

Principles of Management Information Systems

Lecture 6

MGM331

Networks and Cloud Computing

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Chapter 6

- Today's decision makers need to access data wherever it resides. They must be able to establish fast, reliable connections to exchange messages, upload and download data and software, route business transactions, connect to databases and network services, and send output to wherever it is needed.
- Regardless of your chosen major or future career field, you will make use of the communications capabilities provided by networks.
- This is especially true for those whose role is connected to the supply chain and who rely heavily on networks to support cooperation and communication among workers in inbound logistics, warehouse and storage, production, finished product storage, outbound logistics, and, most importantly, with customers, suppliers, and shippers.

Chapter 6

- Many supply chain organizations make use of the Internet to purchase raw materials, parts, and supplies at competitive prices. All members of the supply chain must work together effectively to increase the value perceived by the customer, so partners must communicate well.
- Other employees in human resources, finance, research and development, marketing, manufacturing, and sales positions must also use communications technology to communicate with people inside and outside the organization.
- To be a successful member of any organization, you must be able to take advantage of the capabilities that these technologies offer you.
- This chapter begins by discussing the importance of effective communications.

Principles

- ✓ A network has many fundamental components, which when carefully selected and effectively integrated enable people to meet personal and organizational objectives.
- ✓ Together, the Internet and the World Wide Web provide a highly effective infrastructure for delivering and accessing information and services.

Principles

- ✓ Organizations are using the Internet of Things (IoT) to capture and analyze streams of sensor data to detect patterns and anomalies not after the fact, but while they are occurring in order to have a considerable impact on the event outcome.
- ✓ Cloud computing provides access to state of the art technology at a fraction of the cost of ownership and without the lengthy delays that can occur when an organization tries to acquire its own resources.

Learning Objectives

- Identify and briefly describe network topologies and different network types, including the uses and limitations of each.
- Identify and briefly discuss several types of both guided and wireless communications.
- Identify several network hardware devices and define their functions.
- Briefly describe how the Internet and the Web work, including various methods for connecting to the Internet.

Learning Objectives

- Define what is meant by the Internet of Things (IoT), and explain how it works.
- Identify and briefly discuss several practical applications of the Internet of Things (IoT).
- Discuss how cloud computing can increase the speed and reduce the costs of new product and service launches.

Introduction

- In today's high speed global business world, organizations need always on, always connected computing for traveling employees and for network connections to their key business partners and customers
- Forward thinking organizations strive to increase revenue, reduce time to market, and enable collaboration with their suppliers, customers, and business partners by using networks.

Introduction

Here are just a few examples of organizations using networks to move ahead:

- Many retail organizations are launching their own mobile payment system, with the hopes of reducing payments to financial services organizations while also increasing customer loyalty. Some of these new systems include Android Pay, Apple Pay, PayPal, Paydiant, Samsung Pay.
- Networks make it possible for you to access a wealth of educational material and earn certifications or an online degree.

Introduction

- Telemedicine provides remote access to a physician via a network (typically via a phone or videoconference) to address a healthcare issue. Its use has become well established in rural areas for specialty consultations
- Advances in network technology allow us to communicate in real time with customers, clients, business partners, and coworkers almost anywhere in the world.
- Networks also reduce the amount of time required to transmit information necessary for driving and concluding business transactions.

Chapter 6: Networks and Cloud Computing

Network Fundamentals

Network Topology

Network Types

Client/Server Systems

Communications Media

Communications Hardware

The Internet and World Wide Web

History of Internet

How the Internet Works

Accessing the Internet

World wide web

The Internet of Things

Cloud Computing

Network Fundamentals

- A *computer network* consists of communications media, devices, and software connecting two or more computer systems or devices.
- *Communications media* are any material substance that carries an electronic signal to support communications between a sending and a receiving device.
- The computers and devices on the networks are also sometimes called network nodes.

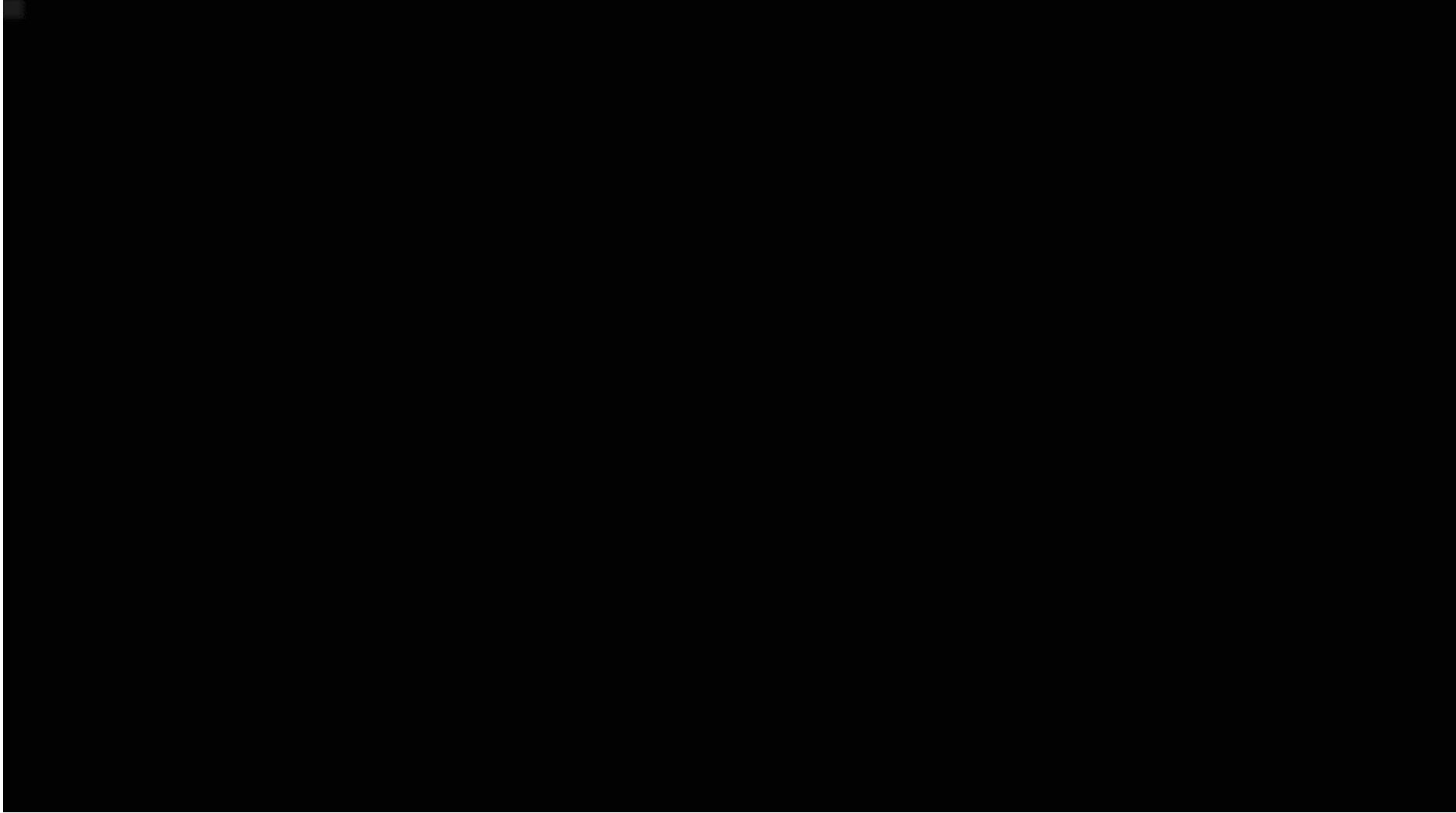
Network Fundamentals

- Organizations can use networks to share hardware, programs, and databases and to transmit and receive information, allowing for improved organizational effectiveness and efficiency.
- Networks enable geographically separated workgroups to share documents and opinions, which fosters teamwork, innovative ideas, and new business strategies.
- Effective use of networks can help a company grow into an agile, powerful, and creative organization, giving it a long term competitive advantage.

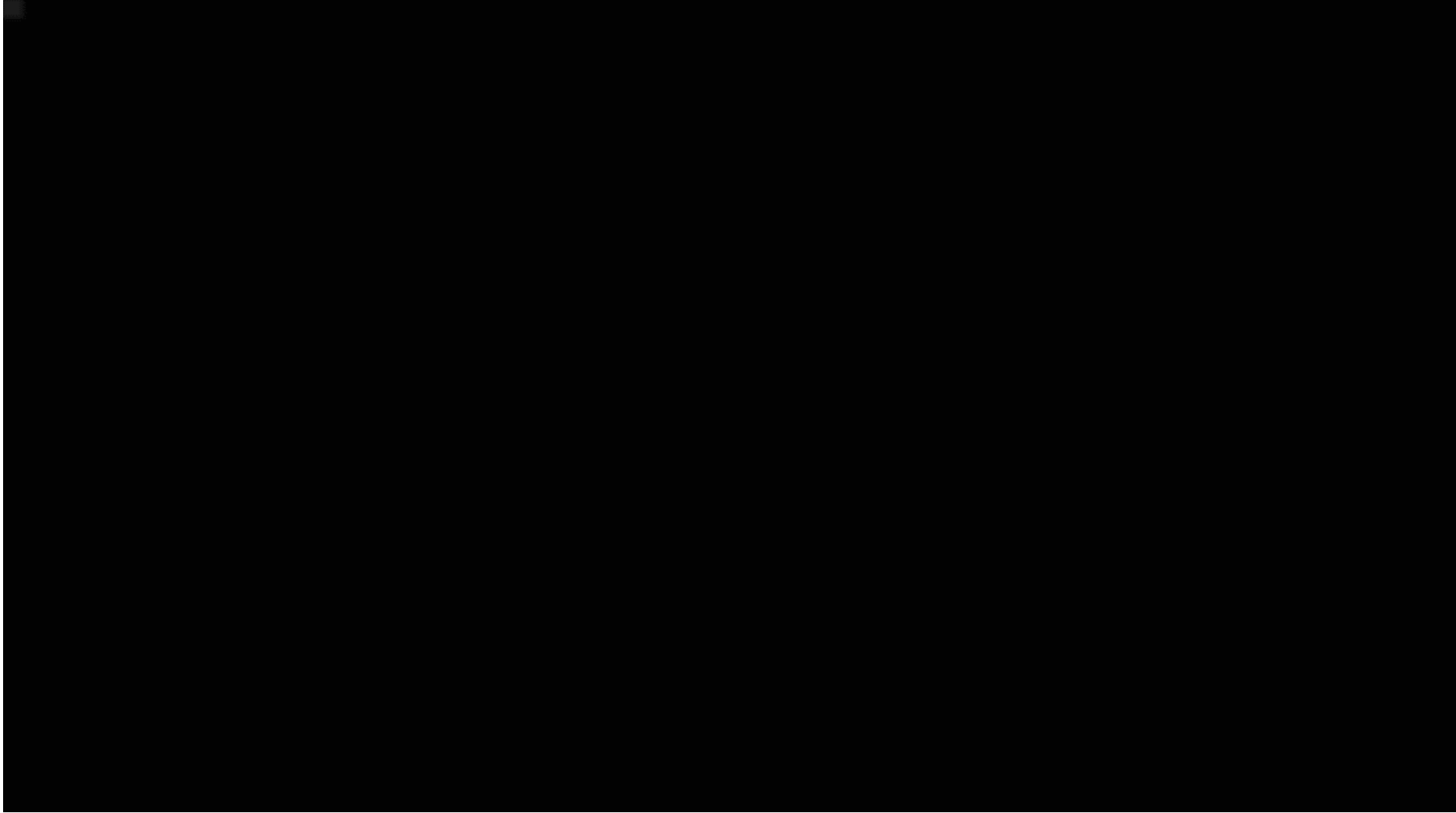
Network Topology

- *Network topology* is the shape or structure of a network, including the arrangement of the communication links and hardware devices on the network.
- The transmission rates, distances between devices, signal types, and physical interconnection may differ between networks, but they may all have the same topology.
- The most common network topologies in use today are the ring, star, bus, and mesh.

Network Topology



Network Topology



Network Topology

- In a *star network*, all network devices connect to one another through a single central device called the hub node.
- A failure in any link of the star network will isolate only the device connected to that link.
- However, should the hub fail, all devices on the entire network will be unable to communicate.

Network Topology

- In a *bus network*, all network devices are connected to a common backbone that serves as a shared communications medium.
- To communicate with any other device on the network, a device sends a broadcast message onto the communications medium. All devices on the network can “see” the message, but only the intended recipient actually accepts and processes the message.

Network Topology

- *Mesh networks* use multiple access points to link a series of devices that speak to each other to form a network connection across a large area.
- Communications are routed among network nodes by allowing for continuous connections and by bypassing blocked paths by “hopping” from node to node until a connection can be established.
- Mesh networks are very robust: if one node fails, all the other nodes can still communicate with each other, directly or through one or more intermediate nodes.
- Saudi Telecom Company (STC) is the largest communications services provider in the Middle East and North Africa. STC recently deployed a mesh network that ensures network survivability even in the case of multiple outages with restoration of service within 50 milliseconds.

Network Types

PAN PERSONAL AREA NETWORK



Network Types

- A *personal area network (PAN)* is a wireless network that connects information technology devices close to one person.
- With a PAN, you can connect a laptop, digital camera, and portable printer without cables. You can download digital image data from the camera to the laptop and then print it on a high quality printer all wirelessly.
- *Local Area Networks* A network that connects computer systems and devices within a small area, such as an office, home, or several floors in a building is a local area network (LAN).
- Typically, LANs are wired into office buildings and factories. Although LANs often use unshielded twisted pair copper wire, other media including fiber optic cable is also popular. Increasingly, LANs use some form of wireless communications.

Network Types

- A *metropolitan area network (MAN)* is a network that connects users and their computers in a geographical area that spans a campus or city.
- A MAN might redefine the many networks within a city into a single larger network or connect several LANs into a single campus MAN.
- A *wide area network (WAN)* is a network that connects large geographic regions.
- WANs usually consist of computer equipment owned by the user, together with data communications equipment and network links provided by various carriers and service providers.

Client/Server Systems

- In *client/server* architecture, multiple computer platforms are dedicated to special functions, such as database management, printing, communications, and program execution.
- These platforms are called servers. Each server is accessible by all computers on the network.
- Servers can be computers of all sizes.
- The server distributes programs and data to the other computers (clients) on the network as they request them.
- A client is any computer (often a user's personal computer) that sends messages requesting services from the servers on the network.

Communications Media

- The communications media selected for a network depends on the amount of information to be exchanged, the speed at which data must be exchanged, the level of concern about data privacy, whether the users are stationary or mobile, and a variety of business requirements.
- Transmission media can be divided into two broad categories *guided* (also called wired) transmission media, in which communications signals are guided along a solid medium, and *wireless*, in which the communications signal is broadcast over airwaves as a form of electromagnetic radiation.

Communications Media

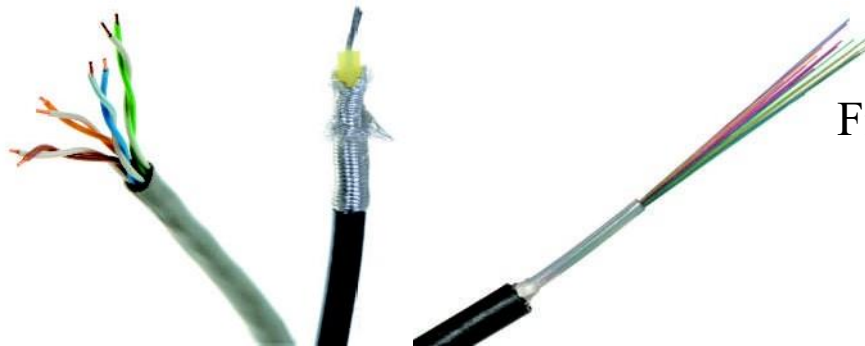
- *Guided Transmission Media Types*
- Table 6.1 summarizes the guided media types by physical media form.
- The three most common guided transmission media types are shown in Figure 6.5

Media Form	Description	Advantages	Disadvantages
Twisted pair wire	Twisted pairs of copper wire, shielded or unshielded; used for telephone service	Widely available	Limitations on transmission speed and distance
Coaxial cable	Inner conductor wire surrounded by insulation	Cleaner and faster data transmission than twisted pair wire	More expensive than twisted pair wire
Fiber optic cable	Many extremely thin strands of glass bound together; uses light beams to transmit signals	Diameter of cable is much smaller than coaxial cable; less distortion of signal; capable of high transmission rates	Expensive to purchase and install

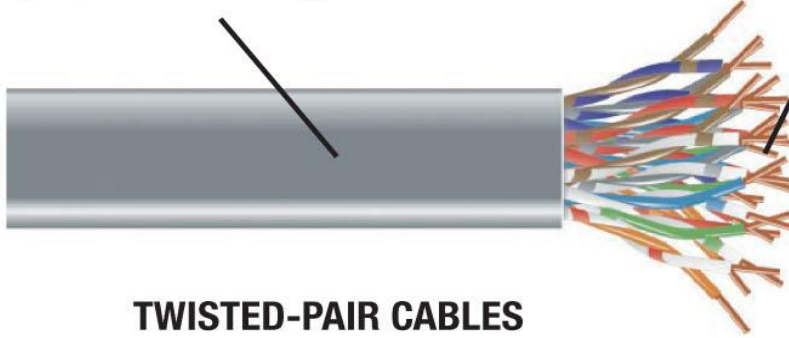
Coaxial cable

Twisted pair wire

Fiber optic cable



The entire cable is covered by a plastic covering.



Pairs of copper wires are insulated with a plastic coating and twisted together; most cables contain at least two pairs.

TWISTED-PAIR CABLES



The entire cable is covered by a plastic covering.



Outer conductor is made out of woven or braided metal.

White insulating material surrounds the copper wire.

The innermost part of the cable is a single copper wire.

COAXIAL CABLES



The entire cable is surrounded by strengthening material and covered by a plastic covering.



The core of each fiber is a single glass or plastic tube, which is surrounded by a reflective cladding.

A protective plastic coating protects each fiber; a cable contains multiple fibers.

FIBER-OPTIC CABLES



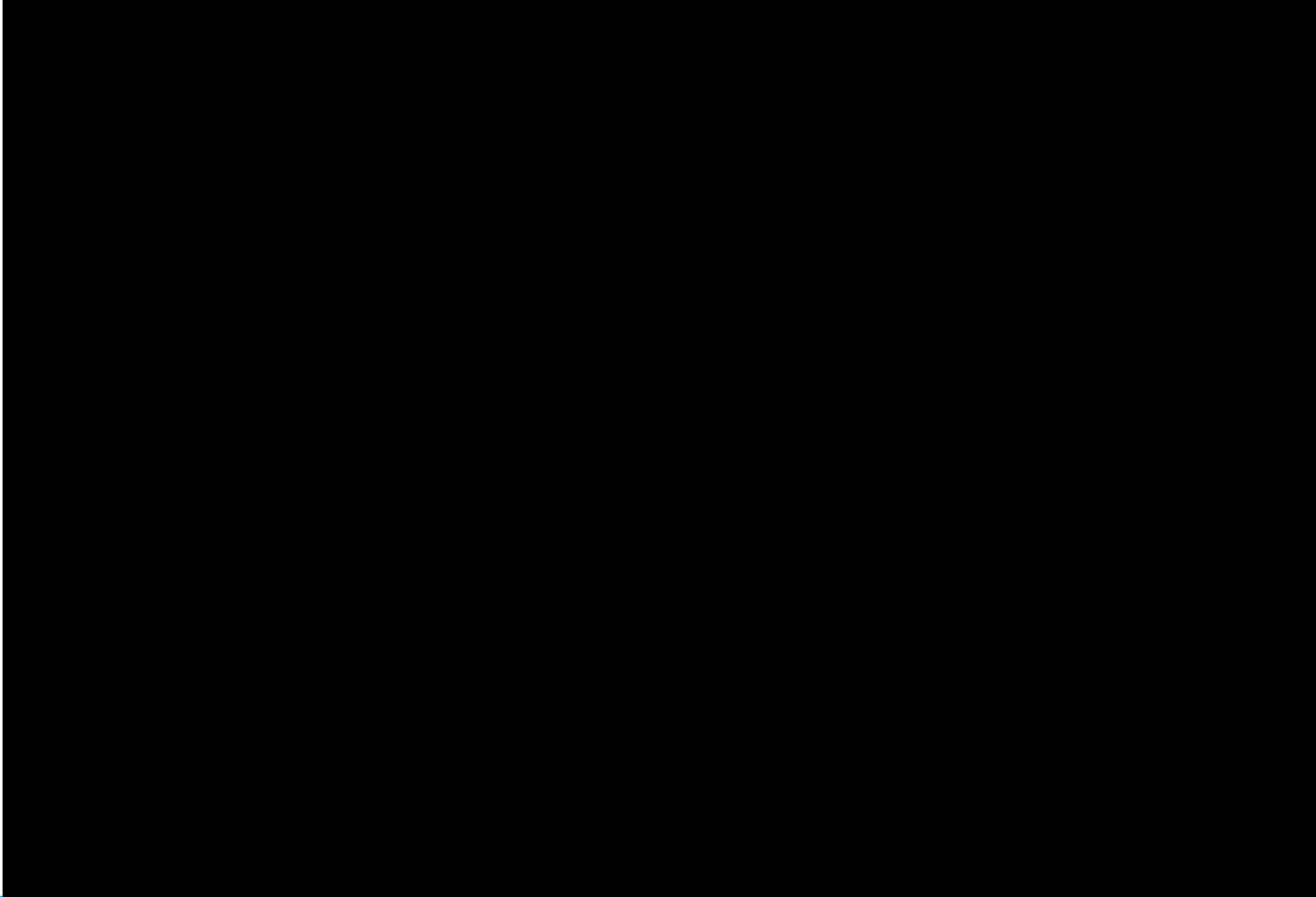
Wireless Technologies

- All wireless communications signals are sent within a range of frequencies of the electromagnetic spectrum
- *Frequency*, measured in hertz (Hz), which counts the number of waves that pass by a stationary point in one second.
- *Wavelength*, which is the distance from the peak of one wave to the peak of the next.
- These two attributes are inversely related so the higher the frequency, the shorter the wavelength.





Communications Hardware



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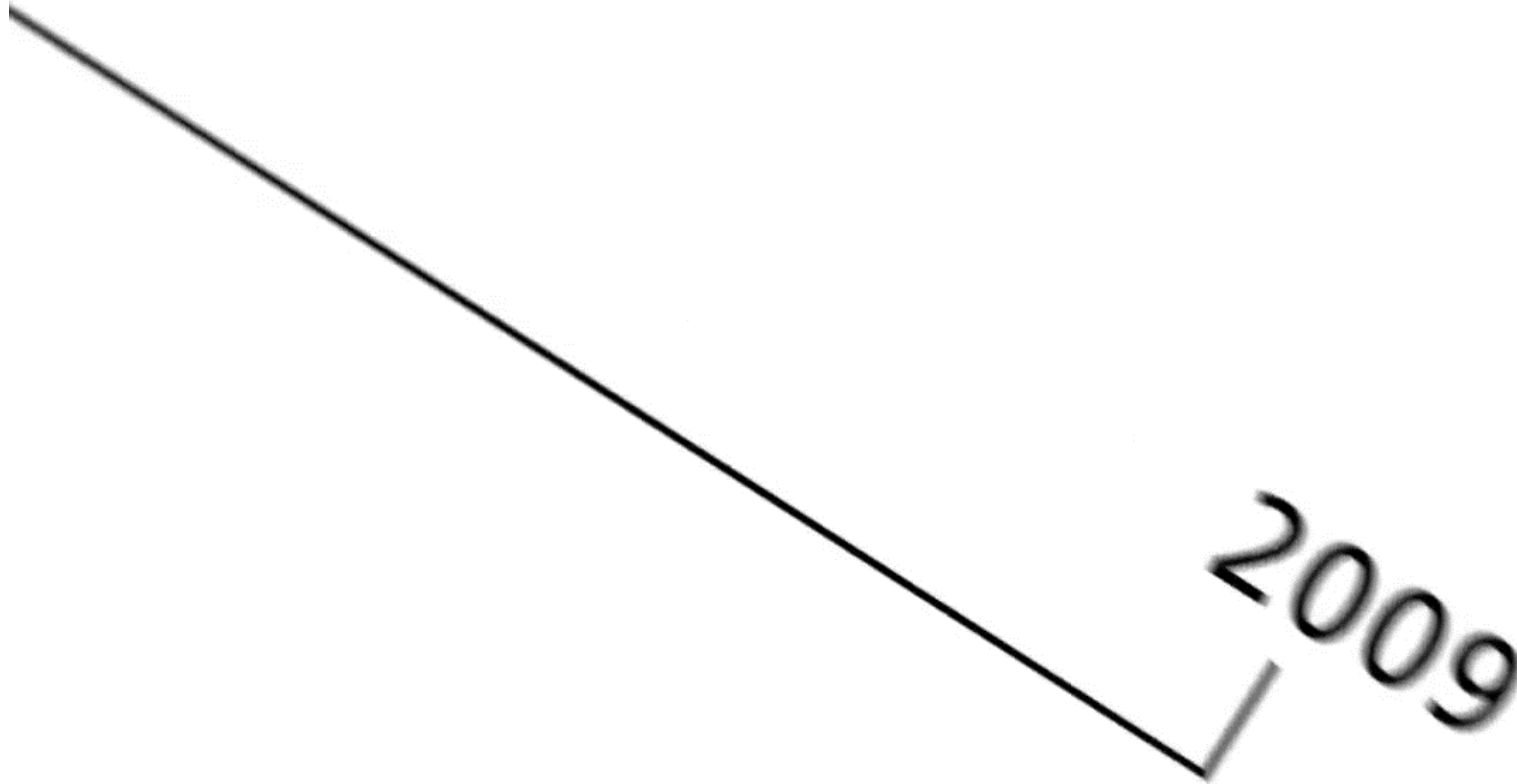
The Internet of Things

Cloud Computing

The Internet and World Wide Web



History of Internet



How the Internet Works

- In the early days of the Internet, the major communications companies around the world agreed to connect their networks so that users on all the networks could share information over the Internet.
- The cables, routers, switching stations, communication towers, and satellites that make up these networks are the hardware over which Internet traffic flows.
- Fiber optic cables that span the globe over land and under sea make up the Internet backbone.
- The various communications networks that are linked to form the Internet work much the same way they pass data around in chunks called packets, each of which carries the addresses of its sender and receiver along with other technical information.

Accessing the Internet

- *Connecting via a **LAN Server***: used by businesses and organizations By connecting a server on the LAN to the Internet using a router, all users on the LAN are provided access to the Internet.
- An ***Internet service provider*** (ISP) is any organization that provides Internet access to people.
- To connect to the Internet through an ISP, you must have an account with the service provider
- Wireless Internet service over ***cellular*** and Wi Fi networks has become common.

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The Internet of Things

- The *Internet of Things* (IoT) is a network of physical objects or “things” embedded with sensors, processors, software, and network connectivity capability to enable them to exchange data with the manufacturer of the device, device operators, and other connected devices.
- Sensors are being installed in a variety of machines and products, ranging from home appliances and parking garages to clothing and grocery products.

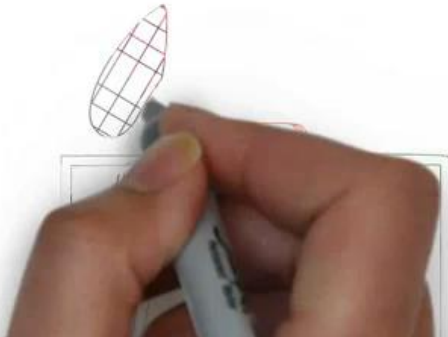
The Internet of Things

- A *sensor* is a device that is capable of sensing something about its surroundings such as pressure, temperature, humidity, pH level, motion, vibration, or level of light.
- The sensor detects an event or changes in quantity and produces a corresponding output, usually an electrical or optical signal.
- The data is then transmitted over the Internet to an operational historical database containing data from many sensors.

The Internet of Things

- The database may be on a data storage device in a local control room, in an enterprise data center in another state, or hundreds of miles away in the cloud.
- The operational data can be accessed via the Internet and analyzed by users with personal computers or portable devices including smartphones.
- Updates, alerts, or even automatic adjustments may be sent to the devices on the IoT based on this analysis.

What is IoT?



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Cloud Computing

- *Cloud computing* refers to a computing environment in which software and storage are provided as an Internet service and accessed by users with their Web browser.
- Apple developed its iCloud service to allow people to store their documents, music, photos, apps, and other content on its servers.
- Cloud computing offers many advantages to businesses. With cloud computing, organizations can avoid large, up front investments in hardware as well as the ongoing investment in the resources that would be required to manage that hardware.

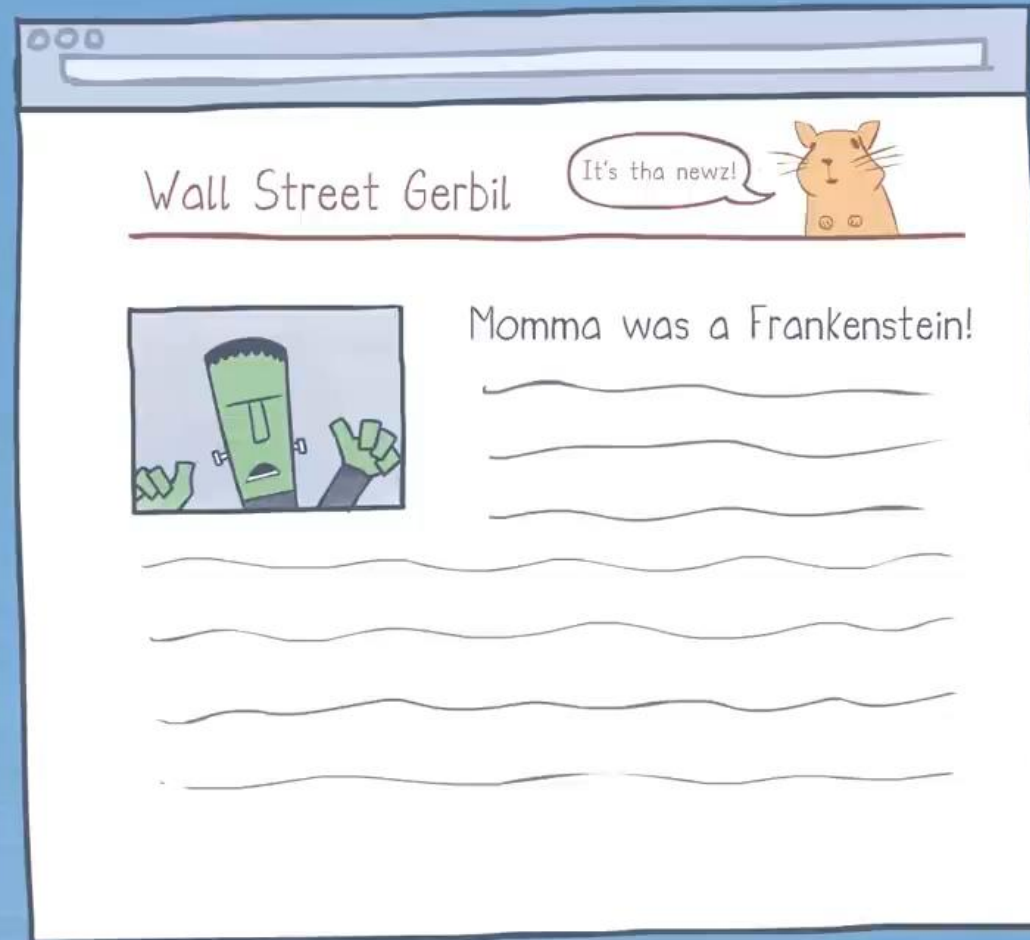
Cloud Computing

- Instead, they can provision just the right type and size of information system resources from their cloud computing provider, pay for it on an ongoing basis, and let the service provider handle the system support and maintenance.
- In most cases, the cloud computing service provider provides access to state of the art technology at a fraction of the cost of owning it and without the lengthy delays that can occur when an organizations tries to acquire its own resources.

Cloud Computing

- This can increase the speed and reduce the costs of new product and service launches.
- For example, Spotify offers its users instant access to over 16 million licensed songs. The company faces an ongoing struggle to keep pace with the rapid release of new music, adding over 20,000 tracks to its catalog each day.
- “Spotify needed a storage solution that could scale very quickly without incurring long lead times for upgrades. This led us to cloud storage.”

What the Internet is Doing to Our Brains



Summary

- A network has many fundamental components, which when carefully selected and effectively integrated enable people to meet personal and organizational objectives.
- A computer network consists of communications media, devices, and software connecting two or more computer systems or devices.
- Communications media are any material substance that carries an electronic signal to support communications between a sending and a receiving device. The computers and devices on the networks are also sometimes called network nodes.

Summary

- Networks let users share hardware, programs, and databases across the organization. They can transmit and receive information to improve organizational effectiveness and efficiency.
- They enable geographically separated workgroups to share documents and opinions, which fosters teamwork, innovative ideas, and new business strategies.

Summary

- Network topology indicates how the communications links and hardware devices of the network are arranged.
- A network can be classified as personal area, local area, metropolitan, or wide area network depending on the physical distance between nodes on the network and the communications and services it provides.
- A client/server system is a network that connects a user's computer (a client) to one or more server computers (servers). A client is often a PC that requests services from the server, shares processing tasks with the server, and displays the results.

Summary

- Communications media can be divided into two broad categories: guided transmission media, in which a communications signal travels along a solid medium, and wireless media, in which the communications signal is sent over airwaves. Guided transmission media include twisted pair wire cable, coaxial cable, and fiber optic cable.
- Wireless communication is the transfer of information between two or more points that are not connected by an electrical conductor.
- Together, the Internet and the World Wide Web provide a highly effective infrastructure for delivering and accessing information and services.

Summary

- Organizations are using the Internet of Things (IoT) to capture and analyze streams of sensor data to detect patterns in order to have a considerable impact on the event outcome.
- The Internet of Things (IoT) is a network of physical objects or “things” embedded with sensors, processors, software, and network connectivity capability to enable them to exchange data with the manufacturer of the device, device operators, and other connected devices.

Summary

- Cloud computing provides access to state of the art technology at a fraction of the cost of ownership and without the lengthy delays that can occur when an organization tries to acquire its own resources.
- Cloud computing refers to a computing environment in which software and storage are provided as an Internet service and can be accessed by users with their Web browser. Computing activities are increasingly being delivered over the Internet rather than from installed software on PCs.
- Cloud computing offers many advantages to businesses. By outsourcing business information systems to the cloud, a business saves on system design, installation, and maintenance. Employees can also access corporate systems from any Internet connected computer using a standard Web browser.

Reference

