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BACKGROUNDER

MOVING TO THE DIGITAL HOME

Intel Unlocks the Door with Innovative Technologies and Cross-Industry Initiatives

It's often said that home is where the heart is. That's probably because home — whether it's an apartment in Manhattan, Beijing or Paris, a Tudor in Toronto, London or Boston, or a penthouse in Sydney, Hong Kong or Milan — is at the heart of people's lives. Home is where people go to rest and nest, to spend time with friends and family, to escape the pinball game of work, and to be entertained by more engaging games, from TV's "Survivor" series to PC-based diversions such as Halo and the Sims.

Homes are such a nexus, in fact, that people willingly invest a great deal of money to make the place they call home as comfortable as possible. For example, U.S consumers spent an estimated $214 billion on home improvements, maintenance and repairs in 2001, a figure that exceeded annual expenditures in major industries such as clothing, legal services and commercial construction.[1] Last year in China, an estimated 40 million households spent on average $1,000 on home improvement.[2] Meanwhile, the average household in the United Kingdom will spend about $3,600 (U.S.) on home improvements this year, a number that's expected to grow to $4,600 by 2007[3].

When the dust of remodeling settles, people seem intent on spending their at-home hours having fun, being entertained and being more productive. The Wall Street Journal recently reported that the top three things people like to do in their homes are watch TV, listen to music and use a personal computer. Consumer spending patterns uphold these findings. In the United States in 2002, $94 billion was spent on consumer electronics, an amount that's predicted to

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[1] February 2003 Harvard Joint Center for Housing Studies report, quoted in *The New York Times* 6/1/03.
[2] "Unleash a tiger in the home," by Elen Lewis, Brand Strategy, July 2003.
[3] "£1bn spent this weekend on homes and on DIY," *The Liverpool Daily Post*, 4/19/03.

climb to $120 billion by the end of 2003[4] or $150 billion per year if you include content services. Many of these consumers, 25 million households, or more than half the PC owning homes in the United States[5] are enjoying the benefits of broadband that greatly improves their Internet experience for sharing photos, videos and music with friends and family and taking advantage of new services such as streaming radio and movie downloads.

Many consumers are also buying themselves digital devices and services, a trend that's reflected in soaring sales of digital cameras, MP3 players, CD/DVD players, digital TVs (DTVs), personal video recorders (PVRs), digital set-top boxes and similar hot gadgets. The wave is clearly cresting as consumers move in droves from analog to digital devices, driven largely by a desire to get the utmost enjoyment out of the current proliferation of rich digital content. Another reason consumers view digital as dynamite: they can create, edit, manage, and host their favorite tunes, photos and personal video using a PC and share them seamlessly by means of wireless networking and broadband connections.

The crossover to digital media and the convergence of connected devices has significant appeal in the opposite direction as well. Recent focus group studies indicate that consumers today want to enjoy their digital content on their home TVs and stereos. For example, consumers like the idea of socializing while viewing digital photos with friends and other household members on a large-screen TV in the family room, or listening to music from playlists on high-fidelity speaker systems throughout the house.

The Time is Right for the Digital Home

As consumers continue to acquire, experience, store and play with increasing amounts of digital media on their computers, DTVs, PDAs, MP3 devices, digital set-top boxes and DVD players, the line between the consumer electronics (CE) and PC domains has become blurred. But consumers today don't dwell much on the distinction. Most simply look forward to a time when getting the best value for their money means accessing compelling content on *any* device easily— and enjoying rich features with excellent audio/video quality. Consumers also eagerly anticipate the day when they can conveniently and affordably share digital media among all the devices they own and be entertained whether they're in the rec room, the kitchen or the den.

Fueled by the widening availability of broadband and wireless networking technologies, that day is fast approaching. It's embodied in Intel's vision of the digital home, an environment

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[4] The NPD Group, July 2003.

[5] The PC as a Multimedia Platform, 2004 Parks & Associates

in which consumers can enjoy digital content, regardless of the source, across various devices and stream it to any location throughout the home and beyond. This vision bridges what until now have been islands in the home — the CE island inhabited by TVs, stereo systems, broadcast media and so forth, and the PC island populated by Internet content and broadband connections — and integrates them by means of a seamless, interoperable home network.

"Interoperable" is the key word in that sentence. To unlock the door to the digital home, consumers need media-sharing technologies that make their digital devices easy to use, easy to connect and easy to share, resulting in an exceptional entertainment experience.

Getting From Here to There: Intel's Role

Aligning the CE and PC Industries

Intel recognizes that making the digital home happen requires a commitment on several fronts. The company's foremost commitment consists of working with PC and CE industry leaders to develop guidelines and specifications for interoperability because historically these two industries have followed independent product development paths. Consequently, their products weren't built on the same technologies, and didn't work together.

To help remedy this problem, earlier this year Intel spearheaded the formation of a blue-chip, cross-industry group to collaborate on standards-based specifications for accelerating the development of interoperable products. The Digital Home Working Group (DHWG), formed in June 2003, aims to simplify the sharing of digital content among networked CE devices, mobile devices and PCs. Group members are working to deliver technical design guidelines for vendors to use in developing digital products that can share content through wired or wireless networks in the home. Affected products include PCs, TVs, set-top boxes, printers, stereos, mobile phones, PDAs, DVD players and digital projectors.

The effort to create DHWG guidelines is in keeping with Intel's longstanding pledge to develop industry specifications. Intel has been instrumental in helping to drive numerous key enabling technologies that vendors routinely design into products so they will work together, including Universal Plug and Play (UPnP), Universal Serial Bus (USB), Serial ATA and the 802.11a wireless networking standard, popularly known as Wi-Fi.

Conducting User-Centered Research & Development

At a time when the economy has forced many manufacturers to scale back on their investments in new product research and development, Intel continues to raise the bar by

accelerating innovation in this area. Intel's R&D efforts combine its core competency in technology development with outside-the-box thinking, consumer feedback and input from market intelligence, ethnographic field work, product research and industrial design. The result is a user-centered design process that generates tangible product concepts and usage models based on real consumer needs.

Recent products steered to market through this inventive process are the Gateway 610 Media Center PC and the Linksys Digital Media Adapter, both built on Intel-based designs.

Delivering Silicon

With its heritage of continuous technology advancement and infrastructure-enabling expertise, Intel is delivering core technologies for new computing devices, networking products and consumer electronics to advance the digital home experience for people worldwide.

Intel recognizes that delivering high-performance processors and chipsets for home devices is crucial to making the digital home a reality. One of Intel's silicon building blocks is the Intel® Pentium® 4 processor supporting Hyper-Threading (HT) Technology. HT Technology makes this processor ideal for digital home multitasking. For example, a consumer can play an intense 3-D game on his home office PC while simultaneously using the same PC to wirelessly transfer digital video of his son playing soccer to the TV in the family room.

Developing Technologies for CE Devices

Intel's role in bringing about the digital home also includes addressing the CE industry's need for scalable platforms that offer consumers greater ease of use and seamless access to their digital media. Intel focuses on developing silicon building blocks, reference designs and software stacks for CE devices, such as digital set-top boxes, digital TVs and digital video recorders (DVRs).

The industry can expect to see Intel develop more ingredient technologies for CE devices, including silicon with advanced technologies for media and video processing and developer tools based on industry standards.

Making Premium Digital Content Available

The digital home is not simply about hardware or devices; it also depends on a continuing stream of great digital content — games, music and videos — that will compel consumers to buy these powerful new digital devices. Without adequate protection, content creators simply won't

make great content available over digital networks. Grasping this imperative, Intel turned its attention to technology that lets consumers share premium content among digital devices, even when it's protected by diverse content-protection schemes.

One result is Digital Transmission Content Protection (DTCP) over IP, a specification that Intel co-developed with consumer electronics companies Hitachi, Matsushita (Panasonic), Sony and Toshiba. When built into products, DTCP over IP will allow a consumer to, for example, download a protected movie onto her PC or digital set-top box and transfer it — with the rights management solution preserved — to other home devices, such as a big-screen TV for more entertaining viewing.

Ushering in New PC Technologies

Intel also continues to develop innovative technologies and product designs for the PC platform targeted to help make devices in the digital home more fun and easy to use. Two current examples include a next-generation I/O standard called PCI Express* for dramatically improved graphics; and the Balanced Technology Extended (BTX) platform standard, a new form factor for designing high-performance consumer PCs that are cool (as in temperature), quiet and small.

In 2004, Intel plans to deliver a new technology that will make home networking easier by embedding a wireless access point and router functionality in a PC. And, Intel is making good progress with instant on/off technology, a feature that's high on consumers' wish lists.

Innovative Solutions Mark Progression to Digital Home

Companies across the computer, consumer electronics and entertainment industries have a part to play in laying the foundation for the digital home, and many are bringing to market products and services that support the vision of exciting new consumer usage models. The stage is already set with a fair number of innovative media-sharing products and technologies that are here today or will be soon.

One of the hottest new product categories certain to help make the digital home real is the digital media adapter. Available today for less than $200, this product enables consumers to wirelessly transfer digital music, photos and/or video from their PCs to TVs and stereos outfitted with the adapter. For example, instead of showing pictures of a child's soccer game on a 15-inch PC monitor, consumers could wirelessly send the digital images to a big-screen TV so the whole family could view them from the sofa. Or, to ease the cleaning-out of a downstairs closet, a person could stream Beatles hits onto the home stereo from an upstairs PC. Over time, DMAs

will become integrated into CE products (like stereos), enabling you to quickly pick up and access your digital music collection to any room in the home.

Other cornerstone product categories and/or devices that are advancing the digital home vision include networked DVD players, smart set-top boxes, DTVs and consumer electronics PCs such as Hewlett-Packard's Media Center Edition PC* and Gateway's 610 Media Center PC*. These and other emerging digital home solutions hold not only great promise for consumers, but also new business opportunities for device manufacturers and content and service providers.

Services that enable consumers to enjoy digital media in new ways have also emerged. For example, services such as Radio@AOL* let consumers stream live radio onto the PC or to a TV or stereo by means of a digital media adapter. Rhapsody*, one of several digital music services available today, provides unlimited access to a vast library of music from all five major music labels, plus more than 200 independent music labels. From Elvis Presley and Sting to Outkast and Clay Aiken, the easy-to-use Rhapsody service features more than 400,000 songs. Meanwhile, film buffs can take advantage of services such as Movielink*, which delivers movies over the Internet for viewing on a home PC or TV. Movielink offers U.S. broadband customers a wide selection of hits, including hundreds of new releases, Hollywood favorites, classics and foreign films.

Conclusion

The PC and CE industry are riding a massive digital media wave, buoyed by consumer interest in all things digital and cross-industry efforts to satiate that interest. As seamless interoperability becomes a reality, Intel believes that the vision for the digital home will be fulfilled, creating an environment where CE and computing devices interact transparently thus setting the stage for personalized content to be delivered on any device, anytime and anywhere. To consumers, such an environment is likely to seem not just a digital home, but a digital nirvana.

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depending on the specific hardware and software you use. See http://www.intel.com/info/hyperthreading/ for more information