Managing the IS Infrastructure and Services

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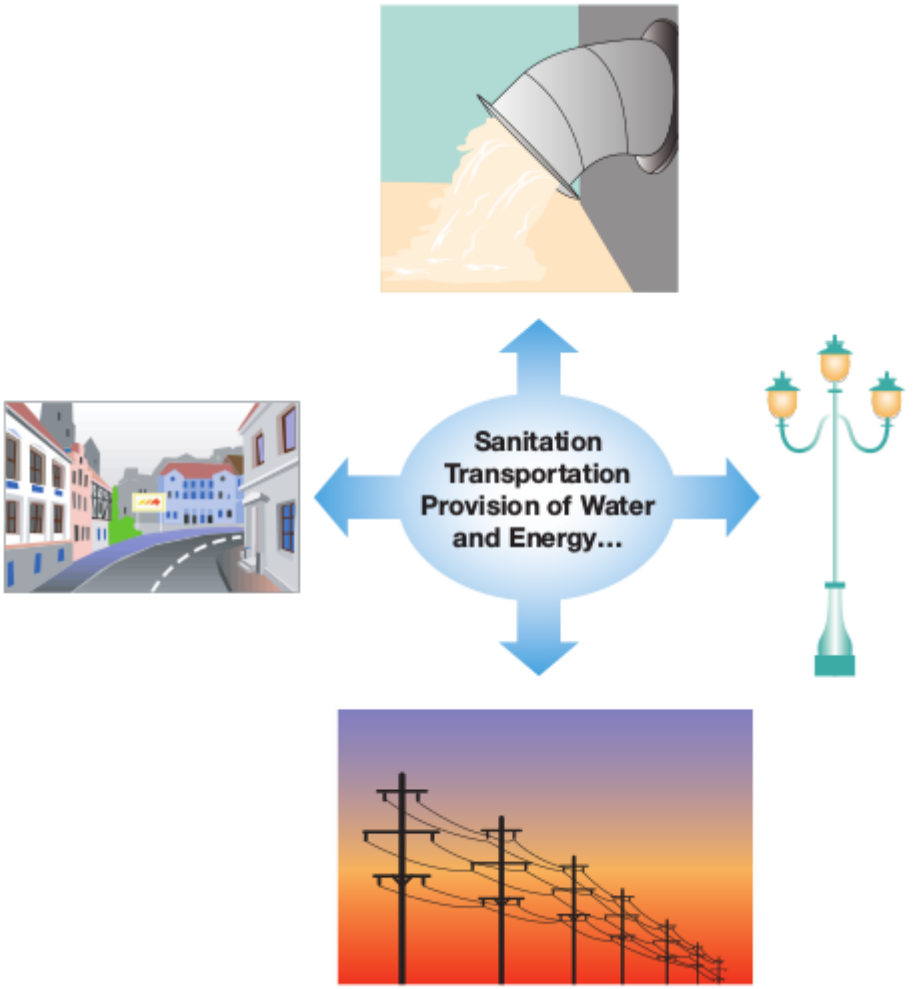
Managing Information Technology
L3-FIST3UIT

Infrastructure in a city

FIGURE 3.2

Infrastructure components of a city enable the provision of basic services.

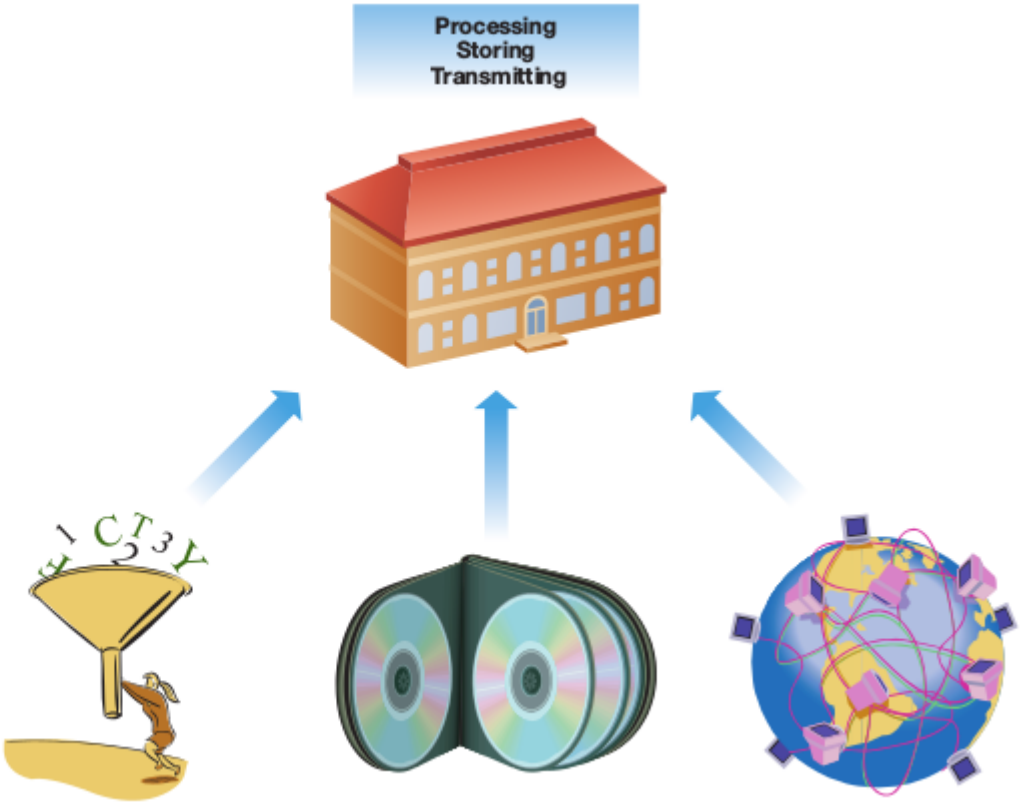
Source: Edin Ramic/Shutterstock.



IS Infrastructure

FIGURE 3.4

The information systems infrastructure enables processing, storing, and transmission of data.



IS Infrastructure as an Enabler

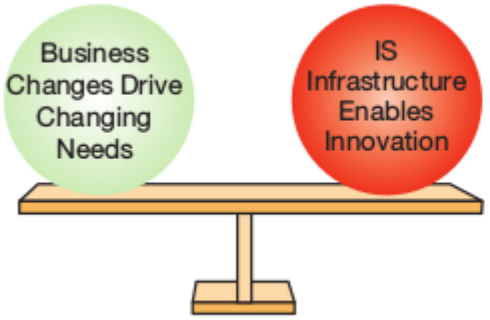


FIGURE 3.5

Business–IT alignment drives IS infrastructure changes to enable innovative business models and processes.

IS Infrastructure Requirements

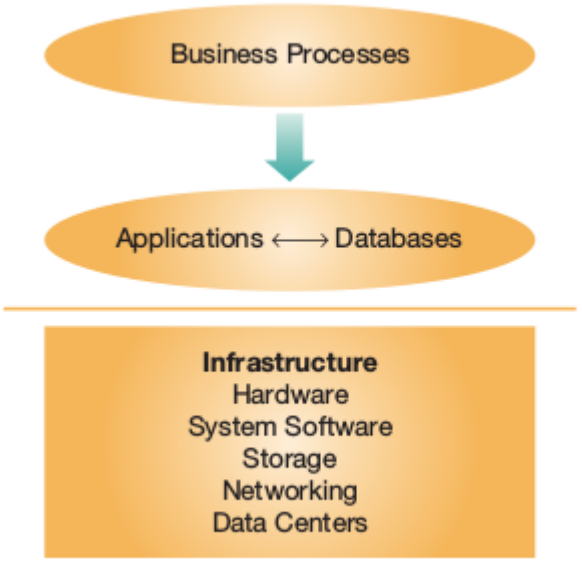


FIGURE 3.6

A robust and evolving IS infrastructure is needed to support an organization's strategy and business processes.

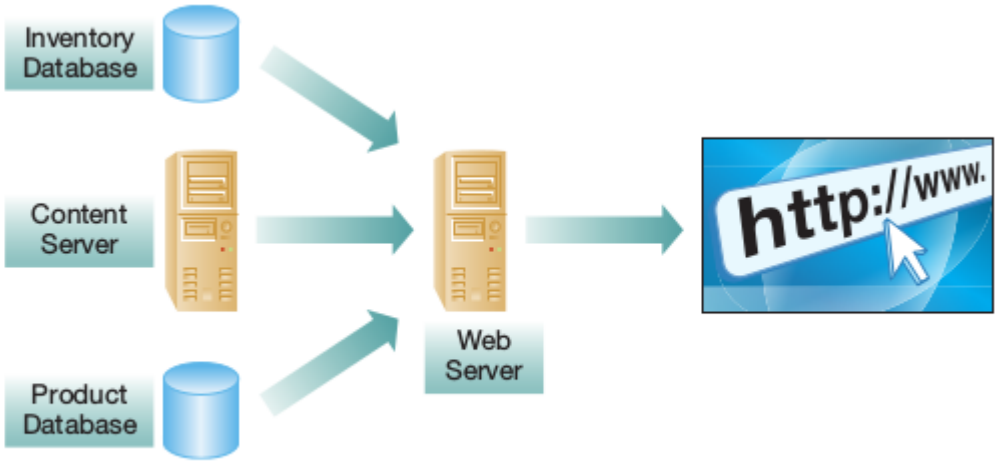
IS Infrastructure Requirements

- Application software
  - Automating business processes
  - E-Commerce
  - Productivity software (Office, CRM)
- Databases
  - Data models
  - Database management systems (DBMS)
- **Supporting Business Processes**

Dynamic Access to Databases

FIGURE 3.7

Dynamic web pages are assembled using data from various databases.



IS Infrastructure Components

- Hardware
- System software
- Storage
- Networking
- Data centers

Hardware

TABLE 3.1 Characteristics of Computers Currently Being Used in Organizations

Type of Computer	Number of Simultaneous Users	Physical Size	Typical Use	Random Access Memory	Typical Cost (in US$)
Supercomputer	One to many	Like an automobile to as large as multiple rooms	Scientific research	5,000+ GB	Up to $200 million
Mainframe	1,000+	Like a refrigerator	Transaction processing, enterprise-wide applications	Up to 3,000+ GB	Up to $10 million
Server	10,000+	Like a DVD player and mounted in a rack to fitting on a desktop	Providing websites or access to data-bases, applica-tions, or files	Up to 512 GB	Up to $50,000
Workstation	Typically one	Fitting on a desktop to the size of a file cabinet	Engineering, medical, graphic design	Up to 512 GB	Up to $10,000
Personal computer	One	Fitting on a desktop	Personal productivity	512 MB to 32 GB	Up to $5,000
Mobile device	One	Handheld	Personal productivity	512 MB to 6 GB	Up to $750

Hardware

- Workstations
- Personal computers PCs
- Mobile devices
- Embedded systems
- Programmable logic controllers (PLCs)
- Various Internet of Things technologies (sensors, controllers,...)

Hardware

- Radio frequency identification (RFID)
- QR codes and smart tags

FIGURE 3.8

RFID tags can range in size from being a fraction of an inch up to several inches across.

Source: Albert Lozano-Nieto/Fotolia.

System software

- Operating systems
  - Windows
  - OS X
  - Linux
- Device drivers, peripherals coordination

System software

FIGURE 3.9

Operating systems coordinate the interaction between users, application software, hardware, and peripherals.

System software

- Common OS functions

FIGURE 3.10

Operating systems provide a common layer for different underlying devices so that applications only have to be developed for different operating systems rather than for each different computer model.

Storage

- Operational data
  - Used for managing business processes
  - Transactions, Data analysis
- Backup data
  - Short term copies of organizational data
  - System disaster recovery
- Archival data
  - Long term copies of organizational data
  - Compliance
  - Reporting

Storage Requirements

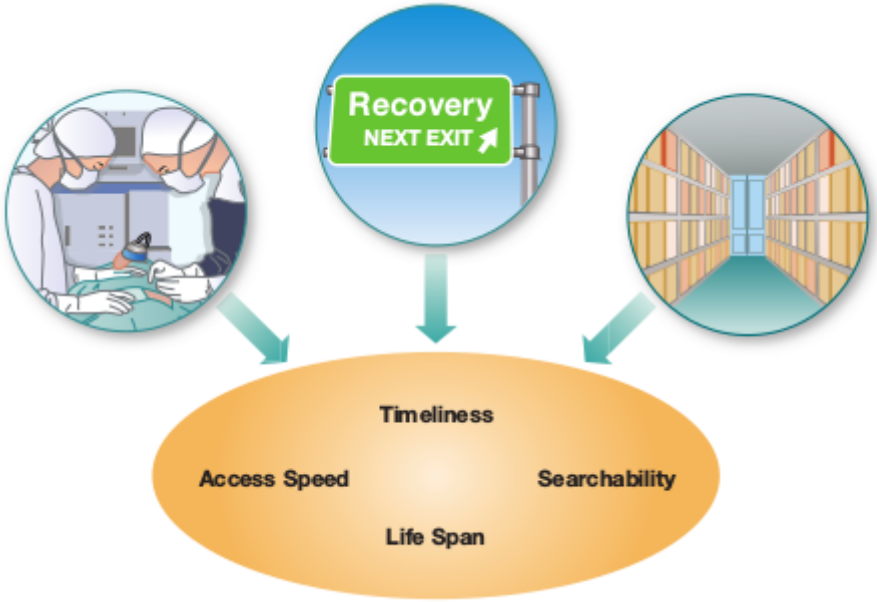


FIGURE 3.11

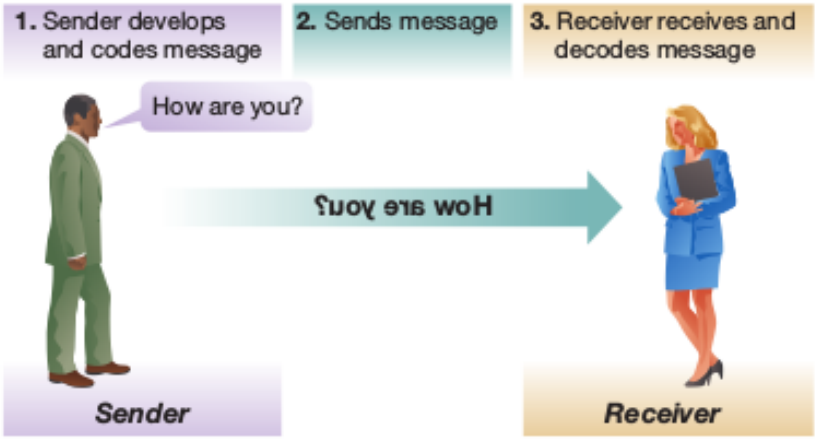
Operational, backup, and archival data have different requirements.

Networking

- Human communication
- Computer networking

FIGURE 3.12

Communication requires senders, a message to share, and receivers.



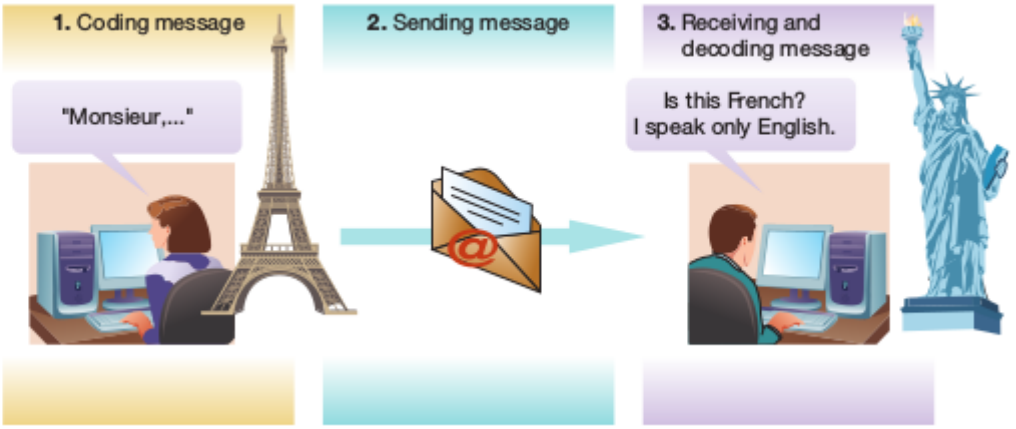
- A sender (source) and a receiver (destination) that have something to share (a message)
- A pathway or transmission medium, such as a cable, to send the message
- Rules or protocols governing communication between senders and receivers

Networking

- Coding, sending, and decoding

FIGURE 3.13

Coding, sending, and decoding a message.



Computer networks

- Transmitting bits, bytes
- All types of content can be transmitted
- Various size (text, photo, video clip)
- Bandwidth is the transmission capacity
  - Bits per second (bps)
  - LAN adapters 10 Mbps to 1 Gbps

Servers, Clients, and Peers

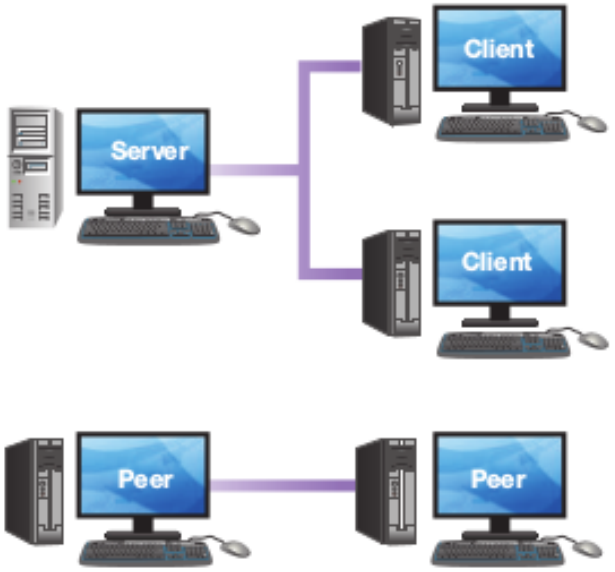


FIGURE 3.14

A server is a computer on the network that enables multiple computers (or "clients") to access data or services. A peer is a computer that may both request and provide services.

Types of Networks

TABLE 3.2 Types of Networks

Type	Usage	Size
Personal area network (PAN)	Wireless communication between devices, using technologies such as Bluetooth	Under 10 meters
Local area network (LAN)	Sharing of data, software applications, or other resources between several users	Typically within a building
Wide area network (WAN)	Connect multiple LANs, often with distributed ownership and management	Large physical distance, from spanning multiple buildings or the area of a city to worldwide (Internet)

Internet and WWW

- Hypertext, web page
- Hypertext Markup Language HTML
- Hypertext Transfer Protocol HTTP, and HTTPS
- Web domain names and addresses

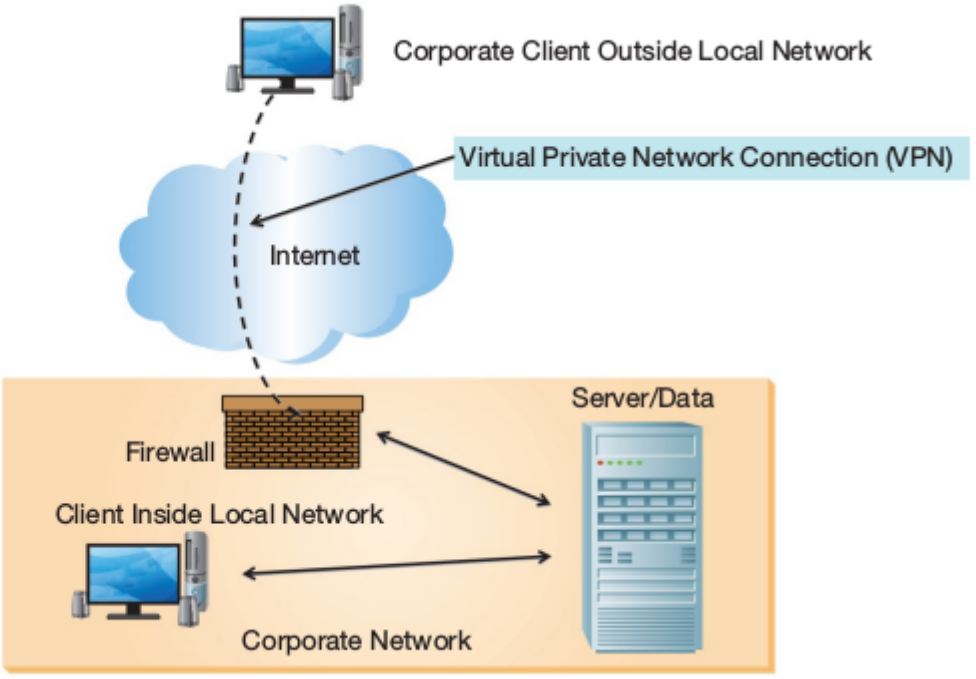
FIGURE 3.15
Dissecting a URL.

Intranets

- Web based technology for internal communication
- Intranet's content is behind **Firewall**

FIGURE 3.16

Typical intranet system architecture.

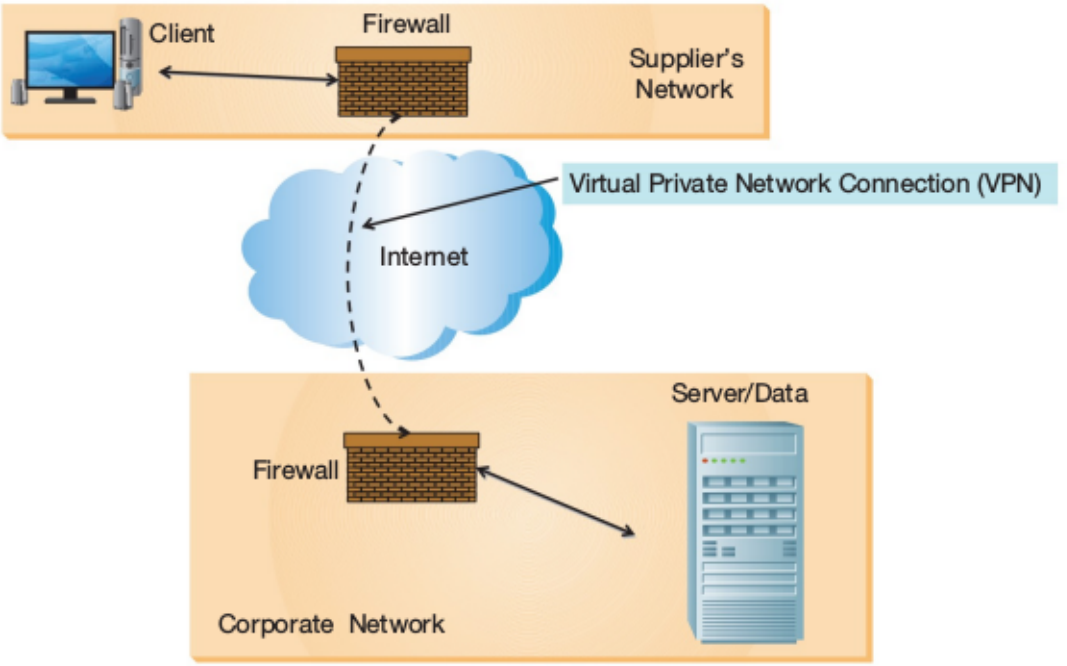


Extranets

- Better timeline and accuracy
- Cost effective, centralized document management

FIGURE 3.17

Typical extranet system architecture.



Internet, Intranet, and Extranet

TABLE 3.3 Characteristics of the Internet, Intranet, and Extranet

	Focus	Type of Content	Users	Access
Internet	External communications	General, public content	Any user with an Internet connection	Public and not restricted
Intranet	Internal communications	Specific, corporate, and proprietary content	Authorized employees	Private and restricted
Extranet	External communications	Communications between business partners	Authorized business partners	Private and restricted

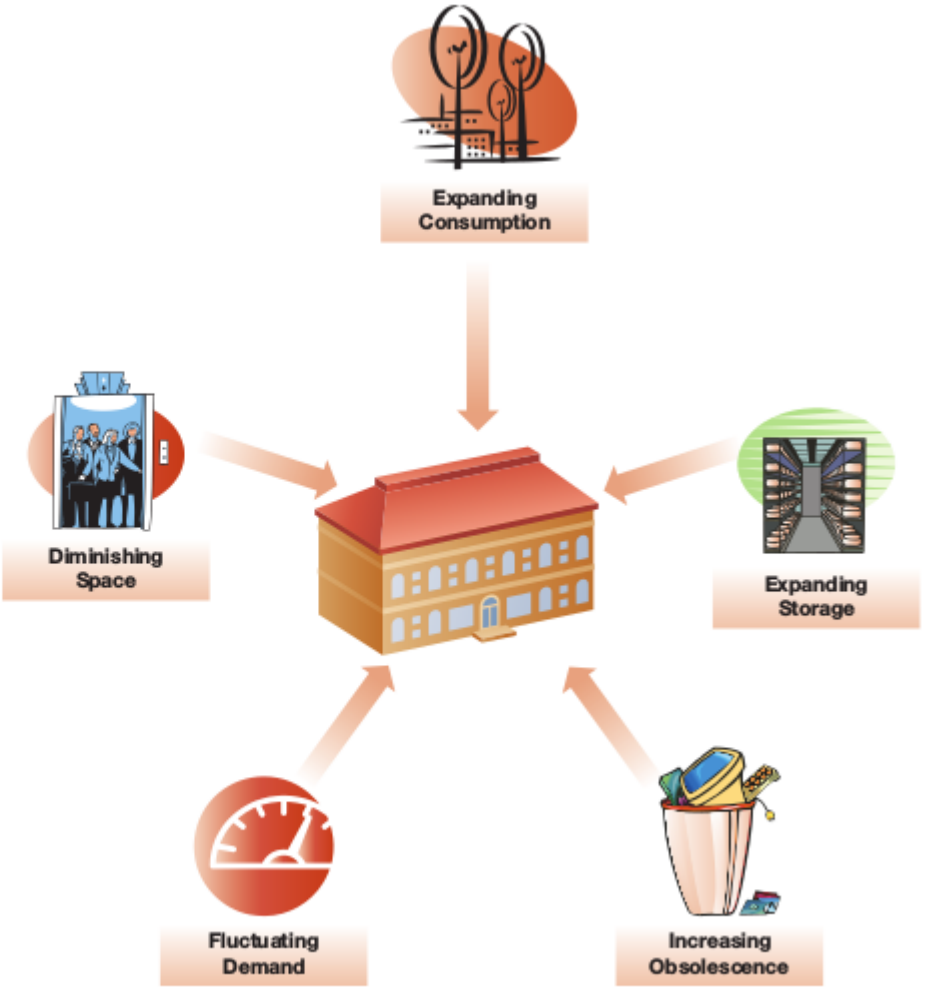
Data centers

- Needs for infrastructure
- Massive amounts of data
- Every business is becoming an **e-comerce**
- Needs for **high availability** of hardware, storage, networking
  - “five-nines”, 99.999 percent availability

Issues and Challenges

FIGURE 3.18

Information systems infrastructure challenges for modern organizations.



Six Generations of Computing

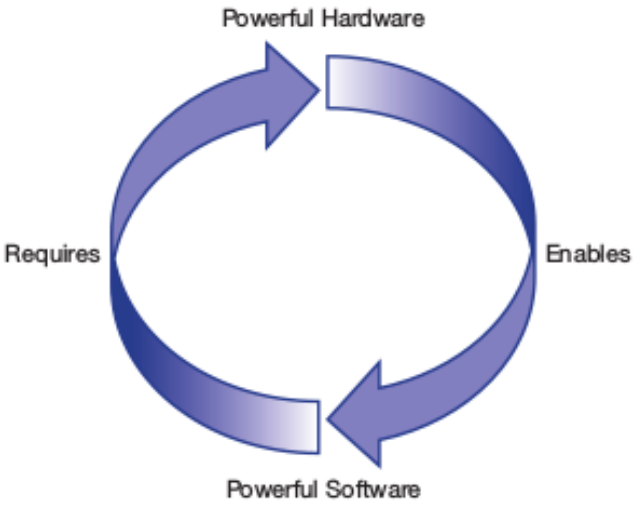
TABLE 3.4 Six Generations of Computing

Generation	Time Period	Major Characteristic	Events
1	1946–1958	Vacuum tubes	• Mainframe era begins • ENIAC and UNIVAC were developed
2	1958–1964	Transistors	• Mainframe era expands • UNIVAC is updated with transistors
3	1964–1990s	Integrated circuits	• Mainframe era ends • Personal computer era begins • IBM 360 with general purpose operating system • Microprocessor revolution: Intel, Microsoft, Apple, IBM PC, MS-DOS
4	1990s–2000	Multimedia and low-cost PCs	• Personal computer era ends • Interpersonal computing era begins • High-speed microprocessors and networks • High-capacity storage • Low-cost, high-performance integrated video, audio, and data
5	2000–2010	Widespread Internet accessibility	• Interpersonal computing era ends • Internetworking era begins • Ubiquitous access to Internet with a broad variety of devices • Prices continue to drop; performance continues to expand
6	2010–present	Ubiquitous mobile connectivity	• Advent of powerful mobile devices and ubiquitous mobile connectivity • Big Data • Cloud computing • Internet of Things • Social networking

New Hardware/Software Cycle

FIGURE 3.19

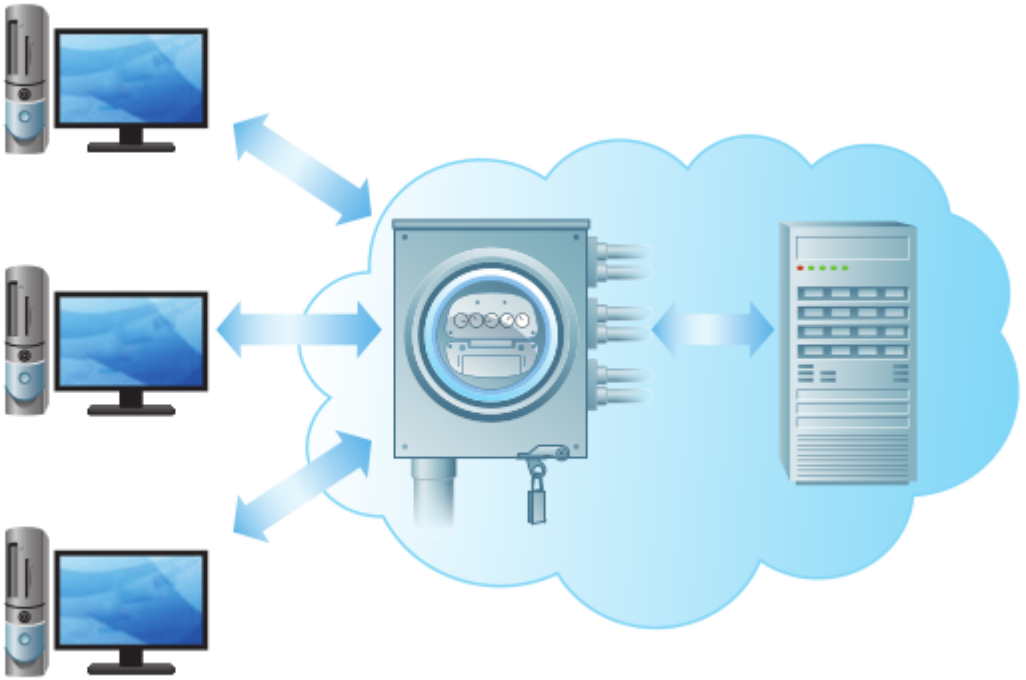
New hardware enables more powerful software; more powerful software often requires new hardware.



Cloud Computing

FIGURE 3.22

Cloud computing uses a utility computing model, allowing companies to pay for computing resources on an as-needed basis.



Cloud Computing

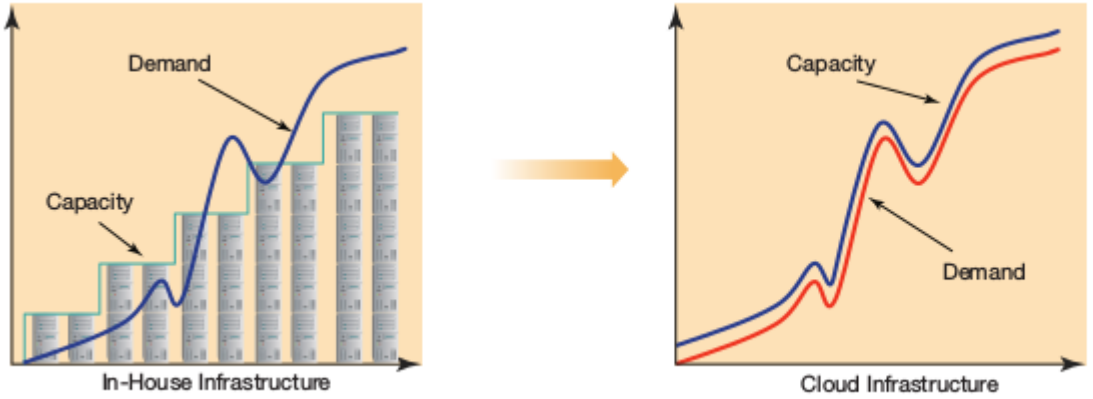


FIGURE 3.23
It is difficult to match demand using an in-house infrastructure; with a cloud infrastructure, resources can be added incrementally, on an as-needed basis.

Cloud Computing Service Models

FIGURE 3.24

Services by IaaS, PaaS, and SaaS providers.

Public vs. Private Clouds

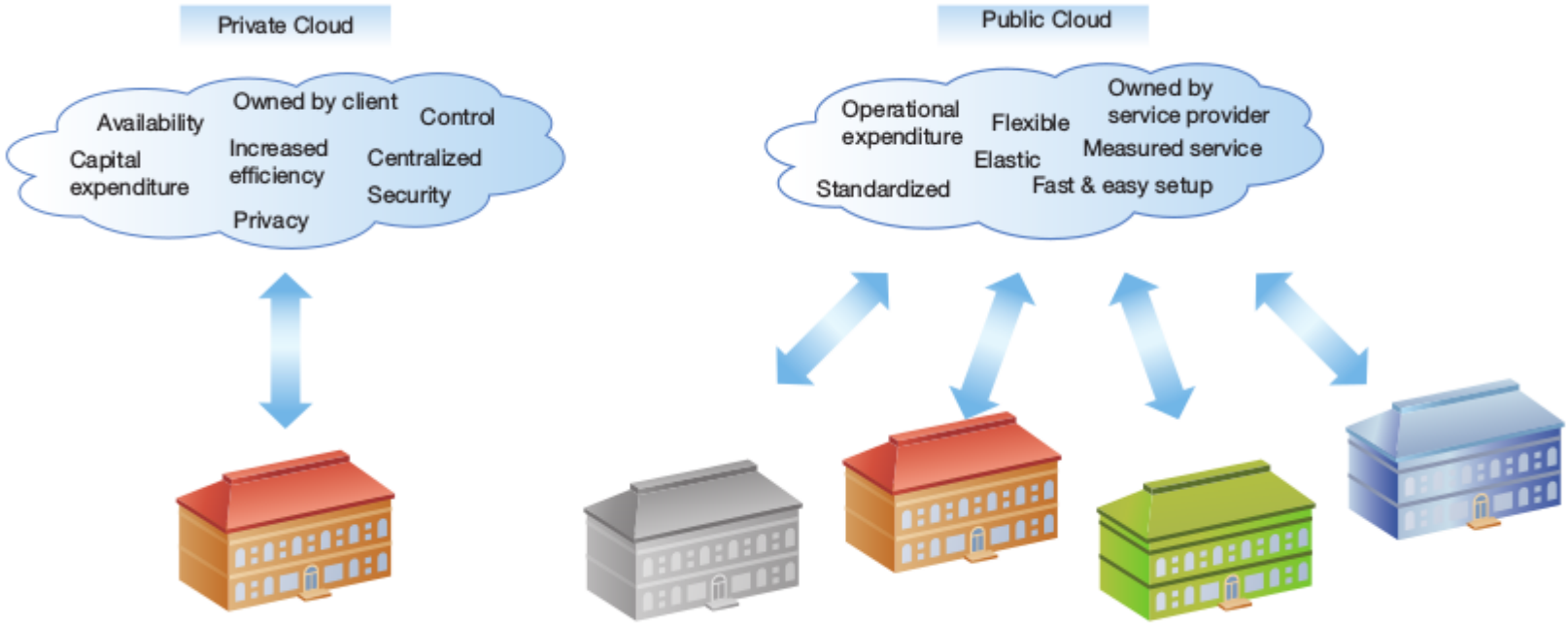


FIGURE 3.25

Public clouds versus private clouds.

Considerations

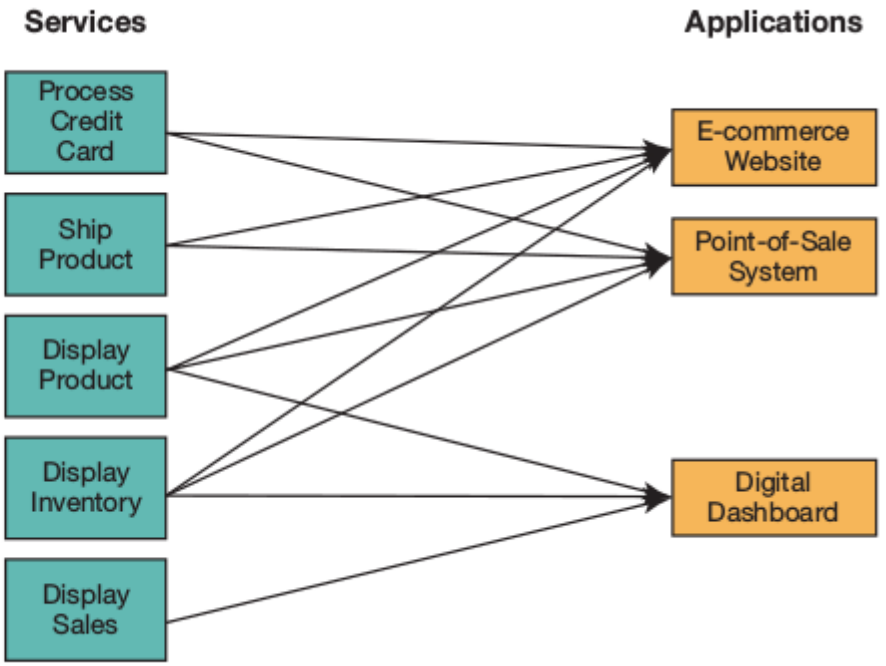
FIGURE 3.26

Organizations have to consider various issues when managing their cloud infrastructure.

Service Oriented Architectures

FIGURE 3.27

Using SOA, multiple applications can invoke multiple services.



Grid Computing

- Supercomputers, cost over $200 million
- May be needed only occasionally

FIGURE 3.28

The Titan supercomputer can perform more than 20,000 trillion calculations per second.

Source: Courtesy of Oak Ridge National Laboratory, U.S. Dept. of Energy.

Grid Computing

FIGURE 3.29

Grid computing: Computers located around the world work on parts of a large, complex problem.

Content Delivery Networks

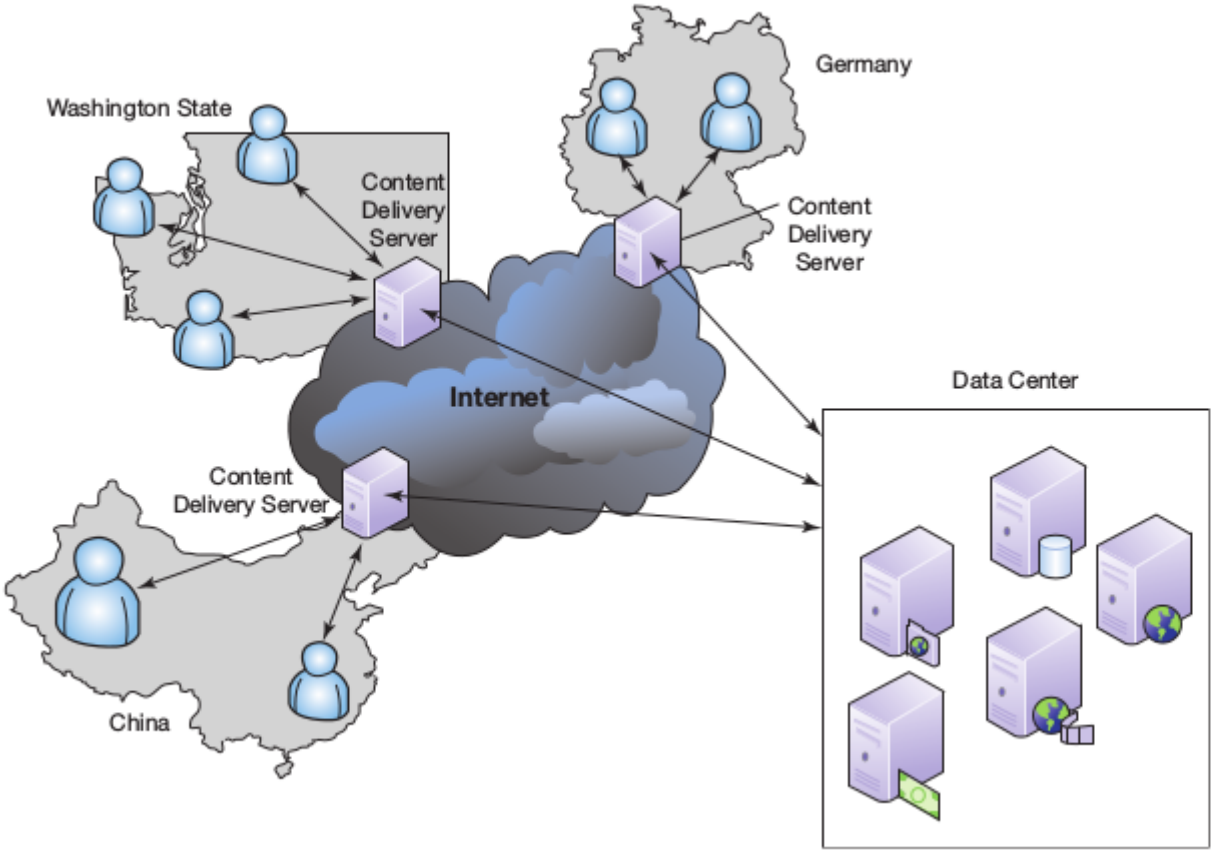


FIGURE 3.30

Content delivery networks store copies of content closer to the end user.

IP Convergence

- Voice over IP (VoIP)
- Videoconferencing over IP

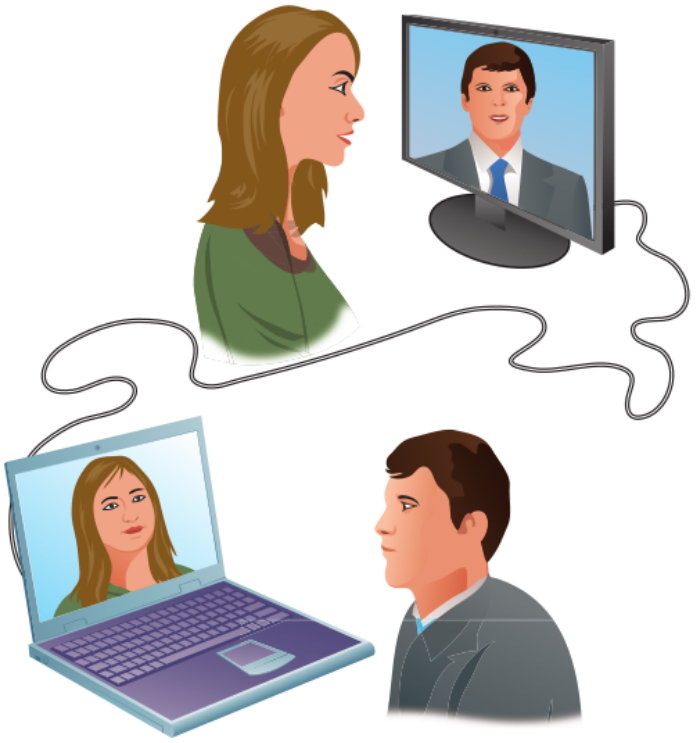


FIGURE 3.32

Desktop videoconferencing equipment helps organizations and individuals to reduce their telecommunications costs.

Key Points

- IS infrastructure needs and requirements
- Essential components of an organization’s infrastructure
- Managerial issues
- Cloud computing and current trends

References/Acknowledgements

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