

Electronic Commerce

Lecture 3

IT392

E-commerce infrastructure

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Chapter 3

- This chapter examines the Internet, Web, and mobile platform of today and tomorrow
- How they evolved, how they work, and how their present and future infrastructures enable new business opportunities.
- The Internet and its underlying technology are not static phenomena, but instead have changed, and continue to change, over time.

Chapter 3

- Computers have merged with cellphone services
- Social networks now engage millions of Internet users; and software technologies such as cloud computing and smartphone apps have revolutionized the way businesses use the Internet

Learning Objectives

- Discuss the origins of, and the key technology concepts behind, the Internet.
- Explain the current structure of the Internet.
- Understand how the Web works.
- Describe how Internet and web features and services support e-commerce.

Chapter 3: Technology infrastructure for E- commerce

The Internet: Technology Background

Internet infrastructure and Access

The Web

The Internet and Web: Features and Services

Trends in E-commerce infrastructure

Development of The Internet Timeline

The Internet: Key Technology Concepts

Cloud Computing

The Internet Backbone

Internet of Things (Iot)

Who Governs The Internet?

Hypertext Markup Language (HTML)

Search Engines

Podcasting

Evolution of The Web (Web 1.0, Web 2.0, Web 3.0)

Virtual Reality, Augmented Reality, and The Metavers

Trends in E-commerce infrastructure

Business

- The Covid-19 pandemic continues to affect businesses of all kinds worldwide, with both short-term and long-term impacts.
- Mobile devices provide a rapidly expanding social marketing and advertising platform and foundation for location-based web services and business models.
- The growth in cloud computing and bandwidth capacity enables new business models for distributing content and other types of services online.
- Big data (huge sets of structured, semistructured, and unstructured data) produced by the Internet creates new business opportunities for firms with the analytic capability to understand it.

Trends in E-commerce infrastructure

TECHNOLOGY

- Mobile devices become the dominant mode of access to the Internet
- Cloud computing reshapes computing and storage and becomes an important force in the delivery of software applications and online content.
- The Internet runs out of IPv4 addresses; the transition to IPv6 continues.
- The decreased cost of storage and advances in database software enables the collection and analysis of big data.

Trends in E-commerce infrastructure

TECHNOLOGY

- 5G cellular technology begins to be widely deployed, providing faster Internet access for mobile devices.
- The Internet of Things (IoT), with billions of sensor-equipped devices connecting to the Internet, is powering the development of smart connected “things” such as televisions, houses, cars, and wearable technology.

Trends in E-commerce infrastructure

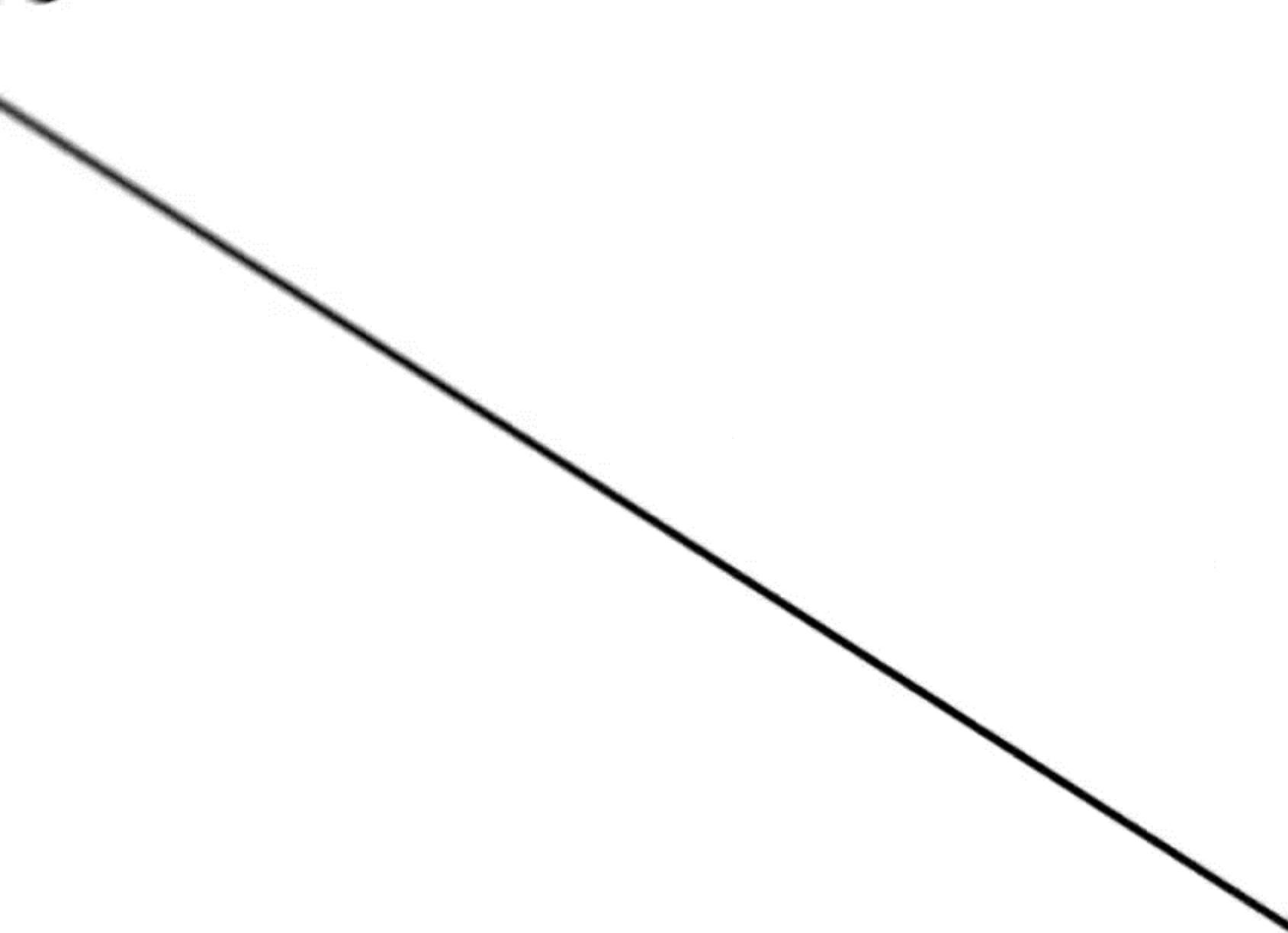
TECHNOLOGY

- Artificial intelligence technologies play an increasing role in e-commerce, with applications ranging from supply chain logistics to intelligent personal assistants to autonomous vehicles.
- The metaverse, a reenvisioning of the Internet and Web as an immersive experience based on virtual and augmented reality technologies.

Trends in E-commerce infrastructure

SOCIETY

- The Covid-19 pandemic creates social and ethical challenges, including new security and privacy issues, as well as heightening concerns about the digital divide.
- Government control over, and surveillance of, the Internet expands in many nations.
- Countries such as Russia, China, and Iran increasingly disconnect from the global Internet, creating concerns about the Internet ecosystem fracturing into “splinternets”: a collection of isolated networks completely controlled by sovereign nations.



2009

Development of The Internet Timeline

Year	Event	Significance
۱۹۶۱	Leonard Kleinrock (MIT) publishes a paper on “packet switching” networks.	The concept of packet switching is born.
۱۹۶۹	The first packet-switched message is sent on ARPANET from UCLA to Stanford.	The communications hardware underlying the Internet is implemented for the first time.
1972	E-mail is invented	The first “killer app” of the Internet is born.
۱۹۸۱	IBM introduces IBM PC, its first personal computer.	Personal desktop computers provide the foundation for access by millions of people to the Internet.
۱۹۸۴	Domain Name System (DNS) is introduced.	DNS provides a user-friendly system for translating IP addresses into words that people can easily understand
۱۹۸۹	Tim Berners-Lee proposes a worldwide network of hyperlinked documents based on a common markup language called HTML—HyperText Markup Language	The concept of an Internet-supported service called the World Wide Web based on HTML is born.

Development of The Internet Timeline

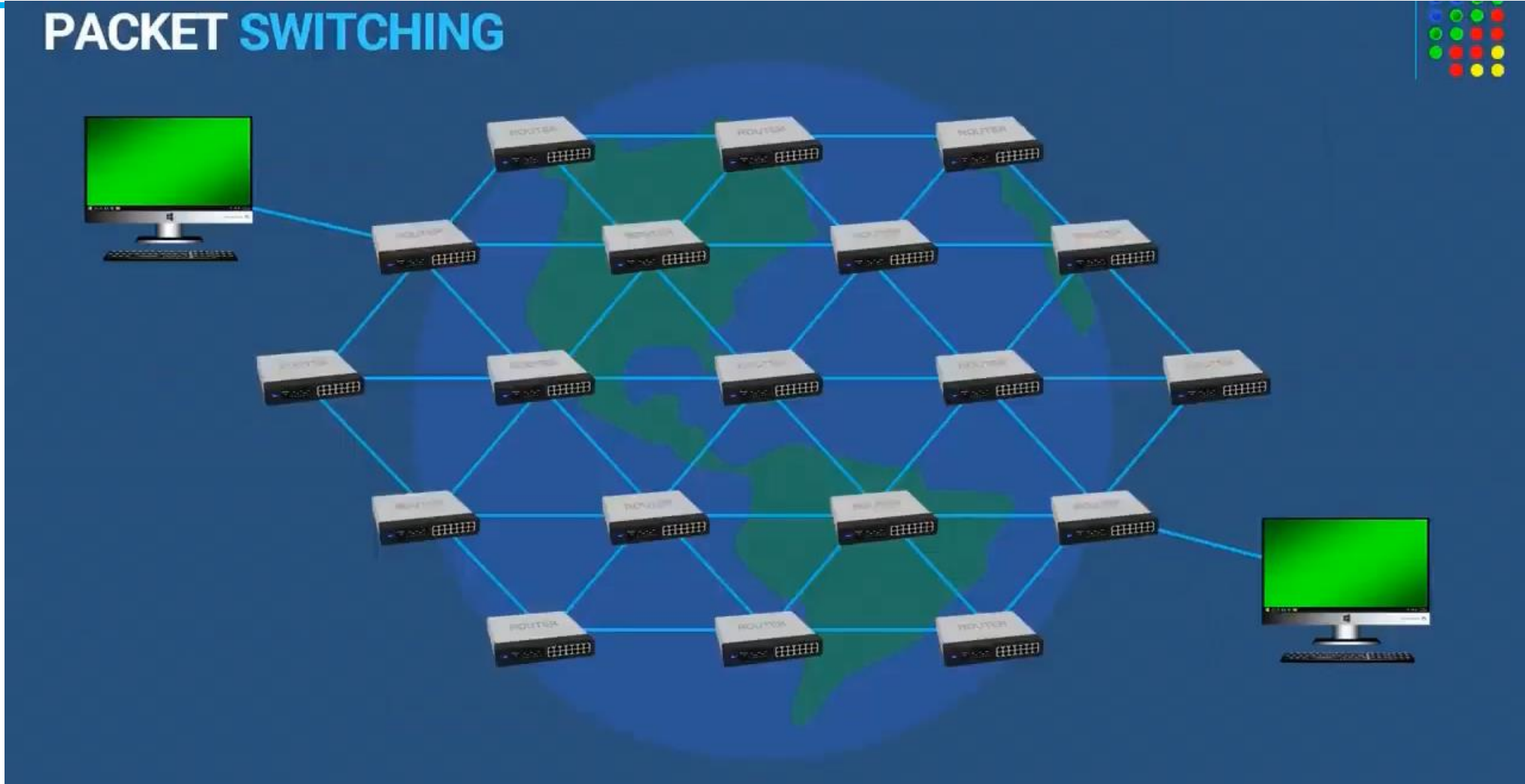
Year	Event	Significance
1990	Jeff Bezos founds Amazon.	E-commerce begins in earnest.
1998	The Internet Corporation for Assigned Names and Numbers (ICANN) is created.	Governance over domain names and addresses passes to a private, nonprofit, international organization
2007	The Apple iPhone is introduced	The iPhone represents the beginning of the development of a viable mobile platform .
2012	World IPv6 Launch day.	IPv6 increases the pool of available Internet addresses, enabling continued expansion of the Internet.
2013	The Internet of Things (IoT) starts to become a reality	Internet technology spreads beyond computers and mobile devices to anything that can be equipped with sensors, paving the way for an Internet of Things (IoT) .
2014	Apple introduces Apple Pay and Apple Watch.	Apple Pay becomes the first widely adopted mobile payment system; Apple Watch ushers in a new era of wearable Internet-connected technology.

Development of The Internet Timeline

Year	Event	Significance
۲۰۱۹	The commercial availability of 10 Gbps Internet access increases.	Advanced technologies such as virtual reality, augmented reality, artificial intelligence, and 4k streaming video drive demand for faster broadband access speeds.
۲۰۲۰	The Covid-19 pandemic sweeps the globe; Internet usage skyrockets.	The pandemic illustrates the resiliency of the Internet to cope with a tremendous surge in demand.
۲۰۲۲	SpaceX's Starlink takes the lead in the race to deploy low earth orbit (LEO) Internet access satellite systems	LEO satellite systems can provide broadband Internet access to underserved areas and help bridge the digital divide

The Internet: Key Technology Concepts

PACKET SWITCHING



The Internet: Key Technology Concepts

- **Packet switching** is a method of slicing digital messages comprised of bits (binary digits) into discrete units called **packets**, sending the packets along different communication paths as they become available, and then reassembling the packets once they arrive at their destination
- **Transmission Control Protocol/Internet Protocol (TCP/IP)** has become the core communications protocol for the Internet.
- **TCP** establishes the connections among sending and receiving computers and makes sure that packets sent by one computer are received in the same sequence by the other, without any packets missing.
- **IP** provides the Internet's addressing scheme and is responsible for the actual delivery of the packets.



The Internet: Key Technology Concepts

- **IP addresses** Every device connected to the Internet must have a unique address number called an Internet Protocol (IP) address.
- **Domain names:** The Domain Name System allows expressions such as googl.com to stand for a numeric IP address.
- **DNS servers:** DNS servers are databases that keep track of IP addresses and domain names on the Internet.

The Internet “Cloud Computing” Model: Hardware and Software As A Service

- **Cloud computing** is a model of computing in which computer processing, storage, software, and other services are provided as a shared pool of virtualized resources via the Internet.
- These “clouds” of computing resources can be accessed on an as-needed basis from any connected device and location cloud computing as having the following essential characteristics:
- **On-demand self-service:** Consumers can obtain computing capabilities such as server time or network storage as needed automatically on their own.

The Internet “Cloud Computing” Model: Hardware and Software As A Service

- **Ubiquitous network access:** Cloud resources can be accessed using standard network and Internet devices, including mobile platforms.
- **Location-independent resource pooling:** Computing resources are pooled to serve multiple users, with different virtual resources dynamically assigned according to user demand. The user generally does not know where the computing resources are located.
- **Rapid elasticity:** Computing resources can be rapidly provisioned, increased, or decreased to meet changing user demand.
- **Measured service:** Charges for cloud resources are based on the amount of resources actually used.

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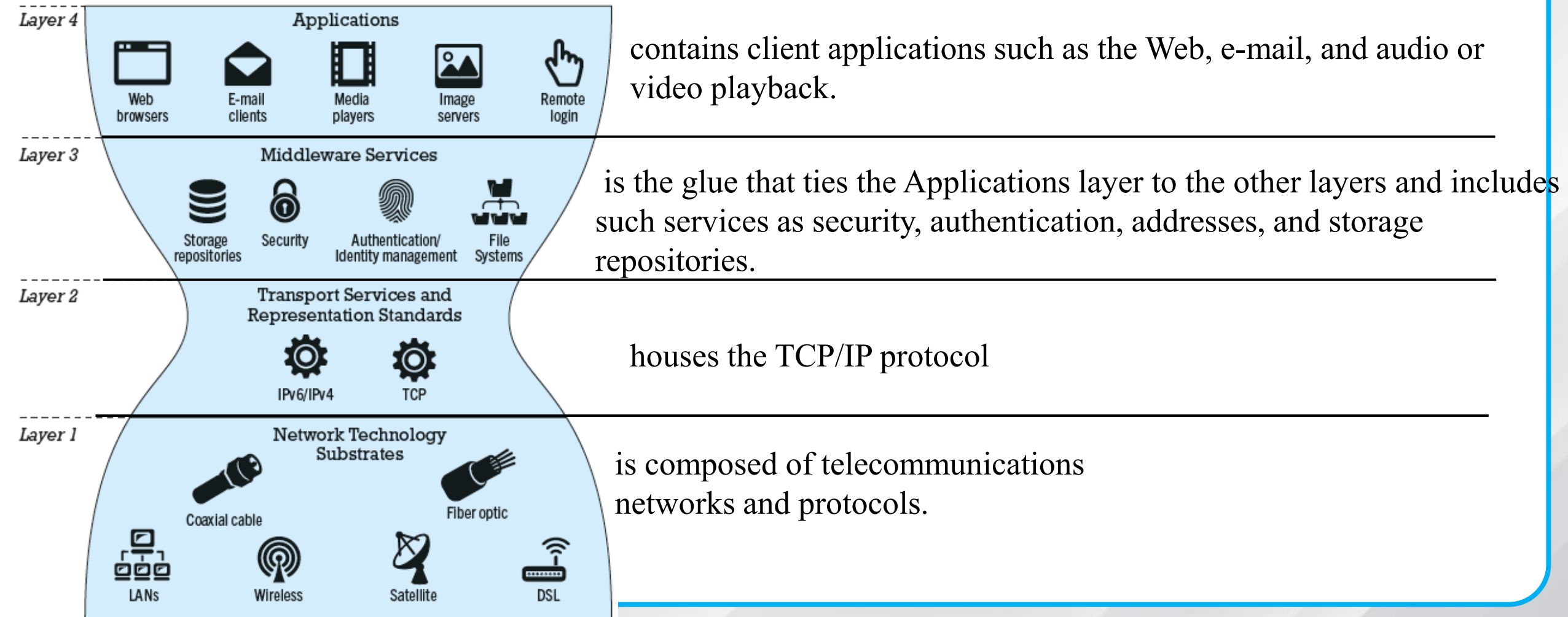
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Evolution of The Web (Web 1.0, Web 2.0, Web 3.0)

Virtual Reality, Augmented Reality, and The Metavers

Internet infrastructure and Access

FIGURE 3.9 THE HOURGLASS MODEL OF THE INTERNET



Internet infrastructure and Access

- The Internet's **backbone** is created by numerous privately owned networks comprised of high-bandwidth fiber-optic cables that are physically connected to each other and that transfer information from one private network to another.
- **Bandwidth** measures how much data can be transferred over a communications medium within a fixed period of time and is usually expressed in bits per second
- in the United States, the backbone can carry data at rates of up to 100 Gbps.
- Connections to other continents are made via a combination of undersea fiber-optic cable and satellite links.
- The backbone also has built-in redundancy so that if one part breaks down, data can be rerouted to another part of the backbone.
- **Redundancy** refers to multiple duplicate devices and paths in a network.

Internet infrastructure and Access

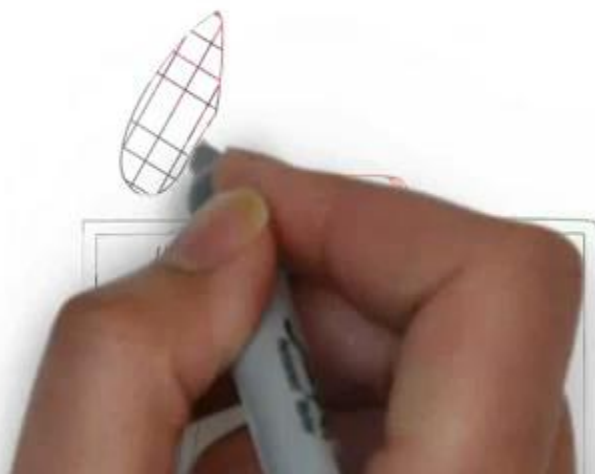
Internet of Things (IoT)

- The Internet of Things (IoT) refers to the interconnection of everyday devices via the Internet, enabling data collection and analysis.
- IoT powered 'smart' connected devices include consumer electronics, home appliances, cars, medical devices, wearable tech, and even clothing.

Internet infrastructure and Access

Internet of Things (IoT)

- Despite the popularity and development of IoT technology, concerns regarding interoperability, security, and privacy persist.
- **Security risks** stem from the potential for malware to spread across a connected network and the difficulty in issuing patches to devices, leaving them vulnerable.
- **Privacy** concerns arise from data collected by smart devices revealing personal details about consumers' lives.



Internet infrastructure and Access

WHO GOVERNS THE Internet?

Despite the common belief, the Internet is not an ungoverned entity.

It operates over private and public telecommunication facilities, all of which are subject to laws and regulations.

A complex network of governing bodies, national governments, and international professional societies ensures the proper functioning of the Internet.

There is no single governing organization for the Internet, but many that influence and monitor its operations, like ICANN, IETF, IRTF, IESG, IAB, ISOC, IGF, W3C, and NOGs.

Internet infrastructure and Access

WHO GOVERNS THE Internet?

- The Internet Corporation for Assigned Names and Numbers (**ICANN**) is a non-profit organization that coordinates the Internet's systems of unique identifiers.
- The Internet Engineering Task Force (**IETF**) is an open international community that develops and promotes Internet standards.
- The Internet Research Task Force (**IRTF**) focuses on the evolution of the Internet,
- The Internet Architecture Board (**IAB**) helps define its overall architecture.
- Internet Society (**ISOC**) monitors Internet policies and practices.

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The Web

- **Web** provided a platform for presenting various forms of digital content like text, images, videos and sound worldwide.
- The Web was introduced by Dr. Tim Berners-Lee
- Berners-Lee initially created HTML, HTTP, a web server, and a browser - pivotal components of the Web.
- His prime strategy was to establish formatted pages within his computer linked via hyperlinks, which was handled through a program he wrote.
- These HTML pages were stored on the Internet and could be accessed by remote client computers using HTTP.

The Web

HTML

- It is structured using opening and closing tags, defining different elements such as headings, paragraphs, and anchor links.
- It can handle various media types and contains customizable key-value pair attributes in opening tags.
- An HTML file is based on a Document Object Model (DOM) and has a head and body, with the body containing the User interface (UI).
- It can include images and links to other web pages and certain UI elements like nav bars can be styled together using a div tag. To use, simply paste file path into a web browser.



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The Internet and Web: Features and Services

Search engine: How Google Search Works

1. Google's search works by continuously mapping the hundreds of billions of web pages to create an index, a metaphorical giant library.
2. When a search query (such as lasagna) is entered, Google's ranking algorithms attempt to understand the query and sift through possible matches in the index, prioritizing the most relevant information.
3. The ranking of search results is influenced by hundreds of factors including keywords, location of the words on a page, how pages link to each other, location of the search, and freshness of the page.

The Internet and Web: Features and Services

Search engine: How Google Search Works

4. Google's algorithms also work to recognize and flag scam websites to ensure they don't make it to the search results.
5. The algorithms' efficiency enables billions of daily searches, filtering out spam, and ranking results based on relevancy in just fractions of a second.
6. Google continually updates Search. Any potential update's effectiveness is gauged with the help of thousands of Search quality raters, following the Search Quality Evaluator Guidelines.
7. Feedback from raters is utilized to evaluate changes; however, it doesn't directly impact search result rankings.

Google



Google Search

I'm Feeling Lucky

The Internet and Web: Features and Services

Podcasting (the name originated from a mashup of the word “iPod” and the word “broadcasting”)

- A **podcast** is a digital audio presentation, such as a radio show, audio from a conference, or simply a personal presentation, stored online as a digital media file.
- Listeners can download the file and play it on their mobile devices or computers.
- More than one-third of the U.S. population (about 125 million people) listen to podcasts monthly.



The Internet and Web: Features and Services

Evolution of the Web (Web 1.0, Web 2.0, Web 3.0)

- The web as we know it has evolved significantly over the years and is typically divided into three phases: Web 1.0, Web 2.0, and Web 3.0.
- Web 1.0, often known as the "read only" web, lasted from around 1991 to 2004 and was characterized by static content and a lack of interactivity.
- Web 2.0, which many of us currently experience, is an interactive and social web that allows users to create and share content easily.
- However, this iteration of the web has issues, including data security, breaches, and centralization of power in just a few companies.

The Internet and Web: Features and Services

Evolution of the Web (Web 1.0, Web 2.0, Web 3.0)

- Web 3.0 aims to address these issues through decentralization.
- This next evolution of the web will be more distributed, using blockchain technologies and peer-to-peer networks.
- It will be permissionless and verifiable, with native integrated payment systems, making it a more secure and democratic digital space.
- Users will have greater control over their data and will be incentivized to participate in developing and maintaining the network.
- This "tokenization" could democratize value creation and give users a direct stake in the platforms they use.

The Internet and Web: Features and Services

Virtual Reality, Augmented Reality, and The Metaverse

- **Virtual reality (VR)** involves fully immersing users within a virtual world, typically through the use of a head-mounted display (HMD) connected to headphones and other devices that enable navigation through the experience and allowing users to feel as if they are actually present within the virtual world.
- **Augmented reality (AR)** involves overlaying virtual objects on top of the real world via smartphones, tablets, or HMDs.
- **Mixed reality (MR)** is an enhanced version of augmented reality in which virtual images can interact with the real environments onto which they are overlaid
- **Metaverse** is envisioned as an immersive, visual, 3-D virtual reality in which users can connect, socialize, collaborate, and transact

REVIEW

Discuss the origins of, and the key technology concepts behind, the Internet.

- The Internet has evolved from a collection of mainframe computers located on a few U.S. college campuses to an interconnected network of thousands of networks and millions of computers that is accessed by more than 4.5 billion people worldwide.
- Packet switching, the TCP/IP protocol suite, and client/server technology are key technology concepts behind the Internet.
- The mobile platform has become the primary means for accessing the Internet.
- Cloud computing refers to a model of computing in which firms and individuals obtain computing power and software applications over the Internet rather than purchase the hardware and software and install it on their own computers.

REVIEW

Explain the current structure of the Internet.

- The Internet of Things (IoT) builds on a foundation of existing technologies—such as RFID tags, low-cost sensors, inexpensive data storage, big data analytics software.
- Governing bodies such as ICANN, IETF, IRTF, IESG, IAB, ISOC have influence over the Internet and monitor its operations, although they do not control it.

REVIEW

Understand how the Web works.

- The Web was developed during 1989–1991 by Dr. Tim Berners-Lee, who created a computer program that allowed formatted pages stored on the Internet to be linked using keywords (hyperlinks).

Describe how Internet and web features and services support e-commerce.

- Together, the Internet and the Web make e-commerce possible by allowing people to access product and service information and to complete purchases online.
- Some of the specific features that support e-commerce include communication tools; search engines; and downloadable and streaming media.

REVIEW

- Web 2.0 applications and services include social networks, blogs, and wikis.
- Web3 does not yet exist but is envisioned as a new kind of Internet service: one that is based on blockchain technology, that will be much more decentralized than the current Web environment, and that will be controlled by creators and users rather than by Big Tech companies.
- Virtual reality, augmented reality, the metaverse, and intelligent digital assistants have begun to enter the consumer market and attract significant attention.

Reference

