

BY BRIAN DIPERT • TECHNICAL EDITOR

STRIKING BACK AGAINST Song Wars

APPLE'S CONTINUED DOMINANCE OF THE DIGITAL-AUDIO-CONTENT AND -PLAYER MARKETS SEEMS INEVITABLE. THEN AGAIN, SO DID ITS DOMINANCE OF THE PC MARKET MORE THAN A DECADE AGO. HOW DOES THE MICROSOFT-LED AUDIO ARMY PLAN TO COUNTERATTACK, AND HOW MIGHT APPLE REPEL ITS CHARGE?



“I’m planning to spend some serious money; I intend to outmarket everyone. The MP3 war has started, and I am the one who has declared war.” These belligerent words were attributed to Creative Technology’s Chief Executive Officer Sim Wong Hoo at a press conference in Singapore last November 17 (**Reference 1**). A more recent broadside from Samsung echoed those sentiments. As the *Korean Times* reported in its March 17, 2005, edition, Ahn Tai-ho, senior executive director of Samsung Electronics and chief executive officer of Samsung’s digital-audio-device and home-theater-system manufacturing subsidiary, indicated that “Samsung Electronics has set its worldwide MP3 player sales target to over 5 million units this year. By shoring up our digital-audio-device business, we will grow into the world’s top MP3 player vendor by 2007” (**Reference 2**). Sony, too, has aspirations of dominance in the digital-audio market, though its execution of its multiyear-old vision has, to date, been uninspiring (see **sidebar** “Walkman redux?”).

Their common enemy? Apple. That fact will be of no surprise to any of you who have noticed the plethora of white ear buds worn by so many passersby (see **sidebar** “By the numbers”). I counted them on one in five sidewalk strollers during a 30-minute time span one morning in San Francisco. A mid-March report from iSuppli predicts a robust 29.1% compound-annual-growth rate for digital-audio players through 2009. JupiterResearch Vice President and Senior Analyst David Card reiterates that prediction. He forecasts that digital-audio-player sales will increase 35% this year to 18.2 million units from 16.2 million units in 2004 and that by 2010 there will be an installed base of 56.1 million units (**Figure 1** and **Reference 3**). “Historically, any new device or medium that reaches a US household penetration of 15 to 20% creates a critical mass of customers for other products and services,” he says. Card predicts that digital-audio players will reach this critical-mass threshold by year-end. In-Stat is equally optimistic about sales of online music, forecasting that the worldwide market will grow 134.4% this year to \$1.65 billion and, by 2009, to nearly \$10 billion.

How much of this vigorous future growth will Apple capture, or, perhaps more accu-

THE IPOD EMPIRE





AT A GLANCE

- ▶ Apple's audio division has executed well in a quickly growing market and today holds a dominant position that competitors will be hard-pressed to address.
- ▶ DRM (digital-rights-management)-inclusive audio tracks curb consumers' future player choices.
- ▶ Feature profusion and price reductions distinguish competitors' offerings.
- ▶ A storage conversion is under way to smaller format hard-disk drives and, perhaps eventually to flash memory.
- ▶ Processor and display differentiations and developments reveal differences of opinion in future platform evolutions.

rately, *won't* Apple capture? The company's market domination and momentum might, at first glance, seem unstoppable. Then again, in 1992, Apple's share of the PC market hit a peak of 12%; its estimated share today is a quarter of that pinnacle. Some forecasters think that past Wintel-versus-Apple PC trends, along with Apple's reluctance so far to license its FairPlay DRM (digital-rights-man-

agement) technology—with analogies to its past reluctance to license its computer OS and hardware designs—prophesy that the iPod-plus-iTunes market momentum will eventually also peter out. Rio's Peter Zan, director of product marketing and programs, puts it this way: "Apple's biggest problem is, ironically, the same thing that got them to where they are now: Steve Jobs." However, whereas natural evolutions in computer hardware and software compel users to upgrade—and, therefore, open the door to a platform switch—every few years, a similar natural upgrade cycle doesn't exist for consumers who are content with two-channel Red Book CD-like audio quality. Therefore, these consumers aren't motivated to repurchase content they've already bought. How strong a long-term platform lock, therefore, do 350 million (as of early April) DRM-bound iTunes Music Store downloads represent?

One way to determine the barrier to Apple's competitors is to look at the approximately 15 million iPods sold through the end of March. If you assume that each iPod owner has purchased an average of two iPods and that a high percentage of iTunes Music Store-track downloads end up in iPods, you end up with an average of around 50 tracks owned—and, therefore \$50 spent—per person through the first quarter of 2005. Microsoft's Windows Media Group Man-

ager David Caulton has conducted a market survey whose results give a different slant on this data. Caulton claims that less than 25% of iPod owners are buying *any* content from the iTunes Music Store and that most files now stored on iPods are DRM-free, MP3-encoded tracks that users can migrate to other players. Online purchases, Caulton points out, are also only around 2% of the worldwide sales of CDs. "The digital-audio market is the equivalent of the PC industry in 1982 to 1984," Caulton says. "It has crossed the chasm in awareness but not in adoption." But you knew he'd say that, right?

PAINT APPLE PROPRIETARY

AAC (Advanced Audio Coding), which iTunes uses, doesn't represent an unstoppable barrier to industry adoption; it's industry-standard, and any company can obtain access to it through Via Licensing (Reference 4). However, the FairPlay DRM, which iTunes also uses, is a different matter. Take Roku, for example. The company has licenses to Apple's Rendezvous (now Bonjour) and DAAP (Digital Audio Access Protocol) technologies for its PhotoBridge and SoundBridge networked-media players, along with its OEM-licensable software and SoundBridge WiFi Media Module. Hence, one might assume that Apple would also grant Roku a license for its FairPlay DRM scheme. However, accord-

WALKMAN REDUX?

Sony's first public admission of its digital-audio aspirations occurred at the 1999 Comdex show, during then-Chief Executive Officer Nobuyuki Idei's keynote speech. With the demo assistance of guitar virtuoso Steve Vai, Sony unveiled the Memory Stick Walkman and the, for those days, high-capacity, 64-Mbyte Vaio Music Clip. The business was Sony's to win or lose, and lose it Sony's hardware division did, the victim of a slow-moving corporate culture and a paranoid sibling

content division. Until recently, Sony's players, which now also support MP3, supported only the company's proprietary ATRAC (Adaptive Transform Acoustic Coding) compression algorithm. Sony's players' embrace of MP3 is still imperfect (Reference A). And, to this day, Sony's Connect online music service is an ATRAC-only play, one that also employs the proprietary MagicGate DRM (digital-rights management).

Can Sony turn around its digital-audio fortunes?

Key to the answer is Sony's recent revamping of its upper-management team. Sony's new chairman and chief executive officer, Howard Stringer, is the former chief executive officer of Sony America's Entertainment Business Group. According to his bio on Sony's Web site, Stringer had "responsibility for developing the strategic linkage between the entertainment and electronics businesses, and furthering the company's content businesses worldwide" (Reference B).

Can Stringer replicate his past US success on a worldwide basis in a job in which he sets rather than implements corporate direction? Will he continue Sony's past prioritization of its music assets, or will he open his hardware content to competitors' tunes? Only time will tell.

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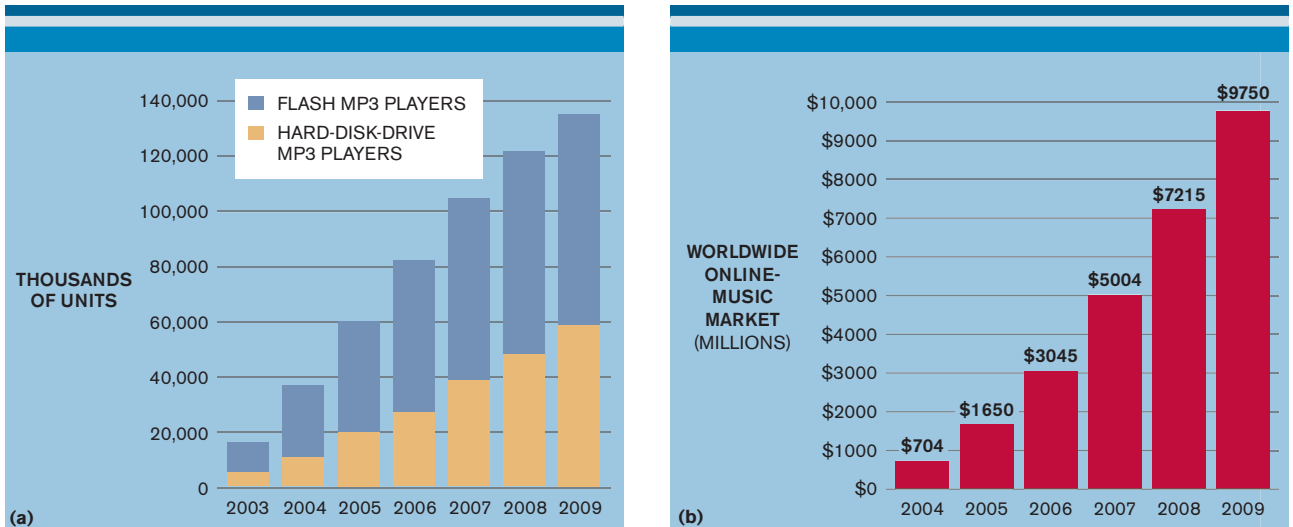


Figure 1 Market projections for sales of digital-audio players (a, courtesy iSuppli) and content (b, courtesy In-Stat) forecast a rosy future.

ing to Roko Founder and Chief Executive Officer Anthony Wood, “although we asked for a license, we were refused—politely, but refused.” By press time, Apple had not granted any company legal access to FairPlay; Hewlett-Packard also offers iPods and has an approximately 2% market share, but the company simply resells Apple-developed products.

Microsoft and RealNetworks, among others, brand Apple’s unwillingness to share its DRM secrets with the broader music marketplace as the actions of a monopolist. Their arguments seem to have caught the ear of the US Government; a congressional subcommittee on April 6 held a hearing on digital-music interoperability and availability. Although the subcommittee reportedly invited Apple to attend, it declined (Reference 5). Microsoft and RealNetworks’ accusations might hold more water if many people didn’t view the two companies themselves as monopolistic. And, pragmatically, the arguments of Apple’s competitors also assume a level of technical sophistication and long-term perspective that the average consumer may not possess, particularly in light of the iPod’s short-term allure.

Late last July, RealNetworks announced that it had reverse-engineered FairPlay so that customers of its RealRhapsody service could transfer acquired tracks to iPods through the company’s Harmony codec- and DRM-transcoding technology. Apple’s response was immediate and fervent (Reference 6): “We are

stunned that RealNetworks has adopted the tactics and ethics of a hacker to break into the iPod, and we are investigating the implications of their actions under the DMCA [Digital Millennium Copyright Act] and other laws. We strongly caution Real and their customers that when we update our iPod software from time to time, it is highly likely that Real’s Harmony technology will cease to work with current and future iPods.” Saber-rattling aside, RealNetworks’ chief strategy officer, Richard Wolpert, claims that Apple has

never sued his company and that Harmony currently supports every iPod except the iPod Photo. (RealNetworks has subsequently also restored compatibility with the iPod Photo.) Until RealNetworks legally acquires a FairPlay license, though, the company’s service will likely always be under a cloud of uncertainty, one iPod-firmware revision away from Apple’s locking it out.

The iTunes Music Store isn’t without its own clouds of uncertainty. Sony, for example, is both a music-content-rights holder and, with Connect, an online content provider. If Connect becomes more popular, will Sony restrict or block access to its labels’ content on the iTunes Music Store? Also, a number of utilities have circumvented FairPlay. For example, Hymn is the successor to a program amusingly called PlayFair, and Jon Johansen developed DeDRMS (decryption of DRM system). Johansen’s nickname is DVD Jon because of his DVD-encryption-evading DeCSS (decryption-of-content-scrambling system). Both Hymn and DeDRMS, as well as Apple’s own iMovie application, strip the encryption data from a downloaded music track. Another program that Johansen co-authored, PyMusique for Linux, takes advantage of the fact that Apple doesn’t add FairPlay encryption to iTunes Music Store files until after a consumer downloads and stores the tracks on a destination PC hard drive. PyMusique inserts itself between the server and the iTunes client and blocks FairPlay DRM-data insertion. The



Figure 2 Microsoft’s PlaysForSure (a) and Apple’s Made for iPod (b) logos both promise a positive consumer experience.

BY THE NUMBERS

Some extracts from Steve Jobs' Jan 11, 2005, keynote address at the San Francisco MacWorld Expo provide tangible evidence of Apple's current dominance in the digital-audio market (Figure A and Reference A). Jobs claimed the following:

- Cumulative downloads from the iTunes Music Store had reached 230 million and were currently at a 1.25 million-per-day rate, extrapolating to 500 million downloads per year.

- The iTunes Music Store had achieved and had consistently held a 70% market share throughout 2004.

- Whereas the company had sold more than 733,000 iPods in the 2003 holiday quarter, in the 2004 holiday quarter it sold more than 4.5 million iPods, representing a 500% year-to-year growth rate and translating to more than 10 million iPods sold to date with more than 8 million sold in calendar year 2004 alone.

- Third parties had so far introduced more than 400 accessories for the iPod product family.

- Since the unveiling a year earlier of the iPod mini, based on a 1-in. hard-disk drive, Apple had captured a significant share of the flash-memory-player market. (Apple did not respond to repeated requests for the source of Jobs' market-share data.)

More recent follow-up data from Apple extended the company's string of success stories. On March 2, Apple announced that iTunes Music Store downloads had passed the 300 million threshold, and, on April 13, as part of its second-fiscal-quarter earnings announcement, Apple

revealed that iTunes Music Store downloads had passed the 350 million milestone. Here's another telling quote from the company's first-quarter earnings release: "Apple shipped 1,070,000 Macintosh units and 5,311,000 iPods during the quarter, representing a 43% increase in CPU units and a 558% increase in iPods over the year-ago quarter" (Reference B).

The earnings report reveals that iPod-hardware sales represented slightly more than 31% of Apple's total revenue for the quarter. During the earnings briefing, Apple Chief Financial Officer Peter Oppenheimer and Executive Vice President of Worldwide Sales and Operations Tim Cook estimated that Apple had captured more than 43% of the US flash-memory-based-player market, after less than one quarter's worth of iPod Shuffle sales, along with a No. 1 share of that market for February, according to NPDTechworld (Reference C). Cook and Oppenheimer also reported that Apple had a 90% share of the hard-drive-based music-player market.

Rio's vice president of product marketing, Daniel Torres, discounts the significance of Jobs' claim that third parties had introduced more than 400 iPod accessories. (The company upped this figure to more than 500 for the second-fiscal-quarter-earnings briefing.) Torres' market analysis reveals that more than 200 of these items were cases of different color, style, and vendor variants,

and 100 more were headphone-jack-based and therefore audio-player-generic peripherals. He also points out that Apple's recently announced Made for iPod branding program, along with the potential that Apple will introduce an accessory after a partner works to create a market for it, may chill the forward-looking industry embrace of the iPod. (One example is Apple's recently announced iPod Camera Connector, a concept that Belkin last year premiered.)

Apple positions Made for iPod as a means of protecting iPod owners from unscrupulous accessory suppliers but is also reportedly a convenient way for Apple to extract a 10% tariff from its accesso-

ry partners. Torres does begrudgingly admit, however, that even 100 iPod-proprietary, mostly dock-derived hardware accessories represent an impressive show of industry support. Judge for yourself: A 102-pg buyer's guide is freely downloadable from the iPodlounge Web site (Reference D).

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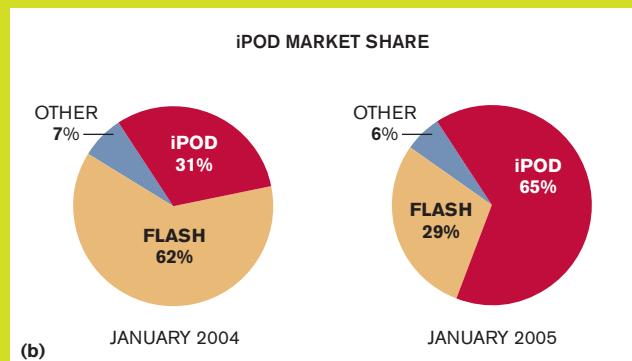
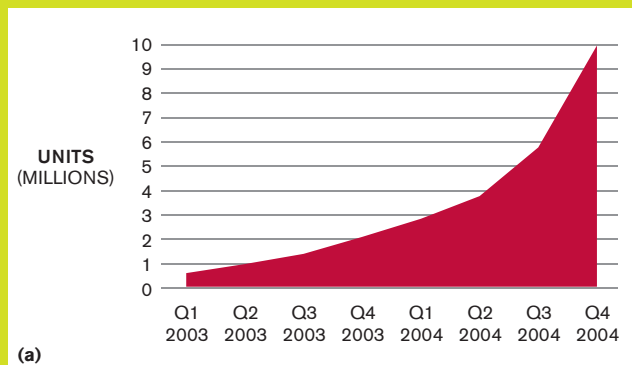


Figure A Apple's iPod sales are on a steep upward ramp (a), and the company hopes to capture a significant portion of the flash-player market with its iPod Shuffle (b).

SharpMusique variant, developed under the C# language and, therefore, Windows-executable, is also available.

The participants in the Microsoft-led PlaysForSure program base it on the company's Windows Media codec and DRM scheme, but it's not an all-Microsoft play (Figure 2). PlaysForSure, whose intent is to reassure consumers that their PCs, digital-audio players, and content will smoothly interoperate, encompasses numerous portable- and networked-player manufacturers, player-building-block suppliers, and content-service providers. It's reminiscent of the differentiation- and innovation-permitting ecosystem that Microsoft has assembled around its Windows operating systems for PCs or its Windows Mobile OSs for Pocket PCs, Pocket PC Phones, and Smartphones. Although crackers have several times temporarily circumvented the Windows Media DRM, Napster Chief Technology Officer Bill Pence points out that it exhibits two key characteristics that FairPlay appears to lack: revocability of infringing clients and renewability to prevent further infringement (Reference 7). Apple declined to provide any details of its DRM scheme.

SARCASM RECONSIDERED

The iPod Shuffle is a classic case study in successful synergy among a company's design, manufacturing, and marketing divisions, the latest in a long line of such examples from Apple. Chief Executive Officer Steve Jobs, who just the year before had sarcastically dismissed the idea of a flash-based portable audio player, became mindful of criticism that Apple's iPods were more expensive than competitors' offerings. As a result, in January, he unveiled products that, at \$99 for a 512-Mbyte device and \$149 for a 1-Gbyte unit, were competitively priced. The two iPod Shuffle variants were also particularly attractive to parents tired of children's incessant appeals for an iPod but unable to stomach the higher prices of hard-disk-drive-based variants. However, Apple omitted the LCDs, FM radios, memory-card slots, and other features users find in competitors' players. The company also simplified the user interface, reducing the number of necessary buttons, thus again slimming the Shuffle's cost and maximizing profit. Then it was



(a)



(b)



(c)

up to Apple's marketers to rebrand "random-play" mode as "shuffle" and transform the missing LCD from a vice to a virtue with slogans such as "life is random," "give chance a chance," and "enjoy uncertainty."

Researcher iSuppli recently published an analysis of the 512-Mbyte variants of the iPod Shuffle and Rio Forge Sport. The company estimated a materials cost for the iPod Shuffle of \$43.21 and a total cost, including manufacturing, of \$45.37; it estimated a materials cost for the Rio Forge Sport of \$50.34, or \$52.76, including manufacturing costs. This cost differential occurred despite the Rio Forge Sport's use of an older and presumably lower priced SigmaTel audio processor. The researcher also stated that the iPod Shuffle achieves its compact size partly through a high-density design that places components extremely close together. The density of the iPod Shuffle design is higher than that of the Rio Forge Sport and dozens of other handheld devices, including mobile phones and PDAs, which iSuppli had dissected. The iPod Shuffle also uses ultrathin chip-scale-packaged semiconductors; iSuppli stated that this was the first time it had encountered this packaging technology in electronic equipment that it had analyzed (Reference 8).

How do other companies compete with Apple's combination of brand allure and design, manufacturing, and marketing

Figure 3 If imitation is the sincerest form of flattery, then Apple must be pleased with Luxpro's Super Tangent (a), whose looks are reminiscent of an iPod Shuffle (b). PortalPlayer's flash-memory-based reference design takes a different tack, with a color display and still-image capabilities (c).

savvy? Phil O'Shaughnessy, global head of press relations for Creative Technology, says, "Our strategy is simple. We offer customers equivalent features at a lower price and more features at a comparable price." Other vendors' products with a similar

SWEET AND SOUR SOUNDS

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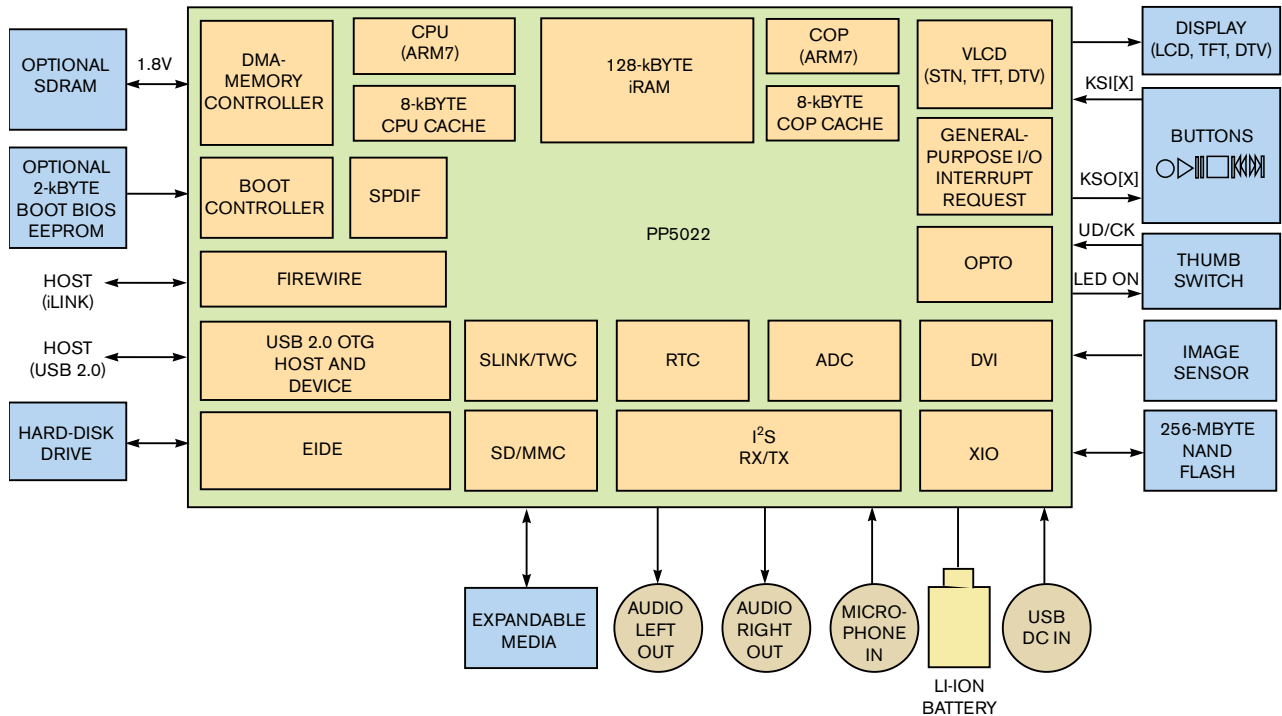


Figure 4 The highly integrated PortalPlayer PP5022's use of a low-current, 0.13-micron process leads to significant power savings.

storage capacity to Apple's players frequently tout attributes such as FM radios and FM recording ability; line and microphone inputs or a built-in microphone, again with recording capability; displays; replaceable batteries instead of limited-cycle embedded battery packs; capacity expansion using removable memory-card support; surround-sound virtualization; and the ability to store calendar, contact, task, and other data from Outlook (references 9 and 10).

Microsoft's "Six Tips For Buying an MP3 Player with Flash Memory" predictably highlights features that partners' products offer and the iPod Shuffle doesn't (Reference 11). LuxPro takes imitation to the extreme with its Super Tangent, which it originally called Super Shuffle but renamed in response to pressure from Apple's legal team (Figure 3). The Super Tangent doesn't do FairPlay or AAC, but it does handle MP3 and WMA, including DRM-inclusive WMA files, and it also supplies an FM-radio and voice-recording capability. In attempting to offer lower prices than Apple and each other, competitors are treading a dangerous path of consumer confusion and back-

lash as they make reactive claims about their players' song-storage capacities. Dell players, for example, translate megabytes to more consumer-friendly number-of-track specifications, assuming a 64-kbps bit rate and four minutes per track. Apple conversely benchmarks its players using a 128-kbps-bit-rate assumption; Rio straddles the fence by publishing both 64-kbps WMA and 128-kbps MP3 song-count estimates.

THREE WILL SURVIVE?

Sandisk's director of retail-product marketing, Eric Bone, forecasts that, in the long-term, only three main suppliers will survive the inevitable flash-memory-based-player business shake out: Apple, Sony, and Sandisk. Samsung and the Sandisk/Toshiba alliance are the primary suppliers of the NAND flash memory now predominant in these players, giving the three companies important cost advantages over Apple, which has to absorb the NAND-flash suppliers' markups. Bone estimates that flash memory is a density-dependent approximate 80% of the total cost of a player, and iSuppli's analysis bears out his statement. "Within a month of

entering the market last year, Sandisk captured the No. 1 market-share position," he says, a spot it held until Apple in January unveiled the iPod Shuffle.

Bone also points out that none of today's audio-processor chip sets implement the error-detection and -correction functions that support MLC (multilevel-cell) NAND-flash memory. When manufacturers begin to add this feature, the price reductions will accelerate. As an interim bridge, Sandisk plans to roll out players that embed TransFlash cards, whose integrated controllers manage the MLC NAND-flash memory also inside the cards, and communicate with the rest

GET PERPENDICULAR

For an entertaining audio-visual introduction to perpendicular-recording technology in hard-disk drives, point your browser at www.hitachigst.com/hdd/research/recording_head/pr/PerpendicularAnimation.html. Before you do, make sure to install Macromedia's Flash player, plug in your speakers, and crank up the volume. What will Hitachi's marketers think of next?

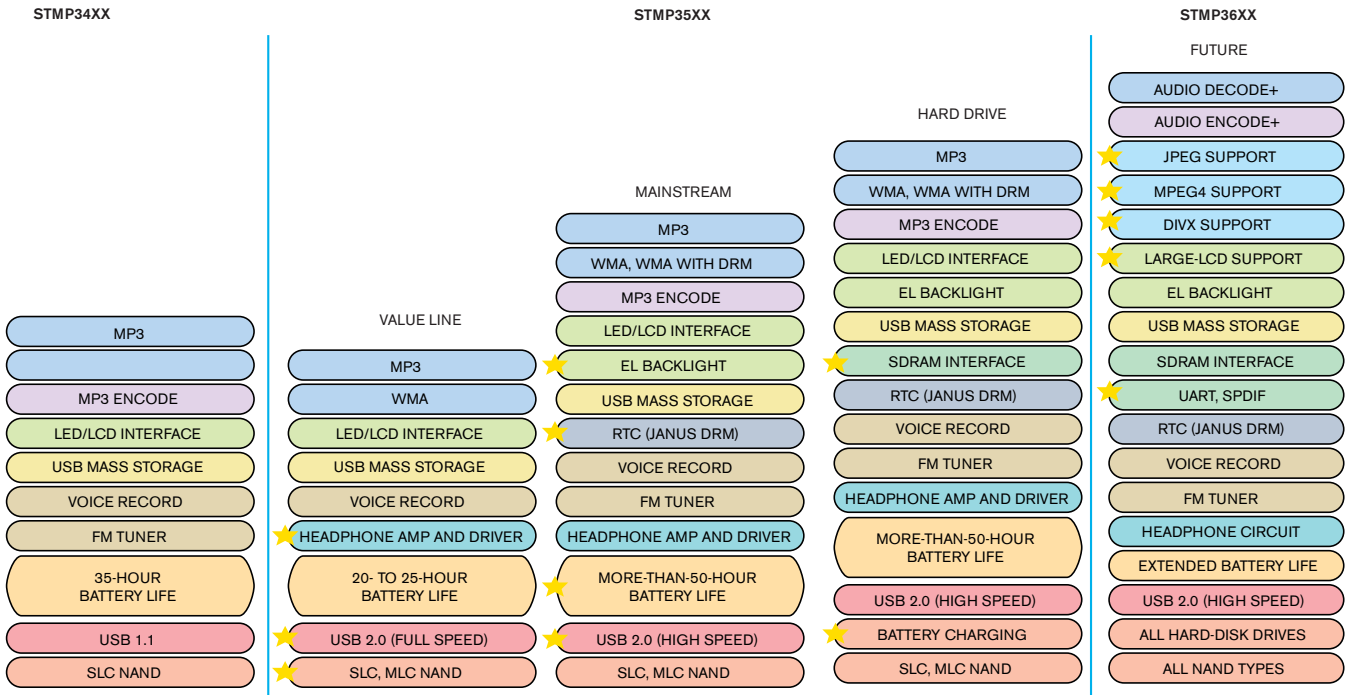


Figure 5 SigmaTel's road map includes an ARM9 transition and increasing levels of integration.

of the system over an SD Card-derived interface. Sandisk has also added removable memory-card interfaces to its second-generation and future players, providing the company with yet another potential revenue stream.

Turning the spotlight to hard-disk-drive-based players, consumer-electronics giants Samsung and Toshiba also make hard drives, although Samsung doesn't yet offer 1.8-in. and smaller variants. Much of the initial success of the iPod was due to the gamble Apple and Toshiba took on the then-nascent 1.8-in.-hard-disk-drive form factor. (Creative Technology and other companies were then using bulkier but more mature 2.5-in. drives.) The svelte iPod's success left few 1.8-in. drives available for anyone else until supply and demand eventually became more balanced. Hitachi, Seagate, and Toshiba plan to move their portable hard drives to perpendicular, or vertical, recording technology over the next few years; Hitachi hopes to offer 2.5-in. drives that incorporate the capacity-boosting approach by year-end and to unveil a 20-Gbyte, 1-in. hard-disk drive by early 2007 (see sidebar "Get perpendicular"). Toshiba's 4-Gbyte, 0.85-in. hard drive just entered production, and Samsung hopes to begin shipping a 4-Gbyte, 0.85-in.

hard-disk drive during the next quarter.

Western Digital's recent entry into the 1-in.-hard-drive market, joining GS Magicstor, Hitachi, and Seagate, has improved the likelihood of adequate supply for all. If Napster To Go and alternative subscription-based services take off, a 0.85- or 1-in. drive's capacity may be all that a player needs; this application's demand for 1.8-in. units may evaporate. Or, taking obsolescence to the next step, hard-disk drives may disappear by decade's end if the predictions of Jim Handy, analyst for Semico, are correct. In his presentation at January's Storage Visions conference, which preceded the Consumer Electronics Show in Las Vegas, Handy observed that a hard-disk drive has a capacity-independent fixed cost derived from platters, heads, motors, chassis, and the like, whereas semiconductor memory's cost is more linearly related to capacity. When a 4-Gbyte flash-based player costs the same as its equivalent-capacity hard-disk-based alternative, why would customers choose the bigger, bulkier, less rugged, and more power-hungry option if that's all the capacity they require?

ADDING TO THE PICTURE

Audio-processor suppliers' product road maps reflect diverging perspectives

on how the player platform will evolve over time. PortalPlayer's primary focuses are integration and power savings; the company has embedded hardware-acceleration-function blocks for still-image processing in its latest generation dual-core, ARM7-based PP5022, along with image-sensor and USB OTG (On the Go) support. Also, a migration to a low-voltage, 0.13-micron process enables the implementation of additional onboard memory and significantly reduces power consumption (Figure 4). Apple heavily touts low power consumption in its promotional materials for its second-generation iPod Mini. PortalPlayer partnered with austriamicrosystems, which developed a companion 0.35-micron, mixed-signal chip, to produce the PP5022-based, dual-die PP5024 device, which also handles audio amplification and mixing, power management, and battery-charging functions (see sidebar "Sweet and sour sounds").

SigmaTel is pushing performance; the company is moving from a proprietary DSP core to an ARM9 processor, and it will over time beef up its integrated-peripheral set to address divergent platform requirements (Figure 5). According to Brad Hale, director of marketing, and Bobbi Bone, marketing manager for Sig-

maTel's portable system-on-chip group, the company's system partners will enhance their players to harness the ARM9 core's performance. Added functions may include still-image playback with fast picture-to-picture transitions, high-quality video playback, still- and video-image capture, gaming and telephony, and digital-satellite and terrestrial-radio reception. In the company's current product line, all chips except the 3502 integrate the real-time-clock function necessary to implement Windows Media 10 DRM-based subscription services, such as Napster To Go.

Texas Instruments offers dual, parallel product lines for audio-only and audio-plus-imaging systems; the audio-plus-imaging parts also find use in customers' digital still cameras and videocameras. TI's most recent, early 2005 audio-DSP introduction for the TMS320DA295 exemplified the company's primary focus on cost. The chip, which, unlike its predecessor, integrates a headphone amplifier and stereo DAC, was a relatively minor part of the pitch. Instead, TI heavily promoted the production-worthy reference designs that it based on the part. "OEMs are experiencing more time-to-market pressure," says Marketing Manager Kevin Hawkins, "so TI has developed two reference designs that can be taken to market as is, or the OEM can choose to further customize them to differentiate their product and make it their own." Bundling deals provide another common means of lowering the price-driven barriers to entry. In such deals, for example, a content provider gives away or significantly subsidizes an audio player in exchange for a guaranteed one-year or multiyear subscription agreement. Such strategies clearly work for cell phones, and there's no reason that they shouldn't work for audio, too.

Although the iPod Shuffle dispensed with a display, many other manufacturers' product plans are headed in the opposite

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direction. By means of analogy, although color displays' benefits became most evident with the emergence of camera-inclusive cell phones, many consumers were willing to trade off the higher prices and reduced battery life of color-display-containing phones simply for products that they felt were more eye-catching and readable. Similarly, flash- and hard-disk-based players with color displays are beginning to appear in tangible numbers: iRiver's H10 is available, and Creative's OLED (organic-LED)-inclusive Zen Micro Photo should hit the market in July (Reference 12).

Apple is not standing still in the face of this competitive onslaught. The company now offers only one monochrome, 20-Gbyte iPod based on a 1.8-in. hard disk. Last October, Apple introduced the 40- and 60-Gbyte iPod Photos at \$499 and \$599, respectively. Both products are now \$150 less expensive, and the \$499 variant is also 10 Gbytes slimmer. With the price reduction, the company removed several previously included accessories, such as a dock, from the box. Apple is also broadening its color-display pitch to encompass not only photo storage, but also album viewing and the more general easier-to-read attribute.

PRESS "PLAY" TO CONTINUE

The PlaysForSure alliance hopes to turn—and Apple hopes to repel—the tide in several other key areas. For one, PlaysForSure plans to stress the interoperability of audio content not only in PCs and portable audio players, but also in PDAs, cell phones, LAN- and WAN-connected media adapters, and other devices. It also hopes to change the rules of the game with subscription-based services and to expand the platform beyond audio and still imaging into video and other functions. **EDN**

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