
SECTION THREE: SELECTING A DIGITAL VIDEO CLIENT/SERVER SYSTEM

Digital audio and video exist today in a state of paradox: demand for digital files in audiovisual formats is great; mature standards supporting digital video and audio on optical media (CD, CD-ROM and DVD) and broadcast systems (satellite, TV, HDTV) are widely available. Systems to support digital video over IP, however, while offering exciting functionalities and tremendous potential, are still emerging rather than proven, particularly in critical areas of interoperability and adherence to open standards. It is possible to select the right system for your needs, among many good, fairly solid offerings, but more care must be taken than in the selection of client/server systems to support electronic text. In early 1999, selecting the right digital video client/server system to grow with your developing needs is still a risky venture, requiring careful planning and needs assessment.

Hardware and software must be selected for two separate but convergent processes to support digital video: encoding (file creation) and service (file storage, transmission and display). Generally, these two processes are completely separate purchases, yet they must seamlessly interoperate. A major problem with digital video, even in 1999, six years after the adoption of the MPEG1 standard, is the fact that most digital servers remain sensitive to the digital encoder card used to create MPEG1 and MPEG2 files, as well as to the decoder cards used to read MPEG files, particularly MPEG2 files. The situation improves each year but remains a frustrating and expensive problem to solve, depending on the systems selected. Lack of interoperability can involve custom API programming, particularly at the client end, serious performance issues at the client, and, in some cases, re-encoding of the video assets.

How can this problem be addressed? If at all possible, the encoding system and the client/server system should be selected in tandem or at least with due consideration to the interoperability of both processes. Don't encode too many files before knowing that the encoding system selected can be supported by the chosen client/server system. Otherwise you may be limiting your options to a client/server system based on the encoding system rather than on user need. It is tempting to say that the more expensive system should be chosen first. But which system is more expensive? In actual dollars, a client/server system will generally range from \$15,000 to \$100,000 while the encoding system ranges from \$300 to \$10,000. However, video encoding is a time-consuming, labor-intensive process. The cost in staff hours is much greater for encoding than for client/server set-up and support. Also, like all magnetic media, videos have a fairly short shelf-life, which decreases, with each use. Rare, irreplaceable videos should be encoded only once, and then digital use copies should be struck from the digital master.

It is best to give precedence in selection to the client/server system. The client/server system provides the functionality to support current user needs and to respond to changing need. Therefore it has the greatest impact on user satisfaction. Any encoder system supporting MPEG standards at an acceptable level (composite bit stream for MPEG-1, main level for MPEG-2) is going to produce acceptable files for the user, provided the operator creating the files is competent and well-trained. The human eye cannot distinguish small differences in quality among MPEG files. Problems with the client/server system, such as denial of service, jitter and poor audio/video synchronization resulting from streaming problems, incompatible files, client interoperability issues, or network overload will be very noticeable to the human senses.

When selecting a client/server system, load a copy of the client on a range of local computers and test MPEG1 files created from different encoding systems. These files may be created in-house, "borrowed" from other institutions, or found on the web. For example, the Library of Congress now offers MPEG videos for view. (add URL). Test different frame resolutions, bandwidth encoding speeds and, preferably, 30 frames/second. Test files with audio (talking heads, music) and video, high action, etc. Compare playback quality among vendor clients and also compare playback quality against inexpensive or shareware players, such as Window Media Player, VMPEG-1.7 from the MPEG Software Simulation Group, or Xing MPEGPlayer.

It is possible, and sometimes unavoidable, to select the encoding system first. Most client/server vendors test encoder cards for interoperability and either publish acceptable encoder systems on their web pages or provide that information to prospective buyers on request. A fairly safe strategy is to purchase an encoding system supported by the largest number of client/server vendors. If you have purchased an encoding system that is not widely supported by client/server vendors, your options are to purchase from the vendor--or provide in-house--the custom API programming needed to create hooks to your files or to select a vendor with very open file support, providing streaming and client playback independent of the encoder card and encoding software used. Always test a system with your encoded files before purchase, however, regardless of vendor claims.

Decoding at the client end is another significant issue, particularly for MPEG-2 service. Many vendors support hardware decoding only and may be very limited in the different cards they support. Again, client/server vendors publish tested decoder cards or should provide this information on request. It is important to know your client population before selecting both the encoding and the client/server system. Do you already have a widely-deployed decoder system that you do not want to replace? Are you supporting a controlled user base, such as a computer lab, or a large heterogeneous user population with varying and unknown operating systems, processing speeds and RAM? Are you supporting a wide range of bandwidths, such as different LAN topologies and dial-up traffic? What percentage of your user population uses Windows, MacOS or UNIX desktops? Which UNIX desktop operating systems must be supported—Linux or a vendor-proprietary OS, such as Solaris, AIX, or IRIX?

The installed user base is a critical criterion for selecting both the encoding system and the client/server system. You can purchase a system only for a managed computer lab but you risk serious user dissatisfaction. Most users won't settle for anything less than full access at their desktops. --And the system will be blamed for performance failures, not the inadequate desktop. If you are serving (and most of us are!) a heterogeneous, somewhat unknown user population, it is best to select flexible systems--encoding systems supporting a range of bandwidths and standards and client/server systems supporting a range of bandwidths, encoding systems, client operating systems, and network protocols. A flexible system will also offer a choice clients--system-proprietary and Web-plug-ins or helper applications.

There are several components of a system or vendor selection process:

Market Survey

The first step in vendor selection is a survey of the market, looking at existing technology, new standards and emerging technologies, customer deployment of current technology, customer satisfaction surveys, the experiences of your colleagues, and, of course, the web pages of all the digital video client/server vendors identified in the market survey. Even in cases where a vendor has already been pre-selected, such as in a statewide digital video initiative, knowing the available technology and offerings of competing vendors is invaluable for working with the pre-selected vendor. In your market survey, concentrate on articles and web sites that survey the market, evaluate existing vendors and technologies and predict future enhancements for digital video technology. Sign up for electronic discussion lists that include users of digital video technology. Ask questions about different vendors and their offerings. Experienced colleagues are probably the best source for information, since they can respond to real-world implementation and management concerns. Sources for information include the following:

- *Colleagues:* Contact any colleagues that have purchased digital video client/server systems. Ask for copies of any of purchase information that your colleague is able to share, such as RFI (Request for Information); RFP (Request for Proposals); purchase order outlining specifications and service requirements; and contract. For government agencies, after bids are awarded, this is generally freely available or, at worst, available through the Freedom of Information Act. Ask for your colleague's experiences with the selection process. Which vendors were eliminated, and why? Ask for experiences with installation and deployment. What level of assistance was provided with set-up and initial troubleshooting? Did the product perform as described? What ongoing issues and concerns are your colleagues experiencing?
- *Vendor References:* Vendors will provide you with references from their clientele. Be sure to check all references from institutions of a similar size and purpose. Verify titles and responsibilities for reference contacts. Is the contact a high-level administrator without sufficient hands-on experience or technical expertise? If so, consider the reference contact a starting point for locating the appropriate person to answer your questions.

- *Websites*: General video information, such as this Website, and also vendor-specific Websites. Look at vendor press releases, generally posted at vendor web sites, for the past year to six months, to get a feel for development patterns in digital video, as well as for each vendor.
- *Discussion Lists*: Subscribe to any electronic discussion lists where digital video users discuss their experiences. Some vendors may host discussion lists for their customers.
- *Conferences*: At conference booths, talk not just to vendors but to other users spending significant time at the booths. Discover their level of expertise and deployment plans and be sure to exchange cards. Current customers often take advantage of conference booths to discuss issues and concerns with vendors. This is a great way to develop a reference list independent of the list supplied by the vendor.
- *Journal Articles*: Articles that survey functionality and customer satisfaction are critical, but don't neglect predictive articles looking at future enhancements. A clear migration path for future technologies is critical for more expensive purchases.

Purchasing Instrument

After a market survey to familiarize yourself with the state-of-the-art for digital video, it is necessary to select the functionalities that are both critical and desirable for your project and to codify those functionalities into a purchasing document, whether an RFI, RFP or a purchase order. If possible, design an instrument that can be sent to a number of vendors.

Be sure that the bid section will result in competitive pricing that can be compared uniformly across vendors. A good practice is to provide a bid sheet with individual line items for each meaningful system component. Meaningful system components vary by project and are best determined by the individual institution, after an extensive market survey. These line items can include the entire system (hardware & software); individual line items for component pieces (streaming server, multicast server, etc.); and line items for services, such as installation, training, and ongoing maintenance. It is critical to request information about warranty and maintenance costs. One often-overlooked pricing differential is warranty period, with some vendors offering three months and others a year or longer. The author has required multi-year bids on ongoing maintenance costs for large-scale purchases, to insure that her organization is able to financially maintain a selected system over time and to insure that vendors do not offset low purchase costs with high maintenance pricing.

For RFPs, although a purchase is implied, be sure to include language that states that the organization you represent is not required to issue a purchase order in response to bids received.

Distribute your purchasing instrument to the widest possible vendor pool. You will probably work closely with your institution's Purchasing Department but do not rely solely on their list of identified vendors. Supplement that list with the vendors you discovered in your market survey.

Your purchasing instrument should require the names and contact information of all customers similar in size and mission to your institution. Do not ask for selected customers, but the complete list of customers meeting your description. A critical component of the selection process is the checking of references. Be sure to ask standard questions of each reference, for comparison purposes, as well as open-ended questions about their experiences. Many vendors may not provide a complete list, even though it is requested. If necessary, ask the contacts provided what institutions or companies they contacted for references, and expand your reference pool in this manner.

Contractual Issues

Depending on your institution and the size and nature of your purchase, no contract may be required, or there may be a purchase contract and a maintenance contract. For expensive projects, where expense includes not just the purchase itself but the staffing and training required for deployment, a purchase contract is a good idea. A purchase contract can provide the following benefits:

Financial and risk protection.

If the contract includes innovations not yet available, the purchase contract can outline staggered payments for scheduled deliverables. The contract can also define financial performance incentives for functionalities that are very new or that do not perform as specified, particularly if you select a vendor for very good reasons in spite of concerns expressed in reference checks about the performance of certain functionalities or problems with ongoing troubleshooting and support. Most vendors have an honest desire to serve customers well, but they are frequently understaffed and focused more on generating new business than on support for existing customers. Financial incentives (also known as financial penalties, when the vendor steps out of the room!) are an effective way to insure service and minimize risk, particularly for very new technologies. Vendors are more likely to agree to financial incentives for performance for large, expensive projects and for projects that will be heavily promoted by the purchasing institution.

For government entities, which of course includes state universities, financial penalties can be tricky but not impossible. Steep reductions in ongoing maintenance costs, free extension of the warranty period, payment in free enhancements, free additional streams, etc. can usually be worked out with your contracts department as well as with the vendor. The goal is to avoid enriching the coffers of your institution's "general fund," which might go toward the purchase of uniforms for the football team, and instead to impose performance penalties that directly compensate your digital video implementation.

Financial protection can and should include price caps for ongoing maintenance and should, if at all possible, lock in prices for enhancements that are part of the purchasing instrument response, and thus the contract, but not yet available for purchase.

Upgrades and Enhancements

A contract is a good place to negotiate for functionalities requested in the purchasing instrument which the vendor is willing to develop but unable to currently supply. Before purchasing a digital video client/server system, be sure to identify, possibly through a non-disclosure agreement, any anticipated enhancements scheduled for release in the next six to fourteen months. If you include any planned enhancements in the purchase contract, be sure to minimize the risk to you contractually. Many vendors offer ongoing maintenance plans that include software-based enhancements. Knowing the vendor's development plans will help you determine the value of a combined maintenance/upgrade plan.

Be careful in a contract to negotiate only for enhancements to current functionalities that would benefit a range of users, such as a MacOS client, for example, and not replacement functionality that would result in the purchase of a non-standard current product. You do not want to risk ongoing problems with new releases and upgrades that will not interoperate with your nonstandard product. If current functionality requires re-working to customize service for your institution, you are probably buying the wrong product. Obviously, very large institutions, such as government entities and consortia, will have better success negotiating functionality upgrades for existing products. If a vendor meets your needs in most areas but lacks one or more key requirements, consider developing a consortial purchase arrangement with other institutions with similar needs.

If you identify a significant enhancement to service that you contract with the vendor to develop, be sure to use the purchase contract or another contract instrument to spell out the specifications and the financial incentives for completion. If your institution's involvement in designing and testing the enhancement will be significant, consider a joint marketing venture, or at least a substantial innovator's discount for the purchase and ongoing maintenance of the enhancement. Make sure all joint venture or pricing arrangements are clearly established in the contract.