

Operating System Strategy for Rugged Mobile Computers

Executive Summary

After more than a decade of stability using mobile computer operating systems based on successive versions of Microsoft® Windows Mobile® and its predecessors, the current situation is far more dynamic. Major players in the consumer smartphone market are migrating users to rich interfaces focused on screen interaction rather than keypads. Powerful multi-core processor architectures enable highly responsive applications. The tight integration of sensors, wireless connectivity, and application services frameworks are driving a new paradigm, allowing developers to easily integrate key functionality into their apps via standard system APIs. A large ecosystem has emerged to provide apps, resources, and tools to facilitate development.

But what does this mean for the enterprise? How does a changing user base drive new application interfaces? Which ecosystem should IT embrace for mobile devices? These are questions with no singular answer, yet multiple alternatives are offered for consideration. This paper will outline several options and provide guidance as to which ones may best fit the needs of each individual enterprise.



Preface

This paper will discuss the major operating system environments for mobile computers and the strategy that Honeywell recommends to serve customer needs with each. The scope of this discussion is limited to operating systems used on handheld computers and does not address strategy for larger form factor devices such as vehicle mount computers. This paper is intended as an introduction and overview to the various technologies discussed; many online resources are available for further technical information.

Microsoft Windows Embedded 8 Handheld

Not so long ago, Microsoft launched their newest solution for mobile computers targeted at enterprise customers. Windows Embedded 8 Handheld® (WE8H) provides a modern touch-oriented user experience built on top of a powerful processor architecture that provides high-performance solutions for the AIDC industry.

Windows 8 Strategy

WE8H is part of a unified operating system strategy from Microsoft based around a common kernel, leveraging shared programming APIs and a common tool chain to enable streamlined application development. Previous generations of Windows Mobile were based on the Windows CE® kernel, which diverged significantly from the mainstream desktop operating systems and provided few synergies from the perspectives of development and support. With Windows® 8 a common core is shared across Windows® 8 Pro for

desktops, laptops, and tablets, Windows® RT for tablets, and Windows® Phone 8 for consumer smartphones. WE8H is an extension of Windows Phone 8, adding several enterprise-specific features along with specific branding.

The common Windows 8 architecture benefits IT by enabling developers' apps to potentially work across the entire enterprise. WE8H apps can be developed using the same tools as other platforms, eliminating the need to maintain multiple tool chains and enabling the use of modern user interface frameworks. It also provides added flexibility in use of developer resources, reducing the need for specialization around different tools and environments.

WE8H Hardware & Software Environment

WE8H is closely based on Windows Phone 8 and shares many of the same hardware characteristics with the consumer product. The architecture is designed around a Qualcomm® Snapdragon™ processor and many device characteristics are standardized by Microsoft to ensure a consistent user experience across different manufacturers' products. In its initial releases, WE8H supports only a limited set of enterprise extensions, namely barcode scanner and magnetic stripe reader interfaces. Common AIDC-specific features such as keypads and resistive touch screens are not supported, requiring adaption to capacitive touch input and on-screen keypads. WE8H supports finger gestures as the primary input method. The user interface is designed with every part of the screen accessible, enabling actions like swiping, pinching, and dragging to manipulate on-screen controls.

WE8H includes a security model that promotes system stability. Individual apps are "sandboxed", i.e., running in their own "chambers" and unable to interfere with other apps. Only the app in the foreground (displayed on the screen) is active, ensuring it is highly responsive to user input. Multiple apps may be used, but those not in the foreground are suspended until the user returns to them. Data stored locally on the device can be encrypted for added security. A built-in "Enterprise Corner" is used to limit apps available to end users, so Partners and ISVs no longer have to design apps to run in kiosk mode as

was previously required. To further promote system integrity, applications must be "signed" by Microsoft before they can be installed on a WE8H device.

Customer/Partner/ISV Benefits of WE8H

O/S-level support for accessing scanner data means that device-specific drivers and APIs are no longer required. This improves portability of apps across multiple vendors' WE8H products. The Visual Studio 2012 development environment is consistent with other Windows 8 products. There is no longer a need to support a separate set of tools and resources solely to support apps running on mobile devices, resulting in greater IT agility.

The Windows Phone 8 ecosystem and marketplace may be leveraged to augment enterprise-specific applications with additional apps to provide specific functions and capabilities. Using the "Enterprise Corner" feature of WE8H enables the user to access multiple applications from a set controlled by IT, providing greater freedom to use general market functionality in a controlled way.

Implications for Existing Customers

The vast majority of existing apps in the AIDC industry run under Windows Mobile and/or Windows Embedded Handheld operating systems and are not readily portable to WE8H. The touch-centric user experience requires "reimaging" the application interface and is developed using new tools from Microsoft. While some program logic may be portable to the new development environment, customers and partners should likely expect a complete rewrite of their application's user interface.

Android

Google® Android™ operating system has captured the majority share of new consumer smartphone sales over the past two years, owing to its processing capabilities and broad availability on a large variety of mobile computer hardware. Promoted as an "open" platform, Android encourages all comers and enjoys frequent product updates and a deep, well-established application ecosystem. In stark contrast to the other major consumer smartphone operating system, Apple® iOS for iPhone®, Android is available on hardware from

many vendors, is offered a variety of form factors, and is supported by numerous app stores that provide retail outlets for developers to market their apps.

Android Landscape & Strategy

Android is notable for the rapid succession of product versions released over the last several years. Named alphabetically after sweet goods, the latest “Jelly Bean” is the tenth major version released. Also worth noting is that adaptation of the latest version is notoriously low; at present, a significant percentage of Android devices are still running the “Gingerbread” release from 2010. This fragmentation stresses the ecosystem as developers are forced to support multiple versions or, more commonly, choose to quickly abandon support for older versions.

Google’s vision for Android is oriented almost entirely around the consumer market. Android is a vehicle to support Google’s search and advertising strategies, and demand is driven by new features added in frequent updates to the code base. Google has shown little interest in supporting the needs of enterprise customers who expect much longer product cycles; they have ceded this to device vendors and others who see enterprise markets as an opportunity.

However, there have been several features added starting with Android v4.0 (“Ice Cream Sandwich”) that appeal to enterprise customers including improvements to the security model, remote wipe capability, encryption, and whitelisting/blacklisting of applications. The lack of these features in earlier versions of Android has limited enterprise adoption; broader acceptance of Android is expected as devices supporting newer Android versions come to market.

Android Ecosystem

Android is an open system supported by many resources, developers, and enthusiasts. Other than published documentation, Google provides relatively little direct support, instead relying on the user community for this function. As such, an enterprise customer considering Android must also evaluate the support systems of their potential vendors; they will be more reliant on the vendor for support than other alternatives discussed in this paper.

In contrast to Microsoft Windows Embedded 8 Handheld and Apple iOS, Android apps may be obtained from multiple app stores or marketplaces. Google does not curate a collection of apps to be offered through a single portal. Upon registration, any developer may post an app to the Google Play store; other marketplace providers may have different requirements. Evaluation of the app for quality and suitability to purpose is left to the customer acquiring it, though more app stores provide a means for other users to rate and post comments about apps.

Android solutions in the AIDC market tend to rely on Mobile Device Management systems for maintenance and configuration of mobile devices. Again, Google provides few tools to manage enterprise systems, i.e., company-owned devices managed on behalf of the end users.

Hardware vendors developing Android solutions are not as constrained as they are under WE8H. Many processor architectures are supported and as an open source solution, vendors are free to modify and extend Android functionality as they see fit. However, the more modifications that a vendor makes to the core Android system, the less compatibility they will have with others in the market. This should be included in evaluation criteria when selecting an Android vendor.

Customer Benefits

With a very broad and active ecosystem for applications, the customer deploying an Android solution has great leverage to source and adopt apps to perform specific functions within their environment. IT departments can be more responsive to customer needs by deploying small apps to accomplish specific tasks quickly and easily. Enterprises developing their own apps will find many tools and resources readily available to support their efforts.

Android provides a broad and mature set of services, APIs, and frameworks that facilitate faster and easier app development. These tools enable developers to incorporate a broad array of application functionality through simple system calls instead of having to develop, debug and support these capabilities independently. The Android services ecosystem is currently far more mature and complete than newer systems such as Windows Embedded 8 Handheld.

Android uses a virtual machine model for app execution; each app is “sandboxed” with its own process and file system. This promotes security and system stability. In addition, there is a good inter-application communication model and a shared file area that enables multiple apps to work together.

End user acceptance of Android is high due to its familiarity and ease of use; many employees already have experience with smartphones and understand the navigation of the user interface and the use of gestures. As a result, user training for an Android-based solution can potentially be easier and faster than older system designs.

Implications for Existing Customers

Enterprises targeting an Android deployment should expect to develop or acquire new applications. Existing apps written for Windows Mobile or Windows Embedded Handheld cannot be leveraged to the Android environment.

Android is more open in the sense that a true lockdown or kiosk mode is not present, but Device Management tools may be utilized to enable Android’s whitelist/blacklist features to control app execution by the end user.

HTML5

Although not an operating system per se, HTML5 is a browser standard with significant implications in the enterprise space as a way to simplify the management of applications in the field and reduce dependency on the device operating system.

What It Is

HTML5 is the latest evolution of Hypertext Markup Language (HTML), which is the language used to build all web pages and web applications. Web applications are device agnostic; a developer can create an application to run on the web and that application can generally be run on any device hosting a capable web browser. HTML5 continues this tradition of enabling device-agnostic web applications, but adds features that give it the potential to be much more than the next iteration of a web standard. HTML5 allows applications to execute locally on the device, even when disconnected from the web, and it contains features that make application

execution much more responsive than traditional web applications. Perhaps the most exciting aspect of HTML5 for the general application development community is enabling web applications to run, look, and feel much like a native app. The user interface elements are much more sophisticated than previous versions of HTML and complex graphical elements can be rendered locally in the browser engine. As a result, the advent of HTML5 has generated considerable buzz and excitement in the application development community.

Benefits & Limitations

HTML5 applications run within a browser environment which provides independence from the underlying operating system. HTML5 browsers are a standard component of most new operating systems, including Windows Embedded 8 Handheld and Android. Customers deploying an HTML5-based solution will enjoy simpler management of the mobile device, with application updates as simple as refreshing a web page. They will also be less reliant on local data storage; in many cases, the captured data is transmitted directly to the web site. Offline operation is also enabled, meaning the end user can continue with their work even in the case where connectivity is interrupted. Finally, migration of the solution to different hardware, even if running a different operating system, can be achieved with little or no rework of the application code.

Not all applications are suitable for migration to HTML5. Applications that rely on complex grid controls for data input, or that require heavy database processing at the point of transaction, may not deliver satisfactory results in an HTML5 environment. Apps oriented around data capture, including scanned data, and forms completion apps are common in the AIDC industry and are ideal candidates for development under HTML5.

Windows Mobile 6.1 and Windows Embedded Handheld 6.5 do not have HTML5 support in their native browsers. However, Honeywell provides an alternate HTML5 industry-standard browser for these platforms at no charge. In addition, an HTML5-enabled version of the **Honeywell** Browser product is available at the same license fee as the previous version. In addition to a fully-functional

browser control for hosting apps and web pages, the Honeywell HTML5 Browser provides interfaces to common peripherals and implements a lockdown mode that enables the customer to control the end user's ability to navigate the Internet or other parts of the mobile computer.

Windows Embedded Handheld 6.5

The venerable Microsoft Windows Embedded Handheld® (WEH) 6.5 operating system and its Windows Mobile and Pocket PC predecessors have serviced the AIDC industry extremely well over the past dozen years and will continue to do so through the end of the decade. Thousands of apps are deployed on this family of operating systems, enabling the management of field workers and the collection of data on millions of devices daily. The operating system is mature and stable; the investments made by OEMs to extend and stabilize it make it a very robust platform for mission-critical mobile computing.

Current Status and Future Plans

WEH 6.5 was launched in 2010 as a rebranding of Windows Mobile 6.5. More importantly, support responsibilities for WEH 6.5 were assumed by the Windows Embedded Business unit within Microsoft, ensuring a long support timeline for the product. Microsoft has committed to providing extended support for this operating system until 2020. Predecessor operating systems such as Windows Mobile 6.1 remained with the Mobile Communications Business unit and support for those operating system versions has now ended. However, Honeywell is able to provide support for older operating systems no longer supported by Microsoft until product End of Service.

WEH 6.5 is in a maintenance mode and no feature enhancements are expected. Microsoft updates provided to OEMs such as Honeywell consist primarily of bug fixes and security updates. These updates are rolled into periodic blockpoint releases provided for current products such as the 70 Series and CK3R/CK3X mobile computers from Honeywell.

The Honeywell Strategy The Honeywell strategy is to offer solutions in all of these areas:

- Windows Embedded 8 Handheld: Honeywell is a launch partner with Microsoft and is planning to offer products in the future based on this operating system.
- Android v4.1: Honeywell has developed this operating system on its CN51 mobile computer. Our extensive experience in meeting the needs of embedded enterprise customers is directing the development of additional software to help tailor Android to the needs of our customers. For enterprise customers, we strongly recommend against deploying solutions based on older versions of Android (prior to v4.0), which lack key security features and are not supported on newer generations of processors.
- Windows Embedded Handheld 6.5: A full line of mobile computer products supporting WEH 6.5 is currently available from Honeywell, including 70 Series, CK3R/X, CN50, and CS40. In addition, the CN51 mobile computer released in October of 2013 provides WEH 6.5 on a next-generation processor platform, setting the stage for bridging of WEH 6.5 to Android – the customer can roll out on WEH 6.5 and migrate to Android in the future without replacing their Honeywell devices. In addition to Microsoft's support commitment until 2020, Honeywell will support WEH 6.5 for the service life of the products on which it runs.
- HTML5 Browsers: Honeywell mobile computers running Windows Mobile 6.1 and Windows Embedded Handheld 6.5 can take advantage of the industry's first standard HTML5 browser, available at no extra charge. In addition, HTML5 support has been added to the **Honeywell** Browser which provides greater functionality to control **proprietary** peripherals. Apps developed for either HTML5 solution can migrate to newer operating systems that support this standard, providing the customer with flexibility as they move forward.

Tools used by developers to create and maintain applications for WEH 6.5 remain at their current versions; WEH 6.5 is not supported by the newer Microsoft tools available for Windows 8 development. Many Partner/ISV development frameworks continue to support WEH 6.5 based on its extensive install base in the AIDC industry.

Implications for Existing Customers

Customers currently deployed on WEH 6.5 should not feel the need to abandon this platform urgently. It is stable and well-supported and will remain so for many years to come.

Customers considering new deployments or application rewrites would be wise to consider some of the newer tools and operating systems that are becoming available. For applications that are a good fit for HTML5, this enables a transition strategy that can be deployed on current hardware and easily migrate to newer hardware (and operating systems) as comes time to upgrade.

Summary

Much has been written in the press about the suitability of consumer phone operating systems in the enterprise. While most of these articles concern use of smartphones by white collar professionals, relatively little is discussed where it comes to directed workers running mission-critical apps. This category, characterized by workflows tightly controlled by management, typically limits the areas of the device that the worker can access and often restricts use of wireless communications to specific tasks. Devices are commonly “locked down” to only those apps needed by the worker, who may not even be aware of the operating system running the device.

The unique characteristics present a challenge when adapting consumer technology to the directed worker model. While tools exist for device manufacturers to create “appliance” devices that can meet the requirement directly, this approach was abandoned long ago in favor of a more open model that allows for compatibility across devices rather than tying the application directly to a specific vendor’s hardware. Microsoft Pocket PC® (later Windows Mobile) was the first operating system to embrace this idea; many years of development improved the Windows Mobile product by adding features specifically to address the needs of the embedded enterprise.

The market has reached an inflection point where the traditional solution has been joined by a number of viable alternatives, each with their own challenges. Microsoft’s latest offering, Windows Embedded 8 Handheld, has a strong business focus and excellent security model, combined with a modern touch-based user experience. Android offers a similar user interface, but embraces a much more open development model that provides many choices but needs more control to be used in embedded solutions. Android also has the greatest opportunity for vendors to diverge from the standard to implement unique solutions at the cost of compatibility. For less-complex applications, a new alternative based on the HTML5 web standard is yet another consideration that avoids dependence on any single operating system and provides a method for customers to roll out their solution on one platform, yet maintain the agility to move to other platforms in the future.

About Honeywell

Honeywell Scanning & Mobility (HSM) is a leading manufacturer of high-performance image- and laser-based data collection hardware, including rugged mobile computers and bar code scanners, radio frequency identification solutions, voice-enabled workflow and printing solutions. With the broadest product portfolio in the automatic identification and data collection industry, HSM provides data collection hardware for retail, healthcare, distribution centers, direct store delivery, field service and transportation and logistics companies seeking to improve operations and enhance customer service. Additionally, HSM provides advanced software, service and professional solutions that help customers effectively manage data and assets. HSM products are sold worldwide through a network of distributor and reseller partners. For more information on Honeywell Scanning & Mobility, please visit www.honeywellaidc.com

About Supply Chain Services

Supply Chain Services is a leading provider of best-in-class, customized data collection, barcode scanning, barcode printing, rugged mobile computing, wireless networking solutions, and managed mobile services that offer out-of-the-box automation and improvements for the value-chain processes of manufacturing, distribution, warehousing, and logistics companies. As specialists in the automated identification and data collection (AIDC) industry, we are a single source for evaluating, designing, integrating, implementing, managing, and supporting data collection technology infrastructures that generate very high and very fast return on investment for our customers. For more information about Supply Chain Services, please visit www.supplychainservices.com



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