SUAN SUNANDHA
RAJABHAT UNIVERSITY

ETI 6303

Network, Communication and Information Systems

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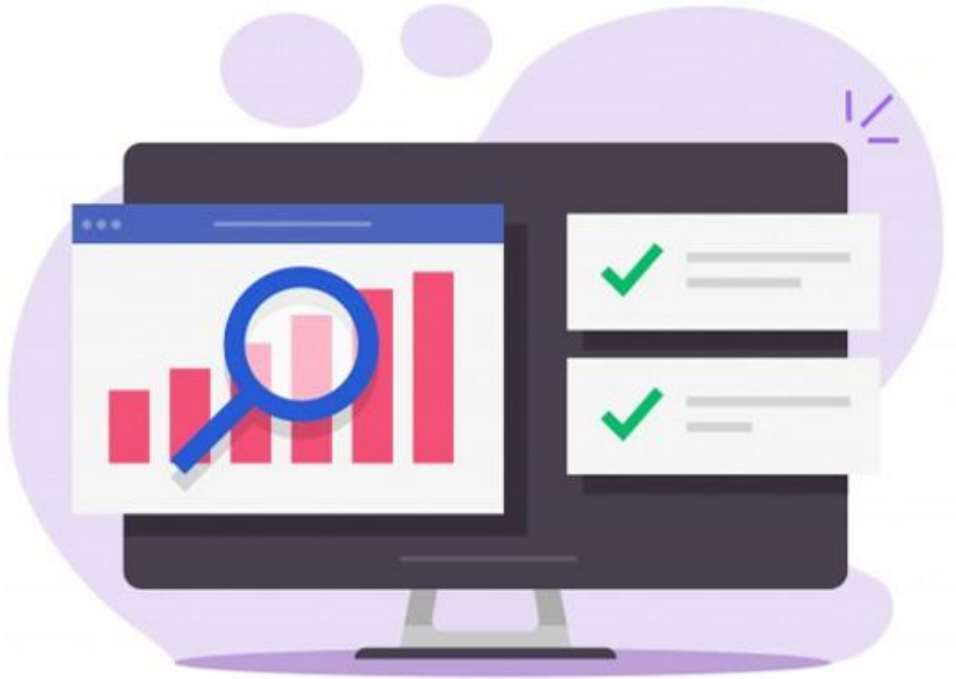
When using a network, people can communicate efficiently with a group of people through instant messaging, video conferencing, social media, chat rooms, etc. It is easy to share files, data, and information. The files and programs on a network can be protected using passwords

Here are some of the biggest advantages of networking.

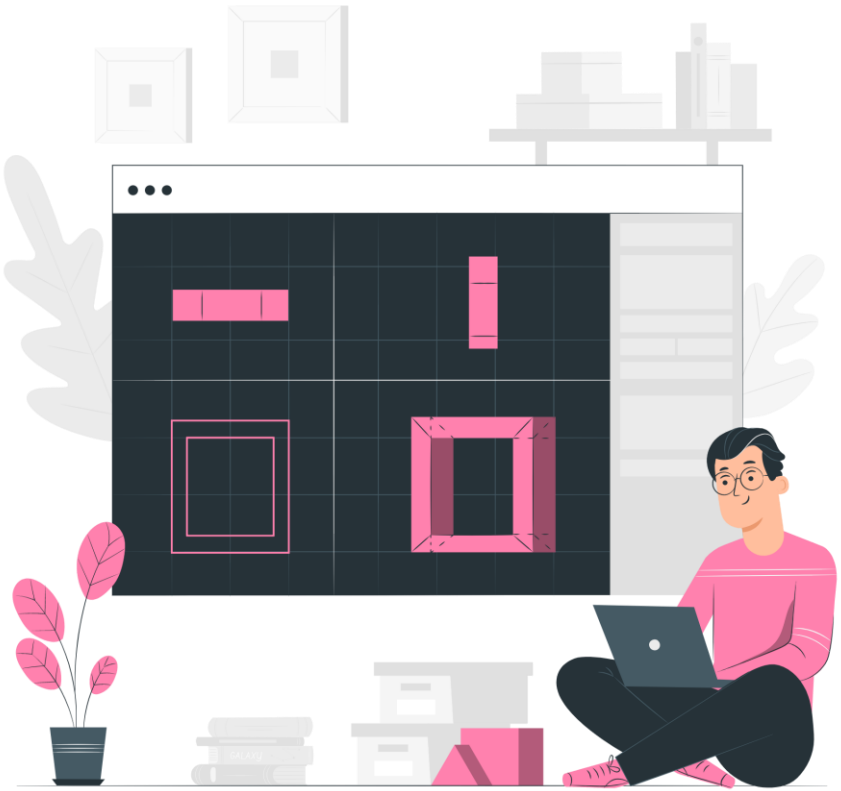
1. Strengthen business connections. Networking is about sharing, not taking.
2. Get fresh ideas.
3. Raise your profile.
4. Advance your career.
5. Get access to job opportunities.
6. Gain more knowledge.
7. Get career advice and support.
8. Build confidence.



Network communication work

The internet and most other data networks work by organizing data into small pieces called packets. To improve communication performance and reliability, each large message sent between two network devices is often subdivided into smaller packets by the underlying hardware and software.

The field of communication involves the transmission of information from one place to another place or storing information for later retrieval. A communication system is a pair of stations – a transmitter station and a receiver station.



Communication networks are collections of receiving and transmitting stations that may relay information from one station to another by means of other stations acting as relays. There are many components in the process of transmitting information in a communication system.

One component is information representation in minimal form, that is data compression. A second aspect of communication is modulation; the process whereby information is mapped into waveforms suitable for propagation.

A third aspect is error control coding; the method by which errors made in receiving information can be corrected. The performance of a communication system is usually measured in terms of the probability of incorrectly decoding the information or the distortion between the original information-bearing signal and the reconstruction, and the energy used.

In communication networks there are many components needed in the processing of sending information from one station to another via a set of intermediate stations. One aspect is medium access control – meaning which stations should transmit and when.

Another aspect of communication networks is routing – meaning which set of stations should be used as relays in communicating information from one station to another station.

The performance measures in communication networks are the network throughput (correctly decoded packets end–to–end) along with the energy consumed.

Communications research at U-M is investigating the fundamental limits of performance possible in communication systems and communication networks and the practical methods of achieving close to the fundamental limits.

The applications that are of interest include cellular communication networks, sensor networks, and optical communication systems.

Specialties Communication theory, Coding theory & practice

- Communications: Wireless, mobile, spread-spectrum communications
- Coding & Modulation: Channel coding, Polar codes, Algebraic coding, Modulation, Receiver design

Information theory

- Source coding : Lossy and lossless source coding, Quantization, Distributed compression
- Image compression : Image compression & processing
- Information theory : Multi-user information theory, Secrecy capacity, Function computation
- Quantum Information theory : Quantum information science and engineering, Quantum information theory

Networks

- Performance analysis: Stochastic scheduling and resource allocation, Communication networks, Cloud computing systems
- Telecommunication networks : Mobile / wireless /
- Ad hoc / sensor / broadband satellite networks
- Control : Stochastic control, Decentralized stochastic systems, Discrete event systems, Smart grid

Networks

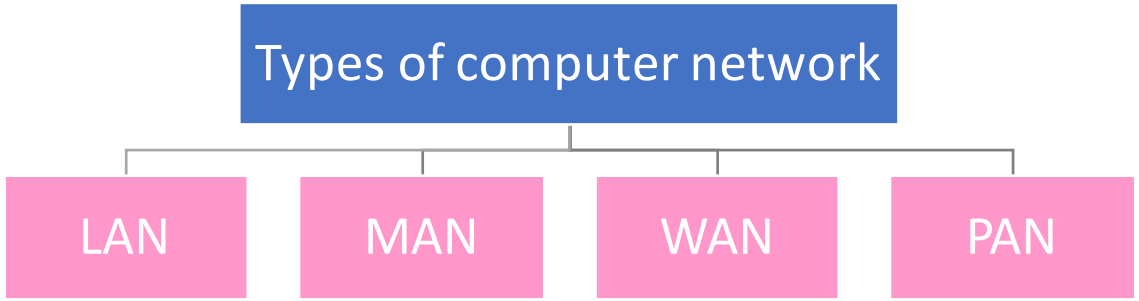
- Economics: Mathematical economics, Game theory, Energy markets, Spectrum markets, Network economics, Bayesian learning
- Social networks: Social network analysis, Recommender systems, Crowdsourcing, Random graphs
- Security: Cybersecurity, Privacy

The network communication for information system

Network communication, or internetworking, defines a set of protocols (that is, rules and standards) that allow application programs to talk with each other without regard to the hardware and operating systems where they are run.

Key differences between Computer Network and Data Communication. Data Communication deals with the communicating process across different regions and through different process whereas Computer Networking transfers information, files across different localities to communicate data along with it.

A computer network is mainly of four types:



- LAN (Local Area Network)
- PAN (Personal Area Network)
- MAN (Metropolitan Area Network)
- WAN (Wide Area Network)

Components of Data Communication

Message : The message is the information (data) to be communicated. ...

Sender : The sender is the device that sends the data message. ...

Receiver : The receiver is the device that receives the message. ...

Transmission medium : ...

Protocol:

What are the 3 components of a network?

There are three primary components to understanding networks:

1. Physical Connections;
2. Network Operating System; and
3. Application Component.

network and explain characteristics of network

A network is a set of devices (often referred to as nodes) connected by communication links. A node can be a computer, printer, or any other device capable of sending and/or receiving data generated by other nodes on the network. A network must be able to meet a certain number of criteria.

The 4 main components of a network?

Networks are comprised of four basic elements: hardware, software, protocols and the connection medium. All data networks are comprised of these elements, and cannot function without them.

There are different ways of setting up a LAN , each with different benefits in terms of network speed and cost. Three of the main topologies include bus, star and ring.

The Components of Network Management

- Network administration.
- Network maintenance.
- Network operation.
- Network provisioning.
- Network security.

The 5 characteristics of a network

To keep up, the network must adjust accordingly. The five characteristics laid out above may not be the full story, but they are a step in the right direction.

In my opinion, there are five characteristics each much have:

- Agility.
- Scalability.
- Integration.
- Resiliency.
- Security.

The main difference between network and networking is that network is a collection of computing devices connected via a communication medium to exchange information and resources while networking is the practice of creating, maintaining, securing and troubleshooting the network

Network and data communication work together in transferring information

Data Communication is a process of exchanging data or information In case of computer networks this exchange is done between two devices over a transmission medium. The hardware part involves the sender and receiver devices and the intermediate devices through which the data passes.

Definition of Computer Network The simplest definition of a computer network is the collection of autonomous computers that are interconnected and shared for the purpose of resources sharing.

Broadly speaking, transmission of information is the main purpose of computer network, which connect a number of computer system by using a communication line.

A computer network consists of a transmission medium and a communication device. From the user point of view, the computer network is defined as : it is an automatically manage network operating system which manages resources used by users. The entire network is like a large computer system, which transparent to users.

A more general definition is: the use of communication lines will be geographically dispersed, with independent functions of computer systems and communications equipment connected in different forms, to achieve resource sharing and information transmission by a complete network software and protocol.

In general, the computer network is distributed in different geographical areas of the computer and a dedicated external equipment with communication lines interconnected into a large, powerful system, so that many computers can easily communicate with each other to share information, hardware, software, data and other resources.

In a nutshell, a computer network is a collection of many autonomous computers that are interconnected by communication lines.

The Combination of Computer Network and Communication System Development Prospects Computer communication network is a combination of computer technology and communication technology to form a new communication, mainly to meet the needs of data communications.

It connected multiple computers, terminals and ancillary equipment and equipped them with the corresponding network software in different geographical location to achieve the communication process of resources sharing and the formation of the communication system.

It not only meet the document transmission needs of local area of a business, company, school and office data, it can also perform information exchange, storage and processing, provide voice, data and image synthesis in a country or even in the worldwide.

The computer communication revolution brings the important facts as follows:

There is no essential difference between data processing equipment (computers) and data communication devices (switching transmission equipment). There is no essential difference between data communications, voice communications, and video communications.

The computer communication revolution brings the important facts as follows:

The distinction between a single processor computer, a multiprocessor computer, a local area network, a metropolitan area network, and a remote network is becoming increasingly blurred.

These trends led to the component manufacturing integration to system integration of the computer industry and the communications industry. Another impact is the development of an integrated system that can transmit and process various types of data and information.

No matter technology itself or the organization of technical standards, both are forced to complete a variety of communications to develop a single public network system, which can access to the world's information sources and a variety of information through this network in a simple and unite way.

The Computer Network Communication System Risk Prevention

The vulnerability and loopholes of computer network communication systems are the objective condition of possible risk, and the threat or attack is the subjective condition of risk.

With the popularity of Internet technology, the transmission of information becomes unusually fast and convenient, which undoubtedly a great driving forces for human development. However, when the open interconnection of Internet networking technology brings human information resources to share the full potential, it also let the outside world access to your information without authorization and steals your information resources at the same time.

Security risks of computer network communication system are mainly from:

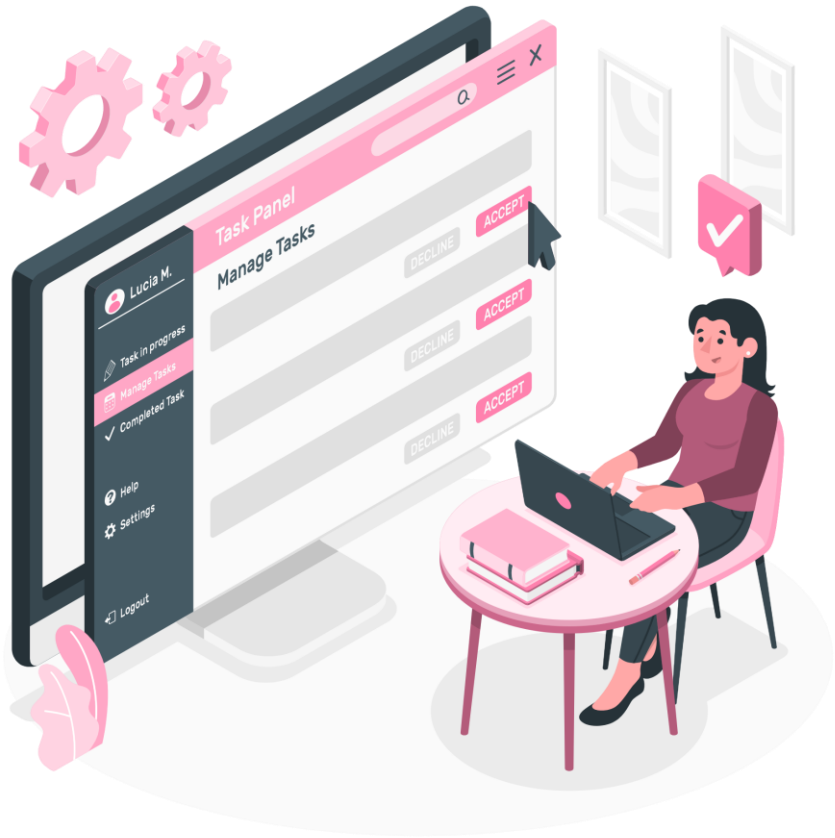
(1) Hardware components. Security risks of hardware components are mostly from the design, and these problems mainly reflect the physical security issues. Since this problem is inherent, the solving way is usually strengthen the manual compensation measures, software programs is seldom used. Such security risks should be reduced or eliminated as much as possible when come to self-made hardware and hardware purchasing.

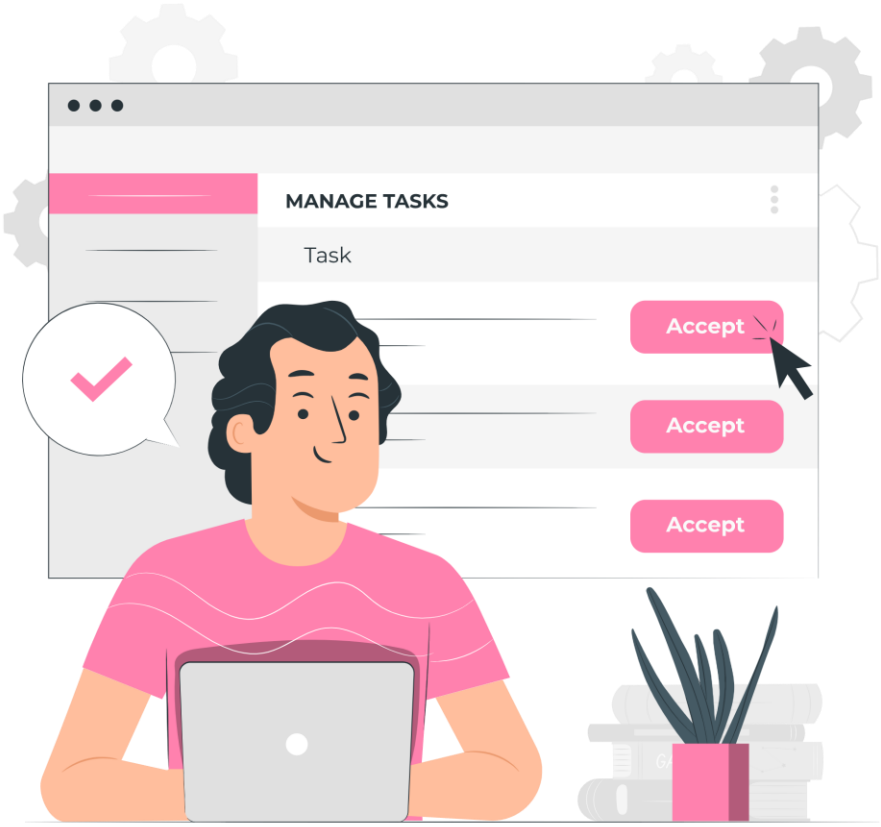
(2) Software components. Security risks of software components are mainly from the design and software engineering problems. The negligence in the software design may leave security vulnerability; the unnecessary redundancy in the software design and the software is too long and too much, and there is a security vulnerability that is unavoidable; the software design is not modularized according to the requirements of the information system security level.

The security level of the software cannot reach the proper level of security; software engineering caused by the software system internal logic confusion, resulting in garbage software, this software is absolutely not available from the security point of view. software.

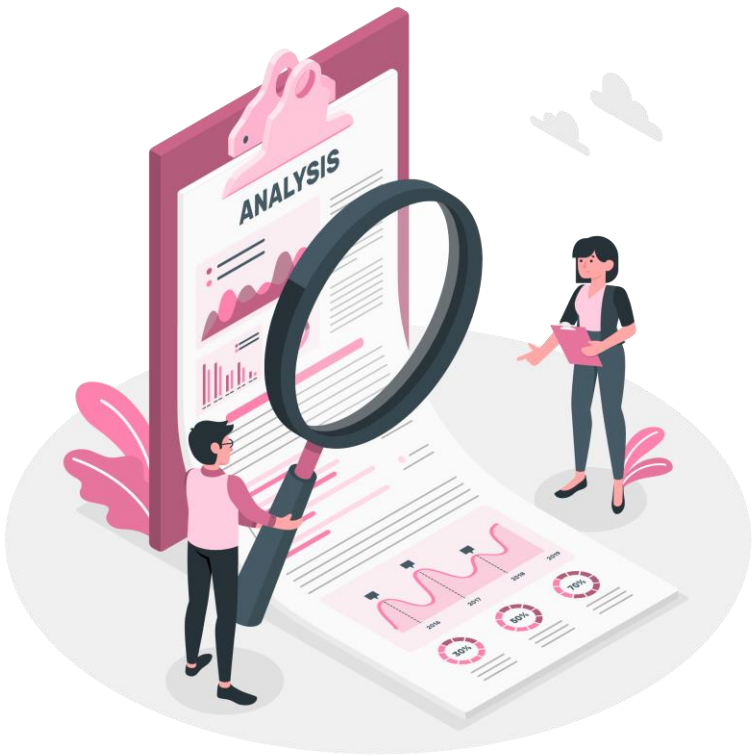
Software components can be divided into operating platform software, application platform software and application business software.

These three types of software form a software component system in a hierarchical structure. The operating platform software is at the base level, which maintains the platform on which the system components are running. Any risk of the operating platform software can be directly compromised or transferred or extended to the application platform software.

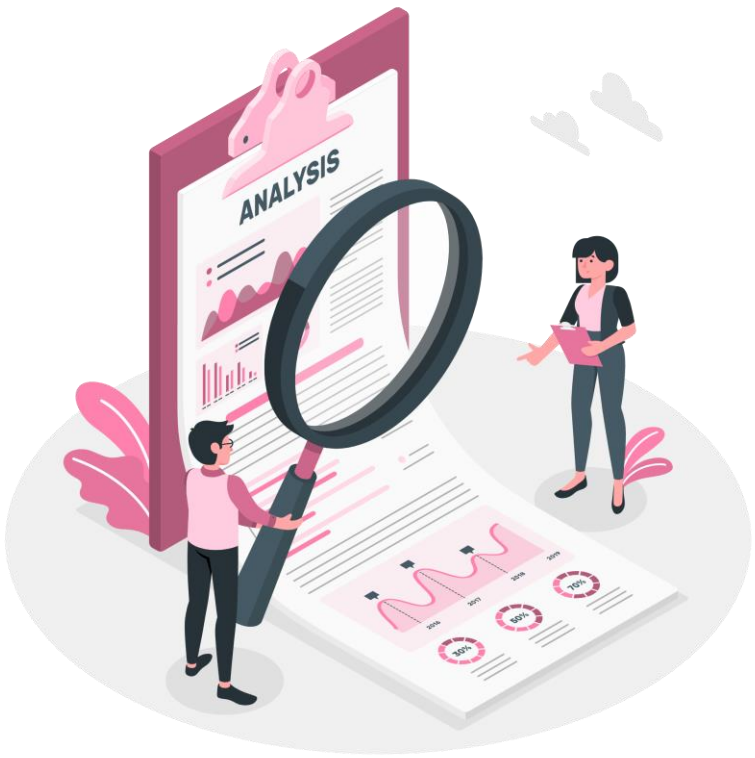




The security level requirements of the operating platform software required for the security of the information system not to lower than the system security level requirements. In particular, the operating system security level of the security service component of the system must be at least higher than the level of system security.

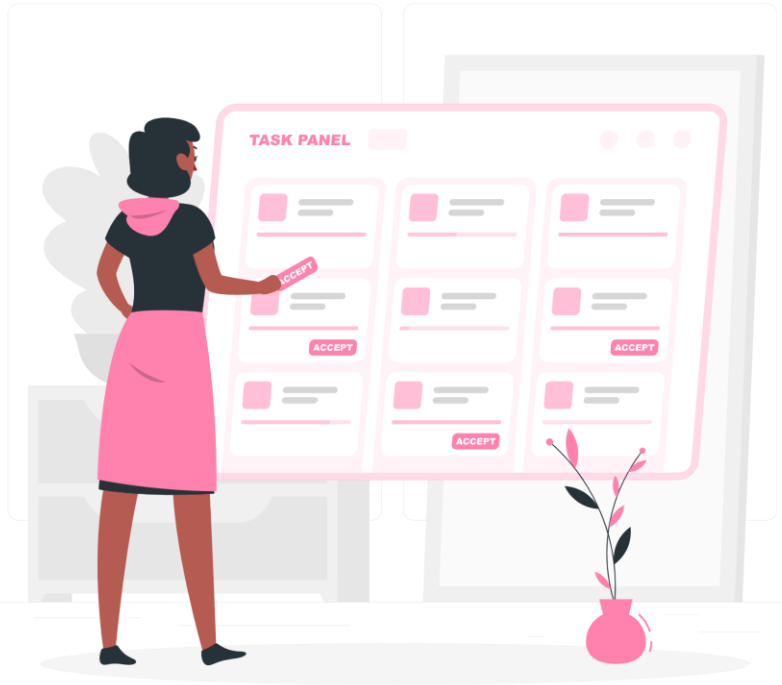


Therefore, it is strongly recommended that the commercial and universal practical operating system must not be used directly in security service components of the operating system.

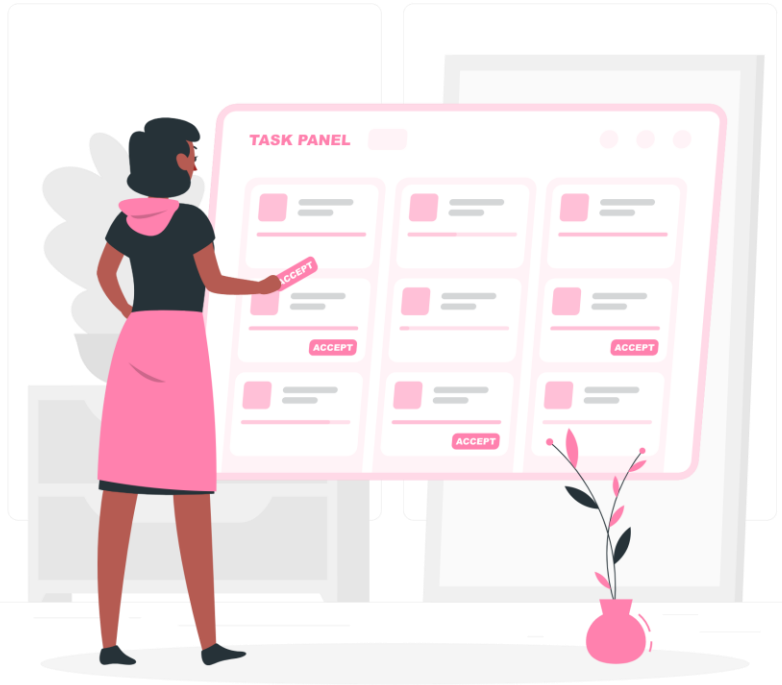


Application platform software is supported by the operating platform in the middle level to run support and management applications business software. On the one hand, the application platform software may be aff ected by the risk of software from the operating platform.

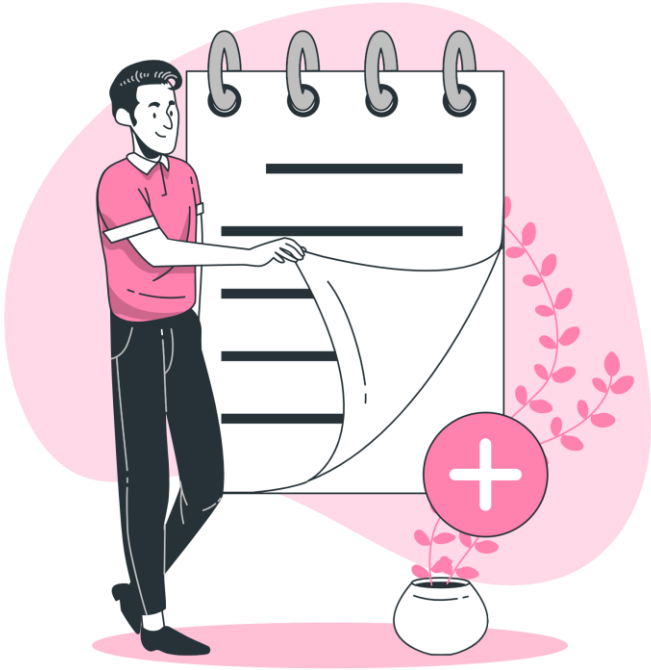
On the other hand, any risk of the application platform software can be directly compromised or passed to the application business software. Therefore, it is very important to apply the security features of the platform software.



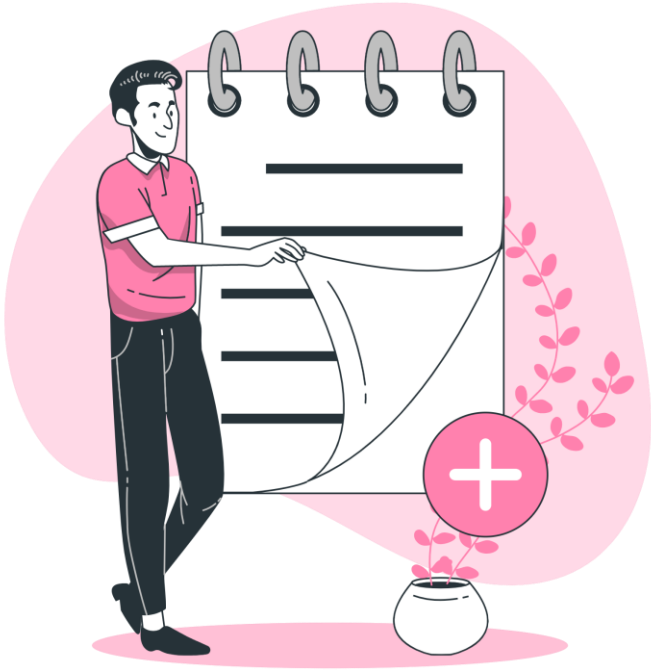
At the same time, the application platform software must provide the necessary security service function for the application software while providing its own security protection.

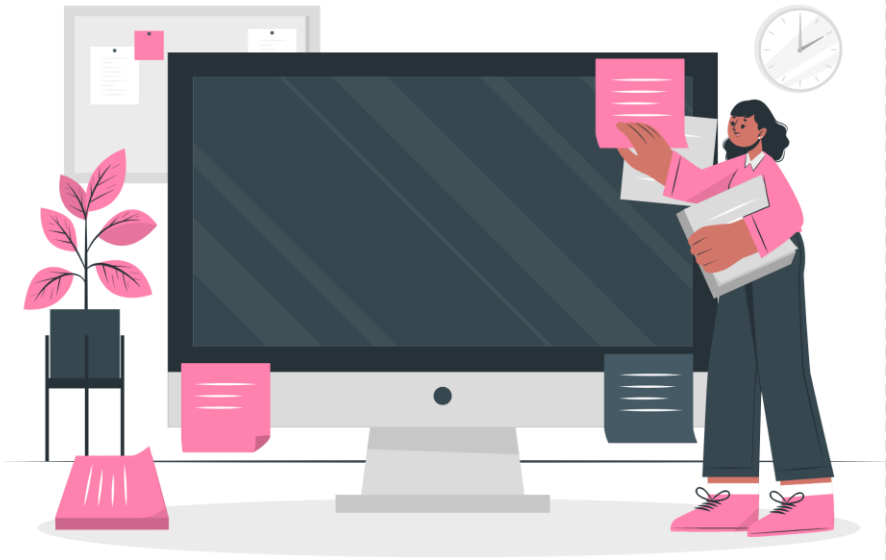


At the top level, application business software can directly deal with the user or entity. Any risk of applying the business software is directly expressed as the risk of the information system, so the integrity of its security function and its own security level must be greater than the minimum requirements for system security.



In general, outsourced commercial application business software is more secure than homemade application business software.





(3) Computer network and communication protocol. In today's computer network communication protocols, the communication protocol between the LAN and the dedicated computer network is relatively closed because it cannot connect and communicate with heterogeneous computer networks directly.

This 'closed' computer network is better than the open Internet security features, there are two reasons, one is the relative closure of the computer network system, reducing the external computer network or site directly into the system the possibility, but the information of the electromagnetic leakage and protocol analysis is based on the exists of interception of the problem: Second, the dedicated computer network itself has a more complete, mature identity authentication, access control and permission division and other security mechanisms.

(4) Analysis on the Convergence Trend of Computer Network and Communication System Information technology usually refers to the natural information function to expand or enhance the technology, human natural information functions including eyes, ears, nose and other information collection function; brain information storage and processing functions; nerve, muscle and other information transmission function and so on.

These people's natural information function manned this information system has been closely linked with the organic. Therefore, as a kind of information technology to enhance and expand the natural information function of human beings, it gradually develops towards the comprehensive direction to meet the natural needs of human and human society feature although the initial development process often begins with the simple single information function.

For computer and communication to form a computer network, the information collection, processing, storage, transmission and utilization of fi ve natural information functions may be based on the formation of a variety of information technology through the modern and bring in the global human society a broader space. This will be a more profound information technology revolution

Although the traditional computer and communication system, the computer network system will continue to have a parallel development stage as a relatively independent system with the formation, but with the social information process, people demand for integrated information function growth. Further integration of computer, communication systems and computer network system is the trend.

First of all, computer functions are increasingly being integrated into the computer network, which caused lesser and lesser computer applications. Now, the communication system and the computer network system are further merging along two basic paths: First, the traditional information transmission service-based communication system through the integration of computer technology, expansion of non-communication information services to the computer network direction ; the traditional information processing services consisting mainly of computer networks, and further integration of advanced communications systems, including the development of integrated information services for more advanced computer networks.

Q&A