



# platform solutions

on-line news for the hardware developer

Issue 7, March 20, 1998

## Feature Story

Each month we'll provide a feature article on key industry trends and developments. Authored by a member of Intel's Executive Staff, you'll find insightful and useful information for product development, planning and execution.

## Top News Stories

Delivering an in-depth report on key platforms, products and technologies, our Top Stories provide a monthly source of information on the issues affecting hardware developer. Be sure to check in every month for the latest stories that are driving the evolution of the industry.

## Platform News and Information

Every month we cover the latest developments in platform initiatives and technologies. Our "Platforms" pages provide news on the latest trends and initiatives for the business, home, mobile, server and workstation platforms. Our "Industry Events" page keeps you up to date on upcoming industry gatherings targeted at the platform and peripheral developer, including the new Intel Developer Forum.

## Technology News

Our "Technologies" pages give you quick and detailed information on the industry status of specific platform technologies, from the emergence of the Accelerated Graphics Port (AGP) to the latest advances in Intel microprocessors, memory, Audio, USB, 1394, DVD, Power Management, and PC 98/99. This department is your source for the hottest technology and product announcements, white papers, design guides, specifications, tools and developer events available to the industry.

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***On behalf of all of us at Platform Solutions, welcome to the future of the PC platform!***

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## **Feature**

### ***Enhancing the Value of IA Computing Platforms***

By Ron J. Smith  
Vice President and General Manager  
Computing Enhancement Group, Intel Corporation

*Intel's Vice President of Computing Enhancement provides an inside look at Intel's efforts to enable balanced platform performance, easy connections to the PC, and new growth markets for Intel Architecture computing platforms.*

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Intel Architecture (IA) based computing platforms are going through a period of tremendous change. PC's and servers are becoming a central tool for conducting business over the Internet. Consumers are demanding the performance and connectivity needed for visual computing applications and peripherals. To meet these needs, PC-based platforms are diversifying into many different market segments. Intel processors and other platform building blocks are being developed specifically for these new segments, delivering the needed performance and connectivity, as well as the economies of the open PC industry. This period of rapid change is creating new opportunities for the computer industry. But we are constantly challenged to deliver greater and greater value—the best compute performance and capability at the lowest possible price for each market segment.

The mission of Intel's Computing Enhancement Group (CEG), is to deliver products that enhance the value of IA computing platforms. We accomplish this by working with the industry to develop new, open technologies that deliver more powerful platforms and have a clear value proposition for the computer user. In turn, we incorporate these technologies into new products that are vigorously tested and validated in our labs. These technologies and products can be categorized into the Connect, Enhance, and Grow areas.

#### **Connect—Enable Easy Connections to the PC**

The digital convergence that is taking place as cameras and other devices move from analog to digital provides a need and opportunity for an easy connection to the PC. Universal Serial Bus (USB) was the first technology for an easy, low-cost connection for new medium speed peripherals. USB is supported in all of Intel's chip sets, as well as in a complete product family of controllers for peripherals such as monitors, speakers, and cameras. The next step in this evolution is **1394** (<http://developer.intel.com/solutions/tech/1394.htm>), which will be used by high-speed peripherals requiring greater bandwidth connections like digital video cameras, DVD players, and other consumer electronics devices.

#### **Enhance—Provide Balanced Platform Performance**

The heart of CEG's mission is to deliver products that enable balanced platform solutions. Most notably, Intel PCI chipsets are designed for mobile, desktop, workstation, and server platforms. These products deliver high-performance I/O expansion and also integrate support for the latest hard disk interface and memory technologies. The next step in platform balance is to provide optimum 3D graphics price/performance for the Pentium® II processor. **AGP technology** (<http://developer.intel.com/solutions/tech/aggp.htm>) was specifically designed for optimized 3D and is shipping in volume today with the Intel 440LX AGPset. Likewise, the Intel740™ graphics accelerator implements the full AGP 2X architecture and is tuned to work with the Dual Independent Bus (DIB) architecture of the Pentium II processor and AGP.

It is not just chip sets and graphics products that enhance the platform. Intel's PC flash product line is geared toward BIOS and manageability applications, providing the ability to update BIOS and store system configuration information. For server platforms, our family of I/O processors, the i960<sup>®</sup> RP and i960 RD processors, improve system performance by handling most of the I/O interrupts, freeing the processor for other activities. These processors support I<sub>2</sub>O<sup>®</sup> technology in which a single device driver can be used for multiple operating systems, providing a faster time-to-market for server vendors and lower support cost for IT professionals.

### **Grow—Support New Growth Markets**

CEG also focuses on enabling new growth markets. Intel's fastest ramping processor for embedded applications is the Pentium processor. The combination of Intel's embedded Pentium processor module and the Intel 430HX PCIset enables a fast time to market solution. The PC market segment generates economies-of-scale for tools and support that the embedded arena has learned to harness. The Pentium processor is now used in industrial PCs, points-of-sale terminals, and telecommunications equipment. Another high growth focus area is the flash memory market. Flash components and software are used in many applications beyond PC platforms, including cellular phones and networking equipment. The recently announced Intel StrataFlash<sup>™</sup> memory doubles the storage capacity in a given space and will be used in digital cameras, set top computers, and other emerging applications.

You will find more details about Intel StrataFlash memory and Intel's chip sets and graphics technologies, as well as 1394, in this month's top stories. I invite you to stay in touch with Intel's balanced platform products and technologies on an ongoing basis through the *Platform Solutions* newsletter and Intel's developer web site. The evolving computer market place in 1998 is sure to bring more opportunities than we can even imagine today. But the time is now to deliver the enhanced value that computer users are looking for. Please join Intel in taking advantage of the opportunities to Connect, Enhance, and Grow IA computing platforms.

### **About the Author:**

Ron Smith is Vice President and General Manager of Intel's Computing Enhancement Group (CEG). He is responsible for all of CEG's operations that deliver products and solutions to enhance the value of IA computing platforms.

### **For More Information:**

To learn more about **Intel's chip set and graphics technology directions**, read the Q&A with Avtar Saini, Vice President and General Manager of Intel's Platform Components Division, in this month's issue of *Platform Solutions*

( <http://developer.intel.com/solutions/issue/stories/top1.htm> )

To learn more about **Intel StrataFlash technology**, read the Top Story by Curt Nichols, Intel Flash Products Marketing Manager, in this month's issue of *Platform Solutions*

( <http://developer.intel.com/solutions/issue/stories/top2.htm> ).

For information on **1394-based Digital Content Protection technology**, read the Top Story by Brendan Traw from the Intel Architecture Labs in this month's *PSN*

( <http://developer.intel.com/solutions/issue/stories/top5.htm> ).

## **Top Stories**

### ***Delivering Innovation Through Balanced Platform Solutions***

Q&A with Avtar Saini  
Vice President and General Manager  
Intel Corporation, Platform Components Division

*The Intel Architecture PC has diversified into multiple platform types, each designed for a specific computing role. This brings with it the challenge of delivering the full performance and capabilities of IA processors to each new platform type. Platform Solutions News recently talked with Avtar Saini, Vice President and General Manager of Intel's Platform Components Division, about the role his group plays in enabling balanced platforms that take full advantage of IA processor performance. Here are some excerpts from that conversation.*

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#### **Where do Intel's chip sets and graphics components fit into the big picture?**

"Chip sets are like spokes in a wheel leading out from the hub formed by the microprocessor—they handle all sorts of peripheral functions, like I/O, memory, graphics, and so on. In the Platform Components Division at Intel, we focus on everything that goes on around the microprocessor. We work to drive technology initiatives that advance the Intel Architecture platform and to grow the market by delivering world-class chip set and graphics products.

"We did it in the past with the PCI bus and EDO DRAM, and we're doing it now with such technologies as AGP 2X, UltraDMA/33, ACPI, and high-quality 3D graphics chips. It's all about delivering a truly balanced platform."

#### **A balanced platform...what does that mean?**

"It means that everything around the microprocessor has to keep pace, otherwise you're just not going to get optimal performance and functionality from your PC. We know from Moore's Law that processor performance doubles every 18 months...well, that doesn't really matter unless the rest of the platform keeps up. The system is only as good as its slowest part. So the idea is to do everything in unison—not only processor innovation, but innovation in our chip sets as well."

#### **How hard is it to maintain a balanced platform?**

"It gets harder all the time, because it gets more complex. A few years ago, you just had to integrate PCI chip sets and CD-ROM technology...now, you've got AGP chip sets, graphics accelerators, DVD ROM, we're moving to 100-MHz SDRAM, and on and on...there's a lot more pieces of the puzzle that have to come together. Platform transitions increasingly require system-level tuning and all sorts of enabling initiatives across the industry to move up to the next level."

#### **With all that complexity, why would Intel venture into the world of chip sets and graphics?**

"It all starts with our microprocessor leadership. We're in an excellent position to use our processor technology to effect positive change across the platform. Take graphics, for example. For a while, that area was lagging...the PC was stuck in a 2D world. By getting more involved in graphics, Intel has been able to accelerate visual computing relative to the rest of the platform.

"Our AGP chip set is the first good example. It's great to focus on contributing to the industry through initiative development, but what ultimately makes things happen, I believe, is products. Intel's presence and product introductions in the graphics area have helped a lot of application developers to push the envelope and really get into that next generation of product development. As a result, graphics innovations are happening—3D, video, DVD ROM...it's all starting to come together."

**How are you using Intel's capabilities to help deliver balanced platform solutions?**

"First of all, we use the same advanced process technology and fabs that we use for our processors; our chip sets and graphics chips follow right behind. Second, it's much more than just the hardware—it's all about delivering truly complete solutions. On the software side, we're working to optimize drivers so that everything fits together. And, of course, it's also about industry cooperation. Whether it's Microsoft\* for OS support, Rambus\* for developing memory interface specifications, or any number of ISVs, IHVs, and BIOS vendors, we're working very closely with all these companies. They know what we're doing and where we're going. We know what they're looking for and what they need to take the next steps.

"And finally, we know that validation is important. At Intel, that's our crown jewel, the key to success. We do all sorts of simulation before taping out our chips. When we have silicon, we go right back and engage in comprehensive system-level compatibility validation. With so many complexities affecting the platform, continuous validation is an important tool to really ensure optimal balance."

**Where do we go from here?**

"Onward and upward, of course! (laughs) In the near term, we'll see improvements like 100-MHz SDRAM, then in 1999 Direct Rambus for system memory. Intel is actively involved in the next round of AGP innovations leading toward AGP 4X out there in the future. The emergence of 1394 and the video capabilities it will provide is another thing to keep an eye on. And while some things emerge, others will disappear. Over the next few years, the ISA bus should just about vanish...I think that's pretty clear to everyone."

**What's the important message for OEMs and IHVs?**

"A balanced platform. It's that basic. There are plenty of opportunities out there for OEMs, IHVs and ISVs to add their particular value to help advance the PC platform and keep it balanced. We want them to know that at Intel, we're doing our part to help. We welcome their involvement, because we're as motivated as anyone to make it all happen."

**About the Author:**

Avtar Saini is Vice President and General Manager of Intel's Platform Components Division and Co-General Manager of Intel's Graphics Components Division, where he is responsible for developing PC platform initiatives by spearheading the design and delivery of Intel's chip set and graphics components products. For Avtar's full Executive Bio, please visit the **Intel pressroom**. (<http://www.intel.com/pressroom/kits/bios/saini.htm>)

**For more information:**

On Intel chip sets, visit **Intel's chip set products** web site. (<http://developer.intel.com/design/pcisets/>)

On **Intel Graphics components**, visit Intel's graphics products web site. (<http://developer.intel.com/design/graphics/>).

Visit Intel's **Interactive 3D graphics** web site. (<http://developer.intel.com/technology/3d/index.htm>)

To stay up-to-date on AGP technology news, visit the **AGP technology page** in *PSN*. (<http://developer.intel.com/solutions/tech/agp.htm>)

To stay up-to-date on Memory technology news, visit the **Memory technology page** in *PSN*. (<http://developer.intel.com/solutions/tech/mem.htm>)

## Intel StrataFlash™ Memory Technology

By Curt J. Nichols  
Marketing Manager  
Flash Products Division, Intel Corporation

*Offering more density, in less space, at lower cost, this new flash technology enables a new memory model that allows added capacity and features for a wide range of PC-centric products.*

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For nonvolatile storage of code and data, the industry has used a variety of memory types, including ROM, boot-ROM, and different types of E<sup>2</sup>PROM. Traditional flash memory has sometimes been included in this mix, although system designers are often deterred by flash memory's relatively higher price per-bit compared to other memory alternatives. Consumers of PCs, peripheral devices, and CE products have learned to constantly expect more features and functions, they have also learned to expect these benefits at low cost. This dynamic requires a new memory paradigm that supports added capacity and functionality, without added cost.

As new products, applications, and PC platform initiatives emerge, the industry needs a new memory model that makes it easier to integrate code and data and enables scaling to next-generation memory densities and beyond. Intel StrataFlash™ memory delivers this new memory model by effectively doubling the density of flash devices, without significantly increasing costs. From its introduction, Intel StrataFlash memory has received rave reviews in the press and awards from publications as diverse as *Industry Week*, *Discover Magazine*, *EDN*, *Computer Technology Review* and even *Playboy Magazine's* "Twelve Gizmos for Christmas." This new memory model makes it much more cost-effective for system designers to add memory capacity in a wide range of PC-centric products.

### Two Bits In The Space Of One

Intel StrataFlash memory is based on an integrated high-density NOR-based architecture. The architecture offers some immediate advantages for designers of classic, as well as emerging, applications:

- More density in a smaller space—By storing two bits in each memory cell, Intel StrataFlash technology has enabled the creation of a 64-Mbit flash device, effectively doubling memory functionality at today's lithography levels. Now available in a µBGA\* chip-size package, Intel StrataFlash memory offers the highest density in the smallest form factor available.
- Lower cost—Intel StrataFlash memory provides significant cost reduction to technological advances with the combination of scaling and multiple bits-per-cell. This will enable \$1 per Mbyte by the year 2001.
- Higher-integration memory architecture—A single memory type can store both boot code and data. Because erase cycles are block-independent, blocks used for code storage are unaffected by frequently erased data blocks.
- Flexibility for system designers and users—Intel StrataFlash memory supports directly executing boot code, downloading application code to RAM, and storing data in nonvolatile memory. This memory type has the density to support these features in one—instead of several different—memory types.
- Low power—In addition to the traditional flash memory benefits of direct cell access, nonvolatility, and rewritability, Intel StrataFlash memory has low power requirements (5 V<sub>cc</sub> and 2.7-3.6V I/O).
- Reliability—Intel StrataFlash memory supports 10-year data retention in typical code applications.



- An easy upgrade path—The memory model is a complete hardware and software solution that enables easy upgrades to 128 Mbits and beyond. Intel's Common Flash Interface (CFI) makes it easy to upgrade to future high-density Intel StrataFlash devices, because the commands and drivers will remain the same. CFI is also a JEDEC standard. Designers can benefit from it immediately, because reference code is available now.

### Support For New Visual Computing Applications

Intel StrataFlash memory offers revolutionary price-performance advantages for designers working with the latest generation of Visual Computing applications such as PC cameras and a wide range of other PC-centric products:

- In cameras designed with the **Intel 971 PC Camera Kit** (<http://developer.intel.com/design/imaging/kit.htm>), Miniature Card-based Intel StrataFlash memory works like "electronic film," enabling user-friendly connectivity between the camera and the PC.
- In a handheld device, the memory has the high density needed to support hours of voice recognition and enable hours of recording time.
- In networking applications, Intel StrataFlash memory lets manufacturers save valuable board space while upgrading memory capacity for more code storage, without adding to system cost.
- In the new generation of "digital set top boxes" enabled with Internet access, new features like Web browsing and information delivery can quickly double the amount of code and data storage needed in a set top box. Intel StrataFlash memory provides the densities needed to support these advanced capabilities at a cost that is competitive with earlier, less capable models.

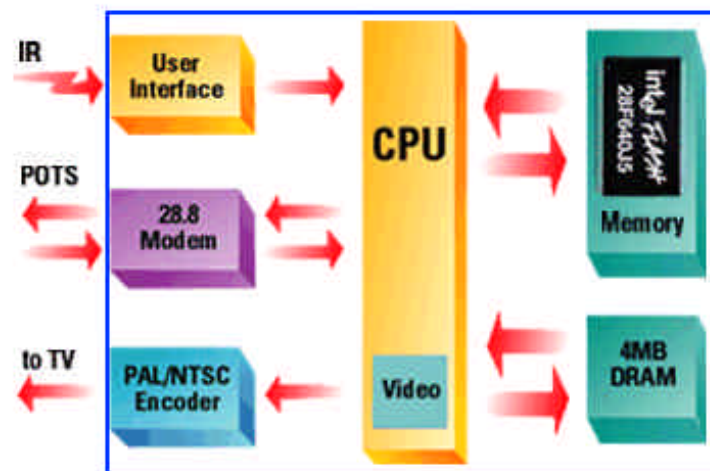


Figure 1—Example of Integrated Code/Data Model in an Internet Set Top Box

Today, the benefits of Intel StrataFlash memory, including direct execution of system boot code, are found primarily in devices surrounding the PC. The convergence of PC and consumer electronics products may make the presence of an integrated resident flash array (RFA) for code and data storage an increasingly attractive option for PC designers. Besides having "instant-on" functionality, the programmability of Intel StrataFlash memory-based RFA makes it easier to implement value-added features, without adding system costs.

**Design With Strataflash Memory Now**

Intel StrataFlash memory is more than new technology. It represents a revolutionary new memory model. Designers can replace the current array of different memory types with a single high-integration alternative that harnesses the power of process scaling to store more code and data in less space. While providing a flexible design solution, Intel StrataFlash memory is the new paradigm that the industry needs to enable the future density and performance gains of process scaling, without incurring a jump in costs.

The good news for designers is that Intel currently offers a complete package of comprehensive hardware and software design solutions, including CFI, VHDL, and Verilog models, and Flash Memory Manager for simplified code upgrades. Intel StrataFlash memory products are available in the form of 32-Mbit and 64-Mbit devices ready to help meet today's immediate design goals.

**About the Author:**

Curt J. Nichols is the Marketing Manager for Intel's Flash Products Division. He is responsible for marketing Intel's flash memory products worldwide.

**For More Information:**

Technical background on MultiLevel Cell memory technology.

( <http://developer.intel.com/design/flcomp/isfbgrnd.htm> )

Technical information for designers on Intel's StrataFlash memory Home Page.

( <http://developer.intel.com/design/news/strata.htm> )

Intel's Flash Developer Home Site.

( <http://developer.intel.com/design/flcomp> )

## **Balanced Computing: A New Compute Model for Business**

By Chris Thomas  
Director of the Distributed Enterprise Architecture Lab  
Enterprise Server Group, Intel Corporation

*Intel's Distributed Enterprise Architecture Lab has identified a new compute model that encompasses the benefits of server-centric, network-centric, and connected PC models, allowing businesses to deploy computing resources optimally, with implications for platform and solutions providers.*

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Business computing can be naturally divided into three basic compute models—server-centric, network-centric and connected PC—according to the way the workload is allocated among servers, networks and clients. Understanding compute models is important because they have implications for the platforms that enable solutions, for the way those solutions will perform, and for the flexibility and availability business applications are capable of providing. Balanced computing enables businesses to deploy their computing resources optimally, integrating and extending their existing computing environments with the best new network, hardware and software solutions.

### **Defining compute models**

A compute model describes the way in which applications and data interact with clients, servers and networks in a business environment. Intel's Distributed Enterprise Architecture Lab (DEAL) has identified three basic compute models:

- **Server-centric model**—data and applications reside and execute on a server. The client handles data entry and display of information. This model provides for centralized management and control.
- **Network-centric model**—data and applications reside on the server, and applications are downloaded to the client for execution. This model enables businesses to download applications as needed while maintaining version and access control.
- **Connected PC model**—applications typically reside and execute on the client, taking advantage of the performance and features of the PC. Data can be stored locally or on file servers. In what has come to be known as “client/server” computing, applications typically run locally and interface with servers. This model also enables “occasionally connected” or mobile users to function on and off the network.

### **The integrated alternative: Balanced Computing**

Balanced computing is an inclusive model, offering the benefits of all three basic models and providing for greater flexibility and optimal integration. Balanced computing provides the flexibility to employ server-centric, network-centric and connected PC functionality concurrently. For example, a browser-based order entry application (server-centric) executing a downloaded human resource applet (network-centric) could run concurrently with a spreadsheet application (connected PC)—all on a single client.

While concurrency is a major benefit of the balanced computing model, integration between applications is balanced computing's trademark. Through integration, users benefit by being able to combine the value of applications on clients and servers. As we expand on balanced computing in the future, we will show the value of application integration between client side applications, server-side applications, and between multiple servers and client(s), as well as the value of partitioning features within an application.

### Compute Models Summary

	<b>Server-Centric Model</b>	<b>Network-Centric Model</b>	<b>Connected PC Model</b>	<b>Balanced Computing Model</b>
<b>Data Location</b>	Server	Server	Client and file server	Clients and/or servers
<b>Application Location and Execution</b>	Server	Stored on server. Downloaded to client to execute	Client	Client and/or server
<b>Typical Applications</b>	Centralized business apps, browser apps	Downloaded Windows* applications, Java* applets or ActiveX* plug-ins	Office suites, client aspect of multi-tiered client/server apps	All
<b>Possible Devices</b>	PCs, network computers, terminals	PCs, network computers	PCs	PCs

Implementing balanced computing requires careful attention to many areas of the business environment. Done well, architects can “balance” their solutions to the benefit of all their constituencies: corporate management, business units, end users, business partners and customers. This requires an understanding of each constituency’s needs and consideration of the following:

- Balancing system performance within a single platform or between systems.
- Balancing cost of ownership, ease of use, flexibility, and control.
- Balancing resources based on network bandwidth constraints.
- Balancing the distribution of application, data, and user interfaces.
- Balancing performance with user needs, location and preferences.

Balanced computing is the only model that successfully addresses all of these requirements.

#### Separating compute models from devices

People erroneously associate a compute model with a specific device that supports the model. For example, one might assume that the server-centric model requires dedicated terminals or that a network-centric configuration requires network computers (NCs). Such requirements are artificial. While your choice of compute model does not dictate the devices used, your choice of device can restrict you to certain compute models. Tightly coupling device choices to compute models can restrict flexibility and constrain application developers.

The full-featured PC overcomes these restrictions and constraints by working with all compute models and providing the greatest flexibility. That said, some business solutions may require the tight constraints afforded by specific function devices. By understanding compute models and the opportunities available in a balanced computing environment, companies can ascertain when their business solutions might include a special purpose device.

Similar to the association of computing devices with compute models, software is frequently architected to support a specific model. Helping software developers understand the implications of implementing a balanced computing model is as important as choosing the appropriate devices.

**Impact of Electronic Business**

Rapidly emerging Internet-enabled electronic business increases the importance of architecting to the balanced computing model. In the E-business environment, applications and data must be flexibly managed and support the unique needs of new classes of users, such as suppliers, shippers, partners and customers. Businesses need better ways to balance control of information systems within their corporate boundaries and to cooperate with systems beyond the corporate boundaries. As this process evolves, business systems with built-in flexibility and balance will be in the best position to integrate quickly.

**Intel's solutions focus**

The ever-changing business environment requires new and creative ways to architect solutions that span traditional barriers. Intel is working to help businesses develop balanced and manageable system, network and application solutions to adapt to this environment. Through standards-based activities, client and server specifications, and initiatives such as **Wired for Management** (<http://developer.intel.com/solutions/tech/wfm.htm>), Intel is working with the industry to make Intel architecture-based clients and servers available to support each compute model. These platforms will contain the features needed for effective control of the environment, and they will support networks that meet business requirements. In this new paradigm, where computing involves cooperating with unknown systems and applications, balanced computing will enable the architecting of solutions to meet the growing needs of business.

**About the Author:**

Chris Thomas is Director of the Distributed Enterprise Architecture Lab (DEAL) in Intel's Enterprise Server Group. He is chartered with developing an enterprise architecture and vision for Intel and the computer industry.

**For More Information:**

To read the **full white paper on Balanced Computing Models**, visit the Business Platform technology page in *PSN*. (<http://developer.intel.com/solutions/pltfms/business.htm>)

To stay up-to-date on the latest technology news surrounding the Server platform, please visit the **Server Platform page in PSN** on a regular basis. (<http://developer.intel.com/solutions/platfms/server.htm>)

## 1394-Based Digital Content Protection: An Intel Proposal

By Brendan Traw  
Staff Systems Architect  
Intel Corporation, Intel Architecture Labs

*Intel and leading CE device manufacturers have set the stage for a specification that solves content protection problems, allowing digital video sources to exchange content with CE devices through any external digital bus. This includes the PC-to-CE "convergence pipe" of choice, 1394.*

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The digital convergence of PCs and consumer electronics (CE) devices holds enormous promise for the industry. It also poses immediate challenges. The mere prospect of hundreds of millions of dollars in copyrighted content being pirated is enough to keep any film or recording industry executive lying awake nights. In addition, the highly publicized PC-to-CE convergence has already raised user expectations for new products and rich content via the **Visual Connected PC** (<http://developer.intel.com/solutions/archive/issue1/focus.htm>). To meet these user expectations, the industry must quickly confront the technical challenge of how to protect content within the digital domain.

As a member of the Digital Transmission Discussion Group (DTDG) of the Copy Protection Technical Working Group (CPTWG), Intel has played a central role, together with leading CE manufacturers, in developing a proposed solution. Intel also helped develop the Content Scramble System (CSS) for DVD devices. Even with CSS, however, DVD players are not allowed to supply a digital-out until a valid industry-wide content protection specification can be implemented for 1394.

Digital video sources such as DVD players, set-top boxes, DSS, and PCs are not currently permitted to exchange digital entertainment content with CE devices such as TVs and VCRs through any external digital bus. This includes the PC-to-CE "convergence pipe" of choice—the **IEEE 1394 serial bus** (<http://developer.intel.com/solutions/tech/1394.htm>). Content protection now requires that such signals must first be sent through an analog conversion process.

Thus, the imminent arrival of new digital HDTV technology makes the need for a solution all the more important. Also, the same content protection requirements will apply to computer industry suppliers who want to integrate DVD drives into the PC platform or offer software-based DVD playback.

### New Proposal Solves Three Protection Problems

Intel made headlines recently when it was joined by Hitachi\*, Matsushita\*, Sony\*, and Toshiba\* in announcing a new proposal to the DTDG for digital content protection. The proposal solves three major problems:

- How copyrighted and other valuable content can be protected from unauthorized copying.
- How PC and CE suppliers can cost-effectively protect content without inconveniencing authorized users.
- How digital ports (i.e., 1394) can be practically implemented between PCs and CE devices.

### Four Layers Of Copy Protection

The proposal addresses four fundamental layers of copy protection:

- Authentication and key exchange (AKE)
- Copy control information
- Content cipher
- System renewability

The Intel/CE industry proposal relies on strong cryptographic technologies to provide flexible and robust copy protection across 1394 buses. In addition to its inherent robustness for content protection, this system supports future extensibility, cost effectiveness, and user transparency.

The proposed system is based on robust and accepted cryptographic techniques that have evolved over the past 20 years to serve critical military, governmental, and commercial applications. These techniques have been thoroughly evaluated by hackers and by legitimate cryptography experts, and have proven their ability to withstand attack. The robustness and cryptographic stability of the system are derived from the proven strength of the underlying technologies, rather than merely how well a certain algorithm can be kept secret.

### **Authentication And Key Exchange (AKE)**

Before sharing valuable information, a connected device must first verify that another connected device is authentic. In an effort to balance the protection requirements of the film and recording industries with the real-world requirements of PC and CE users, the proposal includes a choice of two authentication levels, full and restricted.

- Full authentication can be used with all content protected by the system.
- Restricted authentication enables the protection of “copy-once” content only.

The full authentication system employs the public key-based Digital Signature Standard (DSS) and Diffie-Hellman key exchange algorithms. DSS is a method for digitally signing and verifying the signatures of digital documents to verify the integrity of the data.

Diffie-Hellman key exchange is used during full authentication to establish control channel symmetric cipher keys, allowing two or more parties to generate a shared key. Developed more than 20 years ago, the algorithm is considered secure when it is combined with digital signatures to prevent a so-called “man-in-the-middle” attack.

Both the DSS and Diffie-Hellman implementations for the proposed system employ elliptic curve cryptography. This technique offers superior performance compared to systems based on calculating discrete logarithms in a finite field.

Restricted authentication requires a device to prove that it holds a common secret that it shares with other devices.

### **Copy Control Information (CCI)**

Content owners need a way to specify how their content can be used (“copy-once,” “copy-never,” etc.). The content protection system must therefore be capable of securely communicating copy control information (CCI) between devices. Two CCI channel methods are used.

- CCI is embedded in the MPEG stream for devices that can decode this content format.
- In addition, the Encryption Mode Indicator (EMI) provides easily accessible yet secure transmission of CCI to bit stream recording devices (such as digital VCRs) that know nothing about the content. The EMI is placed in an easy to access location. For 1394 buses, this location is the most significant two bits of the synch field of the Isochronous packet header.

### **Content Cipher**

The content cipher must be robust enough to protect the content yet efficient to implement in PCs and CE devices. All compliant devices must include a channel cipher subsystem that encrypts and decrypts control messages and copyrighted content. The subsystem can support more than one cipher, which is negotiated by the AKE subsystem. To provide interoperability, all devices must support the specific cipher that is specified as the baseline cipher. All ciphers are used in the converted cipher block chaining mode. The current proposal recommends two ciphers for consideration as the baseline cipher.

- The M6 cipher is a common-key block cipher algorithm based on permutation-substitution. This is a rotation-based algorithm that functions in the same way as Hitachi's MULTI2 encryption algorithm currently used as an encryption standard for a Japanese digital satellite broadcasting system. M6 does not require key scheduling. It is more simple than MULTI2 and is similar to the algorithms seen in hash functions MD5 and SHA-1 that have shown their ability to withstand cryptographic attacks.
- The modified Blowfish cipher is based on the public domain Blowfish cipher and is included for consideration because of its efficient software implementation for PCs and its support for variable-length keys. The basic Blowfish algorithm has been modified to increase performance on PCs and to reduce the cost and complexity of implementation in CE devices.

### System Renewability

Devices that support full authentication can receive and process system renewability messages that are created by the Digital Transmission Protection Authority (DTPA) and are distributed with content. System renewability supports long-term integrity of the system by enabling latent system capabilities and the revocation of compromised devices.

System renewability messages can be updated from other compliant devices, from media with prerecorded content or via compliant devices with external communication capability (i.e., over the Internet, phone lines or cable).

### Next Steps

With the current proposal, Intel and leading CE device manufacturers have set the stage for the CPTWG to adopt a content protection specification. This removes one of the last remaining obstacles to the convergence of the PC platform with CE applications along the 1394 pipe, enabling the evolution of the Visual Connected PC to embrace new digital content.

Developers can expect to see this specification, which will be available under license, in the first half of 1998. Intel plans to create development tools that will enable the rapid implementation of the specification.

### About the Author:

Brendan Traw is a Staff Systems Architect in Intel's Platform Architecture Lab. He is the key architect and editor of the five-company 1394 content protection proposal.

### For More Information:

Future editions of *Platform Solutions* will provide updates on the status of the digital content protection specification and the status of IEEE 1394.

To download the **current version of the digital content protection proposal**, go to <http://developer.intel.com/solutions/tech/1394cp91.pdf>

To provide **feedback on the digital content protection proposal**, please send e-mail to [1394cp@ccm.jf.intel.com](mailto:1394cp@ccm.jf.intel.com)

For the latest 1394 technology news, visit the **1394 technology page** in *Platform Solutions* at <http://developer.intel.com/solutions/tech/1394.htm>

For information on DVD, please visit the **DVD technology page** in PSN. <http://developer.intel.com/solutions/tech/dvd.htm>



## **Behind Every Successful Demo...**

By Steven Barile  
Senior Technical Marketing Engineer  
Platform Marketing, Intel Corporation

*If you've ever attended an Intel developer event you know that seeing new technology—right out of the lab—spring to life on stage is the most powerful way to share a new PC platform vision. Here's a behind-the-scenes look at how Intel maximizes its success with technology demos.*

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In the life of an engineer, there is one prospect that inspires more fear than death, taxes or even having to make a speech. That's standing before a room full of industry leaders, technologists and senior engineers with an elaborate demonstration of innovative technology, only to have the demo crash. New PC technology demonstrations can be very risky, especially those that involve innovations that live "on the bleeding edge" of platform evolution.

So why do we do it? If you attended the February '98 Intel Developer Forum (IDF), you know that seeing new technology—right out of the lab—spring to life on stage is undoubtedly the most powerful way to share a new PC platform vision. Demonstrations of this magnitude usually give us just one opportunity to make a lasting positive impression of a new technology. So how does Intel maximize success at these events?

Let's look at some examples.

### **Staging the "Mother of All Demos"**

The most mission-critical demonstration ever put on by Intel was conducted at Fall Comdex '91. It was a supplement to the keynote presentation by Dr. Andy Grove, Intel's Chairman and CEO, to introduce the second decade of the PC with the concept of "Computer-Supported Collaboration." To this day, Intel engineers still reverently refer to this as "MOAD"—or the "Mother of All Demos."

This monster demo showed the shipping of natural data types (aka multimedia) around a wireless computer network that spanned the globe. MOAD showcased the hottest technologies of the day—including the fastest notebook PC, wireless technology, and groupware.

MOAD communicated a vision. That vision was then echoed back to the industry by the attendees and the tremendous coverage by the press. With the combination of the internet, one can see that Andy Grove's vision of Computer-Supported-Collaboration and "just-in-time" business as communicated during MOAD in 1991 are truly a reality today.

### **What makes a good demo?**

Like MOAD, every good demo must communicate a technology vision and help to drive home the presenter's key messages. In addition, all successful demos have the following basic qualities in common:

- Demos tell a story. They need to have what TV producers call "story value." Your demo should lead the audience through a realistic scenario that shows the new technology at work, and how it provides benefits to users. Interactions between characters and speakers add humor and keep the audience tuned-in.
- They focus on people. Great demos must do more than just showcase new technologies. You also need to focus on user benefits. This means that the people in your demo are just as vital as the technologies. You should select people that the audience can identify with.

- Good demos take risks. They show new technology that is worth seeing because it is “new stuff.” This puts engineers in the audience “on the edge” of platform evolution—and can also keep them on the edge of their seats.
- Your demo needs to be short and succinct. It should get straight to the point, providing highlights that support the vision introduced in the overall presentation. In addition, a series of quick and dramatic demonstrations is always better than a long one.
- Of course, your demo needs to work, even when the technology being demonstrated is right out of the lab and far from being ready for a final product. As a Technical Marketing Engineer, one of my jobs is to identify the parts of the demo that are likely to fail and figure out how to “tip-toe through the minefield” when we’re out on stage.
- Finally, the demo must be real. At Intel we believe in total honesty in our demos. To have any credibility with a technical audience, all results must be derived from actual technology implementations, exactly as they are represented. Nothing can be faked! In some situations we are pressed for time and must skip steps in order to reach the result in the time allowed. In these cases we always explain these steps.

### **Avoiding “half-baked” results**

To return to our TV analogy, a good demo is like a visual storyboard. It provides selected highlights that quickly communicate a message, by focusing only on necessary details and leaving out the rest. A good demo is similar to a TV cooking show where the host demonstrates how to prepare a cake using pre-measured ingredients—and then, seconds later, removes a completely baked cake from a second oven. Of course the audience understands that the cake was not instantly baked. The essence of a good demonstration is to show the power of new technologies and products and what they yield, even though they may not yet be “completely baked.”

This means that it is perfectly OK to prepare some elements of the demonstration in advance to assure that they will present well, so long as they are prepared in exactly the manner described. This assures that your demo will have the desired impact. In addition, it can save valuable time.

### **An example from February’s IDF**

IDF requires a series of dramatic demonstrations of the latest hardware platform visions, to support executive keynote presentations, labs and discussions with Intel’s top architects.

As a part of Patrick Gelsinger’s (Intel Vice President of Business Platforms Group) keynote presentation at IDF, we presented an ambitious four-part demo. This demo showcased a dozen new platform technologies and showed how they can work end-to-end across all PC market segments.

One of the segments depicted was a workstation. A “marketing engineer” (yours truly) was creating sales collateral in the form of an HTML Web page for both Internet and DVD distribution. During trial runs, we realized that some down-home “marketing vs. engineer” humor would play well, so we gave it a shot. Pat made a tongue-in-cheek remark about “marketing guys” that got a lot of laughs and helped the audience connect with us on stage.

The actual demo involved several steps: the copying of video to the PC from a digital camcorder equipped with a 1394 connector, creating a panoramic image at 2X real time from video, and software only real-time MPEG-2 encode on a Pentium® II processor-based system. The MPEG-2 encode was based on proof-of-concept software from the Intel Architecture Labs. During numerous trial runs, this software ran successfully about 80 percent of the time. It was not hard to imagine the possibility of embarrassing software crash in front of the keynote audience. In fact, during the dry run the night before, the software crashed. (I had to swear on my job that it wouldn’t happen onstage!)

Of course, every time you put on a demo like this, you are putting your credibility on the line. No amount of explanation would have made up for the disappointment if this demo had failed. In addition, a failure at the beginning of the speech could have been more than a little distracting for the keynote speaker (my boss).

To avoid such a negative outcome we captured the video the night before. We were “baking the cake” before the show, so if the video capture demo crashed we could still show the result of the panoramic creation and real time MPEG-2 encoding.

When we did the demo the next day, we hedged against a possible crash by informing the audience that the software was only proof-of-concept quality from the lab. We also needed to correctly set expectations—Intel currently does not have plans to “productize” this technology. As it turned out, the demo worked anyway! The dramatic results were the ultimate payoff for all the time and effort we spent in preparation.

#### **Look for more demos at September’s IDF**

Demos like this help make IDF the premiere technical event to set new directions for the Intel Architecture hardware platform industry. A video of Patrick Gelsinger’s keynote, including the demo described in this article, is currently available for download from the *Intel IDF Keynote Web site* <http://developer.intel.com/design/idf/keynote.htm>. The industry can look forward to equally dramatic demonstrations from Intel and other technology leaders at the next IDF, coming in September 1998.

#### **About the Author:**

Steve Barile is a Senior Technical Marketing Engineer in Intel’s Platform Marketing group. He is responsible for tracking the latest technologies and overseeing their successful integration into Intel’s executive staff presentations.

#### **For More Information:**

To view all of the February IDF keynote presentations including the live demos, visit the **IDF Web site** (<http://developer.intel.com/design/idf>).

## Platform News

### **Business Platforms**

#### **New White Paper Available on Balanced Computing Model for Business**

This white paper explains how three emerging compute models—server-centric, network-centric, and connected PC—offer specific ways to allocate the workload among servers, clients and networks and introduces a fourth alternative, the balanced computing model that encompasses the benefits of the others. Download at the Business Platforms page in PSN online.

([http:// developer.intel.com/solutions/platfms/business.htm](http://developer.intel.com/solutions/platfms/business.htm))

#### **Updated Wired For Management Developers Web Site**

The WfM developers web site has been updated with new content including the **Intel DMI to SNMP Mapper** ([http:// developer.intel.com/ial/wfm/tools/dmi2snmp/index.htm](http://developer.intel.com/ial/wfm/tools/dmi2snmp/index.htm)) and the **Updated PXE PDK** (version 2.1 now available) – (<http://developer.intel.com/ial/wfm/tools/pxe/index.htm>) ([http:// developer.intel.com/ial/wfm/](http://developer.intel.com/ial/wfm/))

#### **New Version of LANDesk® Configuration Manager**

Intel and PLATINUM\* technology Deliver New Version of **LANDesk® Configuration Manager**. ([http:// www.intel.com/pressroom/archive/releases/LD030398.HTM](http://www.intel.com/pressroom/archive/releases/LD030398.HTM))

### **Server Platforms**

#### **Intel Announces New Family Of Network Server Adapters**

Intel Strengthens Focus with a Family of Server Adapters which Provide High-performance, Scalable Solutions for Individual Segments.

([http:// www.intel.com/pressroom/archive/releases/NW030998.HTM](http://www.intel.com/pressroom/archive/releases/NW030998.HTM))

#### **I<sub>2</sub>O\* Technology Is A Key Enabler For I/O On IA-64™ Server Platforms**

Develop your I<sub>2</sub>O driver today and it will run on IA-64 platforms at first release. Since the HDM is running on another processor and is compatible with the I<sub>2</sub>O message passing interface, it will function as soon as the OSM is ported to IA-64 platforms.

(<http://developer.intel.com/solutions/tech/i20.htm>)

#### **SSI Draft Specification Now Comprehends Systems With (8) IA-32 Processors**

Until now, the Server System Infrastructure (SSI) draft specifications for the high-end of the IA server market were planned to comprehend up to (4) IA-64 processors. Based on strong OEM feedback, the high-end of the specification will be split to include an electronics bay and power supply for integrated systems capable of up to (8) IA-32 processors. The high-end elements will now be referred to as high-end modular and high-end integrated elements.

(<http://developer.intel.com/solutions/tech/ssi.htm>)

#### **SSI Contributor Agreement Now Available**

The SSI specification contributor agreement now available to download, sign and submit for access to the SSI specification contributor site. **Release 0.6 of the SSI specification** is soon to be posted on the industry web site this month. (<http://www.ssiforum.org>)

#### **IPMI (Intelligent Platform Management Interface) Specification Available**

A new specification, lead by Intel, Dell\*, Hewlett-Packard\* and NEC\*, for server platform management hardware is available now. This new **specification** compliments the Wired for Management (WfM) Initiative and sets the direction for open, flexible, and scalable platform management hardware for SHV servers. (<http://developer.intel.com/design/servers/ipmi/>)

## Home Platforms

### Industry Working on Home Wireless Communication Specification

In the connected home of the future, many PCs, peripherals, cordless telephones and consumer electronics devices will communicate and interoperate with one another. Intel is working with leading companies in an industry wide organization to create an open specification this year for home wireless communication. To learn more about the announcement, read the **press release** ([www.intel.com/pressroom/archive/releases/CN030498.HTM](http://www.intel.com/pressroom/archive/releases/CN030498.HTM)). For more information on home wireless communication, please visit the **HomeRF industry web site**. (<http://www.homerf.org/>)

## Mobile Platforms

### Intel Sponsors ACPI Implementation Workshop

The event, February 9<sup>th</sup> and 10<sup>th</sup>, in Burlingame, California was a hardware and software compatibility testing event and technical seminar for ACPI implementers. Testing and education were the principal focus of the Workshop. Technical experts from Intel, Microsoft\* and Toshiba\* were available to answer questions and assist with testing. Browse and download the **workshop information and presentations**. (<http://developer.intel.com/design/mobile/acpi/session.htm> )

## Workstation Platforms

### Intel and Microsoft sponsor Workstation Leadership Forum '98

On March 5<sup>th</sup> and 6<sup>th</sup> Intel President and COO, Craig Barrett, and Microsoft Chairman and CEO, Bill Gates, Keynoted at the **Workstation Leadership Forum**. This premier global event on workstation computing brought together the industry's leading application developers, users, and computer manufacturers (<http://www.intel.com/businesscomputing/wrkstn/forum/wlfrview.htm>).

### New World Wide Program for Workstation Software Developers

Intel announces a world wide program for workstation software developers to include Application Solution Centers (ASCs) and Technical Consulting aimed at optimizing, speeding, and simplifying workstation application development.

(<http://www.intel.com/pressroom/archive/releases/wp030698.htm>)

### Intel And Microsoft Unveil Migration Assistance Program (MAP)

MAP is for workstation application developers and is aimed at helping leading RISC/UNIX ISVs develop 32-bit and 64-bit applications for the Intel Architecture and Windows NT\* platform. Apply and return the MAP application by March 31, 1998.

(<http://www.intel.com/businesscomputing/wrkstn/map.htm>)

### Synopsys To Offer Chip Design Tools

Synopsys Inc. announced that by the end of 1998 it will offer many of its electronic design automation (EDA) chip development tools for Intel-based workstations running Microsoft Windows NT. ([http://www.synopsys.com/news/announce/press/intel\\_pr.html](http://www.synopsys.com/news/announce/press/intel_pr.html))

### Intel and Discreet Logic to Develop Visual Effects Product for Merced™ Processor

Intel and Discreet Logic have agreed to work together to develop a new high-end special effects product. The product will be used in the creation of feature films, commercials, music videos, and broadcast programming and will run on a family of Intel Architecture 64-bit (IA-64™) processors.

(<http://www.intel.com/pressroom/archive/releases/CN030598.HTM>)

**New White Paper available on Intel's Visual Computing Initiative for 1998**

This paper provides an update to Intel's visual computing initiative and the workstation market segment, introduced in 1997, describing computing based on video, imaging, and 3D graphics.

HTML format: ([http://www.intel.com/businesscomputing/wrkstn/vc\\_paper.htm](http://www.intel.com/businesscomputing/wrkstn/vc_paper.htm))

PDF format: ([http://www.intel.com/businesscomputing/wrkstn/vc\\_paper.pdf](http://www.intel.com/businesscomputing/wrkstn/vc_paper.pdf))

**New White Paper on Exploiting Parallelism on IA Multiprocessor Workstations**

This paper looks at ISV applications and the performance benefits that come from threading applications to take advantage of parallelism on Intel Architecture multiprocessor workstations.

HTML format – ([http://www.intel.com/businesscomputing/wrkstn/multi\\_paper.htm](http://www.intel.com/businesscomputing/wrkstn/multi_paper.htm))

PDF format – (<http://www.intel.com/businesscomputing/wrkstn/multi.pdf>)

**Intel Developers Forum Workstation Presentation Material Available**

This includes four presentations on Performance Benefits of Dual-Processor Systems, Performance Libraries for Workstation Applications, Designing for Slot 2, and AGP and USWC DMA Buffers Under Windows/NT\* 4.0.

([http://www.intel.com/businesscomputing/wrkstn/feb\\_idf98.htm](http://www.intel.com/businesscomputing/wrkstn/feb_idf98.htm))

## **Technology News**

### ***Microprocessor***

**Intel Announces Celeron™ Processor Brand Name for Basic PC**

Basic PCs are systems that meet the core computing needs and affordability requirements common to some new home and business users. To complement the Pentium® II processor for Performance PCs, the Intel Celeron™ brand processors are based upon the same P6 microarchitecture but provide a cost-effective solution for those designing Basic PC systems.

(<http://www.intel.com/pressroom/archive/releases/DP030498.HTM>)

### ***Memory***

**Updated 100MHz SDRAM Specification to Version 1.51**

Intel has updated the specification and DIMM Module 'Gerber' files are also available now.

(<http://developer.intel.com/design/pcisets/memory/index.htm>)

### ***AGP***

**Intel Working On New Graphics Specification For Workstations – AGP Pro**

Intel announced that it is working with industry-leading workstation OEMs and graphics vendors on a new graphics specification designed to extend AGP to meet advanced workstation graphics needs. The new specification is expected to deliver up to four times the electrical power of today's AGP interface specification. It includes an enhanced connector, improved cooling system, form factor specifications such as graphics card size, and layout specifications to meet the demands of workstation graphics users on both IA-32 and IA-64™ processor based platforms. The new specification will be supported in both AGP 2X and AGP 4X modes. Intel expects to make public the AGP Pro specification during the second quarter of 1998 as an addendum to part of the **AGP Interface Specification Rev. 2.0**.

(<http://www.intel.com/pressroom/archive/releases/wp30698a.htm>)

**Applications That Take Advantage Of AGP Are Shipping Today**

Available on the AGP technology page at PSN online is a list of some applications that are being optimized to take advantage of the benefits of AGP. Some of these applications have already started showing up on store shelves and others will arrive throughout 1998.

(<http://developer.intel.com/solutions/tech/agp.htm>)

**DVD****New White Paper Available on Video Playback Visual Performance Evaluation**

This document provides an overview of the visual playback characteristics which define the end user's experience. This document is intended for individuals unfamiliar with evaluating visual performance. There are four major characteristics covered which define the end user's visual experience: frame rate, temporal linearity, frame quality and lip synch (audio/video lip synchronization).

**Interactive DVD titles for the PC are Shipping Today**

Looking for Interactive DVD Content? A list of interactive titles currently available is on the DVD technology page. Software vendors can add your titles if they're not on the list by sending an email to Platform Solutions [platform\\_solutions@sc.intel.com](mailto:platform_solutions@sc.intel.com) with your title, company, and URL. This list will be updated monthly on the DVD technology page.

(<http://developer.intel.com/solutions/tech/dvd.htm>)

**Audio****Intel Announces Support FOR DVD WG-4 Audio Specification**

With the goal of bringing advanced consumer-quality audio to the PC, Intel is the first PC industry company to join the Audio Working Group that is creating next-generation music industry format.

(<http://www.intel.com/pressroom/archive/releases/dvd21998.HTM>)

**USB****USB Specification Version 1.1 Proposed Modifications Discussed**

The USB core group is deliberating a number of clarifications and enhancements to the current USB Specification version 1.0. An overview of these proposed modifications for incorporation in USB Specification version 1.1 were discussed at the February IDF, together with the implications to hardware and software developers. See the **USB technology page** for more details.

(<http://developer.intel.com/solutions/tech/usb.htm>)

**1394****Digital Content Protection Solution proposed by Intel**

Intel and other leading Consumer Electronics and Computer Companies announced a joint proposal to protect digital video and audio content while providing a robust, fast and transparent method for transmitting and receiving digital content between a variety of products such as PCs, high-definition televisions, set-top boxes, digital VCRs and DVD players. **Download the 0.91 specification** at <http://developer.intel.com/solutions/tech/1394cp91.pdf> .

## ***Instantly Available PC***

### **Power Delivery Requirements and Recommendations version 1.0 Available**

See the latest updates to the Instantly Available PC Power Delivery Requirements and Recommendations revision 1.0 (previously know as Power Supply '98).

(<http://developer.intel.com/design/power/supply98.htm>)

## ***PC 98 and PC 99***

### **PC 99 System Design Guide 0.5 Now Available for Review**

Preview draft 0.5 of the *PC 99 System Design Guide* is now available for industry review. This guide is intended to advance the quality of PC hardware, firmware, and device drivers for products designed for 1999 production by encouraging PC hardware platform initiatives and technical capabilities resulting in improved user satisfaction and market segment growth. Your complete preview copy can be downloaded from Intel's PC 99 web site.

(<http://developer.intel.com/design/desguide/>)

Feedback on version 0.5 of the guide is due by April 6, 1998 and should be sent via email to [PC99@intel.com](mailto:PC99@intel.com) or [PC99@microsoft.com](mailto:PC99@microsoft.com).

## ***Platform Performance Tuning***

### **Intel Ships 3 New IPEAK Tool Products on March 18<sup>th</sup>**

The Storage Toolkit, IPMAT (Intel Power Management Analysis Tool), and IBASES (Intel Baseline AGP System Evaluation Suite) tools are now available. Introductory price offers running through July 1<sup>st</sup>, 1998 are \$799 for Storage Toolkit, \$799 for IPMAT and \$499 for IBASES. IPEAK tools can be ordered by calling 1-800- 538-3373 ext. 301 or 1-503-727-7897.

(<http://developer.intel.com/design/ipeak/>)

### **Industry Technologists and Managers Show Support for New IPEAK tools**

Find out what the industry is saying about the value of Intel's new IPEAK tools.

(<http://developer.intel.com/design/ipeak/users.htm>)



## **Industry Events**

### **CeBIT**

March 18-25, Hannover, Germany

Europe's premier computer, telecommunications, and Information technology industry fair. Intel is on hand to showcase E-business, Small Business solutions, and many other technology demonstrations, as well as Intel executive presentations. For more details on what's happening at CeBIT, please visit Intel's CeBIT web site.

<http://www.intel.com/europe/cebit98/>

### **1394 CeBIT**

March 22, Hannover, Germany

This meeting is sponsored by the 1394 Trade Association to help engineers and designers understand how to work with ICs, software and systems using 1394. Presentations by Sony, Molex, Intel, Texas Instruments, Philips, 3A, Unibrain and many other multimedia bus leaders. This meeting is free! Sessions include: Introduction to 1394, The standard's architecture, How to Design Using 1394, How 1394 Can Last Forever, and so on. For more information visit the Cebit web sites.

[http://www.messe.de/cb98/index\\_e.html](http://www.messe.de/cb98/index_e.html)

<http://www.messe.de/cb98/>

### **WinHEC**

March 25-27, Orlando, FL, USA

Windows\* Hardware Engineering Conference to be held at the Orange County Convention Center. PC industry event for manufacturers and suppliers of hardware products supporting Microsoft Windows family of operating systems. WinHEC brings together technical managers and product developers to examine new technologies for designing future Windows-based computers. For more details and registration information, please visit the WinHEC web site. <http://www.microsoft.com/hwdev/winhec/>

### **DVD on the PC Developers' Conference—Europe**

April 2-3, Dusseldorf, Germany

In an ongoing effort to bring DVD to the PC, Intel will be sponsoring worldwide "DVD on the PC" Developers' Conferences. The purpose of these conferences is to educate the PC industry on DVD technology and promote cross compatibility on PC platforms. The two-day events will focus on training and compatibility, and is free of charge. PC OEMs, peripheral vendors (drives, upgrade kits, playback providers), ISVs/Content Developers, and Retailers are invited to attend. Contact STARK! Marketing Service via e-mail at [DVD@stark.spacenet.de](mailto:DVD@stark.spacenet.de) or fax: (Denninger Str. 132, D-81927 Munich) +49-(0)89-929 00 222 For test space reservations, please contact [Nicolas\\_Buc@ccm.imu.intel.com](mailto:Nicolas_Buc@ccm.imu.intel.com)

**DVD on the PC Developers' Conference—Asia**

April 21-22, Taipei, Taiwan

Watch this Industry Events page for future details on this significant DVD event.

**Comdex Spring '98**

April 20-23, Chicago, IL

Key international event for the entire computer industry. For more information please visit the Comdex web site.

<http://www.comdex.com>

**USB Compliance Workshop**

April 29-30 and May 1st, Milpitas, CA

For Invitation, Registration and Details, please visit the USB Implementers Forum web site.

<http://www.usb.org/developers/index.shtml>

**PCI Expo '98/PC Developers' Conference**

May 18-22, San Jose, California

PC and industrial developers' conference for hardware and software engineers. Intel will provide keynotes on connectivity and USB.

<http://www.annabooks.com>

**USB Plus Developers' Conference**

May 20-22, 1998, San Jose, CA

The USB Plus Developer's Conference will be co-produced by USB-IF and Annabooks. In this 3-day conference, you will hear first hand from knowledgeable speakers currently defining and developing state-of-the-art USB products. Registration and program coordination will be handled by Annabooks. To register simply visit the Annabooks web site. <http://www.annabooks.com/confer/pciregis.htm>

Exhibiting opportunities are available: Contact Shauna Wilson via e-mail ([dwilson1@san.rr.com](mailto:dwilson1@san.rr.com)) or call (619) 689-4942.

**ATM Expo '98**

June 01-05, San Jose, California

Event dedicated exclusively to Asynchronous Transfer Mode and broadband technologies. Intel's Mitch Shultz will be presenting "Servers and ATM" on June 5th. For more information, please visit the event web site.

<http://www.atmyear.com/atmyear98us/index.htm>

### **PC Expo '98**

June 16-18, New York, New York

An international broad-based computer show. For information please visit the PC Expo web site.

<http://www.pcexpo.com>

### **Web Design & Development '98 West**

June 21-25, San Francisco, California

This conference is designed to connect web developers and offer education about how to improve web design. Intel's Jerry Weber will be presenting "Low Bandwidth Special Effects for the Internet" on June 25<sup>th</sup>. For more information, please visit the event web site. <http://www.web98.com>

### **2nd Annual U.S. 1394 Developers' Conference**

June 29-July 2, San Jose, California

Please visit the 1394 event site for more details.

<http://www.1394ta.org/upevents/overview.html>

### **Intel Networking Events & Training**

For Intel's events and training programs on networking products and technologies, please visit the Intel networking events page.

<http://www.intel.com/network/events/index.htm>

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