# Table of Contents

**Course Description** ........................................................................................................... vii

**ComputerPREP Courseware** ............................................................................................ viii

**Course Objectives** ............................................................................................................ viiii

**Classroom Setup** ............................................................................................................... x

**Lesson 1: What Is CTI?** ..................................................................................................... 1-1
  - Pre-Assessment Questions .......................................................................................... 1-2
  - Computer-Telephone Integration (CTI) ...................................................................... 1-3
  - Interactive Voice Processing ..................................................................................... 1-6
  - Fax Systems .............................................................................................................. 1-10
  - Simultaneous Voice-Data ......................................................................................... 1-13
  - Videoconferencing ................................................................................................... 1-14
  - Lesson Summary ....................................................................................................... 1-17
  - Lesson 1 Review ....................................................................................................... 1-19

**Lesson 2: CTI Architectures** ............................................................................................ 2-1
  - Pre-Assessment Questions ....................................................................................... 2-3
  - Signal Processing Boards ......................................................................................... 2-4
  - PBX and unPBX Systems .......................................................................................... 2-7
  - Host-Based Systems .................................................................................................. 2-10
  - Desktop Systems ...................................................................................................... 2-11
  - Client/Server .............................................................................................................. 2-12
  - Hardware .................................................................................................................. 2-14
  - Application Programming Interfaces (APIs) ............................................................. 2-26
  - Standards .................................................................................................................. 2-32
  - Lesson Summary ....................................................................................................... 2-35
  - Lesson 2 Review ....................................................................................................... 2-39

**Lesson 3: CTI Applications by Market** .......................................................................... 3-1
  - Pre-Assessment Questions ....................................................................................... 3-2
  - Corporate and Government ....................................................................................... 3-3
  - Distribution and Retail ............................................................................................... 3-5
  - Electronic Media ........................................................................................................ 3-6
  - Transportation ............................................................................................................ 3-8
  - Lesson Summary ....................................................................................................... 3-9
  - Lesson 3 Review ....................................................................................................... 3-11

**Lesson 4: Developing CTI Systems** ............................................................................... 4-1
  - Pre-Assessment Questions ....................................................................................... 4-2
  - Choosing a Method ..................................................................................................... 4-3
  - Development Choices ............................................................................................... 4-5
  - Planning the Application ......................................................................................... 4-6
  - Building the Application .......................................................................................... 4-9
  - Buying CTI Tools ....................................................................................................... 4-10
  - Lesson Summary ....................................................................................................... 4-13
  - Lesson 4 Review ....................................................................................................... 4-15

**Course Assessment** ........................................................................................................... Course Assessment-1

**Glossary** ............................................................................................................................... Glossary-1
List of Figures

Figure 1-1: Computer-Telephone Integration (CTI) .................................................... 1-4
Figure 1-2: Automatic Number Identification (ANI) .................................................. 1-5
Figure 1-3: CTI System With Auto-Attendant and Voice Mail ................................. 1-6
Figure 1-4: Complex Auto-Attendant and Voice Mail System ............................... 1-7
Figure 1-5: Audiotex System .................................................................................. 1-8
Figure 1-6: Interactive Voice Response (IVR) ........................................................ 1-8
Figure 1-7: Signal Processing Board ........................................................................ 1-9
Figure 1-8: Fax Server .......................................................................................... 1-11
Figure 1-9: Electronic Data Interchange (EDI) ........................................................ 1-11
Figure 1-10: Unattended Faxing ........................................................................... 1-12
Figure 1-11: Fax-On-Demand ................................................................................ 1-12
Figure 1-12: Simultaneous Voice-Data ................................................................... 1-13
Figure 1-13: SVD Using the Wide Area Network (WAN) and the PSTN ................... 1-14
Figure 1-14: SVD Using the Wide Area Network (WAN) ....................................... 1-14
Figure 1-15: Broadcast Video is Accessible to Organizations of all Sizes ............... 1-15
Figure 1-16: Videoconferencing is Used to Connect Rural Hospitals with Universities 1-16
Figure 2-1: PC With Signal Processing Board .......................................................... 2-5
Figure 2-2: Computers Serve the Same Functions As Business Telephone Systems ... 2-5
Figure 2-3: Computers Can Enhance or Replace Traditional Telephone Systems .... 2-6
Figure 2-4: PBX Linked to a Computer is a Common Form of CTI ............................ 2-7
Figure 2-5: Standards Allow Equipment From Different Vendors to Work Together ... 2-8
Figure 2-6: Software Standards Allow Hardware to Utilize Incoming Signals .......... 2-8
Figure 2-7: UnPBX: Signal Processing Board Connects Directly to Telephone Lines .... 2-9
Figure 2-8: Host-Based System with PBX ............................................................... 2-10
Figure 2-9: UnPBX Host-Based System .................................................................. 2-11
Figure 2-10: Desktop CTI System With PBX ............................................................ 2-11
Figure 2-11: Un PBX Desktop CTI System ............................................................... 2-11
Figure 2-12: Client/Server CTI System With PBX .................................................. 2-12
Figure 2-13: UnPBX Client/Server CTI System ...................................................... 2-12
Figure 2-14: Multiple Processors Enable Unlimited Growth .................................... 2-13
Figure 2-15: Telephone Connected to PBX by Proprietary Telephone Line ............ 2-14
Figure 2-16: PBX Connected to Public Network Using a T1 or E1 Line ..................... 2-15
Figure 2-17: Key Telephone System: Calls are Answered from Any System Telephone 2-16
Figure 2-18: PBX System: Switchboard Transfers Calls to System Extensions ......... 2-17
Figure 2-19: PBX System With Four Extensions .................................................... 2-18
Figure 2-20: Unified Messaging Sends E-Mail Notification of Voice Messages .......... 2-18
Figure 2-21: Automated Attendant (Auto-Attendant) ............................................ 2-19
Figure 2-22: CTI “Behind the PBX” Configuration ................................................ 2-19
Figure 2-23: Configuration “In Front Of a PBX” Can Provide Extra Features ........... 2-20
Figure 2-24: CTI Computer Replaces PBX ............................................................ 2-20
Figure 2-25: CTI Can Provide Automatic Call Distribution (ACD) and Predictive Dialing 2-21
Figure 2-26: Communication Among Network Elements Requires Standards ......... 2-21
Figure 2-27: PC and Data Bus ............................................................................. 2-22
Figure 2-28: Telephone Line Interface Connects the PC to Telephones Lines ............ 2-23
Figure 2-29: Voice Bus ....................................................................................... 2-24
Figure 2-30: The API Requests Operating System Services for the Application Program 2-27
Figure 2-31: Full TAPI Defines Three Level of Services ....................................... 2-29
Figure 2-32: First-Party Call Control ................................................................. 2-30
Course Description

Welcome to the *Computer-Telephone Integration (CTI) Essentials* course which will help prepare you for the Certified in Convergent Network Technologies (CCNT) exam, a program sponsored by the TIA™ (Telecommunications Industry Association).

This course is aimed at preparation and review for the CTI Essentials module of the CCNT exam, as well as professional development for Information Technology (IT) professionals. The course is designed to be used in a lecture-based classroom setting.

The *CTI Essentials* course introduces computer-telephone integration dynamics and explains the technology of applications, architectures, and system development. This course has four lessons with each covering several topics. The following presents the four lessons along with the topics covered in each, as well as the course objectives for the *CTI Essentials* course.

### Topics Covered

#### What Is CTI?
- Computer-Telephone Integration (CTI)
- Interactive Voice Processing
- Fax Systems
- Simultaneous Voice-Data
- Videoconferencing

#### CTI Architectures
- Signal Processing Boards
- PBX and UnPBX Systems
- Host-Based Systems
- Desktop
- Client/Server
- Hardware
- Application Programming Interfaces (API)
- Standards

#### CTI Applications by Market
- Corporate and Government
- Distribution and Retail
- Electronic Media
- Transportation

#### Developing CTI Systems
- Choosing a Method
- Development Choices
- Planning the Application
- Building the Application
- Buying CTI Tools
ComputerPREP Courseware

This learning guide was developed for instructor-led training and will assist you during class. Along with comprehensive instructional text and objectives checklists, this learning guide also includes pre-assessment questions, tech terms, as well as lesson summaries and reviews.

Each lesson in this course follows a regular structure, along with graphical cues to illustrate important terms and concepts. The structure of a typical module includes:

- **Pre-Assessment Questions** – Each lesson includes pre-assessment questions to test the student’s understanding of the key concepts presented in the lesson.
- **Objectives** – Each lesson includes a list of objectives to set the stage for the rest of the lesson.
- **Tech Terms** – Tech terms appear in bold in the narrative text for quick and easy access (technical terms are also included in the index and glossary).
- **Lesson Summary** – The Lesson Summaries at the end of each lesson include: an Application Project to extend learning, a Skills Review of key concepts and objectives presented in the lesson, and Lesson Review Questions designed to test understanding.
- **Glossary** – The Glossary contains a list of key terms defined throughout the course which can be used for self-study once the course has been completed.
- **Table of Contents and Index** – The Table of Contents appears at the beginning of the course book and the Index appears at the end. These two allow for easy access to review key areas.

**Course Objectives**

- Describe a standard CTI operation.
- Explain voice processing.
- Describe the features and functions of voice mail.
- Differentiate IVR from Audiotex.
- Explain text-to-speech operations.
- Explain how companies benefit from fax servers.
- Explain the advantage of mini and mainframe fax servers vs. LAN servers.
- Explain the advantages of using store and forward fax systems.
- Explain the advantages of using fax-on-demand systems.
- Identify common SVD applications.
- Describe common SVD configurations.
• Explain the advantages of using videoconferencing as a communications medium.

• Explain how signal processing boards have allowed computers to control traditional telephony functions.

• Describe the importance of industry hardware and software standards to promoting the success of CTI.

• Explain how traditional PBXs integrate with computer networks.

• Explain how signal processing boards and standards-based software supports computer-based voice communications.

• Define unPBX.

• Explain how unPBX systems replace PBXs in CTI systems.

• Describe the operation of a host-based CTI system.

• Describe the operation of a desktop CTI system.

• Describe the operation of a client/server based CTI system.

• Explain the benefits of using a LAN for a client/server system.

• Explain the advantages of a client/server configuration for database transactions.

• Explain how a client/server configuration makes customized telephone systems possible.

• Identify the components commonly used in CTI architectures.

• Describe residential telephone system operations.

• Differentiate between a proprietary analog telephone line and a digital telephone line.

• Explain key system operations.

• Describe the features and functions of PBX systems.

• Describe the features and functions of a signal processing board.

• Describe the function of the bus in CTI systems.

• Differentiate between the common operating systems supported by signal processing.

• Explain the functions and applications of an API.

• Explain the functions and applications of TAPI.

• Explain the functional structure of Windows open services architecture (WOSA).

• Describe how JTAPI (Java Telephony API) allows the development of web-based CTI.

• Describe the components of Novell TSAPI.

• Describe the key events in the evolution of CTI systems.

• Explain how CTI systems are built.

• List the key areas of concern in CTI compatibility.
- Describe CTI applications in corporate environments.
- Describe CTI applications in government environments.
- Explain how distributors in wholesale operations use CTI.
- Explain how CTI is used in retail operations.
- Explain how broadcast and information providers (ISP) use CTI applications.
- Explain how the shipping and transportation industries use CTI.
- Differentiate between the CTI development options.
- Differentiate between the different operating platforms for CTI development.
- Describe the steps for planning a CTI system.
- Describe the differences between application development tools.
- List the key issues to consider when buying CTI tools.

**Classroom Setup**

Student computers are not required for this seminar course. However, if the instructor desires to supplement activities or quizzes electronically, computers addressing these needs will be required for each student. Otherwise, all supplemental material can be distributed as hard-copy documents and completed by students using a pen and paper.
Lesson 1:
What Is CTI?

OBJECTIVES

By the end of this lesson, you will be able to:

- Describe a standard CTI operation.
- Explain voice processing.
  - Describe the features and functions of voice mail.
- Describe the difference between IVR and Audiotex.
- Explain text-to-speech operations.
- Explain how companies benefit from the use of fax servers.
- Explain the advantages of mini and mainframe fax servers versus LAN servers.
- Explain the advantages of using store and forward systems.
- Explain the advantages of using fax-on-demand systems.
- Describe and identify common SVD applications.
- Describe common SVD configurations.
- Explain the advantages of using videoconferencing as a communications medium.
Pre-Assessment Questions

1. An organization might consider using a centralized unattended faxing system to:
   a. Send a high volume of broadcast faxes.
   b. Send batch faxes during off-peak hours.
   c. Generate distribution lists from a database.
   d. All of the above.

2. A text-to-speech system requires special software to recognize, interpret and translate spoken words. What is this software called?
   a. Text normalizer
   b. Letter-to-phoneme program
   c. Speech stabilizer
   d. None of the above

3. Today, it is more common to use videoconferencing technology for distance learning than it was a few years ago. Why is this?

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
Computer-Telephone Integration (CTI)

The telephone is the most widely used business tool. Computer-telephone integration (CTI) turns all these phones into virtual "terminals" so that the telephone keypad becomes a keyboard that callers use to send and receive information and instructions. The combination of the telephone and intelligent data processing saves callers time and saves you money.

Computer-telephone integration (CTI) is the exchange of commands and messages between computers and telephone equipment. In simplest terms, CTI is the technique of coordinating the actions of telephone and computer systems. The ultimate goal of CTI is more efficient handling of incoming and outgoing telephone calls. CTI bridges the telecommunications industry with the computer industry, and introduces new integrated applications such as:

- Automated call management and routing
- Unified messaging
- **Fax systems**
- **Database** interaction
- Simultaneous voice-data (SVD)
- **Videoconferencing**

**fax system**
A configuration of equipment, including PCs, fax machines, servers, and a network, that allows hard copy (written, type, or drawn) materials to be sent through the network system and printed out elsewhere. Fax is the abbreviation for facsimile.

**database**
An electronic receptacle for data storage. A collection of data structured and organized in a disciplined fashion to allow fast, easy access is to information of interest. New data may be imported into the database, and old data may be exported (retrieved) from the database.

**videoconferencing**
A method used to communicate video and audio information between two or more people. A codec (coder/decoder) is used at each end and linked by digital circuits.

CTI involves a connection between a computer (single workstation or a file server on a local area network [LAN]) and a telephone switch (private branch exchange [PBX] or an automatic call distributor [ACD]). In a CTI environment, the computer controls the movement of calls by issuing commands to the switch. CTI adds computer intelligence to the making, receiving, and managing of telephone calls. Originally, the classic application for CTI was in the call...
center, where call volumes easily justified the cost of complex custom-built systems. Due to a number of factors that significantly simplified computer-telephone systems, CTI rapidly expanded to organizations of all types.

- **local area network (LAN)**
  LAN. A network providing data communication between computer stations, usually limited to a single building or complex of buildings.

- **switch**
  A mechanical, electrical, or electronic device that opens or closes circuits, completes or breaks and electrical path, or selects paths or circuits. They operate on either a time- or space-division basis.

- **call center**
  A business location where agents handle a large volume of calls. Most call centers use automatic call distributors (ACDs), a computer using a database management system to enter orders, look up customers, and often provide agents with caller information via “screen pops.” Modern call centers could also have a predictive dialer for making large amounts of outgoing calls quickly, and can include help desks and service lines.

When a call comes in to a call center, it carries some form of caller identification — either **automatic number identification (ANI)** or **calling line ID (CLID)**. The switch reads the calling number, strips it off, and sends it to a computer. The computer looks up the number in a database and instructs the switch where to route the call and the customer’s database record. The computer may instruct the switch to route the call and the customer’s database record to a specialized agent or to the agent the caller dealt with last time. Or, it may connect the caller to the first available agent, using an automatic call distribution (ACD) system.

ANI provides for the transmission through the network of the billing number (BN) of the originating (calling) party. Current networks send this information through the digital Signaling System 7 (SS7) network, although the presence of SS7 throughout the entire network is not required for ANI operations. The calling party cannot block the information. As the call progresses, the BN is presented to the ACD, and the ACD runs a query (lookup) in the database and extracts the profile of the caller. The agent answering the call receives a “screen pop” with the caller’s profile.
Lesson 1: What Is CTI?

To gain access to ANI data from the central office, you must have a “trunk side” connection (toward the central office) that supports this functionality.

The delivery of CLID information assumes the following:

- The entire network of switches must be supported by SS7.
- The calling party must originate the call from a single-channel line.
- The originating line/caller must not block the transmission of information.

**automatic number identification (ANI)**

ANI. Allows the called party to recognize the number of the calling party before the first ring of the telephone. It requires a special connection and a network that has the ability to send the calling number.

**calling line ID (CLID)**

A service provided by the local phone company where information is passed to the called party between the first and second rings of the telephone call. This information consists of the telephone and/or name of the calling subscriber as identified in the originating central office register (database). The information is digitally displayed on or near the telephone, allowing the called party to identify the caller.

Call centers that dial out, such as telemarketing or credit collections services, use predictive dialers. **Predictive dialing** systems are programmed to dial numbers and connect the called party to an agent, or telephone service representative (TSR). The predictive dialing system connects to a database that contains information about each person that is being called. This information is provided to the TSR when the call connection is made. If the dialer encounters a busy signal, the predictive dialing system goes to the next number on the list until it makes a connection. According to general accepted industry claims, a manual dialing center allows agents to talk on the telephone for 25 minutes of each hour, whereas predictive dialing increases productivity to 55 minutes of each hour.
**predictive dialing**
Using computers to make outbound calls, based on information accessed from a database. When an outbound call is successful, the called party is connected with a live operator. These systems are generally used for mass telemarketing and sales applications to increase productivity.

**Interactive Voice Processing**
Interactive voice processing is a broad term made up of two narrower terms—call processing and content processing. Call processing consists of physically transferring the call (similar to switching). Content processing consists of utilizing or processing the call’s content (recognizing it or storing it).

A voice processing system recognizes touch-tone dialing from remote telephones. It may also recognize spoken words, using speech recognition. The most basic form of voice processing is the **auto-attendant**. The auto-attendant answers a company’s phones, prompts the caller to enter the extension he or she wants, and rings that extension. If that extension does not answer, it may send the caller to **voice mail** or back to the auto-attendant. It may also allow the caller to enter a code to hear information, such as the organization’s hours of business.

**auto-attendant**
*Automated attendant.* An electronic device that answers telephone calls without human intervention. A digital recording prompts callers to use the telephone keypad to route themselves to an extension, voice mail, or electronic bulletin board.

**voice mail**
A service allowing callers to leave spoken messages that are stored for later retrieval by the person or persons to whom the call was made. A mailbox owner calls the voice mail system to listen to messages in his or her voice mail box. Also known as voice messaging.

*Figure 1-3: CTI System With Auto-Attendant and Voice Mail*
A voice mail system stores voice "files," plays them back and distributes them to the various users of the system. Voice mail is used in a variety of ways. For example:

- A manufacturer may use voice mail to take orders after hours and on weekends.
- A retail executive may broadcast voice mail messages to her staff.
- A lawyer may use voice mail to receive phone messages, e-mails, and even faxes by using unified messaging.

Many voice mail systems are combined with automated attendants or with interactive voice processing systems, including sophisticated tie-ins to databases.

**Audiotex** is a voice (or fax) bulletin board on a voice mail system. The system broadcasts pieces of information based on caller touch-tone dialing. Audiotex is used as a generic term for interactive voice response (IVR) equipment and services.

Audiotex makes it possible to create a verbal database so callers can select which information they want to hear. The system can prompt you to reply to the announcement or to be transferred to a designated employee who can respond to your request. If desired, a password can be required before confidential or controlled access information can be heard.

**Audiotex**

Interactive voice response (IVR) equipment and services. With Audiotex callers use touch-tones to select specific audio information.

For example, when a customer calls a restaurant, a machine presents a list of options: "Press 1 for directions to our restaurant. Press 2 for today's specials," etc.
Interactive voice response (IVR) is one of voice processing’s most sophisticated and challenging applications. IVR gives callers specific information based on the unique information the callers enter (usually via touch-tone dialing). A common application is banking by phone. Callers enter unique information (a personal identification number [PIN]), and retrieve unique information, such as a checking account balance. Information is returned to the customer by way of a text-to-speech application.

interactive voice response (IVR)
IVR. Based on cues and commands from a touch-tone telephone, IVR responds with either prerecorded or synthesized voice (text-to-speech) to present data. Also known as voice processing.

text-to-speech
The technology that converts ASCII text information into synthetic speech (audio) output. Used in voice processing applications requiring production of broad, unrelated and unpredictable vocabularies. Uses a synthesized voice to “read” back information that is constantly changing.
The key to IVR is accessing unique data. That is what clearly separates IVR from Audiotex, which broadcasts different prerecorded information to callers. IVR sets up a terminal-to-host computer or, to be more precise, a client/server relationship. In an IVR relationship, the client is the telephone caller and the computer data resource is the server.

**client/server**
A local area network architecture that allows one part of an application to run on an individual user's workstation (client) and the other part to run on a network server (server). The client portion of the application requests processing by the server. The server portion performs the processing (database search and sort, etc.) and returns the result to the client.

Text-to-speech is a voice processing system where written information is converted to “spoken” words. Text files are entered into a voice system that consists of a signal processing board and special software that reads and interprets the text files. As a result, synthetic speech is produced.

**signal processing board**
A PC-compatible expansion board containing digital signal processors (DSPs) that perform voice processing functions. It has several important characteristics, such as data bus connection, a telephone line interface, and a voice bus connection. It usually supports one of several operating systems. Also known as a voice card or a speech card.

PCs motherboard data buses were not designed for voice. For voice you need another bus. Several voice processing manufacturers have addressed that need by creating a voice bus at the top of their PC-based voice processing cards. They have tiny pins sticking out of their card where a ribbon cable is attached. Multiple cards can be attached to each other, thus creating the “voice bus.”

There are several voice bus standards. Dialogic Corporation (acquired by INTEL) has produced the Analog Expansion Bus (AEB), PC Expansion Bus (PEB), and Signal Computing System Architecture (SCSA). Multi-Vendor Integration Protocol (MVIP) was developed by a consortium.

Text-to-speech operations can experience several problems, particularly when two or more different languages are involved. Typical text contains many strings that are not words. For example, is St. “street” or “saint”? Is Dr. “doctor” or “drive”? Addressing these problems is the task of the text normalizer. Each language needs its own text normalizer, because each language has its own unique standards.
**text normalizer**
Software that works in conjunction with text-to-speech. It converts non-standard text to prespecified standards. Once text is normalized, it is in a standard format and may be converted to speech.

Sometimes countries that have a common language, such as the United States and England, exhibit clear differences in language usage. For example, the abbreviation for "mister" is always followed by a period in the United States (Mr.), but not always in England (Mr). Once the text has been normalized, for some languages (such as Spanish) the text-to-speech system uses letter-to-phoneme rules to translate the text letters into an exact representation of the desired pronunciation, using the internationally recognized phoneme character set to specify correct pronunciation.

**phoneme**
The smallest unit of speech that distinguishes one utterance from another in all of the variations that it displays in the speech of a single person or particular dialect as the result of modifying influences.

**Fax Systems**
As more companies rely on fax communications to perform their work, network fax servers offer more control and optimal fax communications. Any organization that regularly sends and receives faxes can increase productivity and save both time and money by implementing a fax server.

**fax** Facsimile. An electronic transmission from one internal or external fax machine via a modem to a receiving fax machine.

**fax server** A high-powered computer on a LAN that has one or more PC fax boards installed. Receives, stores, and distributes incoming faxes, and alerts fax recipients. Stores and transmits outgoing faxes. Fax servers can be used to provide fax-on-demand to customers.

Network fax servers make it possible to send faxes directly from the user’s computer. Many fax servers allow the user to fax documents right from the word processor or other application program. Incoming faxes can be directed back to an individual workstation, or a fax can be received by an operator, who then forwards it to an individual workstation.

Fax servers reside in the LAN and can be accessed by the LAN workstations or it can be “dialed into.” It can receive, send, store, forward, and distribute faxes. A fax server can send faxes to thousands of people based on a database of names, and it can also act as an IVR, sending you selected faxes. Following are the two types of fax servers:

- One-call machine—the caller calls from his or her own fax machine, chooses a fax to receive, and selects start on his or her machine. All costs go to the caller.
• Two-call machine—the caller calls from a regular telephone, selects the fax, enters the desired destination fax number, fax server dials and sends the fax to a designated number. Some costs go to the called party.

Figure 1-8: Fax Server

Many mini and mainframe fax servers work in the same way as LAN fax servers. Users can send and receive faxes from their terminals, saving time and money while improving the quality of their fax transmissions. In addition, mini/mainframe fax servers have carved out a niche for themselves through direct integration with specific applications. Mini/mainframe fax servers on the same computer as an organization’s data can provide an electronic data interchange (EDI)-like component for large, vertical applications such as accounting or purchase order systems. This broadens the reach of these applications to any recipient with a fax machine.

mainframe
A large, powerful central computer that does the processing for a network of remote terminals.

electronic data interchange (EDI)
A series of standards that provide computer-to-computer exchange of business documents between different companies’ computers over phone lines and the Internet, without human intervention. EDI software translates fixed field or flat files that are extracted from applications into a standard format. Translated data is then forwarded to communications software for transmission.

Figure 1-9: Electronic Data Interchange (EDI)
The benefits of a centralized system for unattended faxing — high-volume broadcasting, batch faxing during off-peak hours, integration into database management systems for generating distribution lists, and accounting reports — make fax store-and-forward systems an attractive solution for companies wanting to manage high-volume fax activity.

With a fax store-and-forward system, companies can centralize the transmission, reception, and management of faxes. These systems can range in size and complexity from large, multi-line turnkey switches, capable of sending thousands of fax pages per day, to PC-based fax broadcast applications that can run on a microcomputer.

- **unattended faxing**
  The programming of fax equipment so that it functions mechanically, without a live attendant or operator.

- **store-and-forward**
  A situation in which data is entered and stored in a database and then forwarded to a specific location. Store-and-forward is used in various messaging systems, such as fax systems or voice systems. Telephone answering machines are also considered forms of store-and-forward devices.

With the integration of voice and fax, the delivery of information stored in a computer to any fax machine can be performed in response to telephone prompts. With such fax-on-demand systems, customers initiate the calls and select the information they want to receive. Customers can receive information at their convenience.
**Fax-on-Demand**
The process of ordering fax documents from remote machines using a combination of fax and voice processing. It allows a caller to dial into a fax machine and "demand" a specific document by using touch-tone digits. It is also referred to as fax-back.

**Simultaneous Voice-Data**

**Simultaneous voice-data (SVD)** is one of the most widely used CTI applications. Sharing computer screens, Windows applications, and whiteboards while conducting a voice conversation has revolutionized CTI applications. SVD applications range from technical support and sales presentations to videoconferencing. In the following scenario, both document sharing and voice are transmitted over the public switched telephone network (PSTN).

**Simultaneous voice-data (SVD)**
Several techniques for transmitting voice conversations and data transfers over the same analog telephone line. Some of these techniques involve interrupting the voice conversation while data is transferred; others involve transferring the data and voice simultaneously on different bandwidths (frequencies) of the telephone line.

**Public switched telephone network (PSTN)**
The ordinary dial-up telephone network for switched access to local, long distance, and international services.

In this second SVD scenario, document sharing is transmitted over the **wide area network (WAN)**, whereas voice is transmitted over the PSTN.

**Wide area network (WAN)**
WAN. A network with unlimited physical extent, such as cities on both coasts of the United States. Usually made of linked LANs or terminal-to-host networks.
In this third SVD scenario, both document sharing and voice are simultaneously transmitted over a wide area network. In this case, voice communications are handled via a computer microphone rather than by telephone.

**Videoconferencing**

Videoconferencing has been eagerly anticipated ever since it made its debut at the 1964 World’s Fair in New York with the first videophone. Videoconferencing is a method used to exchange video and audio information among two or more people. A codec (coder/decoder) is used at each end and linked by digital circuits.

Since 1990, desktop videoconferencing systems have grown in popularity over the larger room systems. Videoconferencing has made gains in business, education, and health care as the costs and portability of these systems have improved. Systems formerly requiring 1.5 kbps are now available offering acceptable quality for general use at 128 kbps and reasonable 7 khz audio. Factors influencing the growth of videoconferencing are:

- Improved compression technology.
- Reduced cost through very large scale integration (VLSI) chip technology.
- Lower-cost switched digital networks and the emergence of standards.
Broadcast video has been used as a teaching tool for many years. Using broadband-based closed circuit video or satellite uplinks, the technology has usually been used primarily by colleges and universities or large corporations, owing to its high cost. But with the wider availability of high speed phone lines — like Integrated Services Digital Network (ISDN) and digital subscriber line (DSL) — faster PCs, and affordable digital video accessories, distance-learning technology is now being considered by organizations of all sizes. Using videoconferencing as a training delivery system reduces travel, allows more timely delivery of new information, and unlike videotaped training, allows feedback and a two-way dialog between instructor and learners.

**Figure 1-15: Broadcast Video is Accessible to Organizations of all Sizes**

**broadband**
Originally a network architecture that uses analog signals for transmitting a variety of voice, data, video, etc., information in a local area network. More recently, broadband has been used to describe any transmission technology that uses digital signals at speeds of 45 Mbps and up.

**Integrated Services Digital Network (ISDN)**
ISDN. A collection of standards that defines interfaces for operation of digital switching equipment. Instead of using one analog telephone line, ISDN uses three digital channels. Each channel carries voice, video, data, images, or combinations of these. ISDN has two basic formats (for the United States): Basic Rate Interface (BRI) and Primary Rate Interface (PRI).

**digital subscriber line (DSL)**
DSL or xDSL. A set of technologies offered by LECs that provides a low-cost, easily accessible, copper-based solution to the need for T1/E1 service. Some xDSL technologies are based on modems, whereas others are based on the use of a CSU/DSU.

DSL is rapidly capturing the ISDN market because it is cheaper and easier to install, and it is commonly used to support videoconferencing applications. There are several types of DSL services: asymmetric DSL (ADSL), high bit rate DSL (HDSL), and single pair or symmetric DSL (SDSL). Such services provide up to 8 Mbps downstream to the customer, and fewer bits per second upstream to the telephone company.
Videoconferencing technology is used to provide people in even the most remote areas with access to the finest medical resources available. Physicians from large, metropolitan medical centers or from specialty clinics around the world can examine and diagnose patients using two-way video hookups. They can then advise rural physicians on the recommended course of treatment for critically ill or injured patients. Videoconferencing can save time, travel costs, and perhaps even lives.

Figure 1-16: Videoconferencing is Used to Connect Rural Hospitals with Universities
Lesson Summary

Application project
A credit card company with 500 employees has decided to implement a new CTI system to manage contact information and handle incoming and outgoing customer service telephone calls. What CTI features and functions would be useful to this company?

Skills review
Following are the key points presented in this lesson:

- In a CTI environment, the computer controls the movement of calls by issuing commands to the switch. The classic application for CTI is in call centers but CTI is rapidly expanding to organizations of all types.

- A voice processing system recognizes touch-tone dialing from remote telephones. It may also recognize spoken words. The most basic form of voice processing is the auto-attendant, which answers a company’s phones, prompts the caller to enter an extension, and rings that extension. A voice mail system stores voice "files," plays them back and distributes them to the various users of the system.

- Audiotex is a voice (or fax) bulletin board which broadcasts pieces of information based on caller touch-tone dialing. Audiotex is used as a generic term for interactive voice response (IVR) equipment and services, which give callers specific information based on the unique information the callers enter. A common application of IVR is banking by phone.

- Text-to-speech is a voice processing system that converts ASCII text information into synthetic speech (audio) output. It is used in voice processing applications requiring production of broad, unrelated and unpredictable vocabularies. It uses a synthesized voice to “read” back information that is constantly changing. The system contains a signal processing board and software that reads and interprets the text files.

- With a fax store-and-forward system, companies can centralize the transmission, reception and management of faxes. These systems can range in size and complexity from large, multi-line turnkey switches, capable of sending thousands of fax pages per day, to PC-based fax broadcast applications that can run on a microcomputer.

- Simultaneous voice-data (SVD) applications range from technical support and sales presentations to videoconferencing. Sharing computer screens, Windows applications, and whiteboards while conducting a voice conversation has revolutionized CTI applications.
Videoconferencing is a method used to exchange video and audio information among two or more people. A codec (coder/decoder) is used at each end and linked by digital circuits. The technology can allow physicians from large, metropolitan medical centers or from specialty clinics around the world to examine patients and diagnose their conditions using two-way video hookups.

Now that you have completed this lesson, you should be able to:

- Describe a standard CTI operation.
- Explain voice processing.
- Describe the features and functions of voice mail.
- Describe the difference between IVR and Audiotex.
- Explain text-to-speech operations.
- Explain how companies benefit from the use of fax servers.
- Explain the advantages of mini and mainframe fax servers versus LAN servers.
- Explain the advantages of using store and forward systems.
- Explain the advantages of using fax-on-demand systems.
- Describe and identify common SVD applications.
- Describe common SVD configurations.
- Explain the advantages of using videoconferencing as a communications medium.
Lesson 1 Review

1. What is ANI used for in a call center?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

2. What is the simplest form of computer-telephone integration (CTI)?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

3. What type of system stores voice files, plays them back, and distributes them to the various users of the system?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

4. What term is used to describe a system that broadcasts pieces of information based on caller tone dialing?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

5. True or false: IVR gives callers specific information, based on unique information the callers enter.
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

6. A text-to-speech system requires special software to recognize, interpret and translate spoken words. What is this software called?
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
7. What does SVD stand for?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________