The Center for Legal and Court Technology

The World Of Courtroom Technology

by Martin Gruen*

Executive Summary

The courts are at the edge of a technological tidal wave. Technology offers the courts practical help with ever-increasing caseloads and decreasing financial resources. Through the use of appropriate technologies a court may expedite trials and improve the quality of justice while at the same time lowering the cost to both the litigants and the Court.

Courtroom technology is any system or method that uses technology in the form of electronic equipment to provide a clear benefit to the judicial process. This technology is, however, a two-edged sword. When selected carefully and implemented with a well-planned installation, it can provide great benefit in the courtroom. Done improperly, technology can increase costs, waste time, and may even confuse participants in the judicial proceeding.

This white paper gives an overview of the key technology available to courts today and helps to identify specific issues and considerations to address when developing a court technology plan.

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COURTROOM TECHNOLOGY: AN OVERVIEW

To develop a successful technology plan, all the various technological systems and methods must be considered and their benefits evaluated in light of the Court's needs. The basic categories of courtroom technology that should be considered when developing a technology plan are:

- Communications
- Remote appearance systems (videoconferencing)
- Evidence presentation
- Court record
- Courtroom data
- Control systems
- Infrastructure

COMMUNICATIONS

Courtroom technology begins with audio and video communications. Communications are the foundation on which all other courtroom technologies depend and include audio systems, assistive listening devices, foreign language interpretation, teleconferencing, and videoconferencing. Communications systems all have a common structure that has as its base the ability to produce audio that can be heard clearly and consistently by all parties.

Audio Systems

Audio is the basic foundation of any courtroom technology project, and planning a good audio system should be a major part of any technology upgrade or implementation project. Despite this fact, most people do not think much about it. Courts are accustomed to using audio systems for sound reinforcement, which enables people in the courtroom to hear. However, when additional technology for audio conferencing, videoconferencing, translation, or assisted listening is brought into the courtroom, things get much more complicated.

The well designed courtroom audio system includes microphones, an audio processor, audio amplifiers, and an audio control system. If videoconferencing will be part of the technology installation, the audio system must also include an echo-cancellation system.

Microphones

The properly designed audio system begins with choosing the right microphones and location for the microphones in the courtroom. In choosing the proper microphone, you begin by examining location and purpose. If you are amplifying a single person, a cardioid-type microphone is preferred. If you are collecting the sounds of several people at different angles, as during a bench conference, an omni-directional microphone would be the microphone of choice.

Audio Processors

An audio processor collects the sound from several microphones or other audio sources, mixes or combines them, and then distributes the resulting sound to various output devices. The signal is then amplified, recorded, or otherwise utilized. An automatic microphone mixer that turns off microphones when no one is speaking near them reduces any stray ambient noise from the speaker system. An automatic microphone mixer will also provide non-gated signals to recording devices, insuring that no sounds are lost to an electronic record or hearing assistance system. This type of device also adjusts the system if more than one microphone is activated, or other acoustical issues develop, thereby reducing feedback. Audio processors also include digital feedback eliminators that are used to condition the audio to the specific acoustics of the room. Clarity is improved through compressors, limiters and other processing elements of the central audio processor.

Audio Amplifiers

Audio amplifiers create an electronic signal that produces sound through the courtroom speakers. They are often overlooked, but play an integral part in allowing all participants to hear the proceedings. When planning this part of the audio system, consult an audio/video consultant to specify the proper power and type of amplification device(s). Speakers need to be matched to an amplifier of proper power for each particular courtroom.

Audio Control Systems

Audio control systems should be carefully planned and every system should include:

- Microphone mutes - to silence the Judge and Attorney microphones;
- Side Bar controls - to activate the side bar microphone, mute all other microphones, and introduce white noise (a form of static to mask other sounds) into the speaker system to electronically mask the voices of the Judge and Attorneys so that their conversation cannot be heard;
- Volume controls - to adjust the volume on the main speaker system, witness microphone and any audio/video presentation equipment;
- Audio kill switches - to stop audio feed to the media and other such connections.

Echo-cancellation Systems

The integration of a videoconferencing system with the courtroom audio system requires an echo-cancellation system, which prevents the speaker from hearing his or her voice being picked up by the microphones and then played back through the speaker system, a condition that can make interactive conversations difficult. This device is often used for teleconferencing as well as acoustical treatment.

Assistive Listening Devices

Assistive listening devices are used to help individuals who have some degree of hearing loss to hear and thus fully participate in the trial. Assistive listening equipment can also benefit others in the courtroom, such as court reporters sitting at a distance from a witness, who, due to difficult courtroom acoustics, may have trouble understanding what is being said. However, assistive listening systems can only aid people who have at least partial hearing. For people who cannot hear at all but who are able to read, the use of real-time stenographic transcript is a better option; this topic is discussed further under the court record section. Use of such devices may be required under the Americans with Disabilities Act.

Foreign Language Interpretation

Trials increasingly involve people who cannot fully speak or understand English. Foreign language interpretation technology can also have an additional benefit: an interpreter present in the courtroom can provide a translation as the proceedings are happening by using the same system used for assistive listening. In fact, as these systems are available with multiple frequencies or channels, the same system can be used for different languages at the same time, as well as for allowing those with a hearing loss to participate in the proceedings.

Teleconferencing

A growing number of courts use teleconferencing to assist with routine court matters. The system can be as simple as a speakerphone or as complex as an integrated telephone unit on the sound re-enforcement system. Courts can hold docket call and hear motions by telephone. Telephone conferences can be done from either the courtroom or the judge's chambers. This provides a flexibility that traditional face-to-face conferences do not. Telephone conferencing also allows flexibility with scheduling since matters can be planned around access to a telephone rather than availability of the courtroom and all required parties.

The easiest way to create a teleconference is to place a speakerphone on the desk and have the judge and any physically present lawyers dial up the missing party or parties. However, most speakerphones are designed for small to average size rooms. In some cases, the speakerphone may be inadequate to pick up voices from elsewhere in the courtroom - if the participants remain at their usual locations. In the courtroom other participants

may not be able to hear the far end speaker. Installing an integrated teleconference device into the courtroom sound reinforcement system can cure both of these problems. This is accomplished by using a telephone interface that will function like a telephone but use the courtroom microphones and speakers in place of a handset. These interfaces also provide echo-cancellation, which will remove duplicated audio sounds and thus reduce echo and feedback. The installation of a telephone interface does require some degree of planning when the sound system is designed.

REMOTE APPEARANCE SYSTEMS

Remote appearance systems, or videoconferencing, enables individuals or groups of people in different locations to communicate through the use of audio and video equipment. Videoconferencing has been in existence for many years, but recent cost reductions mean that videoconferencing can provide a cost effective method of communication and interaction between people over long distances. This reduces or eliminates time delays and costs due to travel and scheduling.

Any videoconferencing system includes the same basic parts. Each has a camera, or multiple cameras, to collect the video images. Each uses a microphone system to collect the sounds. Each has monitors to display the video, and speakers to present the sounds from the other end of the conference. And all systems have processing equipment and transmission methods to take the audio and video, compress it, and then send it to the remote location where it is decompressed and presented.

Any videoconferencing system requires a method of signal transmission. If the distance is short, as within the building or a building next door, then the transmission method can be simple cable from one room to another. Recent advances in category-five technology allow for entire courthouse video networks to be developed with minimal signal loss. If the distance is longer or if more flexibility is desired, then the transmission methods require a more complex technology. Prior to any videoconferencing equipment purchase, the transmission method that will best serve the court must be identified and the system designed around it. This will affect the total system performance, initial cost, maintenance, flexibility and dependability. The basic types of videoconferencing systems are the desktop, the roll-a-bout and installed room systems.

Desktop Videoconferencing Systems

Desktop videoconferencing systems are cameras and microphones connected to a personal computer. The computer serves as the signal processing and compression/decompression equipment through hardware and software. These were designed for applications where the participants are sitting at a desk or a very small area. This type of system has a limited application in the courts. It can be utilized in a Judge's chambers or small conference room for videoconferencing, but is too small and limited for use in the courtroom.

Roll-about Systems

Roll-about systems were developed to allow the users to move the conferencing equipment from one location to another by "rolling down the hall". The system consists of a camera mounted on top of a monitor. These are either on a cart or built into a cart. Inside the cart is the CODEC that handles all audio and video processing and connects to the communication system. Speakers are also built into the cart. Microphones and control devices are connected to the cart but placed on the desk when is use. In the courts, these systems have been used to reduce cost and create flexibility by using a single roll-about to service several courtrooms. The downside of roll-abouts is the support and maintenance they require. Each time they are moved, court personnel must physically disconnect them, move the equipment and reconnect the transmission lines. Another issue with roll-a-bout technologies involves the way the system integrates with other technologies in the courtroom. Connection to other systems can be difficult and often awkward. If integration with multiple technologies is desired, roll-about videoconferencing systems may not always be the best solution.

Installed Systems

Although roll-about systems provide maximum flexibility, installed, or integrated, systems are usually far more useful in the courtroom context. The ordinary courtroom size and shape makes it difficult if not impossible to capture all speaker possibilities. While the initial cost may be higher, the overall dependability and lower maintenance will reduce the overall cost over the life of the system. Installed systems also provide better quality and performance since they can be engineered for the particular courtroom instead of being designed to make several accommodations for multiple rooms. Voice-activated camera systems may be installed which allow the camera to switch from speaker to speaker without human intervention. This eliminates human error and reduces cost by not requiring special control rooms by integrating the processing equipment into the main equipment rack.

The use of multiple cameras with a video switcher allows the remote viewer to see the entire courtroom, rather than just the head and shoulders of a single speaker. Different video switchers have different display capabilities. Some present just a single image of the speaker while other systems present multiple images all at the same time. Multiple image systems can present two, four, six, nine or more screens. Experience has indicated that configurations of more than four images can become confusing to some viewers. Obviously, with an installed system, the design and installation becomes critical for success.

EVIDENCE PRESENTATION SYSTEMS

Many people consider evidence presentation the most important courtroom technology use. Lawyers use evidence presentation technology to display their evidence and to augment their opening statements and closing arguments. Judges can use the same technology to display jury instructions. These systems provide a superior method of communication combined with efficiency.

Commenting on the use of technology in Cleveland, Ohio, David R. Cohen, Senior Law Clerk to Judge Kathleen McDonald O'Malley, observed:

> *"The new equipment is more than a shiny toy. The Federal Judicial Conference Committee on Automation and Technology has researched the utility of new courtroom technologies, from the perspective of both judges and jurors. The results were markedly favorable. For example, over 90% of the jurors indicated they were better able to see evidence and understand an attorney when counsel used video evidence presentation technology. This finding is in accord with statistics showing that, after three days, people remember 15% of what they heard, but 65% of what they saw and heard - in other words, video evidence presentation can increase juror retention of information by four times."*

Local studies reach the same general result: technology-based evidence presentation, which usually means visually, based information presentation, increases juror comprehension and retention. This technology can also benefit the general public's understanding. In April, 1998, a Federal District Judge reported to William & Mary Law School's Legal Technology Seminar that his presentation of evidence via a large video screen had resulted in highly accurate newspaper reporting of a recent trial. Upon inquiry, the reporter had explained that with the new means of evidence display she could for the first time fully grasp the trial proceedings. The assumption is made that with the use of evidence display, other parties involved in judicial proceeds similarly benefited.

In terms of efficiency there appears to be near unanimous agreement that presentation technology substantially increases the speed at which trial takes place. One pole of judges stated that presentation systems helped them manage trials more efficiently. Consistent anecdotal reports show time savings of from one hour per day to cutting the trial time almost in half.

Courtroom evidence presentation systems consist of two parts: the sources of the evidence or information and the technology by which the evidence is displayed or heard. For example, if a prosecutor wants to play a wiretap recording, the cassette player is the source, and the courtroom audio system speakers are the display means.

Sources of Evidence Presentation

Presentation systems use three types of evidence presentation sources: video, computer, and audio.

Video sources

The document camera represents the simplest and way of presenting material. A document camera consists of a vertically mounted TV camera aimed down at a flat surface. The lawyer puts a photo, document, or object on the surface, and the camera instantly displays the image on the projector or monitor(s) to which it is attached. Some cameras can change between negatives and positives, which assist in the display of x-rays, and others can use microscope capabilities to display slides. The document camera excels at the display of photographs and small blocks of text. Although most cameras are capable of displaying a page of 8 1/ 2 x 11-inch paper, they usually cannot do so with enough resolution to allow the entire page of text to be read. Documents cameras thus are usually zoomed in to a specific portion of the text.

For years lawyers have used VCRs in court to present videotaped depositions, computer animations, day-in-the-life films, and the like. VCRs are inexpensive, reliable, and simple to operate. Nearly all VCRs in the United States use the VHS format, although 8mm players are also available. S Video, a more sophisticated type of video signal, offers higher resolution than ordinary video machines.

Whiteboards were traditionally wall-mounted white rectangular boards on which people can write, usually with colored markers. Whiteboards can be mounted on walls or placed on easels, allowing the judge or jury reads what is written on the board. Enhanced whiteboards send what is written on the board to computer monitors, where the writing appears the same as on the whiteboard, including identical colors. The writing on the board can be saved as an image on the attached computer and can be printed on a connected printer. One of the great advantages of the enhanced whiteboard is that once an image is saved to the computer, it can be restored to the room monitors immediately, even if it was erased in whole or part from the whiteboard itself. Whiteboards can be especially effective for witness drawings or counsel's opening statement and closing argument.

Computer sources

Although many courtrooms rely heavily on videotaped material, an increasing number of lawyers are using computers to show evidence and to help present their openings and closings. Not only are computers the best choice when the lawyers must show many images of documents, but computers are now as easy to use as sources of video material as a VCR, without the risk of damaging the tape. Notebook Computers offer the best display sources for most courtroom purposes. They permit counsel to use software-produced slide shows for opening statements and closing arguments, and to present documents, photographs, graphs, and animations. Lawyers can use a large variety of commercial software for most functions. Microsoft PowerPoint and Corel Presentations offer slide show creation programs. Other specialty software is available for presentation of images at trial. Some software allows images to be catalogued and printed on bar-coded paper sheets, often with thumbnail images for easy identification, which can be read instantly by a bar-code reader. There have been some compatibility issues in the past with certain notebook computers and the evidence display system. It is recommended that attorneys be given the chance to test the compatibility of their notebook computer with the evidence display system before a trial.

Audio sources

Audio evidence is often overlooked but is vital in many trials. The sounds from a wiretap or a black-box need to be heard clearly. Much video evidence may also be accompanied by an audio track, whether initially part of a VCR played videotape or a computer played CD-Rom or DVD. Accordingly, there needs to be connections at the podium for audio and, where used regularly, a cassette player mounted with the other evidence presentation sources. The audio then must be connected to the main courtroom audio system. None of this is complex, but does require planning in both the areas of audio controls and system interfacing.

Source Location

A critical factor in design of evidence presentation systems is where to put the display devices. There seem to be three schools of thought on his subject. One approach is to use a non-movable central podium with display

devices mounted in it. The second approach places devices on a cart, which can be moved from courtroom to courtroom and placed next to a stationary lectern. There is a third variation of this debate, which places a fixed display device island in the courtroom.

The central podium concept uses a custom-designed podium with the document camera mounted on a wing and the monitor mounted into the main work surface on the top of the podium. Other devices such as the video players, annotation devices, and audio players are mounted in the podium. The concept is to provide the attorney with all the equipment they will need to present their case. The obvious advantage to the podium is that the devices can be controlled with little movement and are always readily at hand. Additional advantages are that the methodology requires all parts of the system to be permanently available to all in the courtroom and can be used at a moment's notice. Maintenance is also greatly reduced since devices are not being moved or connected and disconnected which increases wear and decreases their useful life. The disadvantage of this concept is that it is stationary and cannot be moved throughout the courthouse.

The cart concept places all of the same display devices in a cart on wheels, which can be moved from courtroom to courtroom. The advantage of the cart concept is the initial lower cost and flexibility. Instead of having one system for each courtroom, the same cart can service several courtrooms. Disadvantages result from this flexibility, however. The constant movement and connecting/disconnecting of the system will cause wear on connection points and cables. Devices will also receive vibrations during movement that will equate to more maintenance. The courtroom system designs will require special considerations since the cart will require either the monitors be moved from room to room along with the cart, causing considerable set-up time, or monitors installed in each courtroom, increasing the initial cost.

The display device island is really a cross between the podium and the cart. The document camera and other devices commonly found in a podium or on a cart are housed in a piece of millwork that is permanently placed next to the lectern or in another location. The island is typically at a lower height than the podium. The presenter moves from the lectern to the island whenever they need to display physical evidence or use any of the equipment in the island. Proponents of this design believe this allows for a smaller unit that improves the look of the courtroom as opposed to a podium or equipment cart. Opponents point out that while the single unit is lower, it is also wider and when the combined size of both the lectern and the island is considered, the total size is significantly larger. Either way, the combination of a lectern and an equipment island does require more movement on the part of the presenter and does require more floor space in the well of the courtroom.

Courtroom Display Options

Courtroom evidence presentation requires that the lawyer's information be displayed to judge and jury on televisions or computer monitors. The debate over which method of display is most effective often centers on the people involved. Some prefer a single large screen that focuses all participants on a central location. Others prefer smaller monitors dispersed throughout the room that decentralizes the presentation but makes viewing easier for a larger number of people. While most monitor choices are based on preferences, the critical determining features when selecting display devices are really the room design, area layout, lighting, and the type of evidence commonly displayed.

Televisions used in the courtroom, are the same form of electronic device found in most homes today. The low cost of televisions make them popular for reviewing videotapes. The disadvantage of a television is the low resolution. These devices do not provide sufficient resolution for people to read documents clearly and since the display characteristics were optimized for moving images, still text and graphics may exhibit a bit of jitter when they are displayed on a television set. A scan converter is necessary if a television set is used to display the output from a computer. Unless there is only a desire to display video from document cameras, video players and videoconferencing, this type of display is too limited for most courtroom use.

Monitors are similar to television sets but provide much higher resolution making them a better choice for courtroom display systems. The size and type of monitors vary making the types of monitors to be installed different throughout the courtroom. Monitor choice may be based on purpose and room design rather than limited or directed by physical space. For example, for 27" televisions, the mounting choice is either a portable cart or a

yoke to hang the monitor from the wall or ceiling. With LCD monitors, a 15” flat screen can be fitted into most millwork. The flexibility of using different size monitors and their significantly higher resolution make the use of monitors the standard for courtroom display.

There are basically three types of monitors, CRT (Cathode-Ray Tube)**,** LCD (Liquid-Crystal Display) and Plasma. Most courtroom technology systems today provide the judge, witness, and lawyers with individual computer monitors on which to see evidence. Flat screen LCD monitors are increasingly popular due to their small size but large viewing area, making them ideal when desk space is critical. Flat screen monitors can also be mounted on arms or posts in jury boxes. Normally, jury use requires one 14"-15" monitor for each two jurors.

Plasma monitors can be extremely useful. Because of their shallow depth, sometimes four or five inches thick, they can be hung on walls or placed on wheeled stands. This can often allow a remote witness to appear life-size on the wall behind a witness box. Experimental results have shown that when using a 40" monitor in this way jurors perceive a remote witness exactly the same as they do an in-court witness; verdict results are identical.

In many courtrooms, evidence is displayed to the jury on an eight-foot diagonal or larger projection screen with ceiling-installed projector. This is the preferred display method of many attorneys and is considered by many to be the easiest method of evidence display for an inexperienced (with technology) attorney to begin working with. The projector is mounted on a wall or the ceiling, depending upon the courtroom design. The screen is hung in a location chosen for best viewing from large areas of the court. These systems are very dependable and can be used for most presentation systems in a large number of courtroom designs. The screens vary in size, with a usual minimum of six feet, but an eight to ten foot screen is most commonly used in courtrooms.

From the court’s point of view, the relatively low cost of a front projection system is also an advantage because they may cost less than several small monitors that must be installed and equipped with distribution amplifiers. A major disadvantage of front projection systems is that not many courtrooms can accept such a system because of physical constraints. If there are high ceilings, there might not be an acceptable location to mount the projector or the screen. Large windows and bright lights may also make a front projection system impossible since the amount of required strength may force the price above acceptable limits or require dimming the lights for use. Another disadvantage can be the overall impression given by the big screen. A remote witness who appears ten feet tall will be overpowering to some jurors and can create a sense of unfairness to other jurors. This mixed response has been indicated in several tests and it has been found that a life-size image is best for remote testimony.

Annotation Devices

Annotation devices allow a person to mark an image being displayed through video evidence presentation. Common in courtrooms is a “John Madden” style light pen. A witness takes the pen and draws directly on a CRT monitor. The annotation pen is connected to an overlay device that shows the drawing on all of the monitors. Another type of equipment available with the same function is a writing tablet. The tablet works in a similar fashion, but the annotations are made on a tablet with a pen and then displayed on a monitor, not directly on the monitor. Usually, most people find the light pen easier to use than the tablet because the tablet requires the user to draw in one location while looking at another. A touch screen can also be used to create the same effect. A touch screen is a monitor that has special hardware and software associated with it that allows it to react to an object moved across its surface. This allows a witness to use a drawing device such as a stylus or even their finger. Touch screens can be made using a standard CRT type computer monitor, but most are made as a flat panel LCD monitor. Currently, the flat panel LCD touch screen monitors have replaced the light pens and tablets as the preferred annotation method in courtroom display systems.

Video Printers

High technology evidence presentation creates electronic images that are not permanent unless an effort is made to store the image. Whenever another image is displayed or the equipment is turned off the evidence is gone, including any annotations. Video printers are devices designed to create a picture of the video being displayed on the monitors. This is not only important for preserving for the appellate record, and perhaps jury deliberations,

the evidence actually shown, it is critical for the preservation of the annotated material. The printer may be mounted at the podium, equipment cart or at the court reporter's desk, based on the desire of the court.

COURT RECORD

Normally the term court record refers to the transcript of the court hearing together with related court papers and evidence. During trial, the court uses the record to resolve disagreements as to what a person said, to prepare jury instructions, and in a bench trial as an aid to the judge. After trial, the record is used by counsel to decide whether to appeal, and if so, then by the appellate court.

The method of making the record can vary from courtroom to courtroom. Usually the factors that decide which form, or combination of forms, also vary depending on the particular court. Each court record technology presents unique strengths and weaknesses. When considering the different technologies the court should keep in mind that there is a difference between capturing the record, recording what was said at court, and transcribing the record, by producing a text version. Depending upon individual needs, the court may use reporter-based reporting, electronic recording, or both.

The most common form of court reporting today is stenographic reporting. This method employs highly skilled professional stenographic reporters who type on a specially designed steno-machine, which uses a specific form of short-hand to record the events on both a paper strip and a computer disk. Media, the paper or the disk, can be used to create the written transcript of the trial at a later time.

In computer-assisted transcription (CAT), the court reporter uses a small-computerized steno-machine. The reporter has a personalized library of words stored by the computerized steno-machine that he produces by pressing down the machine's keys. Each reporter's library is different, and the reporter's library grows with his or her experience. If the personalized library doesn't recognize the word the reporter typed, it produces a stenotype symbol for later translation. In CAT, much of the reporter's work is done when the reporter takes down the record at trial. Later the reporter merely has to call the record up on a computer and edit it.

Reporters can do more than just produce a transcript after the trial. They can also use a computer to produce an immediate rough draft of the transcript. If the reporter's computer is connected to other computers, those other computers can immediately access an unofficial, or "dirty," copy of the material that later forms the transcript. This is known as real-time transcription, or simply, real-time. Real-time reporters can send their transcript feed to the judge, to the lawyers, or to both. Each can make private notes on his or her personal copy of the transcript as the text scrolls by. This can greatly assist the judge in preparing trial notes and reviewing the recent testimony in order to rule on an objection. The attorneys benefit in several ways. First, they can mark important statements in preparation for later examination or argument. Secondly, the copy can be transmitted by modem to the attorney's office where it can be reviewed by co-counsel and used for research and additional preparation. Real-time has a further advantage in that the text can also be used for assisting a hearing-impaired participant in the trial. Depending upon the equipment used, as it is written real-time can be displayed full screen or as large captioning at the bottom of the monitor. Work with deaf trial participants has shown that both counsel and jurors can use the technology successfully.

The early 1940s marked the dawn of mask court reporting (or Voice Reporters, as they prefer to be identified). The reporter speaks into a mask that contains a microphone. The mask allows the reporter to repeat the proceedings into the microphone without interfering with court proceedings or picking up room noise. A tape recorder connected to the mask records the reporter's voice, which he or she can later transcribe into a printed version. A second microphone (or a connection to the main audio system) is used to create a back-up record to verify the dictation, thus insuring a very accurate record.

Voice recognition technology is now entering the courts. Mask reporters can use these systems by adding a computer with voice recognition capability into their system. The computer can produce a real-time, unofficial

transcript similar to a stenotype reporter's real-time transcript. All of the features of stenographic real-time are available with this form also.

Many courtrooms contain electronic recording systems. These open-mike systems collect everything that is said in the courtroom and record it in various ways. Traditionally electronic recording systems have been divided into audio and video systems.

The most basic electronic recording system is an analog recording system. This device records the verbal events of the trial on an audiotape, usually in the form of cassettes. The audio is divided into channels to allow replay of audio while isolating specific audio tracks. The standard configuration is four tracks with the judge on one, witness on two, defense on three and the plaintiff/prosecution on four. The multiple channels permit the listener to clearly hear several parties speaking at the same time. When transcripts are necessary, the court sends the cassettes to transcribers who listen to the tape and type a text version.

More recent technology involves digital audio. Digital audio systems record information on digital tape, CD-ROMs, computer, or a combination of these media. The recordings are usually played back on a computer rather than a tape player, and often are stored on computer hard disks and then later on CD-ROMs or digital tape. Because digital record systems use computer data, the recorded information can be sent through telephone or high-quality data lines to remote transcribers. This is a great advantage in that the annotations used to create the log can be used to instantly scan for important sections.

Audio/Video recording systems are used in many state courtrooms throughout the United States. The systems use multiple cameras and microphones to record all verbal and non-verbal activities in the courtroom. The video court record is probably the best form of electronic technology for making a record. All actions as well as words can be captured for future playback. Current systems use VCRs for recording but digital systems are now beginning to enter the market. The same multiple camera systems used in video record systems can be useful in remote witness/lawyer appearances, where they can be used to show the whole courtroom to a remote person. This can be important when the Sixth Amendment right to confrontation is involved.

COURTROOM DATA SYSTEMS

Computer-Assisted Legal Research (CALR) services provide access to a wide range of information, including traditional legal research, newspapers and journals, and public records information. Law firms are making increasing use of in-house litigation support systems whereby case-relevant materials are made accessible from computer databases. To make these and litigation support systems accessible to counsel while in the courtroom, in-court telecommunications connections are required. Because the courts do not provide counsel access to courthouse data networks for security reasons, typically, telephone lines at the counsel tables connect counsel to the outside data world. CALR is most ordinarily provided by LEXIS or WESTLAW and can be accessed via direct telephone modem connection or, increasingly, through the Internet.

Electronic filing is a rapidly growing service. In lawsuits where all parties agree to use electronic filing, the attorneys can use the Internet to electronically file documents with the court and serve them to opposing counsel. Not only can the attorneys view the official docket for their case via computer, but also by clicking on a docket entry the attorney can view and download the underlying document and exhibits. Courts will need to provide user manuals, protocols, local rules and possibly a help desk to support the move to electronic filing.

INFRASTRUCTURE

The courtroom infrastructure is not just a method of connecting devices; it is the technology that the courtroom uses to make it possible to use other types of technology. Infrastructure includes wire, conduit, raised floors, plugs, plates and control systems. All need to work together if the courtroom systems are to function as one simple to operate system. Any cabling infrastructure to provide connections between courtrooms and the rack locations should be designed to accommodate future growth and easy access.

There are number issues that have to be considered when planning the location of the racks used to house the electronic equipment for the courtroom systems. The location of the equipment racks is critical to the serviceability of the entire courtroom technology system. Normally the racks are placed in a room adjacent to the courtroom. In the past, the racks have been paced at the Judge's or Clerk's bench and created a situation that was uncomfortable for the judge or clerk and made maintenance extremely difficult. Placing the rack in a separate room of sufficient size will eliminate these problems. The room should also be designed to provide adequate ventilation, which is vital for electronic equipment performance. One issue that has risen with past installation was that the building's heating/ventilation/air conditioning system was turned off during the weekend. If the equipment in the rack is left turned on, temperatures may rise sufficiently in the room to cause damage to the equipment, or significantly shorten its life.

The size of the equipment racks should be as large as possible. A standard EIA 40 to 44 unit rack will accommodate most equipment with significant room for growth. If possible, room for additional racks should be planned for even more growth.

The electrical requirements for the equipment racks are not complicated but do require planning. The entire courtroom electronic systems, such as audio and evidence presentation, including the equipment rack, should all be on the same phase of the electrical circuit. This is required to avoid producing a hum in the audio system and other interference problems. It would be ideal to have a switch at the Clerk bench to turn the system on and off.