The Digital Revolution

• The digital revolution is an ongoing process of social, political, and economic change brought about by digital technology, such as computers and the Internet
• A constellation of technologies, including digital electronics, computers, communications networks, the Web, and digitization, are fueling the digital revolution
Digital Electronics

- Digital electronics use electronic circuits to represent data
- Today, digital electronic devices include computers, portable media players such as iPods, digital cameras and camcorders, cell phones, radios and televisions, GPSs, DVD and CD players, e-book readers, digital voice recorders, and arcade games

The Growth in Computer Popularity

Source: U.S. Census Bureau
The Digital Revolution – Phase 2

• The second phase of the digital revolution materialized when the Internet was opened to public use
  – E-mail
  – Bulletin boards
  – Chat groups
  – Online social networks

Networks, Webs, and Cyberspace…

• A computer network is a group of computers linked by wired or wireless technology to share data and resources
• The Web is a collection of linked documents, graphics, and sounds that can be accessed over the Internet
• Cyberspace is a term that refers to entities that exist largely within computer networks
• Digitization is the process of converting text, numbers, sound, photos, and video into data that can be processed by digital devices
Cloud Computing

- Before cloud computing, most computers ran software based locally.
- With cloud computing, you can use your browser to access, word processing applications that run on the Internet instead of software that you have installed on your local hard disk.
- Cloud computing gets its name from the diagrams that show storage as being part of a cloud.

Convergence

- Technological convergence is a process by which several technologies with distinct functionalities evolve to form a single product.
- Convergence tends to offer enhanced functionality and convenience.
The Digital Society

- Digital technologies and communications networks make it easy to cross cultural and geographic boundaries
- Anonymous Internet sites, such as Freenet, and anonymizer tools that cloak a person’s identity, even make it possible to exercise freedom of speech in situations where reprisals might repress it
- Citizens of free societies have an expectation of privacy
- Intellectual property refers to the ownership of certain types of information, ideas, or representations

Is The Web Dead?

- *Wired* Magazine asked this question in 2010.
- Facebook, Twitter, Instagram and Google Apps has sent the World Wide Web in new directions. This shift is referred to as **Web 2.0**
- **Social media** refers to cloud-based applications designed for social interaction and consumer-generated content.
The Information Age Evolves

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<th>Tired</th>
<th>Uninspired</th>
<th>Desired</th>
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<td>Personal Computing</td>
<td>Network computing</td>
<td>Cloud Computing</td>
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<td>Big corporate and government computers</td>
<td>Desktop Computers</td>
<td>Laptop computers</td>
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<td>Standalone applications</td>
<td>Monolithic software suites</td>
<td>Handheld apps and cloud-based apps</td>
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<td>CB radios</td>
<td>Dial-up Internet access</td>
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<td>ARPANET</td>
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<td>Arcade games</td>
<td>2-D action games</td>
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Data Representation Basics

- **Data** refers to the symbols that represent people, events, things, and ideas. Data can be a name, a number, the colors in a photograph, or the notes in a musical composition.

- **Data Representation** refers to the form in which data is stored, processed, and transmitted.

- Devices such as smartphones, iPods, and computers store data in digital formats that can be handled by electronic circuitry.
Data Representation Basics

- **Digitization** is the process of converting text, numbers, sound, photos, and video into data that can be processed by digital devices.
- The **digital revolution** has evolved through four phases, beginning with big, expensive, standalone computers, and progressing to today’s digital world in which small, inexpensive digital devices are everywhere.

Data Representation Basics

- The 0s and 1s used to represent digital data are referred to as binary digits – from this term we get the word **bit** which stands for **binary digit**.
- A bit is a 0 or 1 used in the digital representation of data.
- A digital file, usually referred to simply as a file, is a named collection of data that exists on a storage medium, such as a hard disk, CD, DVD, or flash drive.
Data Representation Basics

Representing Numbers

- Numeric data consists of numbers that can be used in arithmetic operations
- Digital devices represent numeric data using the binary number system, also called base 2
- The binary number system only has two digits: 0 and 1
- No numeral like 2 exists in the system, so the number “two” is represented in binary as 10 (pronounced “one zero”)
Representing Numbers

<table>
<thead>
<tr>
<th>DECIMAL (BASE 10)</th>
<th>BINARY (BASE 2)</th>
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<tbody>
<tr>
<td>0</td>
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<tr>
<td>1000</td>
<td>1111101000</td>
</tr>
</tbody>
</table>

Representing Text

- Character data is composed of letters, symbols, and numerals that are not used in calculations
- Examples of character data include your name, address, and hair color
- Character data is commonly referred to as “text”
Representing Text

• Digital devices employ several types of codes to represent character data, including ASCII, Unicode and their variants
• ASCII (American Standard Code for Information Interchange, pronounced “ASK ee”) requires seven bits for each character
• The ASCII code for an uppercase A is 1000001

Representing Text

• **Extended ASCII** is a superset of ASCII that uses eight bits for each character
• For example, Extended ASCII represents the uppercase letter A as 01000001
• Using eight bits allows Extended ASCII to provide codes for 256 characters
Representing Text

- **Unicode** (pronounced “YOU ni code”) uses sixteen bits and provides codes or 65,000 characters.
- This is a bonus for representing the alphabets of multiple languages.
Representing Text

• ASCII codes are used for numerals, such as Social Security numbers and phone numbers
• Plain, unformatted text is sometimes called ASCII text and is stored in a so-called “text file” with a name ending in .txt
• On Apple devices these files are labeled “Plain Text”; in Windows, these files are labeled “Text Document”

Representing Text

• ASCII text files contain no formatting
• To create documents with styles and formats, formatting codes have to be embedded in the text
Representing Text

- Microsoft Word produces formatted text and creates documents in **DOCX** format
- iWork Pages produces documents in **PAGES** format
- Adobe Acrobat produces documents in **PDF** format
- HTML markup language used for Web pages produces documents in **HTML** format
Bits and Bytes

- All of the data stored and transmitted by digital devices is encoded as bits.
- Terminology related to bits and bytes is extensively used to describe storage capacity and network access speed.
- The word *bit*, an abbreviation for *binary digit*, can be further abbreviated as a lowercase \( b \).
- A group of eight bits is called a *byte* and is usually abbreviated as an uppercase \( B \).

Bits and Bytes

- When reading about digital devices, you’ll frequently encounter references such as 50 kilobits per second, 1.44 megabytes, 2.8 gigahertz, and 2 terabytes.
- *Kilo, mega, giga, tera*, and similar terms are used to quantify digital data.
Bits and Bytes

- Use bits for data rates, such as Internet connection speeds, and movie download speeds
- Use bytes for file sizes and storage capacities
Compression

- To reduce file size and transmission times, digital data can be compressed
- **Data compression** refers to any technique that recodes the data in a file so that it contains fewer bits
- Compression is commonly referred to as “zipping”

Compression

- Compression techniques have two categories: *lossless* and *lossy*
- Lossless compression provides a way to compress data and reconstitute it into its original state; uncompressed data stays exactly the same as the original data
- Lossy compression throws away some of the original data during the compression process; uncompressed data is *not* exactly the same as the original
Compression

• Software for compressing data is sometimes referred to as a compression utility or a zip tool
• On laptops and desktop computers, the compression utility is accessed from the same screen used to manage files

Compression

• The process of reconstituting files is called extracting or unzipping
• Compressed files may end with a .zip, .gz, .pkg, .tar or .gz