Momentum Builds for Digital HDTV Standard

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Led by the establishment of the Digital HDTV Grand Alliance and the continued strong oversight by the Federal Communications Commission's (FCC's) Advisory Committee on Advanced Television Services, the United States is about to enter the exciting era of digital high-definition television. The Grand Alliance is building the system prototype and preparing it for testing by the Advisory Committee. The standard should be set in 1995, and HDTV service is likely to start as early as late 1996, dovetailing with the first availability of HDTV receivers.

The Digital HDTV Grand Alliance. On May 24, 1993, the three groups that had developed world-leading digital high-definition television (HDTV) systems agreed to produce a single, best-of-the-best system to propose as the standard for the next generation of TV technology. The three groups – AT&T and Zenith Electronics Corporation, General Instrument Corporation and the Massachusetts Institute of Technology, and a consortium of Philips Consumer Electronics, Thomson Consumer Electronics and the David Sarnoff Research Center – are now all working together as the Digital HDTV Grand Alliance. An exciting new model for industry-government cooperation, the Grand Alliance has created a collaborative effort with a pool of technical talent and financial resources that should assure that digital HDTV is deployed first in North America. While previously, the process of formulating a standard had concentrated on selecting the best system from among those proposed, under the Grand Alliance, the best features of all the systems have been combined to produce a system superior to that of any one of the individual proponents. This system adequately meets the needs of all key constituencies–consumers; broadcasters; cable operators; and the computer, consumer electronics and telecommunications industries. For example, the system incorporates progressive scan transmission capability and square pixel capability, two attributes required for interoperability with computers and telecommunication. Likewise, concerns of broadcasters have been addressed by including interlaced scan transmission in the initial deployment. Because of the Grand Alliance system's interoperability between entertainment television and computer and telecommunication technologies, the HDTV standard is expected to be the key enabler to evolving the National Information Infrastructure (NII). Digital HDTV can be an engine that helps drive deployment of the NII by advancing the development of receivers with high resolution displays and creating a high-data-rate path to the home for a multitude of entertainment, educational and information services.

The Standard-setting Process. The HDTV standard-setting process has been and will continue to be a public, open process. The Grand Alliance has been working closely with the FCC's Advisory Committee to complete the standard and launch HDTV. Here is an update on that process:

- The Advisory Committee assigned its Technical Subgroup to evaluate the Grand Alliance proposal in detail. The Technical Subgroup approved most of the key system elements - video compression, transport, scanning formats and the audio subsystem - in October 1993. The final element, the modulation subsystem, was approved in February 1994.
- Extensive field tests of the digital modulation subsystem were successfully completed during the spring and summer of 1994 in Charlotte, North Carolina. The tests measured the digital data signal received at a large number of sites to evaluate RF propagation effects, including multipath, of digitally modulated 8-VSB signal. In addition, to demonstrate interoperability with cable, the 16-VSB signal was tested extensively in several cable systems.
- The other key elements of the system are being completed and integrated. The Grand Alliance plans to install the full system at the Advanced Television Test Center (ATTC) in late 1994. Then, the Advisory Committee will conduct extensive laboratory tests there (with ATTC and CableLabs) and at the Advanced Television Evaluation Laboratory in Ottawa, Canada, to verify that the system meets its expectations.
- Following completion of the laboratory tests in 1995, the Advisory Committee could then recommend the system to the FCC and simultaneously begin final field test verification of the system's performance.
- The Advanced Television System Committee (ATSC), at the request of the FCC, is leading and conducting the efforts of several industry groups to document the specifications of the Grand Alliance system. This will facilitate the FCC's standard-setting process.
- The FCC, in turn, would consider the committees' recommendations in a rulemaking proceeding which should be concluded in 1995.

Key Technical Components of the Grand Alliance HDTV System. The technologies that will be at the heart of the digital high-definition television system being proposed to the FCC reflect the Digital HDTV Grand Alliance's commitment to system excellence and responsiveness to the needs and concerns of consumers, broadcasters, cable operators, computer interests and the telecommunications industry. They are:

- Digital video compression technology will be based on a proposed international standard, MPEG2 (Moving Picture Experts Group) parameters, including the use of "B-frames." (B-frame or Bi-directional Frame motion compensation is a compression technique that improves picture quality.)

tion Superhighway. Increasingly, value-added will come from addressing the technical challenge in providing competitive advantage in the all-important area of user interface.

User interface requirements change as a function of scale. As an example, consider television user interface requirements as a function of the number of available channels. In the early days of TV, the number of channels was limited. As a result, users were easily aware of the available programming. With few choices, frequent channel changes were not an issue. Hence, the marginal value of a user interface device like a remote control was limited. However, as the number of channels increased by an order of magnitude to the 30 to 60 channels typical of cable systems in the USA today, the user interface requirements changed. With a larger number of choices, the probability of frequent channel changes became an issue and the remote control became a necessity. New user interface services such as "StarSight," which provide on-screen menus of available programs, have emerged to address the need.

With digitalization of the cable infrastructure and prospects for yet another order of magnitude increase to 500 channels, even the simple task of scanning the available programs could easily take 10 minutes or more. Clearly, such an increase in scale will make necessary another form of user interface. Next imagine the user interface complexity when the cable infrastructure with 500 or more channels is just one of the "lanes" on the Information Superhighway along side wired, wireless, and broadcast infrastructures. The technical challenges are enormous, but so are the opportunities. Technical solutions on the drawing board include real-time interactive computer synthesized video images of "talking heads" to guide the user through the myriad choices. As a consequence of this scale, the boundary of traditional consumer electronics, computers, and communications will no longer be distinguished by hardware. The interface, not the hardware, will be the reality of the product.

IV. IMPLICATIONS FOR THE CONSUMER

Assuming the formidable obstacles to realizing the vision of the Information Superhighway can be overcome, what incentives and conditions will exist to attract the mass market? To address this question, a quick review of the drivers for the consumer market is in order.

A. Classic Drivers for the Consumer Market

The needs for convenience, safety and security, and leisure are drivers for the consumer market. Success in this market requires providing products and services that meet the "perceived value" and "expectation of performance" requirements in line with the consumers' needs. However, previous product successes lead to new performance expectations and needs by the consumer in a constantly upward spiral. For example, the success of the telephone led to a new set of needs that would have not existed without the telephone. The need for portability led to the cordless phone while the need to receive calls when not at home led to the answering machine.

B. Consumer Needs and the Information Superhighway

What existing or latent consumer need does the Information Superhighway serve? For one, information overload is already here and is not likely to improve. The tremendous number of products available and the increasing complexity within categories is enough to overwhelm even a savvy consumer. Whether buying a new car or new television, consumers have increasing difficulty making an informed choice. Thus, helping consumers manage information as a means of satisfying their need for convenience merits investigation. On the leisure front, integration of entertainment, communication, and data networks on a global scale will enable new services that are not practical or even conceivable today. For example, a global Information Superhighway will eliminate the requirement of geographical proximity. Thus, one could imagine a service that provides the capability to listen to a particular radio station anywhere in the world by having the source signal routed to one's current location. While watching a sports program, imagine being able to "click" on a player and review statistics. These are just a couple of examples out of an unimaginably large set of possibilities. An ever-escalating set of consumer needs supported by a viable business model will determine what is practical. In many cases, implementation speed will be based on consumer willingness to accept "pay as you go" service charges rather than on the cost of the associated hardware itself.

V. Conclusion

The road leading to the Information Superhighway will be "rocky" due to many obstacles: politics, regulations, competitive self-interest, etc. Hence, prediction of the timing for realization of the Information Superhighway is difficult. However, three points seem clear. First technology advances will continue and will be the enabler for moving from the possible to the practical. Second, economics and consumers' needs and wants will be drivers for change. Finally, the major challenge is building the Information Superhighway infrastructure itself. A key milestone of this challenge is making the transition to a digital infrastructure. Infrastructure transitions will occur in discrete technology steps at different rates around the globe based on the state of available technology and existing infrastructures. Countries without the "handicap" of existing infrastructures may be able to make the transition more quickly, perhaps spurring others to follow their lead. While the market for standalone and application-specific consumer products will continue, growth will come from products and services that take advantage of the evolving "intelligent" infrastructure. As a consequence, the boundary of traditional consumer electronics, computers, and communications will no longer be distinguished by hardware. For the consumer, **the interface will be the reality.**

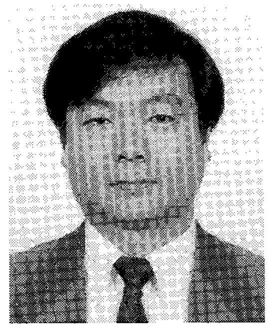
- ◆ The modulation subsystem used in the system, the 8-VSB (vestigial sideband) transmission technology, is rugged digital technology for terrestrial digital broadcasting that assures broad HDTV coverage area, reduces interference from existing analog broadcasts and provides immunity from interference into the digital signal. The higher-data-rate cable mode, 16-VSB, will allow cable operators to transmit two full HDTV signals in a single 6-MHz cable channel.
- ◆ A packetized data transport system, which allows the transmission of virtually any combination of video, audio and data in packets - similar to those used in state-of-the-art digital data communication networks - will concentrate on features and services of MPEG2 that are applicable to HDTV and provided for in the MPEG2 transport layer.
- ◆ Both progressive and interlaced scanning are provided. The formats are 24-, 30-, and 60-frames-per-second progressive scan with a pixel format of 1280 x 720 (number of active picture elements per line x number of active lines), and 24- and 30-frame- per-second progressive scan with a pixel format of 1920 x 1080. The system will also be capable of 60-frame-per-second interlaced scan with a pixel format of 1920 x 1080. These formats provide a good foundation for the migration to a 60-frame-per-second 1920 x 1080 progressive format as soon as technically feasible.
- ◆ The Grand Alliance system will use the 5.1-channel Dolby AC-3 audio technology to deliver compact-disc-quality digital surround sound.

!!! ALERT !!!

If you have been an IEEE member for any length of time, you are probably used to your renewal bill arriving around the same date every year. This year, however, as part of the IEEE's efforts to upgrade service to our members, the bills will be sent out on a rolling basis. Region by Region. The staggered responses from bills mailed over a span of time will allow the processing of your paid bills to be handled quickly and efficiently, your record to be updated expeditiously, and your membership card to go out to you on a timely basis.

Keep an eye out for your renewal notice. The first ones are scheduled to out around November 5, and the last ones about December 10. Remember to fill in all information requested on the bill so that your record will be correct. And most important of all, send in your renewal as soon as possible.

MESSAGE FROM 2ND V.P., INTERNATIONAL AFFAIRS



T.-H. Steve Chao, Ph.D.

The International Affairs Council (IAC) is made up of at least 6 members whose principal residence is outside the United States. The 2nd Vice President, appointed by the Society President, serves as chairman of the Council. Other standing members are the IAC Past Chairperson and CES Chapter Coordinator. The IAC serves as liaison to chapters of CES in other parts of the world.

One of the objectives of the IAC is to sponsor and organize CES workshops and seminars outside the US at least once a year. These can be in association with local chapters and other organizations. The ISCE'94 (November 14-16) in Hong Kong was such an event. Patrick Griffis, President of CES was the Keynote Speaker.

The Far East chapters will provide articles for the next four issues of the newsletter. Chapter coordinators are Steve Chao - Taipei, H. Tanimura - Tokyo, Suki Kim - Seoul, Y.L.Ye - China.

NEWS FROM THE TAIPEI (TAIWAN) CHAPTER

T.-H. Steve Chao, Ph.D.
Chairman

Founded in October 1992, the objective of this chapter is to promote technical development and professional activities on consumer electronics in Taiwan. In addition to promoting participation in international conferences like ICCE and ISCE, it has the responsibility to organize one major technical workshop to coincide with the Taipei Consumer Electronics Show. With only 80 members at present, the chapter actively co-sponsors most activities jointly with IEEE Taipei Section, other academic societies and industrial associations.

Begun in 1992, the annual HD-Media Technology and Applications Workshops have been the most successful affairs so far. This year's event drew 200 people and had 60 papers presented.

Other activities include organizing a Taiwan paper selection for ICCE'94, co-sponsoring ISCE'94 (Hong Kong, November '94) and hosting the session of IWHDTV which will be held in Taipei in October 1995.