Applications

Samurai Romanesque, J2ME, and the Battle for Mobile Cyberspace

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Playing games on a cell phone appears to be a trivial use of wireless technology, but the role-playing game, *Samurai Romanesque*, shown in Figure 1, from Japanese game developer Dwango is no trivial matter. The game is available on Japan's NTT DoCoMo packet-switched i-mode network. Players take a virtual journey through 15th-century Japan, engage other players in real-time battles, visit a thousand historical towns and villages, practice the art of Zen, and even have virtual children. This massive multiplayer role-playing game can accommodate half a million gamers simultaneously. Rendered in color, and resembling the graphics quality of the (8-bit) Game Boy, the game takes the wireless Internet to a new level of complexity and is a sign of things to come, that is, cyberspace on the go.

Dwango built *Samurai Romanesque* on the Java 2 platform, Micro Edition (J2ME), a compact version of Sun Microsystems' Java 2 programming environment. J2ME suits applications such as cell phones, pagers, set-top boxes, and other devices with limited memory and slow processors. NTT DoCoMo's technology uses Sun's reduced K virtual machine, but the company developed its own proprietary version of mobile Java (called DoJa), see Figure 2. The standard application programming interface for J2ME, the mobile information device profile, primarily supports text-based screens, and doesn't cope well with graphics. NTT DoCoMo's version of J2ME—i-Appli, short for Internet applications—supports GIF, horizontal scrolling, list boxes, and other graphics-based functions. The company worked with Japanese handset makers and Sun Microsystems in the US and Japan to develop the required handset technology, shown in Figure 3, and launched its Java service in early 2001.

Data revenue windfall

The new i-Appli service was an overnight success. On the day of its launch, NTT DoCoMo sold 70,000 i-Appli phones. By the end of that year, the figure had reached 10 million. The i-Appli handsets, equipped with a color screen the size of a business card, have many of the capabilities of a stand-alone computer. Subscribers can download software and applications and use them without connecting their handsets to the NTT DoCoMo server. Using a scroll-and-click menu, they can program the phones to retrieve real-time stock quotes, flight schedule updates, and other dynamic information. The latest i-Appli phones can store up to 200 Java applications of 30 Kbytes each.

Subscribers to i-Appli can access about 500 Web sites. Content providers' charges range from $1.00 to $2.50 for a monthly subscription, which users pay on their phone bill. NTT DoCoMo retains 9 percent of the proceeds; the content provider keeps the remainder. Apart from subscription fees, i-Appli users also pay 2 cents per data packet (of 128 bytes each). The billing system, and NTT DoCoMo's generous revenue sharing scheme, played a key role in

1 Poster to promote Dwango's *Samurai Romanesque.* The multiplayer game draws the player into a world of martial arts, Zen, and romance.

Image courtesy of Dwango

making the company one of the largest Internet providers in the world. Its subscriber numbers rival AOL. In the year following introduction of the i-Appli service, the company's data revenue jumped by 102.5 percent.
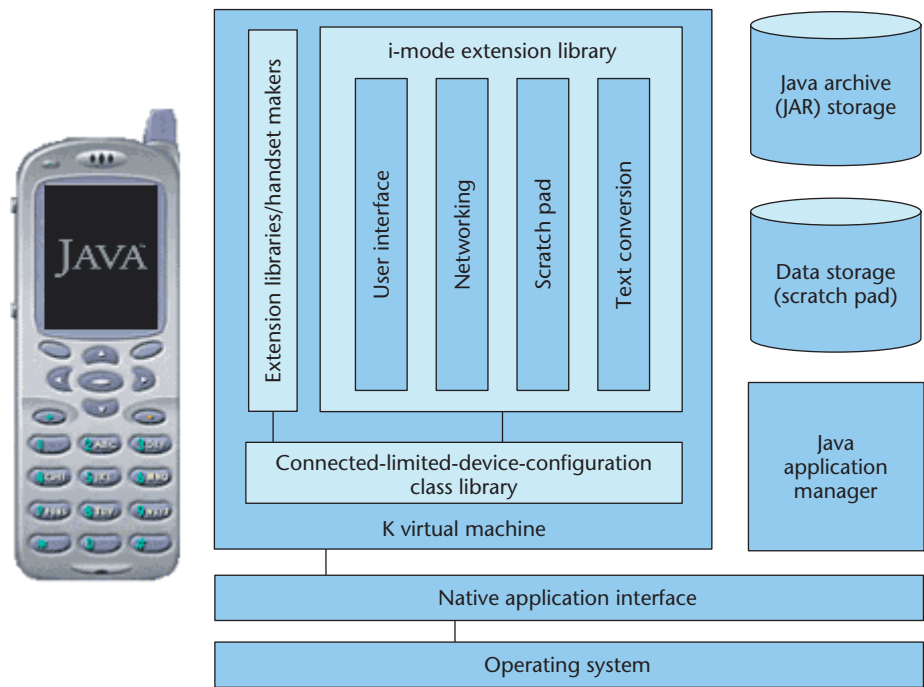
Transferring part of the computation to the handset is an advantage of using mobile Java instead of conventional data service, such as the wireless application protocol. This feature reduces the network load, enables peer-to-peer contact between devices, and significantly improves the user experience. Mobile gaming is a case in point. When playing a peer-to-peer board game such as chess, both players download the chessboard and its 32 pieces to their handsets. When a player moves a game piece by pressing a few keys, the handset only sends the relevant data to the handset of the other player (that is, move E2 to E4). This eliminates the need to transfer the entire chessboard over the network for each move. When carriers around the world adopt mobile Java, and interoperability standards have been improved, playing a game of chess with someone halfway around the world should cost only pennies.

Samurai training

Samurai Romanesque illustrates the potential of Java-enabled wireless technology. The game draws players into a world of martial arts, adventurous travel, Zen riddles, and romance. The intricacy of the game (and the programming it required to develop) is little short of incredible. Running on an Oracle/Linux platform, the game consists of three Java applications, which gamers download to their handset:

2 Diagram illustrating how Java is integrated in the i-mode network architecture. Java programs from Web sites download with normal HTML documents through the same HTTP protocol. Java programs that run internally from the mobile phone handset communicate with the Internet through HTTP. (Image based on data provided by Mobile Media Japan.)

- a training application to learn martial art skills and introduce the player to the game,
- a multiplayer application to participate in the game, and
- a chat application to communicate with other players and receive instructions (assignments) from the server.

The training application consists of three separate applets: sword, physical strength, and mind (in the Zen-inspired samurai tradition). Sword training consists of three minigames: flying bow, cutting a big tree, and hitting a persimmon. These improve the gamer's

3 Internal architecture of an i-mode Java enabled handset. (Image based on data provided by Mobile Media Japan.)
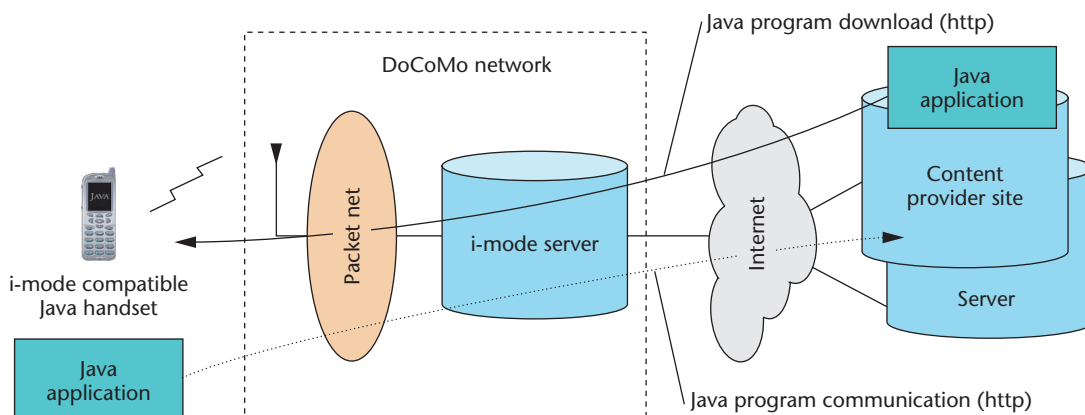
4 In one *Samurai Romanesque* minigame, gamers can earn points or money by taking a part-time job at a wharf, where they catch the yellow bales and carry them to the warehouse.

残りの荷物　　15個

中断

Image courtesy of Dwango

6 *Samurai Romanesque* is seasonally adjusted. In winter, gamers are confronted with snow, making their journeys from town to town more time consuming. The screen displays the current temperature.

大館

:42 大館は雪 -1℃くらいが

終　　　　　　状態

Image courtesy of Dwango

5 A gamer (on the left) travels through Japan. The other four figures are nonplaying characters who might interact with the gamer by starting a dialogue or challenging him to a fight. In the background is Mount Fuji.

桶狭間

合戦中!!

状態

Image courtesy of Dwango

7 A gamer visits a sword school where he has to find a secret document that will send him on a mission.
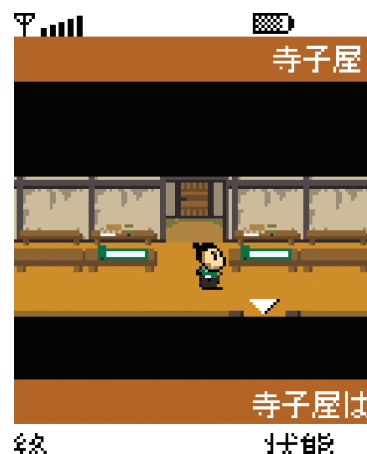

寺子屋

寺子屋は

終　　　　　　状態

Image courtesy of Dwango

hand–eye coordination. The flying bow game subjects the player to a barrage of arrows—by pressing the correct key on the handset at the right moment, the player deflects the arrows.

The mental training practices the user's patience and includes Zen riddles. Other exercises include memory training. A sequence of numbers flash on the screen; the gamer must remember the sequence and enter it into the keypad. Gamers giving the wrong answers are punished. That is, they might have to make umbrellas, a typical activity of the poor, masterless samurai in 15th-century Japan. Gamers can earn money by performing various tasks, including moving bales or other items, as Figure 4 shows, and this increases their strength. The game tracks the players' performances with a point system. When the gamer interrupts play, a Java applet in the handset sends the score to the *Samurai Romanesque* server, and retrieves it when play resumes.

Layered color graphics

Production of *Samurai Romanesque* took a year, involving four writers, three graphic designers, and four programmers. Two programmers maintain the game Web site. The game consists of 1,000 historical villages and towns, complete with castles, hostels, teahouses, postal stations, blacksmith shops, provision stores, and even liquor shops. The game has an additional 3,000 historically accurate interim locations that players encounter as they travel, as Figures 5 shows. To visit all of the game's virtual locations requires six months of continuous play. Figures 6 and 7 show two such environments.

Three layers—landscape, clothing, and character face—compose images. Gamers can scroll horizontally through the background layer, which includes buildings and/or landscapes, shown in Figure 8. Gamers determine the clothing layer based on the role that they choose to play. They select one of nine different characters, ranging from a foot soldier to a general, each having different attire. Gamers can start out as a hero or leading character, or they can take a different approach and choose the more humble, foot soldier role, and gradually build up experience and rise to a leadership rank.

In the character face layer, the server randomly selects one of 16,000 unique faces when a player joins the game. This makes it unlikely that gamers will encounter other gamers with the same face. However, they can change their hairstyle, which requires a visit to a barbershop. Some heads are prone to receding hairlines; others aren't. Also illustrative of attention to detail in the game, a facial injury sustained in a battle will leave

8 *Samurai Romanesque* consists of 300 large location maps, which include towns with establishments where players can obtain information, purchase items, or earn money. The gamer can horizontally scroll through the image.

9 With the i-Appli chat application, gamers can communicate with each other to exchange information and plan strategy to defend or attack a rival clan.

a scar. Figure 9 shows some character faces participating in a chat application.

The "Next-Generation Technology" sidebar discusses the current capabilities of handset technology and its future in offering gamers new experiences.

Multiplayer game design

Unlike first-person shooters and other types of single-player games, a multiplayer game doesn't have room for everyone to play as a hero. Instead of the gamer playing against only the machine, multiplayer games position players against each other. Ryo Shimizu, co-creator of *Samurai Romanesque*, points out that the value of networked games can't be fully utilized when all players have the same aim. Shimizu and his team solved this problem by giving characters three basic motivations: fame (desire to become famous by winning battles), career (rising in the ranks of samurai society), and love (which can lead to marriage, produce virtual offspring, and lets the gamer continue play as his or her character's own son).

Figure 10 (next page) shows the basic game structure. Players move within the parameters set by the game, but can take many different actions to reach their goals. For example, becoming famous requires winning battles; winning battles requires training; training requires buying a sword; buying a sword requires earning money; earning money requires work; work requires resting (at a hotel), which also requires money. The

Next-Generation Technology

Handset and network technology in Japan is evolving rapidly. Samurai Romanesque's 8-bit (GIF) graphics use i-Appli's maximum capacity. Animation frame rates range from 10 to 15 frames per second, depending on the handset's capabilities. When the game was originally designed, i-Appli phones supported 120×130-pixel screens, but recent improvements in handset technology offer 132×176-pixel screens.

Most i-Appli handsets now support GIF and JPEG images and can display 65,536 colors. The top-of-the-line D504i handset from Mitsubishi can display 262,144 colors, providing photographic quality. NTT DoCoMo's 2.5G-network speed has increased from 9.6 to 28.8 kilobits per second. Its 3G service, Freedom of Multimedia Access (FOMA), offers 384 Kbps, enabling streaming video (movie trailers) and live videoconferencing.

Wireless, full-motion video will offer new challenges to game developers. It will also lead to new forms of wireless entertainment, including the merger of mobile services and television. For example, using their camera-equipped cell phones, gamers can appear live in TV game shows. Look for Japanese and Korean players to take the lead.

Korean wireless carrier SK Telecom will soon launch its Personal Mobile Satellite Broadcasting service. This service will let subscribers receive 12 to 15 satellite television broadcasts on their (3G) handsets. The service, offered for a flat monthly fee of about $4, will use satellite technology from Japan Mobile Broadcasting, a unit of electronics giant Toshiba.

game unfolds differently for each player, depending on his or her aims, resources (money), and location.

Additionally, unexpected events, beyond the players' control, confront gamers, adding more variables to the game. The game is set in Japan's warring-states period. Wars break out frequently and in different parts of Japan. Gamers who traveled in the area of conflict during their last gaming session and belong to one of the warring fac-

10 The intricate structure of Samurai Romanesque. The character's aims and desires determine game play. (Image based on data provide by Dwango)
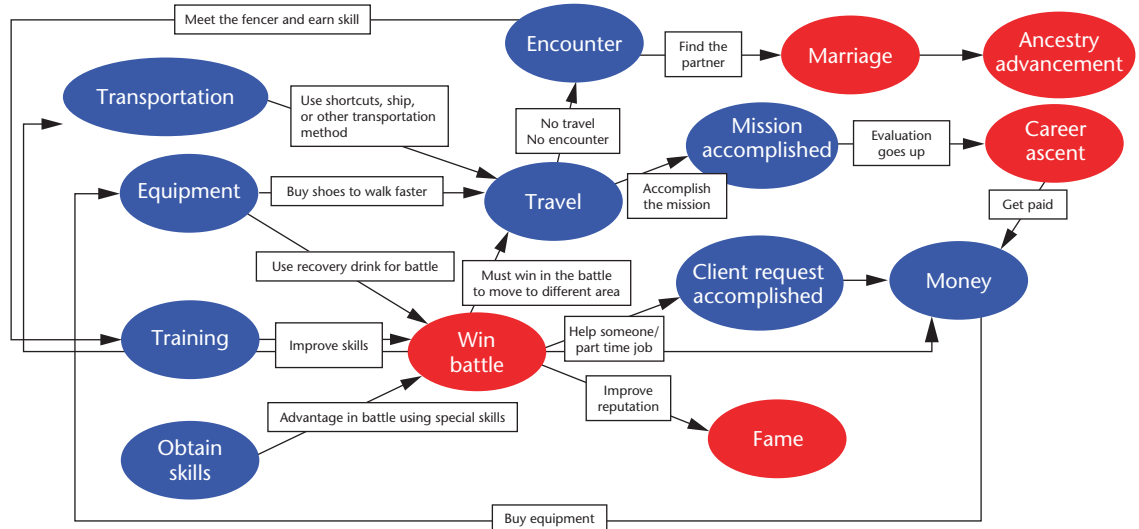
11 At unexpected moments, a lady appears on the screen asking for help. The text reads: "Help me samurai, I am being chased."

12 If the gamer decides to rescue the lady in danger, a bandit confronts the character.

fantastic touch of realism, actual weather conditions, supplied in real time by the Japanese Weather Bureau, are integrated in the game. If it rains in the Kanto area (Tokyo and environs), gamers in the region can't use their muskets (due to wet gunpowder) and become limited in their mobility (because of muddy roads).

Romantic samurai

In another feat of imagination, players can meet a virtual woman, pursue her, and have virtual children. This explains the enigmatic combination of the words *Samurai* and *Romanesque*. The life of the virtual samurai is limited to 40 days; each day that passes in the game counts as one year. If the character fails to procreate, his life as a samurai is finished after 40 days. He surrenders his points (and his rank), and his game is over. But a successful romance produces a son, and lets the gamer continue play. (Because samurai were men, girl players assume a man's role, but producer Dwango says they've received no complaints from female gamers about their forced role-reversal. Most game participants, however, are males between the ages of 15 and 25.)

The game's server determines the place and time of the virtual romance. While traveling from town to town, the virtual samurai might encounter a lady (a virtual character controlled by the server), who is attacked by a bandit and asks for help, shown in Figure 11. The gamer can challenge the brute (shown in Figure 12), rescue the lady, and try to win her over. The gamer and the lady communicate using preset dialogues. She will ask him a few questions, but if she doesn't like his answers (for example, she might be unimpressed by his status), she might disappear.

Making things more complex, the virtual ladies have different personalities; some are kind and sweet, others are attractive but proud. The gamer might decide that the lady isn't his type. Her questions can take an irritating or audacious form, and he might decide to reject her (this might be easier said than done). Some persistent ladies will follow the virtual samurai wherever he goes,

tions receive a text message giving them one-day's notice to report for duty. Battles can involve thousands of gamers attacking and defending a castle. In an almost

Mobile Phone Software—A Battle Between Giants

The battle for the top operating system for the next generation of smart phones pits Microsoft's SmartPhone 2002 (code named Stinger) platform against the Nokia-controlled Symbian OS. This battle has enormous stakes; licensing fees for smart phone OSs could potentially reach $5 a unit. With 400 million handsets sold each year, a leading role in cell phone software will be incredibly valuable. For consumers, mobile phones will act as an authentication/ID, e-wallet, debit/credit card, commuter pass, safety alert (for example, it could connect a fire warning system in a home or office), electronic key chain, navigation tool, and more. Control over these so-called personal trusted devices means power over money and markets.

Microsoft has aggressively pushed SmartPhone 2002, but has found few takers among the world's leading handset makers. The platform's value proposition (that is, commoditized hardware and enterprise connectivity) has attracted some original equipment manufactures, but original design manufacturers such as Nokia, Motorola, and Siemens don't want to help Microsoft extend its dominance in PC software to mobile phones. These companies have well-established brand names to protect, and signing up with Microsoft could reduce them to mere product order fulfillment or other subcontracting roles. The software giant's reputation as a ruthless competitor has hurt its attempt to conquer the smart phone market.

Microsoft's wireless strategy is also hampered by its ambiguous stance toward Java. SmartPhone 2002 does not offer native support for Java. Phone makers licensing this system must use Java virtual machine (JVM) providers, such as Insignia, to support Java 2 platform, Micro Edition (J2ME); a crucial tool for success in the mobile arena. Symbian, on the other hand, does offer native Java support.

With the trend-setting market of East Asia setting the pace, J2ME is fast becoming the lingua franca of the wireless Web. LG Telecom of Korea, the first carrier to launch Java service, has moved nearly all its subscribers to Java technology. NTT DoCoMo's Java-based i-Appli service is demonstrating the quick growth potential offered by the wireless industry. Worldwide, nearly all network carriers are upgrading their networks to accommodate J2ME-enabled services.

Nokia expects to sell between 50 and 100 million Java-enabled phones in 2003. Worldwide sales of J2ME handsets will soon overtake the sale of personal computers. The research firm ARC group expects that sales of Java-enabled handsets will reach 1.1 billion in 2006.

Symbian or SmartPhone 2002

Symbian consortium owners—Nokia, Ericsson, Matsushita (Panasonic) Motorola, Psion, and Siemens—control nearly 80 percent of global handset sales. The consortium converted

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to the point of annoyance. But if the two like each other, the dialogue becomes more loving and intimate, and after several chat sessions, text appears on the gamer's handset screen saying, "You may go to a Shinto Shrine, and hold a wedding ceremony!" The gamer follows instructions and gets married.

But the samurai, being a warrior, discovers that married life isn't a bed of roses. He must continue to travel, win battles, or risk losing his status. While traveling, he can only see a portrait of his wife in the status window of his miniscreen. When he reaches the end of his virtual life, he dies. But thanks to his successful romance, he continues his gaming life as his own virtual son, who inherits his father's status and score. The son further improves his skill and might rise to the rank of warlord. He can rule a large domain from a grand castle and control hundreds of novice samurai. When a rival warlord gathers troops near his castle, and he must determine the best strategy to counter the threat, the player might even forget to get off the commuter train taking him or her to school.

Games drive the wireless Web

Samurai Romanesque, played on a miniscreen, has proven to be an immersive experience for thousands of Japanese youngsters. The game illustrates that always on, packet-switched networks and a billing system that collects micropayments can kick start the wireless Web. More than 50 million Japanese currently use wireless data services, a large part of them youngsters. They download screen savers, ring tones, and other mobile content. The wireless Internet has dramatically altered the spending patterns in Japan. Japanese youngsters commonly spend $40 per month on mobile content.

Apart from boosting revenue, the growing popularity of wireless games has another important benefit for network carriers. Consumers become familiar with programmable handsets and advanced wireless Internet services, much as they did and continue to do on desktop PCs. They learn how to download applications, navigate through multilayered menu structures, and configure their devices to set personal preferences. All this could lower the acceptance barrier to mobile banking, location-based m-commerce, and other wireless services.

European and North American carriers hope to replicate the success of the Japanese carriers. They are rolling out 2.5G packet-switched networks and launching Java-enabled content, including a plethora of games. Estimates vary widely, but most analysts predict a billion-dollar market for wireless gaming in the next few years. According to Datamonitor (http://www.datamonitor.com), the European wireless gaming market will grow from $105 million in 2001 to $4.2 billion in 2006, when analysts predict that 150 million Europeans will play wireless games on a regular basis. Datamonitor predicts that the global market for wireless games will be $17.5 billion in 2006, with the US market generating $3 billion. The Yankee Group (http://www.yankeegroup.com) is more cautious, predicting that gaming in the US will generate $1.2 billion by 2006.

This expected growth also provides other, related opportunities; the "Cell Phone Software—A Battle Between Giants" sidebar discusses the tough competition for the top-provider role of the operating system in next-generation phones.

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Epoc—an OS for PDAs developed by Psion—into a suitable smart phone OS, and licenses its device reference platforms for its shareholders. Symbian enables use of a 640 × 240-pixel display and pen and keyboard inputs. In addition to compatibility with Java, the platform supports widely used standards-based features such as the wireless application protocol (WAP) and multimedia messaging service (MMS), Bluetooth compatibility, and USB ports; and other features such as 3D games and built-in cameras.

The Symbian OS supports several network technologies and is backward compatible; that is, it can switch between (packet-switched) 2.5G and 3G networks and can also negotiate legacy (circuit-switched) 2G networks. Symbian can handle variations in bandwidth and delays in data delivery; handsets preserve application data during a network connection interruption. Symbian gives its licensees access to the OS source code. Hence, handset makers can customize the Symbian interface and add features and functions.

On paper, Microsoft's SmartPhone 2002 is a strong challenger to Symbian. The OS is based on Microsoft's CE 3.0 OS, used in the PocketPC. It supports WAP, cHTML (a stripped-down version of HTML used by i-mode), Extensible Markup Language and Wireless Markup Language script, and the secure sockets layer. The platform's browser, Mobile Internet Explorer 3.0, lets users access Outlook and other Windows desktop programs. The browser supports a display resolution of up to 208 × 240 pixels, and can handle a wide range of graphics, scalable to any size and color. Microsoft incorporated TrueType technology to enhance readability of the small display. The platform lets users track the amount of data they download; a useful feature since most carriers charge for data downloads by the kilobyte or megabyte. It appears unlikely that Microsoft will play a leading role on the consumer market for smart phones, but it will no doubt attract a large part of the enterprise market.

Developer mindshare

In the end, the battle between Microsoft and the Java camp is mostly a battle for the developer mindshare. That is, developers are needed to create applications. More applications means more users, more users means a larger market, which in turn attracts developers.

Microsoft has included portable computing devices in its .Net initiative. In its attempt to stem the Java tide (which goes back to 1995, when the JVM first became available via the Netscape browser), the company developed a competing language (C#) and a tool (Visual J#.Net) to persuade Java developers to write applications for its .Net platform. The .Net compact framework links mobile devices with Windows-based PCs and servers.

Sun in turn is expanding the capabilities of Java 2, Enterprise Edition (J2EE) to handle J2ME wireless clients. The project has wide industry support, and ties in with Nokia's Open Mobile Architecture Initiative. OMAI is an attempt to create a *multivendor ecosystem* with the Symbian OS at its core. OMAI incorporates WAP2.0/XHTML and SyncML, and supports J2ME and MMS. OMAI will also develop back-end software for wireless providers, and has broad support among wireless carriers and handset makers.

Some industry observers have argued that Sun Microsystems' J2EE and Microsoft's .Net are similar and could ultimately converge through the development of bridgeware. These observers point out that the Microsoft Intermediate Language (MSIL)—the input for the common language runtime technology of .Net—enables cross-compiler possibilities that can target both .NET and Java

13 Jamdat Bowling brings a popular sport to wireless devices. Players aim the ball, adjust its throwing power, and add spin to successfully bowl a strike.

Image courtesy of Jamdat Mobile

The expected growth of wireless gaming is drawing hundreds of developers into the market. These include both start-ups and established game makers. Handmark has developed wireless versions of Hasbro's classics *Monopoly* and *Scrabble*. Users can play these games indi-vidually or with a combination of computer and human opponents. Hasbro is working with Infogrames and Jamdat Mobile to port classic board games such as *Boggle* and *Yahtzee* to the wireless Web. Last year, Jamdat Mobile launched a bowling game—shown in Figure 13—for mobile phones that's notable for its high-quality graphics. Sega has also turned to wireless gaming. The Japanese company teamed up with AT&T Wireless to deliver games for the carrier's mMode platform. Sega is also working with Nokia to develop the N-Gage smart console, which enables gaming over cellular networks, and peer-to-peer gaming using the Bluetooth wireless standard.

To address the many interoperability issues that still plague the mobile gaming industry, Ericsson, Motorola, Nokia, and Siemens—all leading handset makers—created the Mobile Games Interoperability Forum (MGIF). Among other things, the forum attempts to streamline specifications for J2ME-enabled phones. Java is ostensibly a write-once, run-anywhere language, but content developers must tailor mobile Java applications to the different controls and commands on handsets—a time-consuming and costly job. Last year, MGIF released its v1.0 specification. This version gives handset makers and game developers a basic set of common, reusable Java APIs for core functionalities on server-based mobile

(MSIL-to-JVM byte code, MSIL to Java, and Java to MSIL).

Smart phones, virtual money

Unlike PCs, mobile phones will more than likely become as ubiquitous as the wristwatch. The number of mobile phone users is increasing by several hundred millions annually. Mobile phones come in many varieties, and most people will eventually own two or more models, each with standard and specific functions. Last year, Taiwan became the first country where mobile phone penetration exceeded 100 percent. Perhaps the most important aspect of this diffusion is the use of the mobile phone as an electronic wallet. This potential e-wallet application in smart phones explains why top handset manufacturers such as Nokia and Sony have begun penetrating the banking business through the development of smart card-based payment systems.

Last year, NTT DoCoMo launched a bar-code-based system that lets subscribers pay bills at convenience stores. The company worked with Sony to develop an electronic payment system called *bitWallet*, letting consumers pay for goods and services with phones equipped with contactless smart cards. (The bitWallet is based on Sony's virtual money called *Edy*, short for *euro, dollar, yen*). Sony's smart cards (Suica) used in bitWallet have a range of about 8 inches (the distance from the reader). This is shorter than Bluetooth's capabilities, but Sony's cards don't require a battery, as do Bluetooth-enabled cards. Sony and Philips Semiconductors are working on a near field communications standard to lower the cost of contactless smart card technology.

End game

For once, Microsoft looks like an underdog. In 2002 British smart phone maker Sendo canceled a SmartPhone 2002-based phone, the Sendo Z100, just days before its scheduled launch. The move surprised the industry because Microsoft is a Sendo shareholder. Adding insult to injury, the British startup turned to Nokia and licensed the Nokia Series 60 (with a browser and messaging program that sits on top of the Symbian OS). Sendo claimed it turned to the Series 60/Symbian combination because of its robustness and flexibility and support for open services such as MMS and Java. The company also claimed that Microsoft's refusal to release the SmartPhone 2002 source code played a role in their decision. Microsoft pointed out that MMS and J2ME can be built on top of its platform, and therefore access to its source code isn't required to build a smart phone.

Meanwhile, Nokia, a powerhouse with more than 35 percent of the global handset market, controls the Symbian consortium. The company is recasting itself as a software company, and the fight between Symbian and SmartPhone 2002 is essentially a struggle between Nokia and Microsoft. The former has won the first round. In the end, the battle will most likely be settled in East Asia. Japan and South Korea have a substantial lead in handset technology, and China has the economies of scale—more than a billion consumers. Last year, China replaced the US as the largest cell phone market in the world. More than 200 million Chinese now own mobile phones, representing a penetration rate of merely 18 percent. When the penetration rate reaches 70 percent, the Chinese market will exceed the combined markets of the US and Europe. The country is also on target to become the world's largest producer of cell phones, and offers a huge army of low-cost but highly talented programmers who can develop royalty-free Linux/Java solutions. In this battle, low-cost production of 3G cell phones and royalty-free software might prove to be the winning combination.

games. The MGIF will integrate with the Open Mobile Alliance (OMA), another standards body established to make mobile technologies interoperable. OMA also has relationships with the Wireless Application Protocol Forum, the Wireless Village initiative, the SyncML Initiative, the Location Interoperability Forum, and the Multimedia Messaging (MMS) Interoperability Group.

Conclusion

The burgeoning international wireless Java market will no doubt produce a host of new games and other applications. But for now, Japan is the place to watch. It has a three- to five-year lead in the wireless market and has both a technical and cultural dimension to its market. Japan is in the forefront of a transition from textual to pictorial forms of communications. On Japanese cell phones, animated figures like birds, bears, and Snoopy-like cartoon characters act as onscreen personal assistants. Researchers in Japan have discovered that consumers trust animated characters more than text-based information and develop an emotional connection with animated figures. Content developer Sanrio maintains a Web-based biography of Hello Kitty, a pop-

ular cartoon character, listing her place and date of birth, likes and dislikes, and details on her favorite pastime—baking cookies.

But cartoons aren't limited to cute services aimed at teenagers. A Japanese content provider developed a Web site where women can track their monthly cycles. Thousands of Japanese women take their temperature in the morning and punch the result into their cell phones. When they log on to the server, they see a koala bear hugging a pole. If the bear moves up the pole, they're ovulating. A similar service lets subscribers track their weight; the onscreen assistant is a pig instead of a koala bear. Animated characters also teach consumers how to program their phones, where to find shopping bargains, and remind them of appointments. If all this seems innocent and inconsequential, perhaps it contains a larger lesson. Japan's sophisticated consumers aren't just interested in technology, per se, but want products they can relate to emotionally. ∎

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