Will Wireless Gaming Be a Winner?

Neal Leavitt

Computer games, whether played on a PC or a console, are among the most commercially successful applications. Now, companies from various sectors of the computer industry are hoping to transfer this success to a smaller stage: cellular phones, PDAs, and other wireless handheld devices.

Boosting this effort is the advent in mobile devices of faster processors, color screens, better sound, and improved input-command features, all of which have elevated mobile gaming to near-console quality, as Figure 1 shows.

Meanwhile, the "A Mobile Gaming Primer" sidebar describes how game designers are trying to develop appropriate content and quality levels for handheld devices and various target demographics.

Frost & Sullivan, a consulting and market research firm, estimated that US wireless gaming revenues were $436.4 million in 2001. Mobile gaming in East Asia generated $827 million in revenues during the same year, according to Datamonitor, a consulting and market research firm.

By 2006, Datamonitor predicts, wireless gaming will generate $17.5 billion in annual revenue worldwide. The company also projects that by 2005, 80 percent of all mobile users in the US and Western Europe will play mobile games at least occasionally.

Figure 1. Newer mobile phones, like the Samsung model shown here, offer color screens, as well as faster processors and other features that let users play sophisticated computer games, like this motorcycle-racing application.

Various types of companies have high hopes for wireless gaming. For example, game vendors see the wireless market as a new revenue source. In addition, handheld vendors and wireless-network carriers are looking for applications that will increase interest in their products and services.

While some industry observers say mobile gaming has a bright future, others contend that the lack of a proven business model, as well as mobile devices' resource and technical limitations, may prevent wireless games from attaining widespread popularity.

NEW APPROACHES

Handheld devices are resource constrained, so developers must be inventive in using limited memories and screen resolutions to keep the game-playing experience interesting. In addition, limited network bandwidth means that games must use fewer textures and sounds than a traditional console, and the data files themselves must be small to allow for easy downloading.

Therefore, games are designed differently and are optimized for handheld devices, said Peter Aloumanis, vice president and general manager of Motorola's iDEN Subscriber Group's US Markets Division.

"[Mobile] games are more compact," said Donald Longueuil, an independent wireless-market analyst. "The graphics are less robust and have fewer pixels, and developers need to strip out as much unnecessary content as they can, [including] frames, [skill] levels, or characteristics." For example, he explained, if there are too many frames for a device's processor to render smoothly, a game may appear jumpy.

Designing games for mobile devices presents other technical challenges. For example, developers must design games that will work on various handsets with different screen sizes, color depths, and application program interfaces (APIs). In addition, the phone buttons are often limited to single key presses, reducing users' ability to control content in a sophisticated way by pressing combinations of keys.

To cope with these challenges, companies have developed several new approaches.

Swerve

Superscape, which sells interactive 3D wireless applications and services, has developed Swerve, a wireless 3D application platform designed for PDAs and cellular phones.

Swerve lets small devices access high-quality games by downloading relatively small amounts of data and then using their processor to build the rest of the file. This eliminates the need to download entire, large game files.

With Swerve, the data for building a single skill level on a standard game can take up less than 50 Kbytes, while the data for even the most complex game rarely exceeds 100 Kbytes per level. Typically, games for PDAs contain up to 2 Mbytes of data. Games for PCs or consoles contain much more data.

Swerve uses efficient techniques for building the surfaces and textures of graphic elements to create smaller download files. Once the initial data is downloaded, the device's processor runs various algorithms to calculate the elements' correct textures and geometries, said Paul Beardow, Superscape's chief technology officer.

Superscape and THQ Wireless have agreed to jointly develop 3D gaming content for mobile platforms. THQ will let Superscape use Swerve to develop and distribute games—including a full version of *MotoGP*, a motorbike racing game—based on THQ's intellectual property.

Mobile processors

ARM Ltd. and Imagination Technologies are collaborating to provide processor cores—slated for release by 2005—that let smart phones and PDAs run data-intensive, console-level 3D graphics. ARM is the leading designer of cellular-phone cores, which it licenses to chip makers. Imagination licenses graphics-hardware designs for the consumer electronics market.

Imagination's new PowerVR MBX Lite graphics core will be an integral part of ARM's Primexsys Wireless Platform for mobile phones. The 3D engine uses tile-based rendering and deferred texturing to eliminate unnecessary graphics processing, thereby minimizing bandwidth and power requirements in mobile networks and chips.

Tile-based rendering partitions a scene into small tiles, each of which can be rendered independently. This handling of smaller data sets substantially reduces the demand for memory, thereby keeping most of the processing in the graphics core, where it is fastest and most efficient. This approach also enables the use of simpler and more cost-effective memory technologies, which are essential for handheld devices.

Deferred texturing identifies surfaces in graphic elements that won't be visible in a scene when it's fully rendered and then discards them before the scene is textured, lit, and shaded, explained John Metcalfe, vice president of business development for PowerVR Technologies, a division of Imagination.

"This eliminates much of the redundant processing performed in conventional 3D systems and, therefore, requires less power and less memory bandwidth," Metcalfe noted. "PowerVR is [thus] better suited to complex applications than conventional systems that texture every surface, visible or not. A traditional 3D renderer simply requires too much memory and power to provide console-level graphics in a phone."

3D graphics toolkit

Intel has developed a 3D graphics toolkit for its XScale, ARM-based mobile processors. Intel's Graphics Performance Primitive toolkit uses short-

A Mobile Gaming Primer

Early cellular-phone and handheld game devices were rudimentary so that they could function with minimal processing and memory resources as well as wireless networks' limited bandwidth. One early game was *Snake*, embedded on Nokia handsets. Users navigated a snake, made of small black-and-white line pixels, to a food source, represented as a pixel square, to make the animal grow.

Now, vendors are releasing handheld devices with faster processors that run at up to 400 MHz and larger memories that hold up to 64 Mbytes. These devices can store and run bigger and better games. They also have larger screens and color displays that permit more interesting features.

This year, for example, Sony Ericsson is scheduled to release its first smart phone, the P800, which includes a big screen and a full-color browser. Michael King, senior industry analyst for Gartner Inc., a market research firm, said, "Sony Ericsson believes there's a whole new frontier for gaming and gaming development for the P800. By getting users to think of cell phones as a game-playing platform, they're creating another avenue to attract customers for other Sony Ericsson products."

The leading mobile-game developers include Fathammer and THQ Wireless. Two of the most popular wireless games are *Hyperspace Delivery Boy* by Monkeystone Games and *Gladiator* by Jamdat Mobile, which works with game designers and wireless carriers to publish wireless entertainment applications.

Sega, a major game publisher, formed Sega Mobile in 2002 to develop games for handheld devices. The new subsidiary sells games to mobile-service carriers, including Sprint, which is offering *Super Monkey Ball* on its new third-generation color phones. Sega's *Borakov* game is preinstalled on Motorola phones sold by Nextel Communications.

Game developers are even beginning to release distributed, multiplayer mobile games, in which participating players connect to a server. For example, Jamdat's *Gladiator* offers multiplayer capabilities.

cuts to approximate the floating-point arithmetic, division, trigonometry, and other operations necessary for game engines to render 3D images. Approximating these operations saves computational resources, which are in relatively short supply in handheld devices.

These abbreviated operations are not as precise as the full versions but are accurate enough for graphics rendered by a small device, explained Laurence Pegrum, an Intel platform architect.

Standards

Ericsson, Motorola, and Siemens have begun working together to develop a wireless-gaming standard. The companies are trying to define standardized APIs and software development kits (SDKs) that developers could use to build games.

Developers thus wouldn't have to spend time and money developing APIs and SDKs and could focus on designing games that, theoretically, could work on multiple types of devices.

Motorola did not offer a timetable for the project. Michael King, senior industry analyst for Gartner Inc., a market research firm, predicted that proponents won't have a standard ready for adoption for 18 to 24 months.

HANDHELD-GAMING PLATFORMS

Today's mobile games run on a variety of platforms. The two most prominent are Sun Microsystems' Java 2 Platform, Micro Edition (J2ME) and Qualcomm's Binary Runtime Environment for Wireless (BREW).

These platforms let complex games run on multiple types of devices. "If I'm a game developer, I don't have to develop games for multiple phones. I just write it once to run on many," said King.

J2ME

J2ME lets programmers use Java and related tools to develop applications, including games, for mobile devices. J2ME consists of programming specifications and the K virtual machine, which acts as an interface between compiler Java binary code and the processor that executes the application's instructions.

In general, any J2ME-enabled device, regardless of its operating system, can run Java code, including that used in games. Another advantage of using J2ME to build games is that game companies have access to the many experienced Java developers.

J2ME currently offers the Connected Limited Device Configuration for devices with relatively few CPU and memory resources, and the Connected Device Configuration for next-generation devices that have more resources and can work with faster wireless networks.

The J2ME and BREW platforms let complex games run on multiple types of devices.

Companies such as Motorola, Nokia, Research in Motion, Samsung, and Sanyo use J2ME in their devices.

BREW

BREW is a wireless-application-development platform for phones that use the Qualcomm-developed code-division multiple access (CDMA) cellular technology. In the future, BREW may run on PDAs and also work on other popular cellular technologies, including time-division multiple access (TDMA) and the Global System for Mobile Communications (GSM).

Developers can create games and other applications that work on any BREW-enabled phone, regardless of the device's operating system.

BREW runs between the application and the mobile chip's OS software. The platform provides common APIs that application developers can use to harness the hardware's capabilities. In addition, an application can use a phone's functionality without the developer having to code to the system interface.

Developers can write BREW natively in C or C++, which produces programs that offer more performance than applications that must be interpreted, such as those written in Java. Meanwhile, said Mike Yuen, Qualcomm's director of product management, "BREW supports other languages including Java, XML, and [Macromedia] Flash."

According to Yuen, BREW handsets scheduled for release within the next 18 months will let users execute complex game commands, such as making characters move and shoot a gun simultaneously, by pressing multiple keys at the same time.

Alltel and Verizon Communications in the US and a number of Asian carriers, including Japan's KDDI Corp. and South Korea's KTF, use BREW in their devices.

CHALLENGES

The adoption of mobile gaming faces several key challenges.

Low US interest

Wireless gaming has not been adopted as widely in the US as in Asia.

"In Japan and in many parts of Europe, a larger percentage of the population takes … mass transit, which allows you to be sitting and looking at a screen on a phone or doing other things besides driving," said Kenneth Smiley, a senior analyst with Giga Information Group, a market research firm.

Moreover, said Smiley, in many Asian countries, unlike in the US, it's considered impolite to talk on trains and buses, which has helped fuel wireless gaming's popularity.

And in the US, he added, "teens have grown up with Nintendo, PCs, et cetera, and are most likely to play games on these [sophisticated] platforms as opposed to a phone."

Nonetheless, the average revenue generated by gaming per mobile user in the US is beginning to creep up, as Figure 2 shows.

If mobile gaming is to succeed in the US, said Nitesh Patel, senior industry analyst for the Global Wireless Practice

at Strategy Analytics, a market research firm, "It will rely on getting sophisticated handsets to the youth market. Therefore, driving down the cost of the devices is paramount for manufacturers and operators."

Business model

The business model that the companies involved in mobile gaming use is critical to the application's success. For example, pricing levels must be right to get people to try and continue playing wireless games. However, pricing models are still taking shape, particularly in the US. Options include per-game, per-minute, or monthly subscription charges.

Verizon Wireless offers games as a menu option on its new handsets. Subscribers choose a game and download it to the handset, incurring a charge of between $1.50 and $5.00 on their phone bill. The subscriber saves money by playing the game on the device without having to remain on the network.

In the long run, said Superscape's Beardow, mobile games must be significantly less expensive than their PC and console counterparts because the wireless versions are not as sophisticated and thus not as appealing to players.

An important factor will be the development of revenue-sharing agreements between wireless-network service providers and third-party game vendors. Providers must agree to and develop ways for vendors to distribute their games over wireless networks to customers and receive some of the resulting revenue, which carriers initially would collect, said Patel.

What may help, said Jamdat CEO Mitch Lasky, is that "mass market games will also probably be supported by advertising and sponsorships, with some compensation flowing back to the content creator."

Technical issues

Wireless technologies still offer unreliable connections that could interrupt games. "Players won't put up with games that crash often," explained Giga's Smiley.

"Network reliability is still an issue and will continue to be for at least another year or two," noted Schelley Olhava, a program manager for IDC, a market research firm. However, Olhava added, improved networking technologies will offer more robust service and thereby help the market.

FUTURE POTENTIAL

Industry observers offer differing opinions about mobile gaming's potential future success. For example, Giga's Smiley said he can't think of many types of games that would be very popular on handheld devices. In particular, he added, the popular *twitch* games that require quick user reactions to sudden events probably won't succeed in the near term. "Both the handsets and the networks can't respond fast enough," he explained.

According to Gartner's King, multiplayer games will do well because the interactive experience will improve as the technology advances. He also said that frequent travelers, who have time on their hands in airports and on flights, will continue to comprise the bulk of users, though they won't produce the most revenue.

"The serious gamers, single males between 15 and 27, will generate the greatest percentage of revenue for the mobile gaming industry over the next few years," he added.

Kathleen Maher, vice president of Jon Peddie Research, disagreed. "I don't see serious gamers going for handhelds as their platform of choice anytime soon because the platform simply doesn't allow for engaging game play in the same way that consoles and PCs do," she said. "They will play [wireless] games only when they're mobile and can't do anything else."

Nonetheless, said Smiley, "I would also look for handheld gaming units like the Nintendo Game Boy to take on wireless capabilities before [phones and PDAs] become more capable of playing games."

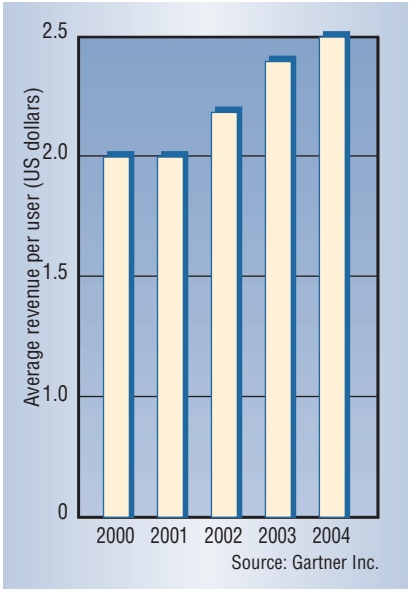

Figure 2. The average revenue generated by gaming per mobile user in the US is starting to increase, from $2.00 in 2000 to an estimated $2.50 in 2004.

"I'm skeptical of wireless gaming," said analyst Longueuil. "There is only so much disposable income, and the games aren't compelling yet."

A recent study by the Ovum market research firm indicated that few respondents would pay more than 50 cents a month to play games on cellular phones.

However, King was more optimistic, particularly if network carriers offer better pricing and customer service, and also work with device makers and game vendors. If this happens, he said, "The market potential is enormous." ■

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