Microsoft® Mobile Explorer™

A Modular Application Platform for Mobile Phones

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Introduction

The convergence of wireless technologies and the Internet has created a tremendous opportunity for the wireless industry. Wireless Internet applications are expected to drive substantial growth for all parties involved — particularly infrastructure manufacturers, software developers, mobile phone manufacturers and network operators. The key to success for all these parties will be to develop solutions that appeal to end users.

Sales of New Wireless Devices
World Market, 1997-2003
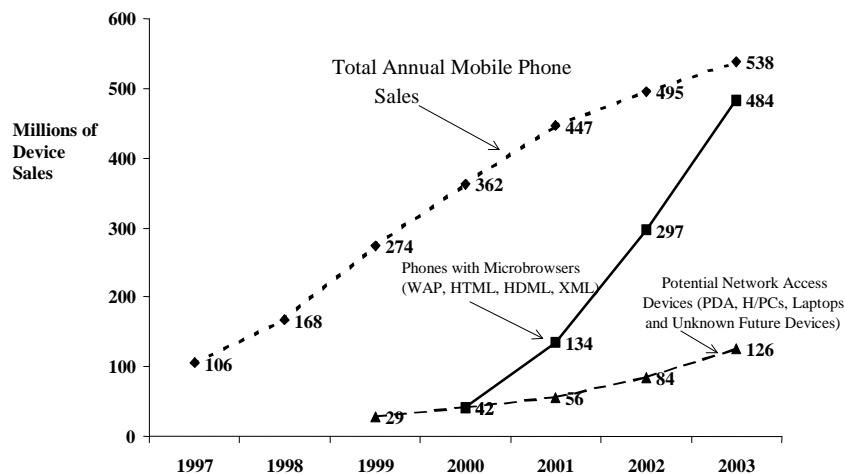
Fig. 1

This is not as simple as it would seem. User demands can be surprising. In the current phase of wireless Internet applications, the industry is primarily focused on Wireless Application Protocol (WAP) as the method to carry and encode information from the Internet. But the exact phone-based wireless Internet services that end users will adopt — and the devices needed to support them — are very much in question.

Infrastructure investments, standards, and the development of Internet applications and device electronics are pushing wireless Internet forward. Figure 1 represents estimates by Herschel Shosteck Associates Ltd. of the actual and forecast sales of Internet-enabled mobile (wireless) devices. The top dotted line indicates the total number of mobile phones that were sold or are expected to be sold in a given year. The middle solid line indicates the number of mobile phones with microbrowsers. These may be capable of browsing WAP content written using wireless markup language (WML) or encoded using HTML or XML. By 2003, Herschel Shosteck Associates estimates that there will be 1.05 billion cellular/personal communication services subscribers worldwide.

It is estimated that in 2003, 484 million of the 538 million new mobile phones sold will be Internet-enabled with various microbrowsers. This estimate is admittedly conservative

because unknown future services could accelerate growth beyond factors that can be accounted for today.

Given this unprecedented and rapid change, today's mobile phone manufacturers are faced with critical decisions regarding their allocation of resources and design of future devices.

Evolution Toward More Advanced Mobile Phones

Wireless applications have the potential to provide information and services any time, to any place and to any user device — given the right platforms. To achieve this vision, there are three general areas in which software platforms are required:

1) **Client devices** (mobile phones)

2) **Servers** in the corporate enterprise or within the network operator

3) **Services** such as content delivery and e-commerce

Microsoft Corp. provides solutions in all three categories. Microsoft® Exchange- and Microsoft Windows® 2000 operating system-based products fit into the second category. Microsoft MSN™ Mobile is an example of a service in the third category. The focus of this white paper is the Microsoft Mobile Explorer™ wireless communications platform, which is a platform for client devices.

In general, the industry is moving from voice-only mobile phones to handheld Internet access devices with voice as a component. There is no doubt that wireless subscribers want access to information and services from the Internet. The lingering question is how terminal manufacturers and wireless network operators will deliver that ability to subscribers — providing reasonable cost, convenience and features, and ensuring end-user satisfaction.

For the next several years, most wireless Internet access devices will retain voice capability as their core function. Of those, Microsoft sees two general categories of devices emerging: feature phones and smart phones.

Feature Phones

Feature phones are the simplest level of Internet-enabled mobile phones. Because of their modest processing power and memory requirements, they are also the least expensive to manufacture.

The typical feature phone of today has a screen capable of displaying four or five lines of text vertically by 12 characters horizontally. Examples include the Ericsson R320, the Nokia 7110 and the Motorola i1000 Plus. Some have larger screens with more display lines, such as the NeoPoint 1000.

The key defining aspect of a feature phone is that it contains a microbrowser, which enables the phone to access Internet content and services. Most microbrowsers read content using the WAP-standard language of WML. The Mobile Explorer microbrowser is "dual mode" — that is, it can read content encoded in either WML or Internet-standard HTML. This is, at present, a unique advantage.

Microbrowsers allow users to look up Internet-based information that is practical and useful in mobile situations, such as news headlines and travel directions. They may also provide the ability to conduct limited e-commerce such as ticket purchases or micropayments to vending machines. The Microsoft Mobile Explorer microbrowser supports advanced features such as cookies and bookmarks, as well as forms-based input.

To facilitate development, a feature phone may use any operating system that normally would be built into a phone. Generally, feature phones cannot be reprogrammed over the air or gain substantial additional capabilities.

Smart Phones

Smart phones improve upon feature phones through their increased sophistication and capabilities. Although still primarily voice-oriented devices, smart phones run an operating system specifically designed to allow programmability. Therefore, a smart phone can perform more sophisticated tasks.

The key differentiator of smart phones is their ability to run built-in applications such as a personal information manager (PIM) as well as applications emanating from the Internet or the network operator. This means that smart phones can grow to accommodate new user demands, much like a personal digital assistant (PDA).

At the smart-phone level, the Microsoft Mobile Explorer platform includes built-in synchronization and other applications. Smart phones generally have additional processing power and a better display (capable of 160x240 characters) as well. Examples of smart phones include the Nokia 9000 series, the QUALCOMM pdQ and the Ericsson R380.

General Requirements of Internet-Enabled Phones

The definition of a smart phone or feature phone is constantly evolving. Regardless of the type of mobile phone, a critical element for the success of any device or service is support for open standards, whether from the Internet or the wireless industry. The Microsoft Mobile Explorer platform supports the WAP standard, Internet content markup languages HTML and XML, and the present security standards such as secure sockets layer (SSL). This wide support for open standards best enables unknown future services.

The wireless industry has rallied around the WAP standard, which provides a set of protocols for transporting and encoding information specifically for use by wireless devices. One of the key aspects of the WAP standard is the content-encoding language WML. Internet-based information must be re-authored in WML if it is to be available to mobile phone users. Whereas WML is optimized for mobile phones, the requirement to

re-author content is a barrier. In addition to the WAP-defined protocols, mobile devices will need to access information that exists on the Internet in other forms.

Moreover, unknown new applications that drive user demand will be created. Most of these will be based on Internet and programming language standards such as Java and the Visual Basic® development system. To accommodate these new applications, a platform must be capable of gaining functions through programmability.

With this flexibility, smart phones will be able to compete in a rapidly evolving marketplace where programmable PDAs and other purpose-built mobile devices (such as MP3 audio players, wireless Instant message devices and handheld games) will soon become a significant portion of the mobile terminal market.

Market Requirements for Manufacturers: Increased ROI, Faster to Market

Manufacturers of mobile phones recognize that there is no single "best" solution for all mobile buyers. Market demand and acceptance will determine which devices succeed. But devising separate operating systems and internal software components to support a range of products will soon become an economically unattractive proposition. A platform that combines "building blocks" of components which can be added as needed for each device — from the simplest feature phone to the most advanced smart phone — gives the manufacturer an efficient way to build a range of products. This is a more cost-effective approach and potentially a much quicker route to market. The bottom line is improved manufacturer return on investment (ROI).

Market Requirements for Network Operators: Increased ARPU

Wireless network operators also benefit from terminals based on a flexible platform. Terminals that enable the broadest possible range of user demands will drive usage of the wireless network. Given the currently speculative nature of wireless Internet services, this is imperative. Some network operators are following a strategy of providing mass-market value-added services based on localization of content, plus "branded" e-commerce offerings. Others are approaching the market with the goal of enabling any service emanating from the Internet. Still others have unique needs particular to their country.

These regional variations in the adoption of particular content services mean that "one size fits all" terminals will no longer be a realistic option for every network operator. A range of Internet-enabled wireless devices will be necessary to fit differing user needs. Herschel Shosteck Associates refers to this as a "spectrum of appliances." Flexible platforms enable a spectrum of appliances with the lowest possible manufacturing cost and corresponding benefits to the network operators' average revenue per user (ARPU).

A further variable is the onward progression of air-interface standards. Wireless networks are moving from the first and second generations to advanced second- (2.5G) and third-generation (3G) networks. As networks move forward, they tend to gain additional capabilities, such as increased bandwidth. Increased capabilities will enable future, as yet unknown, applications. An ideal terminal platform is independent of these evolving standards but also can take advantage of the benefits they provide.

Forecast for the Mobile Phone Industry

At present, the mobile phone industry is in a transitional state, moving from the voice-only phones that have dominated the market to hybrid feature and smart phones. In particular, manufacturers are introducing feature phones that access information from the Internet using a variety of content markup languages (including HDML, WML and HTML) and with a variety of operating systems. According to Herschel Shosteck Associates, by 2003, approximately 90 percent of mobile phones manufactured will include microbrowsers.

The market for feature phones should continue to mature through 2002, at least. During this time, feature phone capabilities will eventually become common in low-end phones. Due to their greater complexity, the market for smart phones will mature over a longer period.

During this transition, the marketplace has been somewhat confused as to the future definition of phones, in particular, the operating systems that will run smart phones. In part, this is the result of a history of constantly changing operating system implementations. Some phones have patched together the user interface from one operating system with another operating system in an attempt to create a market-acceptable product.

At one time, numerous companies were offering or planning to offer operating systems for smart phones. However, smart phones and feature phones need to be supported by more than just an operating system. This requirement for a fully integrated platform designed for the long term has already eliminated most competitors. As the industry matures, only those solutions that continue to meet this test will flourish.

Marketplace Demands

To be capable of meeting market demands in the future, both feature phones and smart phones need to support open and Internet standards, offer flexibility in design and functions, utilize a modular design instead of a patchwork of solutions, and easily connect to shared corporate network databases and services.

Further, smart phones must be able to conduct e-commerce securely using Internet standards, add new applications "on the fly" and synchronize with other devices.

From this perspective, the most important element of a feature or smart phone is the overall platform on which it is built. The platform gives the manufacturer, network operator and wireless subscriber the greatest flexibility and choice. This is the key behind the Microsoft Mobile Explorer platform — a set of building blocks that allow a variety of configurations depending on need.

The Microsoft Mobile Explorer Platform

In the emerging Internet-enabled mobile phone market, much attention has been focused on the development of microbrowsers and operating systems. This can be misleading. A microbrowser or operating system alone is only part of a complete solution.

Instead, Microsoft Mobile Explorer is a flexible platform. Its modular design allows Microsoft associates to build terminals using only the components they need. Each component of the platform is independent of operating systems and air-link standards. By providing this set of independent yet interoperable building blocks, Microsoft Mobile Explorer is much more than a browser or an operating system.

Building Blocks of Microsoft Mobile Explorer

In addition to supporting Internet content and security standards, Microsoft Mobile Explorer will evolve around key wireless industry standards. Microsoft supports WAP, Bluetooth (a short-range wireless communications specification) and SIM Application Toolkit (a set of software tools designed to facilitate application design for subscriber identity module (SIM) card phones). This support is reflected in the design of Microsoft Mobile Explorer.

As noted earlier, Microsoft Mobile Explorer is divided into components, or building blocks, that can be added interchangeably to create phones with different features.

Microsoft Mobile Explorer Component	Features
Windows CE	Microsoft's real-time operating system, specially modified for use in mobile phones
Dual-mode microbrowser	Capable of reading HTML and WML content, with a design path to future XML-compliant languages
SIM Application Toolkit support	Supports existing and future applications created with SIM Toolkit — a key element for global system for mobile communication (GSM) network operators and GSM terminal manufacturers
Virtual machine	Enables phones to run applications written using Java or Visual Basic — essential for downloaded Internet-based applications
Telephony APIs	Supports manufacturer and carrier-developed applications that require telephony APIs, including WAP APIs, for roaming

Security	End-to-end security for transmission of content, e-commerce and applications to the phone; support for WAP's WTLS security protocol
Location-based services	Supports services tailored to the end user's physical location at the time of use
Personal information manager	Calendar, contacts and related services application
Synchronization	Synchronization of user information (PIM, preferences, e-mail, etc.) through the wireless network with applications contained on corporate or Internet servers
User interface	Support for key user interface technologies and third-party plug-ins, such as Tegic T9 intelligent keypad input and voice input
Server-side application provisioning and device management	Adds the ability to download applications created with SIM Toolkit and applications created for the framework of the phone itself; server-side device management critical for corporate enterprises

Microsoft's View of the Wireless Telephone Future

The wireless industry is generally moving from hardware-centric services based on proprietary technologies to software-centric services based on open standards. This means that users, not manufacturers, will determine the "killer applications" of the future — just as they have on the landline Internet.

A parallel trend is the move away from value-added services that emanate solely from and are controlled by network operators. The industry is moving to platforms that enable users to self-provision the services (or applications) which interest them and to obtain those services directly from the Internet.

For terminal manufacturers and wireless network operators, these two trends mean that their added value will begin to come from providing platforms that enable services, rather than the services themselves.

An example is given by wireless application service providers such as InfoSpace, @Mobile, Geoworks Corp. and Wireless Knowledge. These firms are building applications that extend Internet-based applications to mobile phones. At present, users configure some of those applications using software that runs on servers or desktop computers. As the capabilities of smart phones increase, more of these applications will run, and be configured directly, on feature phones and smart phones.

These Internet-based applications and services will be able to serve mobile terminals of varying capabilities. Whatever the application, the Microsoft Mobile Explorer platform enables a range of terminals to be designed from a single set of components designed from the outset to function together.

User Scenarios

A user of a feature phone or smart phone based on Microsoft Mobile Explorer can access a wide variety of content from the Internet — both what is currently available and what may evolve in the future. Some of the types of content are outlined in Figure 2 below.

Category	Applications
Communications	E-mail, fax, unified messaging, Internet access, intranet access
Value-add services	Information services (news, weather, stock), games
PIM	Contact information, calendar, tasks
Customer care	Instant access to account balance, service plan info, etc.
E-commerce	Retail, ticket purchasing, banking, financial trading
Location-based	Restaurant finder, navigation, traffic control,

services	railway
Vertical	Sales force automation, fleet management

Fig. 2

All these applications emanate from the Internet, with the terminal manufacturer providing the device to enable access and the network operator providing the network to enable the content, adding value through certain services such as localization of the subscriber.

Manufacturers' Advantages: Increased ROI

By providing a set of components designed to work together, Microsoft Mobile Explorer potentially decreases the manufacturer's time to market, allowing faster response to what will undoubtedly be a rapidly developing competitive landscape. Since Microsoft Mobile Explorer components are designed to work together and yet be configured in a variety of ways, manufacturers gain economies of scale and have a clear path to future (more capable) terminals as needed. The result is increased ROI.

The choice of platform for wireless devices must be based on market demand. As subscribers begin to adopt Internet-based services, devices that can fulfill a spectrum of user demands will increase in priority from "nice to have" to "absolutely mandatory" on virtually all new mobile phones. Again, this change in user expectations is directly related to the reliance on services that new mobile phones will enable — and the change probably will be dramatic and rapid.

Network Operators' Advantages: Increased ARPU

Microsoft Mobile Explorer allows network operators to accommodate the changing demands of end users. Future subscribers will have differing expectations from current voice-only subscribers. In the past, all terminals had essentially one critical capability: voice communications. Today and in the future, offering a portfolio of Internet-capable terminals will be absolutely critical. The ability of subscribers to purchase and use Internet phones that fit their highly personal needs will be a factor in ARPU — and will contribute to the bottom line for the network operator.

In particular, end users desire broad access to content from a variety of sources. When the content offerings exceed user expectations, the user becomes reliant on the services and the result is air-time usage. While some network operators plan to offer such content themselves through WAP, Microsoft Mobile Explorer enables content from other sources as well. Regardless of the source of content, the network operator benefits from increasing use of wireless air-time.

Microsoft Mobile Explorer also enables connection to outside services, particularly corporate enterprises and services from the Internet. Corporate enterprises may be using Microsoft server products such as Microsoft Exchange, Windows 2000 or the Microsoft BackOffice® family. Microsoft Mobile Explorer is designed to seamlessly integrate with these server products. On the Internet, content and e-commerce services such as MSN

Mobile are also designed to work with Microsoft Mobile Explorer. The extension, provisioning and management of mobile terminals through corporate servers and Internet-based services will be a key growth area the for wireless industry.

Conclusion

The marketplace for new types of mobile phones will be highly competitive over the next three to five years. While in the past manufacturers have been able to build reputations based on smaller and lighter voice phones, the introduction of Internet-based content services is a wild card.

This "sea change" in the industry will open the door for new competition. Manufacturers with fewer users (and even manufacturers who had been virtually unknown, such as Neopoint) may be able to use the shift in user expectations to their advantage. In addition, there will be many new manufacturers entering the arena. Despite a large potential marketplace, dilution is a very real risk. This risk underscores the importance of maintaining a low component cost structure and having a software path toward future devices.

Given that future services to be delivered by mobile phones are only speculative at this time, the most logical path is to utilize software platforms that offer a flexible strategy for the long term — not just a strategy for the next phone model to come out of the factory. The interoperable and independent building block approach of Microsoft Mobile Explorer, combined with its support of standards, yields the flexibility required. The overall picture is a platform that best "future-proofs" terminal manufacturers who seek to establish themselves or protect their existing market share in the emerging terminal market.

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