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Introduction

Digital video technology promises no less than to reshape the electronics industry. Certainly, digital video is already beginning to significantly change how we perceive, distribute and interact with video. It has made its way into our cars, computers, mobile phones and networks. Providing quality entertainment, however, is only the beginning.

Convergence of set-top box and surveillance technology will bring added convenience to our lives. For example, high-definition television viewers watching the big game at home can monitor their front door with a video camera that notifies them of a friend arriving at their front door in a picture-in-picture window on their TV. They can then let them in without having to get up from the big game. Digital cameras, enhanced with object recognition technology, will enhance our quality of life by making sure that everyone in the picture has his or her eyes open before shooting. Our personal safety will be improved by vehicles that can help drivers see clearly through heavy fog or give a warning if a driver is about to hit us from behind. Portable, wireless medical devices will help save lives by assisting doctors make detailed and accurate diagnoses as patients are being taken to the hospital.

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DaVinci™ Technology for Digital Video

Traditionally, engineers have had a limited number of choices for implementing digital video. Hardwired, ASIC-based approaches limited device use and functionality, as well as its ability to adapt. Application-specific devices, while slightly more flexible than ASICs, are still limited in their effectiveness, given the ever-enhancing evolution of multimedia standards and applications. Programmable platforms are the most flexible approach to extend effective product lifetime, but they often require significant investment in software development just to enter the market of digital video technology.

The primary challenge with embedding digital video in applications is that implementing video is a far more complex problem than simply compressing and decompressing images and audio. Digital video can take many forms and formats, and developers need to support a wide range of configurations and factors ranging from support for different resolution/display sizes, varying bit rates, real-time considerations and even the reliability of the video source (i.e., streaming from a hard disk drive versus from a wireless communications link). Even seemingly straightforward tasks, such as managing audio/video synchronization effectively and achieving reliable distribution of video over IP networks, continue to challenge and tax developers. For devices to appeal to a broad base of application developers, they must support multiple standards, including new standards which have yet to be developed. For an example of the importance of this flexibility, consider the rapid deployment and adoption of H.264 video CODEC. The lack of a broadly available digital video development platforms that have adequate performance, low enough cost and reasonable flexibility has been the primary barrier to entry for many engineers. For engineers to incorporate video into new applications, the complexity of designing video must be reduced using low-cost and off-the-shelf video subsystems.

This all becomes possible with DaVinci technology from Texas Instruments.

What is DaVinci™ Technology?

State-of-the-art advances in four key elements are required to successfully facilitate the implementation of digital video: Processors, development tools, software and systems expertise. DaVinci technology provides the foundation for the upcoming digital video revolution by enabling digital video, audio, voice and speech technology into platforms that integrates these four elements.

DaVinci technology leverages TI's 25 years of digital signal processing and integrated circuit expertise to provide systems-on-chip (SoCs) that incorporate leading-edge performance, programmable digital signal processor (DSP) cores, ARM® processors and video acceleration coprocessors optimized for flexible digital video implementations. With a blend of highly-efficient processing capacity, memory, I/O bandwidth, balanced internal interconnect and application-specific peripheral mix, SoCs based on DaVinci technology will provide the ideal amount of horsepower for video applications at the lowest possible cost.

Processors alone are only the foundation of a digital video solution offering. Managing all the components of a digital video system is an extremely complex engineering problem. For many applications, digital video is only one of many components of an even more complex system. Engineers no longer have the luxury to expend time and resources developing what they consider to be base technology.

To truly enable developers to overcome the initial barriers and accelerate their time-to-market, base silicon and software that can be developed to implement digital video are no longer enough. Developers need more than the processors. They need optimized code they can take directly to production. In other words, developers need hardware and software that has already been integrated into digital video subsystems that can be configured – or easily programmed – to meet the specific needs of their application.

Similar to the way the move from assembly to C enabled developers to focus on higher levels of functionality, DaVinci technology enables developers to step beyond the specific and technical details of digital video. No longer must a developer be aware of the details of implementing specific CODEC engines (i.e., MPEG-2, H.263, WMA9) in their video application. Rather, the specific low-level details of video CODEC processing are simplified with an API which enables a developer to use appropriate CODECs with no changes to their upper layer application code.

Moving beyond CODECs is an important step for the widespread adoption of digital video. Innovation is enabled when developers can build upon previously engineered functionality. For example, engineers used to build electronic devices by laying out gates for even the most fundamental functions. Over the years, companies like TI have continued to

integrate functionality onto silicon, providing a foundation for devices that stretch our expectations of what they can do while reducing the amount of engineering required to achieve these expectations. For example, the introduction of DSPs has enabled decades of innovation by providing a computational engine that substantially accelerates signal processing tasks.

With DaVinci™ technology, TI once again enables a whole new level of innovation. Where the introduction of the DSP provided computational acceleration, DaVinci technology builds upon TI's DSP foundation to provide application acceleration. No longer is it necessary for developers to understand the mechanisms behind various audio, video, imaging and speech CODECs.

For those developers who want to get under the hood of the DSP, this is still possible. However, DaVinci has made this an optional step, rather than a necessary one. By supplying production-ready software, including hardware drivers, hand-optimized CODECs and application code for managing audio/video synchronization and streaming over the network, DaVinci technology makes it possible for developers to implement leading-edge video features without ever having to learn how to program a DSP.

Open Platform Development with DaVinci Technology

The primary source of complexity in a digital video system is the number of components a developer must create and manage. Writing code for and managing the interactions between a great many components significantly increases the difficulty of putting together a complete system.

DaVinci technology reduces system complexity by providing an open platform upon which TI and its third parties have already developed and integrated the components which make up a digital video system. They have brought together the hardware and software necessary to enable any engineer to innovate with digital video.

The effectiveness of open platforms is indisputable. For example, the open development platforms available in the PC market have resulted in an explosion of innovative applications that is still going strong. TI's OMAP™ platform ecosystem took development of applications on the mobile phone to new heights by integrating hardware and software so that software developers could build on already existing systems and focus on new markets and revenue streams, including text messaging, downloading of ring tones, and other sophisticated applications on the handset.

DaVinci technology takes the concept of the OMAP ecosystem to a broad base of digital video applications. At the silicon level, TI's expertise and history with video products has enabled TI to develop highly optimized coprocessors and development tools to extend the

capabilities of its silicon-based DSP technology. However, developers do not need to burden themselves with the details of how to program and optimize code for these underlying innovations. Rather, DaVinci™ technology provides access to these innovations through a combination of much easier-to-use standard APIs providing easy access to production-ready CODECs so that developers can focus their development efforts where they can add the most value.

The open development platform offered by DaVinci technology extends to the application as well. DaVinci software will initially support Linux with support for other operating systems in the future. Linux support includes peripheral drivers, real-time application management, application-level APIs and production-ready code. The overall combination of integrated DSP-based SoCs optimized for video, specialized development tools, tuned drivers and CODECs and system-level application code make it possible for developers to implement a complete complex digital video system providing encode and decode functionality with only a few function calls.

The world is poised for change. Off-the-shelf availability of digital video promises to enable and inspire new applications not yet imagined. However, innovation is only possible when engineers are able to focus on new ways to use existing technology rather than having to reinvent it. With DaVinci technology, the complex details behind digital video have already been taken care of, making it possible for any engineer to bring digital video easily and cost-effectively to the consumer market.

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