access control

Honeypots

A honeypot system is a computer that sits in the screened subnet or the DMZ and attempts to lure attackers.

Enable services and ports



Have services emulated

Honeypots

Group of honeypots implemented together is called a honeynet.

Security Testing

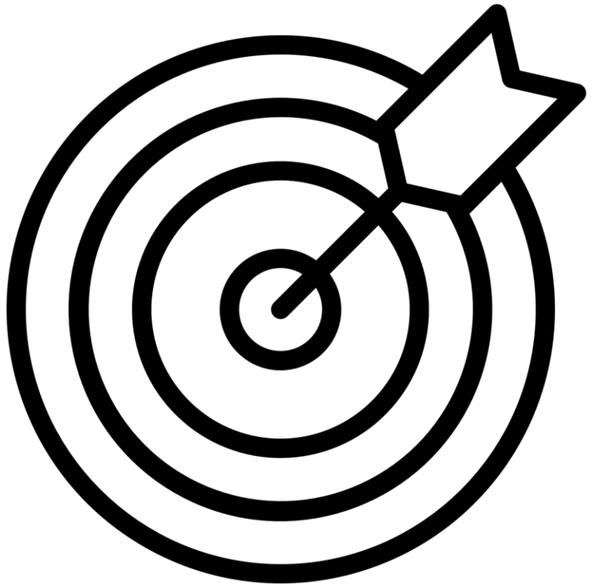
Vulnerability Scanning

It is a process of examining your systems and network devices for security holes and weaknesses.

Vulnerability Scanning

Vulnerability scanners are designed to help administrators and address vulnerabilities.

Vulnerability Scan Goals



- Identify vulnerability
- Identify lack of security controls
- Identify common misconfigurations

Some scanners are capable of remediation checking for misconfigurations.

Penetration Testing

Tries to exploit the system

The most aggressive form of security testing

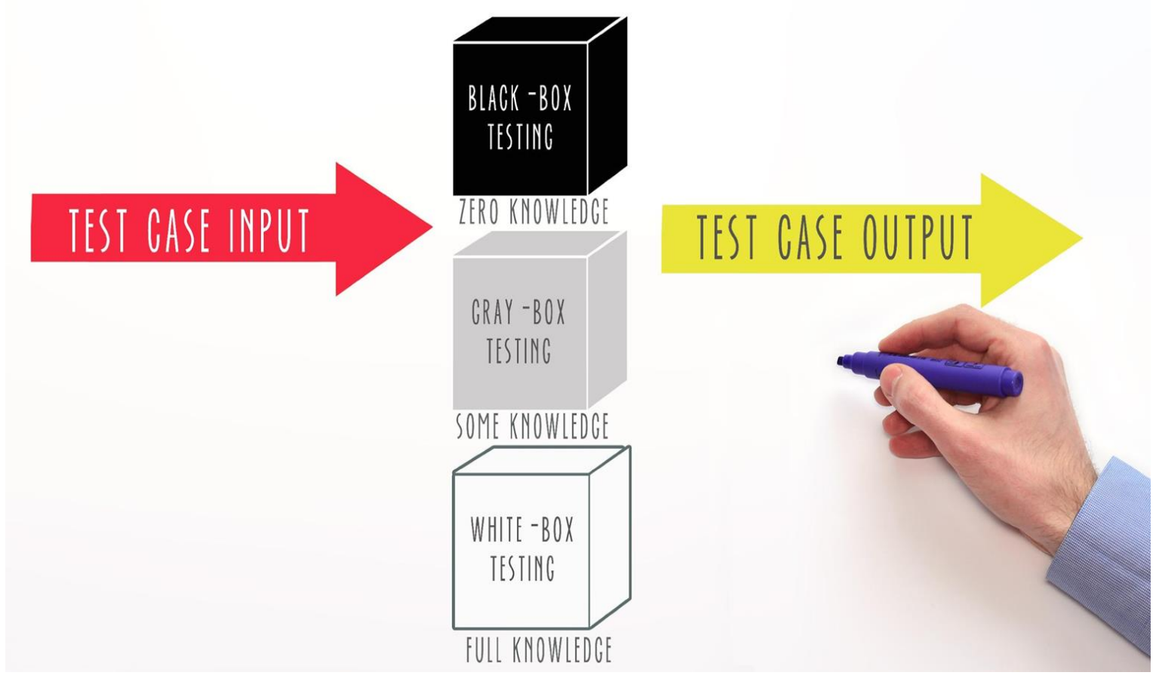
Uncovers any weaknesses within the environment

Simulates an attack from a malicious outsider.

Emulates the same methods attackers would use

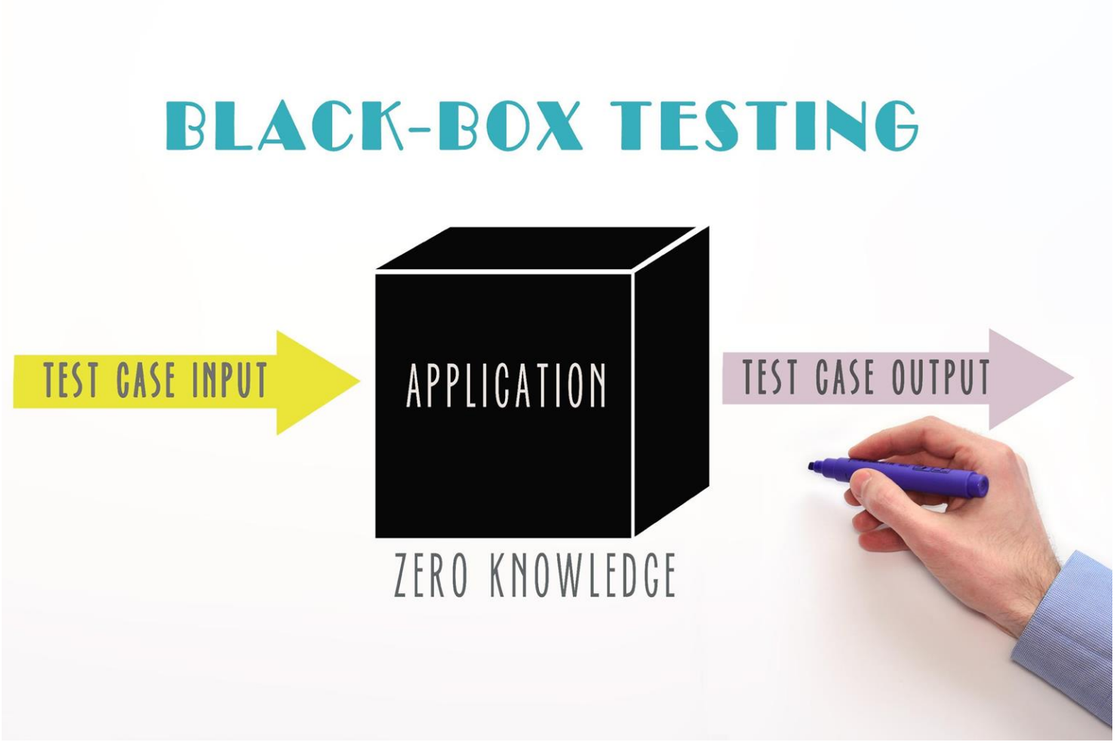
Types of Penetration Testing

The types depend on the organization, its security objectives, and the management goals.



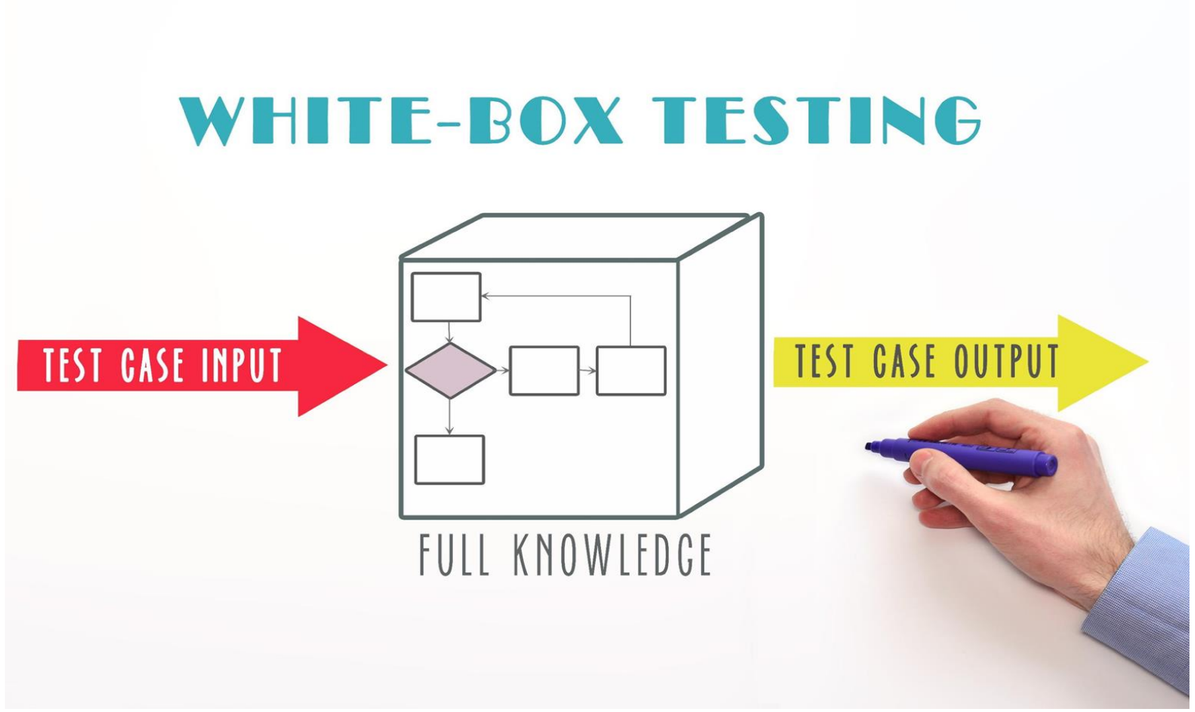
Types of Penetration Testing

In black box testing, the tester has no knowledge of the internal design or features of the system. It simulates the external attacker the best.



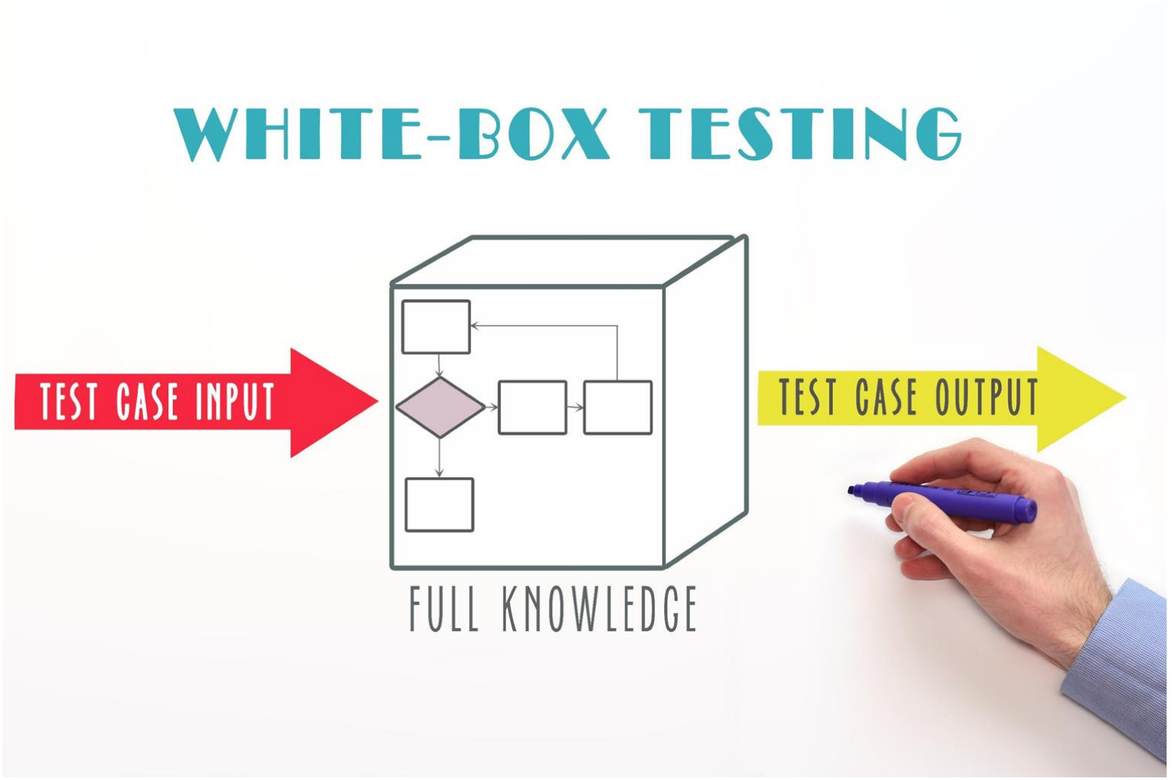
Types of Penetration Testing

In white box testing, the tester has complete knowledge of the internal system, it may yield a more complete result, but it may not be representative of an external hacker. It may be a good indicator of an internal type of threat.



Types of Penetration Testing

In grey box testing, some information about internal working is given to the tester.



- Helps guide tester tactics
- Mitigates the risks

Security Audits

Security Audits

These are systematic evaluations performed with the purpose of demonstrating the effectiveness of controls to a third party.

Security Audits

It is performed by independent auditors. Auditors provide unbiased view of the state of security controls.

Types of Security Audits

- It is performed by an organization's internal staff.
- The reports are intended for internal audience.

Disadvantage: Conflict of interest and hidden agenda

- It is performed by third-party auditors.
- The reports are intended for third-party stakeholders.
- NDA is a prerequisite.

Disadvantage: Cost

Key Takeaways

- Networks are part of a large, centrally managed, internetworked architecture solutions.
- Wireless networks are computer networks that are not connected by cables of any kind.
- Network-based protection or security is a method of preventing your computer network from unauthorized user access.
- Security testing is a process of examining your systems and network devices for security holes and weaknesses.