Chapter 1: Computing and Enabling Technologies

Learning Objectives:

1. Describe the differences between Fiber Optic cable and Copper cable and the role they both play in modern networks.
2. Describe Deep Packet Inspection and how it allows for the Monitoring, Prioritization and Censoring of data.
3. Understand the impact and importance of Compression.
4. Understand how Multiplexing increases Network Capacity.
5. Summarize the importance of Protocols and Layers.
6. Describe Virtualization and its impact on Data Centers.
7. Describe the application of Containers.
8. Define Cloud Services (Public and Private) and why they are used.
9. Define Software as a Service, Platform as a Service, and Infrastructure as a Service.
10. Understand the impact of privacy regulation.

Brief Chapter Outline:

- Fiber-Optic and Copper Cabling
  - Fiber-Optic Cabling: Underpinning High-Speed Networks
  - Information Content Providers: Heavy Users of Fiber
  - Splitting Capacity of Individual Fiber Strands into Wavelengths
  - Fiber-Optic Cabling in Commercial Organizations
- Chips—Building Blocks of the Digital Age
  - Machine Learning
- Packetized Data
  - Per Packet Flexible Routing
  - Throughput
- Deep Packet Inspection: Monitoring, Prioritizing, and Censoring Traffic
  - DPI in Organizations: Protecting Confidential Information
  - Governments Monitor: Terrorism, Web Access, and Unfavorable Comments
  - Carriers, Networks: Categorization and Billing
  - Traffic Shaping: Prioritizing Traffic
- Compression
  - Streaming: Listening and Viewing without Downloading
  - Compression: The Engine behind TV over the Internet
  - Innovative Compression Algorithms—Fewer Bits, Higher-Quality Images
  - Using Codecs to Compress and Digitize Speech
- Increasing Network Capacity via Multiplexing
  - Time-Division Multiplexing
  - Statistical Multiplexing: Efficient Utilization via Prioritization of Network Services
- Using Protocols to Establish a Common Set of Rules
- Protocols and Layers
- Virtualization: Space, Cost, and Maintenance Efficiencies

Scalability and Energy Savings
Virtualization—Enabling Cloud Computing
Managing Virtualization
Managing Memory, Virtual Machines, and Disk Storage in Virtualized Data Centers
Containers: A Newer Form of Server Virtualization
The Cloud: Applications and Development at Providers' Data Centers
Private vs. Public Cloud Service
Cloud Computing Fees
Rationale for Cloud Computing
Three Categories of Cloud Services—Layers in the Cloud
Amazon: The Gorilla of Cloud Computing
Fewer IT Employees; Different Skills—DevOps
Compatibility with the Cloud
The EU–U.S. Privacy Shield

Issues for Discussion:

1. Explain the differences between Fiber Optic cabling and Copper cabling. What are the advantages and disadvantages of each?
2. Machine Learning is a fast growing field and is poised to become an every day part of our life. How will advancements in machine learning effect us the most? Discuss both private and commercial impacts.
3. What does the term "Carrier" mean? What role do Carrier's have in providing Internet access? Should Carrier's use Deep Packet Inspection to throttle, monitor, or discriminate against certain types of network traffic?
4. What are some ways that you think Augmented Reality will have the biggest impact on the daily lives of users?
5. Why is it important that the protocols used on the Internet are available for free in their most basic form? What impact would it have if a company was to start charging for the use of one of these protocols?
6. What are the advantages of Virtualization? Are there disadvantages?
7. Why is Cloud Computing a popular choice for small organizations and start-ups? Can large organizations benefit from Cloud Computing as well? What are the risks that these large organizations face?
8. Define Software as a Service, Platform as a Service, and Infrastructure as a Service.
9. How will the European Union's General Data Protection Regulation Act affect American companies and consumers?

Chapter Exam:

1. Which of the following technologies have driven the growth of Broadband networks? (There is more than one correct answer)
    a. Video Streaming ✓

b. Cloud Computing ✓
c. Microchips ✓
d. Online Gaming ✓

2. Cloud computing has _____ Fiber Optic network capacity.
    a. Had no effect on
    b. Caused a decrease in
    c. Caused an increase in demand for ✓
    d. Completely overwhelmed
3. What are two of the criteria that Service Providers use to determine the best locations for their data centers?
    a. Warmth and plenty of shade.
    b. Proximity to the Service Provider and water. ✓
    c. Availability of electricity and nearness to customers. ✓
    d. Good schools and low property taxes.
4. "Long haul networks?" connect which of the following: (There is more than one correct answer)
    a. Cities ✓
    b. Printers
    c. Countries ✓
    d. Routers
5. Which of the following statements about 'Half Duplex" cables are true? (There is more than one correct answer)
    a. It is capable of sending both directions.
    b. It is capable of sending in one direction. ✓
    c. It is used in the Fiber Optic Networks that run between cities. ✓
    d. It is used to connect to cable modem and routers within your home.
6. Organizations install "Dark Fiber" because_____. (There is more than one correct answer)
    a. They want to limit light pollution.
    b. They want to save money on adding increased future capacity. ✓
    c. Fiber Optic cable is safer underground. ✓
    d. They do not have enough laser emitters to light the cable.
7. Category 5e (UTP) is the most commonly deployed form of what?
    a. Amplifiers
    b. Fiber Optic Cable
    c. Compression Algorithms
    d. Copper Cables ✓
8. All Internet traffic and most high-speed data network traffic, is sent in _____.
    a. Envelopes
    b. Packaging
    c. Packets ✓
    d. Data Boxes

9. Choose the recent developments that have enabled commercially available Virtual Reality applications: (There is more than one correct answer)
    a. Could Computing
    b. Virtualization
    c. Compression Software ✓
    d. Multifunction Graphical Processing Chips ✓
    e. Augmented Reality

10. Match the Layers to the protocols that are most commonly associated with.

1. HTML	A. Layer 2
2. HTTP	B. Layer 3
3. Ethernet	C. Layer 6
4. IP	D. Layer 7

11. Virtualization is a major enabler of _____.
    a. The Internet ✓
    b. Deep Packet Inspection
    c. Cloud Computing ✓
    d. Server Sprawl ✓

12. A Virtual Private Network (VPN) creates a(n)_____
    a. Insecure link between the cloud and the customer.
    b. Quicker link between the cloud and the customer.
    c. Shared link between the cloud and the customer.
    d. Secure link between the cloud and the customer. ✓

13. The Heath Insurance Portability and Accountability Act (HIPAA) is meant to_____.
    a. Protect doctors and insurance companies from lawsuits.
    b. Protect the privacy of people's medical records. ✓
    c. Protect people from overpriced medical costs.
    d. Protect the privacy of doctors.