

# Chapter 2 Computer Network

## 2.1 Introduction to Computer Network

Computer network is a system connecting two or more computers. A computer network allows user to exchange data quickly, access and share resources including equipments, application software, and information.

Data communications systems are the electronic systems that transmit data over communications lines from one location to another. You might use data communications through your microcomputer to send information to a friend using another computer. You might work for an organization whose computer system is spread throughout a building, or even throughout the country or world. That is, all the parts—input and output units, processor, and storage devices—are in different places and linked by communications. Or you might use telecommunications lines—telephone lines—to tap into information located in an outside data bank. You could then transmit it to your microcomputer for your own reworking and analysis.

To attach to a network, a special-purpose hardware component is used to handle all the transmission. The hardware is called a network adapter card or network interface card (NIC), it is a printed circuit board plugged into a computer's bus, and a cable connects it to a network medium.

Communications networks differ in geographical size. There are three important types: LANs, MANs, and WANs.

Local Area Networks Networks with computers and peripheral devices in close physical proximity—within the same building, for instance—are called local area networks (LANs). Linked by cable-telephone, coaxial, or fiber optic. LANs often use a bus form organization. In a LAN, people can share different equipments, which lower the cost of equipments. LAN may be linked to other LANs or to larger networks by using a network gateway. With the gateway, one LAN may be connected to the LAN of another LAN of another office group. It may also be connected to others in the wide world, even if their configurations are different. Alternatively, a network bridge would be used to connect networks with the same configurations.

There is a newly development for LANs: WLAN. A wireless LAN (WLAN) is a flexible data communication system implemented as an extension to, or as an alternative for, a wired LAN within a building or campus. Using electromagnetic waves, WLANs transmit and receive data over the air, minimizing the need for wired connections. Thus, WLANs combine data connectivity with user mobility, and, through simplified configuration, enable movable LANs.

Over the recent several years, WLANs have gained strong popularity in a number of vertical markets, including the health-care, retail, manufacturing, warehousing, and academic arenas.

<sup>[1]</sup>These industries have profited from the productivity gains of using hand-held terminals and notebook computers to transmit real-time information to centralized hosts for processing. Today

WLANs are becoming more widely recognized as a general-purpose connectivity alternative for a broad range of business customers.

Applications for Wireless LANs <sup>[2]</sup>Wireless LANs frequently augment rather than replace wired LAN networks—often providing the final few meters of connectivity between a backbone network and the mobile user. The following list describes some of the many applications made possible through the power and flexibility of wireless LANs:

- Doctors and nurses in hospitals are more productive because hand-held or notebook computers with wireless LAN capability deliver patient information instantly.
- Consulting or accounting audit engagement teams or small workgroups increase productivity with quick network setup.
- Network managers in dynamic environments minimize the overhead of moves, adds, and changes with wireless LANs, thereby reducing the cost of LAN ownership.
- Training sites at corporations and students at universities use wireless connectivity to facilitate access to information, information exchanges, and learning.
- Network managers installing networked computers in older buildings find that wireless LANs are a cost-effective network infrastructure solution.
- Retail store owners use wireless networks to simplify frequent network reconfiguration.
- Trade show and branch office workers minimize setup requirements by installing preconfigured wireless LANs needing no local MIS support.
- Warehouse workers use wireless LANs to exchange information with central databases and increase their productivity.
- Network managers implement wireless LANs to provide backup for mission-critical applications running on wired networks.
- Senior executives in conference rooms make quicker decisions because they have real-time information at their fingertips.

The increasingly mobile user also becomes a clear candidate for a wireless LAN. Portable access to wireless networks can be achieved using laptop computers and wireless NICs. This enables the user to travel to various locations—meeting rooms, hallways, lobbies, cafeterias, classrooms, etc.—and still have access to their networked data. Without wireless access, the user would have to carry clumsy cabling and find a network tap to plug into.

Metropolitan Area Networks These networks are used as links between office buildings in a city. Cellular phone systems expand the flexibility of MAN by allowing links to car phones and portable phones.

Wide Area Networks Wide area networks are countrywide and worldwide networks. Among other kinds of channels, they use microwave relays and satellites to reach users over long distances. One of the most widely used WANs is Internet, which allows users to connect to other users and facilities worldwide.

## Words

alternatively	<i>adv.</i>	二中择一地, 换句话说
attach	<i>v.</i>	附上, 连接
audit	<i>v.</i>	审计, 会计检查, 查账, 核查
augment	<i>v.</i>	增大; 增加
backbone	<i>n.</i>	构架, 中心, 中枢, 主干线
cafeteria	<i>n.</i>	自助食堂
candidate	<i>n.</i>	选择物, 候选人
clumsy	<i>adj.</i>	笨拙的
engagement	<i>n.</i>	约定
exchange	<i>v.</i>	交换, 调换
facilitate	<i>v.</i>	易于, 便于, 助长
cost-effective	<i>adj.</i>	划算的
gateway	<i>n.</i>	网关
halfway	<i>adj.</i>	中途的, 一半的长度
implement	<i>v.</i>	履行
infrastructure	<i>n.</i>	下部结构, 永久性基地, 基础
lobby	<i>n.</i>	门廊, 休息室
metropolitan	<i>adj.</i>	大城市的
mission	<i>n.</i>	使命, 任务, 代表团
	<i>v.</i>	派遣
mobility	<i>n.</i>	灵活性, 移动性, 可动性
overhead	<i>adj.</i>	过顶的, 头上的, 经常的
peripheral	<i>n.</i>	外部设备, 辅助设备
plug	<i>n.</i>	插头, 插塞
profit	<i>v.</i>	有利于, 获益
proximity	<i>n.</i>	接近, 近似, 近程
retail	<i>n.</i>	零售
warehouse	<i>n.</i>	仓库

## Abbreviations

LAN (Local Area Network)	局域网
MAN (Metropolitan Area Network)	城际网
MIS (Management Information System)	管理信息系统
NIC (Network Interface Card)	网络接口卡
WAN (Wide Area Network)	广域网
WLAN (Wireless Local Area Network)	无线局域网

## Notes

[1] 例句: These industries have profited from the productivity gains of using hand-held terminals and notebook computers to transmit real-time information to centralized hosts for processing.

分析: using 引导的动名词短语用 and 连接作介词 of 的宾语, 此句虽然较长, 但是一个简单句。

译文: 这些工业通过手提终端和笔记本电脑将实时信息传送到中央主机进行处理, 从获得的生产率中已获益匪浅。

[2] 例句: Wireless LANs frequently augment rather than replace wired LAN networks—often providing the final few meters of connectivity between a backbone network and the mobile user.

分析: rather than 而不是, often providing...是分词短语作状语, between...介词短语作定语修饰 connectivity。

译文: 无线局域网通常是增加而不是代替有线局域网的功能, 通常是在中枢网络和移动用户之间提供最后几米的连接。

## Exercises

I. Write true or false for the following statements according to the passage.

1. ( ) A computer network is only connected by cable lines, such as telephone lines.
2. ( ) The three types of network mainly differ in their geographical size.
3. ( ) With a network gateway, a LAN can connect another LAN that has the same configuration.
4. ( ) A network bridge and gateway are connectors that are used to connect two LANs or more.
5. ( ) WLAN is replacement for LAN.
6. ( ) NIC is an electric circuit board that is necessary hardware component for computer network.
7. ( ) WLANs transmit data through the air and they needn't NICs.
8. ( ) A metropolitan area network connects two or more computers within a city.
9. ( ) Internet is the most often used WAN of today.
10. ( ) With WLANs, it is possible for users to connect with networks at any corner of the world.

II. Fill in the blanks according to the passage.

1. A computer network allows user to \_\_\_\_\_ data quickly, \_\_\_\_\_ and \_\_\_\_\_ resources.
2. WLAN stands for \_\_\_\_\_.
3. Wireless LANs frequently \_\_\_\_\_ rather than \_\_\_\_\_ wired LAN networks.
4. \_\_\_\_\_ phone systems expand the flexibility of MAN by allowing links to car phones

and portable phones.

5. Network managers in \_\_\_\_\_ environments \_\_\_\_\_ the overhead of moves, adds, and changes with wireless LANs, thereby reducing the \_\_\_\_\_ of LAN ownership.

6. Wide area networks are \_\_\_\_\_ and \_\_\_\_\_ networks.

7. Data communications systems are the electronic systems that transmit data over \_\_\_\_\_ from one location to another.

8. Senior executives in conference rooms make quicker decisions because they have \_\_\_\_\_ information at their fingertips.

9. A wireless LAN is a flexible data communication system implemented as an \_\_\_\_\_ to, or as an \_\_\_\_\_ for, a wired LAN within a building or campus.

10. A network bridge would be used to connect networks with the same \_\_\_\_\_.

III. Translate the following words and expressions into Chinese.

1. telecommunications lines

6. hand-held

2. network interface card

7. clumsy cabling

3. geographical size

8. peripheral devices

4. electromagnetic wave

9. information exchanges

5. gateway

10. flexibility

## 2.1.1 Reading Material 1

**What is a Firewall?**

The term "firewall" illustrates a system that protects a network and the machines on them from various types of attack. Firewalls are geared towards keeping the server up all the time and protecting the entire network.

The primary goal of a firewall is to implement a desired security policy; controlling access in both directions through the firewall, and to protect the firewall itself from compromise. It wards off intrusion attempts, Trojans and other malicious attacks.

### Personal Firewalls

They are meant for the home user in a networked environment. They aim to block simple attacks, unlike the enterprise level firewalls that the corporate world uses at the server or router end. There are many ways to implement a firewall, each with specific advantages and disadvantages.

### Are they really needed?

Nowadays organizations and professionals use Internet technology to establish their online presence and showcase their products and services globally. Their endeavor is to leverage digital technology to make their business work for them.

All the organizations and professionals are shifting from Dialup to broadband and getting a fixed IP. It has led to an increase in security attacks, bugs in everyday working. This does not

mean that Dialup being anonymous dynamic link or the firewall of the ISP network make you pretty safe.

Now if your machine was under attack, you must have wondered what went wrong making your system crash suddenly. It is not necessary for anyone to actually know about you or your IP address to gain access to your system.

If your system is infected or prone to intrusions, then beyond the anonymity of your Dialup connection or a dynamic IP, your system can be hacked.

#### Types of Attacks

**Intrusion** There are many ways to gain unauthorized access to a system. Operating system vulnerabilities, cracked or guessed passwords are some of the more common. Once access is attained, the intruder can send email, tamper with data, or use the system privileges to attack another system.

**Information Theft and Tampering** Data theft and tampering do not always require that the system be compromised. There have been many bugs with FTP servers that allow attackers to download password files or upload Trojan horses.

**A Service Attacks** Any attack that keeps the intended user from being able to use the services provided by their servers is considered a denial of service attack. There are many types of denial of service attacks, and unfortunately are very difficult to defend against. "Mail bombs" are one example in which an attacker repeatedly sends large mail files in the attempt at filling the server's disk file system thus preventing legitimate mail from being received.

#### Types of Attackers

**Joyrider** Not all attacks on computer systems are malicious. Joyriders are just looking for fun. Your system may be broken into just because it was easy, or to use the machine as a platform to attack others. It may be difficult to detect intrusion on a system that is used for this purpose. If the log files are modified, and if everything appears to be working, you may never know.

**Vandals** A vandal is malicious. They break in to delete files or crash computer systems either because they don't like you, or because they enjoy destroying things. If a vandal breaks into your computer, you will know about it right away. Vandals may also steal secrets and target your privacy.

**Spies** Spies are out to get secret information. It may be difficult to detect break-ins by spies since they will probably leave no trace if they get what they are looking for.

A personal firewall, therefore, is one of the methods you can use to deny such intrusions.

#### Words

anonymity	<i>n.</i>	无名, 匿名
endeavor	<i>n./ v.</i>	努力, 试图
hack	<i>v.</i>	劈, 砍



## 2.1.3 正文参考译文

### 计算机网络介绍

计算机网络是连接两个或多个计算机的系统，它允许用户快速地交换数据，访问和共享包括设备、应用软件和信息在内的资源。

数据通信系统是通过通信线路将数据从一个地方传送到另外一个地方的电子系统。你可以使用数据通信通过你的微机将信息发送给使用另外一台机器的朋友。你有可能在为一家公司工作，其计算机系统遍布一座大楼，或者甚至是全国乃至世界。也就是说，所有的部分——输入和输出单元、处理器和存储设备——都在不同的地方，是通过通信连接起来的。或者你可能使用远程通信线——电话线——接进位于外部数据单元的信息。然后你可能将信息传送到自己的微机上用于重新工作和分析。

为了连接到网络上，需要使用特殊用途的硬件部件来处理所有的传送。这个硬件被称为是网络适配卡或网络接口卡，它是插入到计算机总线上的印刷电路板，由电缆将它连接到网络介质。

通信网络由于其占据的地理范围大小而不同。有三种重要的类型：局域网、城市网和广域网。

**局域网** 计算机和外部设备在很近的物理范围内的网络被称为是局域网，例如在一座大楼内，由电缆连接——电话线、同轴电缆或光缆。局域网通常使用总线型的结构。在局域网中人们可以共享不同的设备，这样可以降低设备的费用。局域网可以通过使用网关连接到另外一个局域网或者更大的网。使用网关，一个局域网可以被连接到另一个办公团体的局域网上，它也可被连接到世界范围的其他局域网上，即使它们的配置不同。另外一种方法是用网桥来连接具有相同配置的网络。

对于局域网有一个新开发的网络：无线局域网。无线局域网是灵活的数据传输系统，实现了大楼或校园内有线局域网的延伸或替换。无线局域网使用电磁波通过空气传送和接收数据，最低限度地减少了有线连接。这样，无线局域网把数据连接和用户移动性结合起来，通过简化的配置，形成了移动的局域网。

随着近几年的发展，无线局域网在一些市场领域已经获得了广泛的普及，其中包括健康保健、零售业、制造业、仓储业和学术界。这些工业通过手提终端和笔记本电脑将实时信息传送到中央主机进行处理，从获得的生产率中已获益非浅。如今，对于广泛的商业客户来说，无线局域网正成为公认的通用连接的替代品。

**无线局域网的应用** 无线局域网通常是增加而不是代替有线局域网的功能——通常是在中枢网络和移动用户间提供最后几米的连接。通过无线局域网的灵活性和功能，以下所列描述了可能实现的许多应用当中的一些：

- 医院的医生和护士利用手提或笔记本电脑与无线局域网连接的性能，及时传递了病人的信息，提高了效率。
- 顾问或会计审计事务组或一些小的工作组使用快速搭建的网络提高了工作效率。
- 在动态环境下的网络管理者使用无线局域网最大限度地减少了经常的移动、添加和修改工作，从而降低了局域网所有者的费用。
- 公司的培训点和大学的学生使用无线连接便于访问信息，进行信息交换以及学习。



- 在旧的建筑物内安装网络计算机的网络管理员发现无线局域网是划算的网络基础结构的解决方案。
- 零售商店的老板使用无线局域网简化经常性的网络重新配置（问题）。
- 贸易展览部门工作人员通过安装预先配置的无线局域网最大限度地降低了配置需求，而不需要当地信息管理系统的支持。
- 仓储工人使用无线局域网和中心数据库交换信息提高了生产率。
- 网络管理员使用无线局域网提供运行在有线网络上的关键应用程序的备份。
- 在会议室的高级行政官因为手头有实时信息可供使用，因此可以做出快速的决定。

日益增长的移动用户也成为无线局域网的坚实的后备力量。使用膝上电脑和无线网络接口卡就可实现移动访问无线局域网，这就使得用户可以在不同的地方穿梭 会议室、门厅、休息室、自助食堂、教室等地方 仍然可以访问其网络数据。假如没有无线局域网，用户就不得不携带笨重的电缆寻找网络插头。

大城市网 这些网络用于一个城市内的建筑物之间的连接。移动电话系统通过允许将汽车电话和移动电话接入而扩展了大城市网的灵活性。

宽域网 宽域网是国家和世界范围内的网络。在其他的信道种类中，宽域网使用微波中继和卫星通信远距离到达用户。使用最广泛的宽域网是 Internet，它允许在世界范围内用户和用户及设备的连接。

## 2.2 Data Communications Channels

To get here to there, data must move through something. A telephone line, cable, or the atmosphere are all transmission media, or channels. But before the data can be communicated, it must be converted into a form suitable for communication.

Data communications lines can be connected in two types of configurations: point-to-point and multidrop. A point-to-point line directly connects the sending and the receiving devices, and a multidrop line connects many devices, not just one sending device and one receiving device.

The two ways of connecting microcomputers with each other and with other equipments are through the cable and through the air. There are three basic forms into which data can be converted for communication: electrical pulses or charges, electromagnetic waves, and pulses of light.

Specifically, five kinds of technology are used to transmit data. These are telephone lines (twisted pair), coaxial cable, fiber-optic cable, microwave, and satellite.

Telephone Lines <sup>[1]</sup>Inexpensive, multiple-conductor cable comprised of one or more pairs of 18 to 24 gauge copper strands. The strands are twisted to improve protection against electromagnetic and radio frequency interference. The cable, which may be either shielded or unshielded, is used in low-speed communications, as telephone cable. It is used only in baseband networks because of its narrow bandwidth. Most telephone lines you see strung on poles consist of cables made up of hundreds of copper wires are twisted pairs. Twisted pairs are susceptible to a variety of types of electrical interference (noise), which limits the practical distance that data

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