

# **Multi-Media -- The Intersection of Computing and Consumer Electronics**

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## **Introduction**

The next significant step in the evolution of personal computers will be to integrate audio and video capabilities with the graphics and text processing functions of today's machines. These "multi-media" computers will share a great deal of common technology with the digital consumer electronics products of the future. The capabilities of personal computers and workstations are on an extremely rapid growth path, and the nature of their market encourages early deployment of new technologies in innovative products. This is relevant to Thomson Consumer Electronics because the new "multi-media" technology of the computer industry has the potential to surpass the capabilities of HDTV, possibly even before the politically difficult process of establishing HDTV standards is complete. This means that the computer market will soon become the technology driver for video and display technologies, thus creating a new competitive environment in consumer electronics.

For example, high-resolution, flicker-free displays (on the order of 1000 x 1000 pixels and 66 Hz) are already commonplace on today's high-end PCs. The inclusion of color and grayscale capability in PCs is becoming increasingly common. The next generation of PCs will certainly accommodate audio and high-resolution still imagery, and future generations will surely incorporate full-motion video. Virtually every computer company has a large R&D group devoted to the development of advanced multi-media concepts and prototypes that include these capabilities.

The existence of these R&D efforts is extremely significant. The computing industry supports an astounding rate of technological advance -- it takes a mere 15 years for a supercomputer to reach the desktop. Desktop machines typically double in computing power and memory capacity roughly every three years. The recent advent of parallel processing holds the potential to further accelerate the rate of these advances. To maintain this rate of advance, technology moves rapidly from the laboratory to product. Thus, today's R&D

efforts on multi-media systems are a good indication of what is to come in future computer products. As we will explain, the implications for the consumer electronics industry are of critical importance to TCE.

### **Consumer and Computer Industry Standards**

The rapid introduction of new technology in computing is enabled by the fact that the computer industry operates under a very different definition of “standards” than does the consumer electronics industry. In consumer electronics, there have historically been relatively few standards (e.g., NTSC, VHS) which are widely used over a long period of time. Consumers place a premium upon the preservation of their investment in products that they already own. Broadcast standards must have FCC approval, which requires a difficult and lengthy process to establish. Consequently, consumer standards have been the result of much long-term investment and technology development. However, this situation is changing. The rapid pace of technology advancement has impacted the consumer industry with more rapid introduction of new (and incompatible) products, such as 8mm recorders.

The computer industry exists in a very different environment. Since most PCs are used in the office, there is a much lower barrier to obsolescence. The competitive advantages brought about by adopting new technology and its increased capabilities usually outweigh considerations of replacement cost and inconvenience. In fact, the pursuit of product differentiation and competitive advantage has historically prevented the computer industry from adopting industry-wide standards that are anywhere near the scope of standards in the consumer industry. The computer industry is one which supports many “standards” (e.g. DOS, Unix), virtually none of them industry-wide. Consequently, the computer industry is free to rapidly profit from the deployment of new technology, which in turn fuels the development of further technical advances. As the PC industry matures and has a larger installed base, backward compatibility is likely to become of some greater concern, but the overall economics of the industry are unlikely to change.

### **New Threats and Opportunities for TCE**

In the era of multi-media computers and HDTV, computing and consumer electronics will share an increasingly common base of

digital signal processing and display technologies. Workstations and PCs are already the technology drivers for CRTs, demanding resolution that surpasses HDTV. Video data compression ICs are being rapidly developed by small Silicon Valley start-up companies. An example of the change in competitive environment that this creates is given by the fact that the recent digital HDTV proposal of General Instruments directly leveraged those basic IC developments. The availability of such ICs will also make it possible for small companies in the video-teleconferencing market to extend their expertise into HDTV.

Achieving a technology advantage in video and HDTV in the 90's and beyond will require large R&D investments in displays and digital ICs, the same technologies that are essential to the computer industry. This fact is not lost on the Japanese, who are poised to exploit their vertical integration to leverage their HDTV technology in a major challenge to the U.S. computer industry. Sony not only supplies all of SUN's monitors, but is already a manufacturer of UNIX workstations. Matsushita is the majority shareholder of Solbourne, which is creating Sun clones with hardware designed in Japan.

This situation also poses major threats to Thomson Consumer Electronics. The lengthy standardization process of the consumer electronics industry could slow TCE down, while other industries take the lead in developing digital video technology. This would obviously have a large negative impact on Thomson's patent licensing position. However, the long-term consequences are even more worrisome. *If competitors are able to rapidly develop, deploy, and profit from new signal processing and display technologies in the computer industry, they will be able to fuel an increase in their R&D expenditures and the resulting development of more advanced technology that TCE will not be able to match.* This scenario is made possible by the lack of industry-wide standards and the rapid deployment of new technology in the commercially-oriented computer industry.

On the other hand, a different conclusion is that Thomson has a major new opportunity to profit from its skills and technologies. We are not suggesting that TCE become a manufacturer of commodity PCs, in competition with Taiwan. Rather, a strategic alliance between Thomson and a major U.S. computer company would serve as a vehicle to reap early profits from its digital signal processing and display technologies, with relatively little risk. Initially, TCE could

easily leverage some of its receiver ICs and design expertise to capture a leading share of the market for video frame-grabbers. Ultimately, the right strategic alliance could result in TCE supplying the audio and video subsystem design and components (an integral part of a future multi-media PC), VCRs with data and video interfaces, and high-resolution 16x9 displays. We believe that this approach would bring tremendous leverage to TCE, and provide for early deployment of advanced technology with higher profit margins than are possible in the consumer area. TCE would also enjoy the economy of scale of the consumer business to drive costs down where appropriate.

### **Potential Partners**

This kind of strategy has not gone unrecognized by the Japanese. There are rumors of Apple collaborating with Sony on multi-media systems, but the extent of their commitment to each other is unknown. Every major computer manufacturer is a potential candidate for a strategic alliance, as they all have multi-media efforts underway. The best targets for TCE to pursue are probably Apple, IBM, Sun, DEC and NEXT.

Apple has a reputation for innovation and far-sightedness in their products and software environment. The Macintosh was certainly the leader in exploiting graphics capabilities in PCs, and Apple is likely to be a leader in deploying multi-media.

IBM has evidently decided that it must be in the PC business in order to survive in mainframes (probably a very good decision). Although sales of the PS/2 are very disappointing, they are not to be ignored. IBM seems committed to DVI as an initial multi-media offering.

Sun has evolved to become the leader in workstations. Their future direction is to "capture the desktop", and they are working on smaller, lower-cost workstations. Sun is Sarnoff's partner in developing a High-Resolution Video Workstation for DARPA. This project is introducing them to HDTV technology, and will no doubt generate additional interest in multi-media within Sun.

DEC still maintains a strong position in superminicomputers, but they have clearly fallen behind Sun in workstations. They may view multi-media as an opportunity to leapfrog ahead of Sun.

NEXT is Steve Job's new venture. The NEXT machine is technically aggressive, and is intended as a multi-media platform. It already includes powerful audio processing. The commercial success of NEXT is very unclear.

As a result of our DARPA and COHRS involvement, Sarnoff has established many good contacts at Sun, IBM, Apple, DEC and HP. In conjunction with our efforts on Digital Hierarchy and associated standards activities, we are already beginning to discuss possibilities of collaboration, and to introduce our contacts to Joe Donahue when appropriate.

### **Conclusions**

We believe that Thomson stands to benefit from collaboration with the computing industry. An effective strategic partnership can accelerate the creation of new signal processing and display technologies, with the result of early profits at high margins, and the creation of an advanced technology base for consumer products. Sarnoff can help this process by leveraging our computer industry contacts and our current program with DARPA, in order to establish and contribute to the collaboration between Thomson and partners in the computing industry.