8

Dangerous Intersections

When you're playing Bobby Fischer—and you want to win—don't play chess. Make sure whatever game you're playing—be it network delivery of media vs. stand-alone PC, whatever you're in—that you're not playing a game someone else has mastered when you have an option to play another game.

—*Rob Glaser, Founder of RealNetworks, May 2001*[1]

INSIDE THIS CHAPTER

· The elements of digital media platform technology

· The major players and their diverse business models

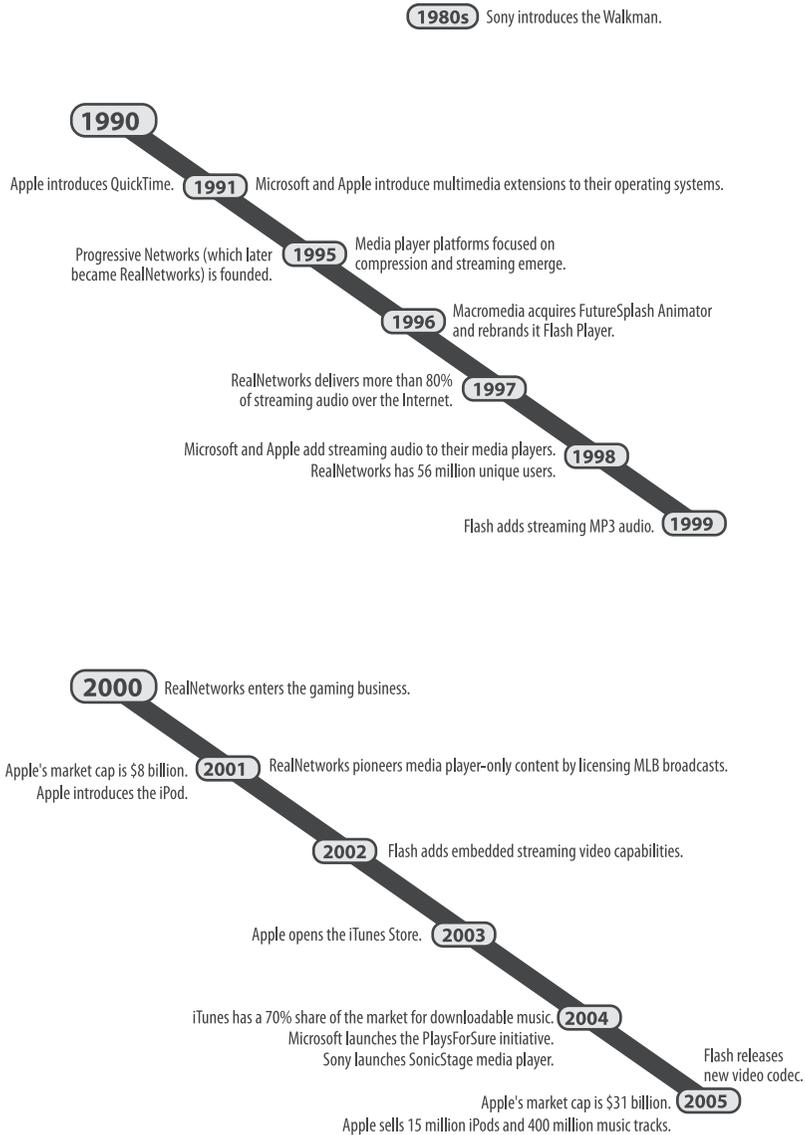· Competition among intersecting digital media platforms

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White headphones dangle from the ears of many employees at the Microsoft campus in Redmond, Washington. These almost always connect to iPods. Apple had sold 15 million of these digital music devices by mid-2005. Since it came on the market in 2001, the iPod has dominated the market for digital media devices with hard disks.[2]

Microsoft must find this grating. iPod users live in an almost entirely Apple world when it comes to music. Apple makes the devices with its proprietary digital software system built in. While iPods can be used with Windows-based personal computers, iPod owners can download music from their computer into their iPods and manage their iPod music only

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1. Amy Johns, "If I Knew Then What I Know Now: Rob Glaser vs. Goliath," *Business 2.0*, May 30, 2001.

2. Apple 10-Q, 2nd Quarter of the financial year 2005, p. 15.
"Apple's iPod Available in Stores Tomorrow," Apple press release, November 9, 2001 (http://www.apple.com/pr/library/2001/nov/09ipod.html).

Chapter 8: Digital Media Timeline

1980s Sony introduces the Walkman.

1990

Apple introduces QuickTime. **1991** Microsoft and Apple introduce multimedia extensions to their operating systems.

Progressive Networks (which later became RealNetworks) is founded. **1995** Media player platforms focused on compression and streaming emerge.

1996 Macromedia acquires FutureSplash Animator and rebrands it Flash Player.

RealNetworks delivers more than 80% of streaming audio over the Internet. **1997**

Microsoft and Apple add streaming audio to their media players. RealNetworks has 56 million unique users. **1998**

Flash adds streaming MP3 audio. **1999**

2000 RealNetworks enters the gaming business.

Apple's market cap is $8 billion. Apple introduces the iPod. **2001** RealNetworks pioneers media player-only content by licensing MLB broadcasts.

2002 Flash adds embedded streaming video capabilities.

Apple opens the iTunes Store. **2003**

iTunes has a 70% share of the market for downloadable music. Microsoft launches the PlaysForSure initiative. Sony launches SonicStage media player. **2004**

Flash releases new video codec.

Apple's market cap is $31 billion. Apple sells 15 million iPods and 400 million music tracks. **2005**

with Apple's iTunes application. And they can generally download music, that is paid for, from the Internet only through Apple's iTunes store.[3] (We mention some exceptions later.)

With its digital music device, Apple has again followed a single-sided, vertically integrated strategy rather than a multisided platform strategy. So far it has worked. Apple's profits have soared. The financial markets appear to believe that iPods have turned Apple around. Apple's market capitalization has increased from $8 billion in 2001, when the iPod was introduced, to $31 billion in 2005. (Compare this 280 percent increase to the Nasdaq, which rose only 7 percent during the same period.[4])

Bill Gates, though, holds the same view on the iPod as he did on the Mac. In May 2005 he conjectured:

I don't think the success of the iPod can continue in the long term, however good Apple may be. . . . I think you can draw parallels here with the computer here [sic], too, Apple was once extremely strong with its Macintosh and graphic user interface, like with the iPod today, and then lost its position.[5]

Of course, back in 1985, when Gates sent his famous letter to Jobs about licensing the Mac OS, his interests were aligned with Apple's. A bigger market for Macs would have made a bigger market for Microsoft's applications. Twenty years later Apple is one of many competitors populating handheld devices with software platforms that do not come from Microsoft. The digital media system that Apple uses for its iPod empire is one that competes with Microsoft in many dimensions. Indeed, the iPod is but one facet of competition among media platforms for encoding, streaming, playing, managing, and limiting the piracy of digital music.

3. RealNetworks has recently reverse-engineered Apple's proprietary scheme, so that currently iPod users can use the RealPlayer to purchase and transfer songs to their iPods; however, Apple has warned that future software and hardware improvements mean that this scheme may not work in the future (Brian Dipert, "Song Wars: Striking Back Against the iPod Empire," *EDN*, June 9, 2005).

4. Market Capitalization on June 22, 2005, was $31 billion, according to Yahoo! Finance. Market Capitalization Apple 10-K, 2001. The Nasdaq closed in December 2001 at 1950.4 and in June 2005 at 2091.07.

5. "Report: Gates Says iPod Success Won't Last," *ABCNews.com*, May 12, 2005.

This chapter is about that competition—one that is quite different from what we have seen for other computer platforms. Elsewhere the competing firms had similar business models and were making money on the same side of the platform. They were all playing more or less the same game. While Microsoft and Apple followed different integration strategies, for example, both earned the bulk of their revenues from computer users. With digital music systems each major player has a quite different business model and source of revenue than the other. Apple is making its money increasingly from selling hardware, while Microsoft's profits come from increased sales of operating systems, and selling content is a growing source of RealNetworks' revenues.

How these intersecting platforms (see Chapter 3) compete with each other is one of the issues we address. The lessons from the digital media player wars are relevant well beyond this narrow category. Software platforms increasingly collide with each other in a process that is sometimes called, wishfully, convergence. They are also colliding with other multisided platforms, as the faltering advertising-supported media industry can attest in the face of the onslaught from Google, Yahoo!, and other Web-based software platforms.

Digital media platforms provide a contrast in many other ways to the software platforms we have discussed thus far. They also, however, have numerous similarities. Multisided pricing strategies have been key to igniting these platforms. Finding marquee customers on one side has been key, too. And, as with all code-based products, they compete by adding features—and thus grow larger—over time. (Most of the platforms we discuss work with digital video data as well as digital audio data. We focus on the audio part of these platforms and especially its relationship to the online distribution of music. Much of what we say, though, has parallels for video and the online distribution of movies.)

Digital Music Technology

The software technology for creating, delivering, and playing back digital music files has several components that help shape competition among the digital music platforms. These are different from the technologies we have discussed thus far.

To begin with, the music has to be in digital form. Much recorded music is already digital. But the raw digital files are too big for distributing music over the Internet or downloading music into smaller devices as digital music files. For those who want to store their music on their computer hard drives, Beethoven's nine symphonies would take up 3,500 megabytes of hard disk space if they were downloaded directly from the CDs.

The invention of software-based algorithms for compressing these large digital audio files on one computer and decompressing the resulting smaller files on another computer has been critical for the use of digital music on computer networks and smaller devices. This software is called a "codec," short for *co*mpression/*dec*ompression. The codec used by iTunes, for example, reduces the size of the original file by up to 90 percent, making all nine of Beethoven's symphonies fit into a more manageable 350 megabytes.

Most codecs make the original file smaller by eliminating portions of the sound that humans cannot hear, such as very high-pitched tones, or by eliminating portions of the file that will not reduce the quality too much. The codec also pulls other tricks to make the file smaller. (Media players have separate codecs for audio and video; some have a codec only for audio.) When the user wants to listen to music, the software decompresses the file to reproduce the song as close to the original as the technology permits. (Users can often choose the degree of compression. Greater compression results in smaller files but poorer sound quality.)

After it has been compressed through one of these algorithms, audio data are put into a "container"—a data file—that can be used for transport and storage. The container file is often referred to as the format. A song stored in an MPEG container file, for example, is in the MPEG format. Most container files can contain multiple audio and video tracks encoded with different codecs. The container also has a label that describes various characteristics of the media data, including the type of compression. In the case of audio and video files this label has information that helps synchronize the audio and video tracks when they are played back. (There isn't necessarily a one-to-one correspondence between a codec and a file format; indeed,

codecs are often independent of the format. However, some pairs of the file formats and codecs have been developed jointly and are used together for legal or technical reasons. The Windows Media codecs that are usually stored in a Windows Media file format are one example.)

The container may also have information related to digital rights management (DRM). A music file downloaded from iTunes, for example, is subject to a license agreement that Apple has with the owners of the music. The agreement says that users can play a song on no more than five authorized computers but can download it to an unlimited number of iPods. After a track is encoded to reduce its size, DRM technology will also encrypt it so that it can be decrypted and played only with the proper set of keys or passwords and thus so that only authorized users can play it.

You must have a media player on your computer to be able to play audio files that you have received from a content provider over the Internet. As a practical matter, that means that you have to have installed a media player that can read the file sent by the content provider and decompress it. Your media player must be compatible with the format and codec used by the content provider. Moreover, it must also understand the DRM technology if one is used. The firms that make digital media platforms have, however, chosen different formats and codecs.

So how do all these components fit together?

For you to buy Charlie Parker's rendition of "Salt Peanuts" for your iPod, "Salt Peanuts" takes the following journey. For iTunes to carry "Salt Peanuts," Apple has to have a deal with the Savoy Jazz music label, which owns the right to this track. Most likely Apple has worked out a deal with Savoy Jazz for many of its songs. Apple provides the publisher the iTunes Producer tool (including the "signed iTunes labels") to encode their music using the AAC codec. After Savoy Jazz has encoded the master tracks of the songs that it has agreed to distribute through iTunes, it provides iTunes with these encoded tracks for distribution. (It is possible that Apple rather than Savoy does the encoding.) Apple uses its media system software to put it on its servers in an MPEG format file, the container used by iTunes Music Store.

You now have to have iTunes software installed on your computer to buy "Salt Peanuts" from Apple and download it onto your machine. (You couldn't have used another media player to download the iTunes song. Even though it would probably understand both the MPEG format and the AAC codec, Apple uses proprietary DRM technology that prevents other players from playing that track.) After you pay the 99 cents for the track, Apple's web server will deliver the song to you over the Internet, along with the keys needed to unlock the DRM protection. The iTunes software arranges to store it on your hard drive.

You can use the iTunes software to play "Salt Peanuts" on your computer as often as you want. Each time you listen, iTunes retrieves information from the file, decrypts and decompresses the audio data, and plays the song. If you want to download it onto your iPod, you just direct iTunes to do that after connecting your iPod. But your iPod has its own software platform that coordinates with iTunes. As on your computer, if you want to hear a song, the iTunes software on the iPod retrieves the file, decrypts, decompresses, and plays. You can also download the song to other computers and devices, but the DRM will stop this if you try to do this for more than five computers.

Of course, much digital audio is not destined for an iPod, nor is it necessarily even distributed over computers. Much content still comes on CDs or DVDs. People "rip" music from these onto their computers. Their media players will most likely give them choices on the extent to which they want to compress the music. People can generally download the music from their computers onto their digital devices. So you could buy a Charlie Parker album with "Salt Peanuts" and download it onto your iPod that way—or onto your MP3 player or other digital music devices.

People also get audio and video content "streamed" to them over the Internet. They get to see or hear the content just as they would watch a movie on television or listen to a radio broadcast. It is possible to listen to hundreds of radio stations over the Internet. Many content providers such as cnn.com offer audio clips and in some cases video clips on their sites. And this technology is being used on cable and other systems for "video on demand," which plays movies over communication networks.

As with listening to the radio or watching television, you often can't save streaming files without special tools.

Nevertheless "streaming technology" has been one of the other key innovations driving the growth of digital media systems. The audio and video signal is sent to the device and it plays an infinitesimal time after the signal leaves the transmittal device. The streaming server does this by sending small portions of the file, called packets. These are stored in a buffer on the computing device and played back. The streaming server continues to replenish the buffer. As a result, when all this works properly, the user perceives the file as playing in real time.

If there is too much traffic on the Internet, there may be a delay in replenishing the file, and the user will see that a movie has frozen or a song has been interrupted. Moreover, the quality of the playback is highly dependent on the speed of the user's Internet connection; slower speeds require the use of greater compression and thus entail greater loss of quality.[6] Indeed, streaming has become viable only because improvements in codecs have made it possible to reduce file size without sacrificing too much quality, and the spread of broadband has increased the size of the data pipe going into many homes and offices.

Many software components have helped create the now vibrant market for distributing audio and video content over the Internet. Media players are key ones and the component that most people use.

Evolution of Digital Media Systems

Software to create and manage digital audio files dates back to at least the early 1980s. Before the early 1990s, however, PCs did not have enough computing power to use media to any substantial degree.

In 1991, Microsoft and Apple both introduced "multimedia extensions" to their software platforms. These additional services, made available through APIs, provided support for media-related tasks, such as playing audio. For the most part, these early multimedia features were

6. With downloaded content, large, high-quality files can be transmitted via slower connections, albeit with correspondingly longer download times.

used by software applications for sound effects or by CD drives for playing music CDs. IBM, the other major contender in PC operating systems at the time, also introduced multimedia features into its operating system (OS/2) in the early 1990s.[7]

Apple and Microsoft evangelized the use of media-related APIs use by developers. Microsoft released the Microsoft's Multimedia Developers Kit and Apple its QuickTime Software Developer Kit. Both companies released significantly improved tools for developers and content providers starting in 1995.[8] At this point, media players were two-sided platforms, appealing to users and developers.

Interestingly, unlike many other platform services, Apple and Microsoft each ported their media-related services to each other's platforms by providing separate applications that ran on each other's platform. We return to this later in the chapter.

The Internet made another platform side possible. From the news to the blues, many Web-based businesses started providing audio and video content that consumers could download onto their PCs. The *New York Times* began to provide online content through its @Times services via AOL. The House of Blues posted interviews with artists online, as well as broadcasts of concerts.[9] Apple, Microsoft, and other media player vendors encouraged these content providers to make their content

7. "Microsoft Ships Windows with Multimedia Extensions 1.0," *Business Wire*, August 21, 1991; Erica Schroeder, "Apple's Multimedia Effort Gains Support; QuickTime Backers Meet at MacWorld," *PC Week*, January 20, 1992. IBM bundled Multimedia Extensions to Program Manager (MMPM/2) with OS/2 2.1 in June 1993 (Gabrielle Gagnon, "OS/2. IBM's OS/2 2.1 Operating System," *PC Magazine*, May 31, 1994).

8. John Sayers and Rockley Miller, eds., "A Look Back: The Year in Review," *Multimedia & Videodisc Monitor*, January 1, 1992; "Apple Ships Quicktime for Windows to Provide Cross-Platform Multimedia Standard," *PR Newswire*, November 10, 1992; "Apple Rolls Out QuickTime 2.1 for Macintosh," *Multimedia & Videodisc Monitor*, October 1, 1995; Andrew Singleton, "Wired on the Web: It's Not Just for Breakfast Anymore," *BYTE*, January 1, 1996.

9. Mark Berniker, "'*Times*' and NY 1 Team for CD-ROM (*Telemedia Week*) (includes related article on combining TV with multimedia)," *Broadcasting & Cable*, January 9, 1995; Marilyn Gillen, "House of Blues Stands at the Interactive Crossroads: (Company Forms the House of Blue Media)," *Billboard*, January 14, 1995.

available for their media platforms. Each vendor provided software that read the digital content, encoded it using their codec, and put it into a file format that their media players could read. Many content providers made content available for the major media player platforms. Media players were three-sided platforms.

Beginning in 1995, with the growing popularity of the Internet, media player platforms started emerging that focused more on compression and streaming so that users could receive music and video files over the slow telephone lines that were the predominant method of connection to the Internet in the late 1990s. Shortly thereafter, software for compression and streaming video over the Internet also started appearing. (Streaming audio technology is a prerequisite for streaming video content, which generally has a sound track.) Apple, Microsoft, Motorola, Oracle, Precept Software, Progressive Networks (RealNetworks), VDONet, Vosaic LLC, Vextreme, and Xing Technology Corporation were some of the pioneers in the creation of streaming audio and video media software. Many of these firms, largely unremembered a decade later, were acquired by other players or folded.

Among the startups, Progressive Networks, which became RealNetworks, was the main success story. Its RealAudio media player, introduced in April 1995, enabled content providers to stream audio content over the Internet and enabled computer users to play this content over the slow dial-up connections that were mainly used at that time. By 1997, RealNetworks was delivering more than 80 percent of streaming audio over the Internet.[10]

As is typical in these platform industries, firms engaged in leapfrog competition to offer better compression, streaming, and other features than their rivals. Consider the innovation that has taken place in digital media platforms since 1995. RealNetworks was the first to add streaming video to its player in early 1997. Apple followed, adding streaming audio to its media player in March 1998, and Microsoft did the same in

10. Archived news on RealAudio.com (http://web.archive.org/web/19961220180029/www.realaudio.com/prognet/prognews.html [downloaded June 18, 2005]); Thomas W. Haines, "RealNetworks Hopes to Make Real Profits When Net Matures," *The Seattle Times*, October 1, 1997.

Table 8.1
Media Player Features Over Time

Date	Product	Features Added
Aug. 1991	Multimedia Extensions for Windows	Media Player can start, stop and pause the playback of sound or animation files. Music Box can play and catalog audio CDs.
Dec. 1991	QuickTime 1.0	Multimedia extension added to Mac OS System 7. Users could combine animation, sound, and video, and incorporate the results into Macintosh applications.
July 1995	RealAudio 1.0	RealAudio 1.0 released. It can stream audio from the Internet (in the RealAudio format and codec).
Dec. 1996	Flash 1	Macromedia acquires FutureSplash Animator and rebrands it the Flash Player.
Jan. 1997	RealVideo 1.0	RealVideo released and bundled with RealAudio in RealPlayer. Plays and streams video.
May 1997	Flash 2	Adds sound capabilities, including support for synchronizing. WAV and AIFF (Audio Interchange File Format) sounds to animations.
Mar. 1998	QuickTime 3	Introduces real-time streaming of digital content over the Internet.
July 1998	Windows Media Player	Streams audio and video.
May 1999	RealJukebox	RealJukebox introduced. Users can play, record, organize, and search for music from single interface, rip CDs, find and download music from the Internet, sync with portable device.
May 1999	Flash 4	Adds streaming MP3 audio.
June 1999	QuickTime 4	Allows streaming of both live and stored video and audio over the Internet. Uses nonproprietary industry standard RTP and RTSP protocols.
Aug. 1999	Window Media DRM	Windows Media integrates DRM.
July 2000	Windows Media Player 7	Integrated a digital audio and video player, "jukebox" features, and Internet radio tuner. Capable of CD burning and copying.

Table 8.1
(continued)

Date	Product	Features Added
Jan. 2001	iTunes 1.0	iTunes, jukebox software-introduced. Users can listen to audio CDs, MP3, or Internet radio, rip CDs and store them on hard drive in MP3 format, maintain music library, burn CDs, and download songs to certain MP3 players.
Apr. 2001	QuickTime 5	Full support for MPEG-1 standard and Flash 4.
Dec. 2001	RealOne Player	Combines functions of RealPlayer and RealJukebox with a media browser. Includes support for audio and video streaming, burning CDs.
Nov. 2001	iTunes 2.0	Adds MP3 CD burning, an equalizer, and cross fading.
Mar. 2002	Flash 6	Macromedia allows developers to embed video streams for playback in the Flash Player.
May 2002	QuickTime 6	Support for MPEG-4, AAC, DVC Pro (PAL), and more.
July 2002	iTunes 3.0	Adds Smart Playlist feature—allows user to automatically create mixes from songs in music library based on chosen criteria.
Aug. 2002	RealOne Player 2.0	Supports all major file formats. Adds DVD playback support.
Sept. 2002	Windows Media Player 9	Built in support for Fast Streaming technology.
Apr. 2003	iTunes 4/ Quicktime 6.2	Integration of iTunes Music Store; music sharing between Macs. Adds DRM.
June 2003	QuickTime 6.3	Support for 3GPP enables users to share video, audio, and text on wireless devices.
Oct. 2003	iTunes 4.1	First version of iTunes for Windows.
Apr. 2004	RealPlayer 10	Supports all major media formats and codecs (RealAudio, RealVideo, AAC, MP3, MPEG-4, Windows Media, QuickTime) and the ability to play music from all major online music stores. Integrated music download store. Ability to fast forward and rewind within streams without delay, and to pause live streams. DRM included.

Table 8.1
(continued)

Date	Product	Features Added
Sept. 2004	Windows Media Player 10	Built-in Digital Media Mall gives users choice of online stores. Supports Janus DRM, which allows time-sensitive DRM (secure clock technology).
June 2005	QuickTime 7	Preview release. Supports playing and streaming high-definition video.
June 2005	iTunes 4.8	Streams QuickTime Video.
Aug. 2005	Flash 8	Integrates new video codec for improved performance.

July 1998.[11] Other companies entered with media players. Adobe's Flash became a leading media player for the distribution of video content almost overnight in 2005. Table 8.1 shows the major media player platforms that were introduced between 1995 and 2005, their capabilities, and their major components. (In addition to these media systems, a number of open-source and small commercial systems have also been introduced.)

These media player vendors were not all in the same business. They were pursuing different strategies for making money, as we see next. But they did have one important thing in common: they gave away the media players to users.

Competition Between Intersecting Platforms

Hardly anyone pays directly for using a media player. All of the major media player developers have Web sites where you can download the latest versions of their basic media players for free. So if you want to get the most recent version of RealNetworks' media player, as of June 2006 you could go to real.com and click on the free download link

11. "Progressive Networks Ships RealAudio System," RealNetworks press release, July 25, 1995; "QuickTime 3 and QuickTime 3 Pro Available Now," Apple press release, March 30, 1998; "Key Corporations, Internet Sites and Industry Vendors Announce Deployment, Support," Microsoft press release, July 7, 1998.

to get a copy of RealPlayer 10.5. Real made its stand-alone media player available for free from the start. When asked, "What's the best move you've made?" Rob Glaser, its chief executive and founder, responded, "Probably making the RealPlayer free."[12] Many PCs for home use come with several media players at no extra charge. These include the media players that are included in the Mac OS and Windows as well as several other media players, such as MusicMatch or RealPlayer. Media players are also included in other products such as music devices or services such as AOL.

Some media player vendors sell premium versions of their players. Apple, for example, charges $29.99 for a beefed-up version of Quick-Time, and RealNetworks charges $19.99 for a premium version of the RealPlayer, RealPlayer Plus. (The premium RealPlayer Plus is also available bundled with the Real SuperPass service for a fee of $12.99 a month.) But nothing suggests that any company sees media players as a significant source of revenue. The financial statements for companies such as Apple and RealNetworks do not break out media player sales, nor do they suggest that these sales provided a material source of earnings. Instead, vendors of media player software hope that through free distribution they will achieve profits from increased sales of complementary goods and services. The mix of such goods and services varies across vendors and, for some vendors, has varied across time as well.

Where Does the Money Come From?

So how do media player vendors make their money? What motivates them to make the significant investment in developing complex media platforms and giving the media players away for free? We consider the answers to these questions next. Table 8.2 summarizes the results for easy reference. Like other software platforms, media players subsidize one customer group to get other customer groups on board. Unlike other software platforms, different media software platforms secure profits from different customer groups. We illustrate this with a detailed discussion of Apple and RealNetworks.

12. Johns, "If I Knew Then What I Know Now."

Table 8.2
Sources of Revenue from Media Players

	Media Player Software (Free Version)	Media Server Software	Content Providers	Application Developers	Hardware Sales	Content Sales	Computer Operating Systems	Major Source of Profits
Apple	—	0	0	+	+	+	+	Hardware sales, and operating systems
RealNetworks	—	+	+	+	0	+	0	Content sales
Microsoft	—	0	+	+	0	+	+	Operating systems
Adobe	—	+	+	+	0	0	0	Media server sales

Apple   Apple first demonstrated the QuickTime product at an Apple developer conference in May 1991.

Apple released QuickTime as a separate add-on in December 1991 and included it as part of the Mac OS System 7 the next year. It also ported QuickTime to Windows and started shipping that version in 1994. As a result, most copies of QuickTime—and the related iTunes software introduced in 2001—run on Wintel computers and not on Macs.[13]

Apple also made the software necessary for distributing QuickTime files available for free. It eventually made the source code for its streaming server software available so that others were free to create versions for non-Macintosh servers. Like other software platforms, with the exception of video games, Apple has made the API-based services in QuickTime available to developers for free, has provided free software to developers to help them write programs using QuickTime, and has spent effort evangelizing its media platform among the developer community.[14]

This poses a mystery: How does Apple make money from its considerable investment in improving and porting QuickTime?

The inclusion of QuickTime with the Mac OS does not require much explanation. As with any feature added to an operating system, it makes the operating system more valuable to some end users and therefore tends to increase sales and possibly the price that the vendor can charge. While it is impossible to know the extent to which QuickTime increased sales of Macs, we note that a 1 percent increase in sales would generate revenues of about $50 million per year.[15] It is not a bad strategy, and it is in any case one followed by many software platforms. We return to this in Chapter 11.

Apple had to make a trade-off in considering whether to port QuickTime to Windows. On the one hand, making its media technology

13. Schroeder, "Apple's Multimedia Effort Gains Support"; Carolyn Said, "QuickTime 2.0 Now Plays on Windows," *MacWEEK*, November 28, 1994; "Apple Unveils New iMacs with CD-RW Drives and iTunes Software," Apple press release, February 22, 2001.

14. http://developer.apple.com/darwin/projects/streaming/. Apple does charge for the SDK for QuickTime.

15. According to the Apple 10-K filing for 2004, Macintosh net sales were $4,923,000,000 (p. 28).

available for free to developers and users of competing software platforms strengthens those platforms and therefore harms Apple. On the other hand, making its media player technology available for these rival software platforms encourages content providers to make content available for that technology. That in turn makes the Mac OS with QuickTime more appealing to end users. Apple presumably decided that having a popular media player for its software platform was more important than losing some sales to competing software platforms. Microsoft made the same decision.

Apple's investment in QuickTime, however, began paying significant dividends by the turn of the century when it introduced the iPod/iTunes music system. Apple introduced the now-iconic iPod in October 2001. These devices could download music (at first only using the Mac OS, and later using Windows) using iTunes. iTunes is based on the QuickTime media player and allows consumers to do many of the things they can do with other media players.[16]

Apple opened its iTunes Store in April 2003. It charged consumers 99 cents per downloaded song. Apple, however, doesn't try to earn significant profits from the iTunes Store. Instead, the iTunes store and media player platform are designed to increase sales of iPods and to some extent Macs. As we discuss later, Apple has tried to design the iTunes/iPod system so that it doesn't work with competing media players or devices. That helps ensure that Apple doesn't lose revenues to others. Thus Apple has adopted a "give away the blades and sell the razor" strategy. That pricing strategy is unique among the industries we have considered.

Apple had sold 50 million iPods by March 2006, and 1 billion music tracks by February 2006. The iPod/iTunes music system helped Apple earn record profits in 2005 and accounted for 32 percent of Apple's net sales in 2005. One brokerage firm has estimated that sales of the high-margin iPod portable players will top 24 million units in 2006.[17]

16. "Apple Unveils New iPods," Apple press release, July 17, 2000; "Apple Launches iTunes for Windows," Apple press release, October 16, 2003.

17. "iTunes Music Store Downloads Top One Billion Songs," Apple press release, February 23, 2006; Apple 10-K for financial year 2005 and quarterly statements 2006; Howard Wolinsky, "What's next for iPod? Popular gizmo may get makeover," *The Chicago Sun Times*, February 19, 2006.

RealNetworks   Rob Glaser, the force behind RealNetworks from its beginning, worked on Microsoft's media platform in the early 1990s. He left and formed Progressive Networks in early 1994. This startup launched its RealAudio Player in April 1995. In early 1996, the *Seattle Post-Intelligencer* reported that more than 3 million people had installed the RealAudio Player.[18] That was about three times more installations than Xing, its nearest competitor, had achieved.

Progressive Networks adopted two classic multisided strategies to establish its position.

First, it made its player available for free. As it noted in its first 10-K filing two years after it launched RealAudio, "From its inception the Company has strategically chosen to offer its RealPlayer software to individual users free of charge to promote the widespread adoption of its client software and speed acceptance of internet multimedia."[19] With the development of browsers and the expansion of the Internet, it was able to distribute its free player easily through Web sites where people could download it.

Second, it developed the second side of its platform, the content providers. According to the *Seattle Post-Intelligencer*, "Progressive has teamed with a host of companies and organizations to serve up a cornucopia of internet audio, from the State of the Union address to the music of Madonna and Meatloaf to a historical tour of the Oscar Mayer Wienermobile."[20] Progressive Networks gave content providers the encoder software they needed to make their content available for RealAudio.

During its early years, Progressive's main source of revenue was from the sale of RealAudio servers—the software that content providers needed to stream audio to users. And even here it appears that Progressive gave away a basic version of the server software, charging only for more advanced versions that streamed content to a large number of users.

18. http://web.archive.org/web/19961220183228/www.realaudio.com/prognet/pr/prodannounce.html; Warren Wilson, "Now Hear This: Seattle Company Leads the Way with 'Streaming Audio' for Internet Sound," *Seattle Post-Intelligencer*, February 19, 1996.

19. RealNetworks 10-K filing for 1998, p. 4.

20. Wilson, "Now Hear This."

Glaser's company changed its name to RealNetworks and went public in November 1997. Its first 10-K filing with the Securities and Exchange Commission provides more insights into the strategy followed by this innovative firm. By this time RealNetworks had expanded from streaming audio into streaming video. At that time its businesses consisted of the RealSystem for streaming audio and video, "a web-site designed to promote the proliferation of streaming media products," and a network of Web sites that were supported by advertising revenues. About 78 percent of its revenues came from software licenses. Although these aren't broken out, they appear to come mainly from licensing server software. (RealNetworks also introduced a premium version of its player in late 1996, from which it received licensing revenues.)

It made RealPlayer widely available to consumers. According to its filing with the SEC,

This strategy has been pursued through various means, such as offering the Company's RealPlayer and Basic Server free of charge over the internet, bundling the Company's products with those of other major vendors and using multiple distribution channels, including both direct sales and indirect original equipment manufacturer ("OEM") and retail relationships.[21]

In the two years since it introduced RealAudio it had made considerable progress. RealNetworks reported in its SEC filing that more than 40 million copies of RealPlayer had been downloaded, more than 260,000 Web pages had content encoded in RealPlayer, and more than 1,200 software developers had joined its development program.[22]

RealNetworks envisioned pursuing three related businesses as of 1997:

1. Licensing server software. Content providers need this software to make audio and video available to RealPlayer users.
2. Expanding its Internet commerce business for content providers and developers. At the time this included RealNetworks products, streaming media tools and utilities for developers, and training.
3. Aggregating content for streaming media. It appears that RealNetworks hoped for advertising revenue from building a network of Web sites that had streaming content.

21. RealNetworks 10-K filing for 1998, p. 5.
22. Ibid., pp. 2–20.

In light of RealNetworks' subsequent evolution, it is interesting that the company at this point in time did not seem to envision that it would make money by providing its own content.

RealNetworks quickly built a five-sided platform consisting of users, content providers, developers, server manufacturers, and other partners. In 1998 it had 56 million unique users of its players. That year CNN, ESPN, ABC, Bloomberg, SportLine USA, and Broadcast.com started offering content in Real. The RealGuide provided users with access to more than 1,700 live radio and television stations. The company added 850 registered developers in 1998, giving it more than 2,000 in its program.[23] And finally, RealNetworks had persuaded America Online, Netscape, and a number of PC manufacturers to bundle its RealPlayer with their products.

But profits were elusive. They were not going to come from free media players for consumers. And unlike Apple and Microsoft, RealNetworks had no prospect of earning money from operating system sales. Nothing prevented the company from pursuing the hardware-centric strategy that later proved successful for Apple. But RealNetworks had always specialized in software. It didn't have hardware in its genes.

Over time, RealNetworks shifted its pursuit of profits from selling server software toward selling content that relies on its digital media platform. As of the summer of 2005, RealNetworks had three major content offerings.

First, its Real Music Store had more than a million songs. Consumers could download these to more than a hundred different digital music devices. Its Rhapsody service provided a variety of subscription services; the basic version allowed users to play songs on their computers but not take permanent possession of the music. This subscription service also worked with portable devices through its Rhapsody To Go program. In December 2005, Real's Music Store had about a 1 percent share of the online digital music market, compared to iTunes' share of 82 percent.[24] In addition, Rhapsody provides access to more than fifty radio stations, including many without advertisements.

23. Ibid., p. 4; RealNetworks 10-K filing for 1999, p. 4.
24. NPD Musicwatch Digital, February 2006.

Second, RealNetworks offered audio and video content through its SuperPass program. Video content included films from iFilm, broadcasts from CNN, ABC, and BBC, and sports radio. Audio content includes access to the radio stations mentioned above. Users also got some free music downloads as part of the package. In May 2005, RealNetworks had 1.85 million paying subscribers, one million of those being to its music subscription services.[25]

Finally, RealNetworks got into gaming in 2000. According to Glaser,

The game strategy is to be publisher, developer and distributor to focus on platforms used by regular consumers, not just hard-core game lovers. You don't need to purchase a special console and we believe that the accessibility of the games is a key to broad demographic penetration. With[in] the foreseeable future, the most important ... platform for us is the PC. The second most important one, which will grow ... is the mobile phone.[26]

As part of these efforts RealNetworks has purchased several game-related companies, including GameHouse and Mr.Goodliving.[27] RealNetworks has two major game offerings: RealArcade, which allows people to play games online, and RealArcade GamePass, which allows people to download games.

As a result of these content-related strategies, RealNetworks has obtained a greater portion of its revenue from consumer subscriptions and less from licensing software for corporate customers. In 2004, RealNetworks earned as much as 70 percent of its revenue from content sales, though it had earned no such revenue before 2000.[28] Within consumer products, about half of revenues were from sales of video (including the Real SuperPass subscription service), 30 percent were from music sales, and the remaining 20 percent were from game sales.

25. RNWK Q1 2005 RealNetworks Earnings Conference Call, May 4, 2005.

26. Ibid.

27. "RealNetworks Revenue Grows 29% in First Quarter of 2004," RealNetworks press release, April 28, 2004; "RealNetworks Enters Mobile Games Market: Acquires European-Based Mr. Goodliving Ltd.," RealNetworks press release, May 11, 2005.

28. RealNetworks 10-K filings for 1998, 1999, and 2005 (p. 22); Erich Leuning, "RealNetworks Turns on Subscription Service," Associated Press Newswires, August 15, 2000.

There's an important strategic complexity here: RealNetworks competes increasingly with other content providers, who themselves have different strategies for making money from various sides of their platforms. Many of these content providers—Yahoo! for example—earn revenues mainly from advertising rather than selling content.

Platform Integration and Interoperability

The companies that have built media software platforms differ in two other related ways that affect how they compete with each other. One involves the extent to which they operate particular sides of the platforms themselves—that is, the extent to which they integrate into one of the business sides as opposed to encouraging other firms to provide those services. The other concerns the extent to which they interoperate with other platforms.

At one extreme is Apple. Its iPod/iTunes platform is integrated into the hardware and content-provider sides of the media platform, and it doesn't interoperate with any other platform. At the other extreme is Microsoft, whose media platform is integrated into neither hardware nor content and which interoperates with all other media platforms that allow it to do so. In the middle are vendors like RealNetworks, which limit interoperability—but not completely—and integrate—but only partially—into the content provider side.

Figure 8.1 summarizes where the various media platforms fall in terms of integration and interoperability. For each it shows whether the platform is integrated fully or partly into a hardware device or the provision of content and the degree of interoperability with other platforms. Apple and Sony operate vertical silos that do not interoperate, at least intentionally, with anyone else. Microsoft and many of the media players that rely on its APIs are unintegrated and highly interoperable. RealNetworks' RealPlayer lies in between.

Why do these companies choose such different business models for the same line of products? As we have noted, each company has different strengths, and their goals vary.

Apple has kept the iTunes/iPod platform tightly integrated. It has leveraged its strength of having software and hardware engineers work closely together to create products that are elegant and easy to use for
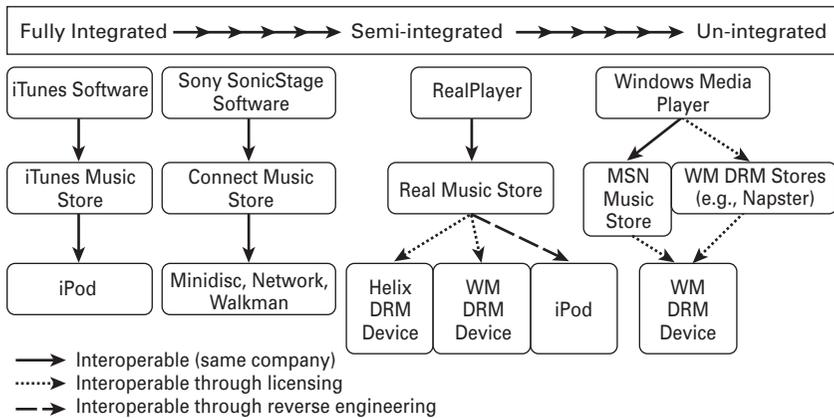
Figure 8.1 Fully Integrated → → → → Semi-integrated → → → → Un-integrated

iTunes Software	Sony SonicStage Software		RealPlayer		Windows Media Player
iTunes Music Store	Connect Music Store		Real Music Store		MSN Music Store / WM DRM Stores (e.g., Napster)
iPod	Minidisc, Network, Walkman		Helix DRM Device / WM DRM Device / iPod		WM DRM Device

→ Interoperable (same company)
······► Interoperable through licensing
– – ► Interoperable through reverse engineering

Figure 8.1
Models of varying integration and interoperability in media players.

consumers. For now, at least, this has given Apple a significant competitive advantage over rivals.

RealNetworks has built a more open media player platform than Apple. It is trying to increase the reach of its media player and content provision to the widest scope of devices and industries. It has deepened its relationships with cable operators and mobile phone producers.[29] And, as we noted before, it has developed Rhapsody To Go for increasingly popular mobile devices.

Microsoft also operates an open media player platform. The Windows Media Player platform enriches the overall Windows software platform. The more open and interoperable the Windows Media Player platform is, the more attractive the Windows platform becomes.

Microsoft thereby earns revenues from increased Windows sales.

Product Differentiation and Multihoming
Digital media platforms differ from other software platforms we have discussed in two significant ways. First, in all of the industries we have discussed, competing firms served roughly the same platform sides and earned their profits from similar sides. Makers of PC operating systems

29. "Wall Street Web Stocks: Napster and RealNetworks CEOs Sound Off on Yahoo—Update 2," *AFX International Focus*, June 17, 2005.

all make their money from end users, video game console makers make their money mainly from selling games or securing royalties from other game makers, PDA makers make money from end users, and smart telephone manufacturers make money from device makers, who pass the costs on to end users. In contrast, the current models for digital media platforms range from Microsoft, which earns its return on media systems mainly from licensing its operating system; to Apple, which increasingly earns its profits from selling digital music devices; Real, which earns its profits mostly from content subscriptions; and Adobe, which makes profits from Flash server sales.

The other key difference is the importance of usaging several platforms, or what we have called multihoming. In most sectors, most end users use a single software platform; that is the case with PCs, PDAs, and smart mobile phones. People may have more than one video game console, but they seldom buy two of the most recent generation. Multihoming is more prevalent on the other sides of these industries. Application developers often write for multiple platforms and sometimes port applications (especially games) from one platform to another. Some of the large hardware manufacturers also engage in some multihoming. For example, IBM and Hewlett Packard sell computers with different software platforms. Most makers of PDAs and mobile telephones, however, use just one software platform.

In contrast, multihoming is prevalent on almost all sides of media platforms. Many people use several media players. Some might watch a movie using QuickTime, listen to streaming music using RealPlayer, and manage their music collection using iTunes and listen to it on their iPods. About 40 percent of consumers who used media players use two or more every month.[30] Most content providers make their audio and video material available in several formats. More than 85 percent of the most popular Web sites had content in at least two of the following formats: Windows, Real, QuickTime, or MPEG formats. On average they had files in 3.1 different formats as of late 2005.[31] (Stores operated as part

30. Nielsen NetRatings, Custom Rollup Reports, January 2005 to December 2005.

31. Media Metrix, Top 1000 Website Survey, Dcember 2005.

of one of the vertical silos such as iTunes and Google's videostore are the key exceptions.) Many PC manufacturers install multiple media players for their users, though digital music devices and mobile phones typically have just one. A 2006 study found that large manufacturers install an average of 5.6 media players on consumer and small-business computers sold in the United States.[32] (Multiple media players are not common, however, on mobile phones and other small computing devices.)

Multihoming appears to be prevalent for media platforms for several interrelated reasons. For one, media player platforms provide many distinct services valued differently by heterogeneous consumers. These platforms provide both audio and video, downloading and streaming, and interoperability with non-PC devices. It doesn't cost consumers much to use several platforms—it is easy to get several media players for a PC and to switch between them, depending on the task. Their choices are based on what they want to do, whether the task is streaming a movie clip or downloading a song from iTunes or Napster. One reason is that the decision by consumers to use a particular media player depends on decisions by content providers to make material available for particular media players. Consumers might prefer to use Windows Media Player with their iPods, but Apple's iTunes store prevents that. In other cases content providers make decisions to use a particular media format because it is better in some relevant respect; that is why many streaming video providers rely on Flash.

Another reason, though, is that media player platforms have differentiated themselves to appeal to different consumers. They have developed different looks and features that appeal in varying degrees to different users for different uses. For the past several years, for example, *PC Magazine* has recommended MusicMatch for organizing and playing downloaded music but not for playing video or streaming content (for which MusicMatch offers minimal capabilities). iTunes, on the other hand, has distinguished itself by being very good at managing music libraries and working with the popular iPod. The newest release of

32. LECG, "Survey and Analysis of Media Players Installed on New PCs Sold in Europe and the United States," March 2006.

Windows Media Player is recommended for organizing mixed media libraries, such as those that include music as well as photos. RealPlayer is currently the only player that allows users to integrate music tracks with different DRM protection schemes, so a person can put songs bought from iTunes and those purchased from Real's Music Store in the same playlist.[33] Flash is the most compact player, which makes it very quick to download. That is a plus for content providers who want to standardize on a particular media player of their choice. They automatically download it to the PC of the consumer who tries to view their content.

Making content available exclusively for a single media player is another important differentiation strategy. RealPlayer pioneered this approach in 2001. It struck an exclusive deal with Major League Baseball to host audio broadcasts of games and video highlights that would only be available to people who had a subscription with Real and used its RealPlayer. Other exclusives followed. As of June 2005, the newest album of the popular rock band the White Stripes was only available before its official release on Real's media platform. Also, all free online content from the hit television show "American Idol" will be offered only in Real's formats.[34] Apple adopted a similar tactic with iTunes. Although people can obtain many of the songs on iTunes from other online music stores, the iPod is designed so they should only be able to use it with songs they have purchased and downloaded from the iTunes store. (As of this writing, RealNetworks has been able to reverse Apple's iPod technology to sidestep these restrictions, but this compatibility is likely to be eliminated by Apple in the next software or hardware update of iTunes or the iPod.)

33. Matthew P. Graven, "MusicMatch Jukebox 8.1," *PC Magazine Review*, November 11, 2003; Matthew P. Graven, "MusicMatch Jukebox 7.5," *PC Magazine Review*, February 1, 2003; "Microsoft Windows Media Player 10," *PC Magazine Product Guide*; http://www.pcmag.com/article2/0.1759.1641331.00.asp "RealPlayer 10.5," PC *Magazine Product Guide*, http://www.pcmag.com/article2/0.1759.1654038.00.asp.

34. Derek Caney, "Major League Baseball Inks 3-Year Pact with Real Networks," *Reuters News*, March 27, 2001; Brian Garrity, "Billboard.biz: Real Grabs White Stripes Exclusive," *VNU Entertainment Newswire*, June 6, 2005; Carl Bialik, "RealNetworks to Stop Providing Services to Baseball Site," *Dow Jones Business News*, February 5, 2004.

Digital Rights Management

Media software platforms are central to the growing market for the distribution of audio and video content over the Internet to PCs, digital music devices, and mobile phones. DRM technologies are a critical component of these platforms. Without these technologies the owners of content—the artists, music publishing companies, and movie studios—would never have assented to the distribution of their otherwise easily pirated content online.

DRM is perhaps best thought of as a software platform in itself, although in practice, the DRM software platform is an integral part of the overall media software platform. The DRM platform provides a mechanism for granting people permission to use certain content, preventing those without permission from using that content, and managing payment terms for using one or more copies of that content. DRM platforms used for content distributed online typically have five components:

1. Software that locks up the content so that it can only be accessed with the proper key

2. A "rights expression language" that describes how the content can be used

3. Software that manages and distributes the keys to unlock the content

4. A method for collecting payment for the usage rights

5. Software on the consumer's device that monitors usage and locks or unlocks content, depending on the rights the consumer has to a copy of the content and payment for that copy

Like the media platform overall, the DRM technology is distributed across several different parts of the platform.

Most DRM technologies work in a very similar way. Audio or video tracks are first encoded using a codec. The resulting encoded track is encrypted and stored in a container. When a user purchases the track online, the track is downloaded onto the user's computer. The unique decryption key along with relevant rights information (number of authorized computers, expiration date, number of allowed playbacks, and so on) is stored in a key depository on the customer's computer and also on the music store servers. Alternatively, when one transfers the track

onto a portable media player, the key is also transferred into that player's key depository. When the user wishes to play the track, the proposed usage is checked against the associated right: Is this computer authorized? Has the allowed number of playbacks been exceeded? Finally, if authorized, a key is retrieved from the depository and the track is decrypted (DRM), decoded (codec), and then played (media player).

Like many of the software platforms we have discussed, DRM makers have to get several groups on board their platform to make it a success. The content owners are a particularly critical platform side for DRM, though. They have to be convinced that the DRM solution strikes the right balance between persuading consumers to buy the content and preventing consumers (and others) from pirating songs, movies, and other valuable intellectual property. Finding the right balance is more important than it seems. Before iTunes there were many unsuccessful attempts at selling digital music and video protected by DRM. Interestingly, iTunes wasn't successful because its DRM technology, FairPlay, was better or more secure but because it was more user-friendly. Apple pioneered the concept of "good enough" protection: good enough to keep innately honest customers pretty honest while making DRM as invisible to them as possible. Apple recognized that dedicated hackers will eventually break through any protection and, accepting that inevitability, decided to make the experience pleasant for everybody else.

Content owners like EMI and content service providers like Yahoo! find content protection solutions useful because these solutions allow them to charge for content while discouraging nonpayers from gaining access to the content. Many content owners and content service providers have, of course, used content protection solutions of varying degrees of sophistication for a long time. Those solutions range from producing printed material in forms that discourage photocopying to encrypting broadcasts for satellite television. Stricter solutions generally impose greater cost and inconvenience on content users. Consequently, content owners and providers have always faced trade-offs deciding whether and to what extent to rely on content protection solutions.[35]

35. For example, "the tone of the discussion by music industry interests is one of enabling flexible business models and avoiding consumer backlash, as much as it is about controlling piracy. In this respect, the music industry may be

As RedMonk analyst Stephen O'Grady notes, "It comes down to the rights of consumers vs. the rights of business. What people want is fair use of content purchased at a reasonable price."[36] The adoption of DRM solutions for digital music devices illustrates the importance of these trade-offs. Apple FairPlay is not regarded as the "best" DRM solution in terms of eliminating piracy or managing content licensing.[37] But it is regarded as good enough, relative to the constellation of economic factors, that content owners must consider.[38] Just as important, FairPlay is the DRM feature associated with the iPod player, which is by far the most popular digital music device on the market today. (DRM solutions are features of media software platforms and are one of many ways in which these platforms differentiate themselves. Each of these DRM features, however, is substitutable from the standpoint of content owners, store owners, and music consumers.[39])

As with other multisided platforms it is difficult to get one side on board without simultaneously attracting the other sides. People who

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learning a positive lesson from its early experiments with DRM." Bill Rosenblatt, "Microsoft and Music Industry Discuss Future of CD Copy Protection," *DRM Watch*, September 23, 2004.

36. Byron Acohido, "IBM raises stakes in digital media circle," *USA Today*, April 19, 2004 (http://www.usatoday.com/tech/news/techinnovations/2004-04-19-ibm-digital-rights_x.htm, downloaded August 26, 2005).

37. Apple's iTunes and its FairPlay solution have been undermined a number of times: "programmers have worked to strip out the anti-copying features, called FairPlay, included with every song purchased from the iTunes store. Several programmers have created software that does appear to remove the FairPlay protections altogether, allowing the purchased songs to be distributed without restriction." Ina Fried, "Apple Disables iTunes Song-Swapping Tool," *CNET News.com*, April 29, 2004; http://asia.cnet.com/news/personaltech/0,39037091,39177444,00.htm (downloaded August 26, 2005).

38. "Apple's Own FairPlay Copy Protection Tools Have Also Won the Big Record Labels' Approval and Form the Heart of the Company's iTunes Music Store." John Borland, "MP3 getting antipiracy makeover," *CNET News.com*, March 2, 2004.

39. Analysts see these as providing similar benefits to consumers and content owners: Sony, Microsoft, and Apple, along with several others, all have music stores which sell content and have their own content protection solutions. "Sony to take on iTunes in Europe," *Reuters Newswire*, September 30, 2004.

license content over the Internet or wireless networks need to have the DRM software installed on their computing devices. Generally that means having a media player that uses the same DRM technology as has been used by the content owner. Likewise, the content providers need to be on board. Some of them act as intermediaries between the DRM solution providers and the content owners, while others, such as Apple, are both the DRM solution provider and the content provider, and still others, like Sony, are the content owner, content provider, and DRM solution provider (although Sony makes its content available to other providers and subject to other DRMs).

The Future

Between 2000 and 2004, the number of hours that American households spent surfing the Web increased from 1.1 to 2.7 billion. About 75 percent of American households used the Internet on a regular basis by February 2006. An increasing amount of commerce is being done on the Web. In the United States, the total dollar amount of sales through Web-based transactions (excluding travel) increased from $34 billion in 2001 to $86 billion in 2005.[40] From 2000 to 2005 the percentage of American households with broadband connections increased from 5 percent to 60 percent.[41] These changes are all interrelated: the more users there are, the more content that is created for them; the more content there is, the more use there will be; and greater use drives an increased demand for high-speed connections. All of these trends are happening in many countries outside of the United States—usually less rapidly, as in Germany, but sometimes far more rapidly, as in Korea.

Media platforms are useful without access to the Web—people play CDs and DVDs and download them to other devices, for example. But media platforms have become far more popular for users, content

40. "Two-Thirds of US Web Users Now On Broadband," *eMarketer*, March 2006. http://www.emarketer.com/Articles/Print.aspx?1003875.

41. Jeffrey Grau, "Retail E-Commerce: Future Trends," *eMarketer*, February 2006. Ben Macklin, "The Broadband Report," *eMarketer*, April 2001; Ben Macklin, "North America Broadband," *eMarketer*, March 2005.

providers, application developers, and hardware makers because of the growth of Web-based delivery mechanisms for digital content. In 2005, American consumers downloaded more than 353 million songs legally. (Estimates suggest that they also downloaded more than 430 million songs illegally that same year.[42])

Digital media systems will play an important role in the emerging markets for digital content. Predictions are always hazardous, but it seems clear that the rapid growth we have seen in recent years will continue, especially as digital content becomes downloadable and playable on more devices.

Consider the possibility that smart mobile telephones will be used for this purpose. Mobile telephones are ubiquitous: more people globally have them than PCs. It is anticipated that by 2008, almost 15 percent of the mobile phones shipped will be "smart" and therefore capable of downloading and playing digital content. That is 130 million devices.[43]

Alternatively, iPod and similar devices may continue their rapid growth and become the device of choice for consumers. One analyst predicts that more than 180 million portable media devices will be sold in 2009.[44]

Beyond this, as DRM technology has advanced, more content owners have seen digital distribution as highly desirable. The music companies that once sued to shut down Napster embraced, after initial skepticism, the idea of paid downloadable music. The movie studios are following, and several "movie stores" have emerged on the World Wide Web.

A further development concerns home entertainment. As more content is distributed over the Internet, it is inevitable that consumers will have a computer, with a software platform, wherever they watch television. The only question is what form that computing platform will take. We return to this subject in Chapter 12.

42. Jeffrey Grau, "Retail E-Commerce: Future Trends," *eMarketer*, February 2006. Ben Macklin, "The Broadband Report," *eMarketer*, April 2001, p. 45.

43. http://www.ifpi.org/site-content/press/20050119b.html. Yankee Group, "Pumping Up the Volume for Online Music Services," January 23, 2004.

44. Alex Slawsby, Allen M. Leibovitch, Randy Giusto, Kevin Burden, David Linsalata, and Ramon T. Llamas, "Worldwide Mobile Phone 2005–2009 Forecast and Analysis" (IDC report no. 33290), April 2005, tables 5 and 6.

INSIGHTS

• All digital media software players are available at no additional cost as part of a software platform or as a free application and all add features over time to attract additional users, developers, and hardware makers.

• Some providers of digital media platforms have integrated them into their overall software platform and derive revenue from overall software platform sales (Windows); others have provided separate platforms and tried to earn money from the provision of content (RealNetworks); and still others have tried to earn revenue from an integrated hardware/software/content platform (Apple).

• Apple has pursued a single-sided strategy in which it has integrated into all possible sides of the digital media software platform business. It has adopted a unique "sell the razor/give away the blades" strategy: it earns profits from the sale of its hardware (iPod) and loses money or breaks even on its software platform and content provision (iTunes).

• Multiple software platforms with conflicting strategies have survived in part as a result of differentiating themselves to appeal to varying segments of consumers, content providers/owners, and application developers.

• As with other software platforms pricing low to one side, evangelization of the platform, and feature accretion through bundling have been important competitive strategies.