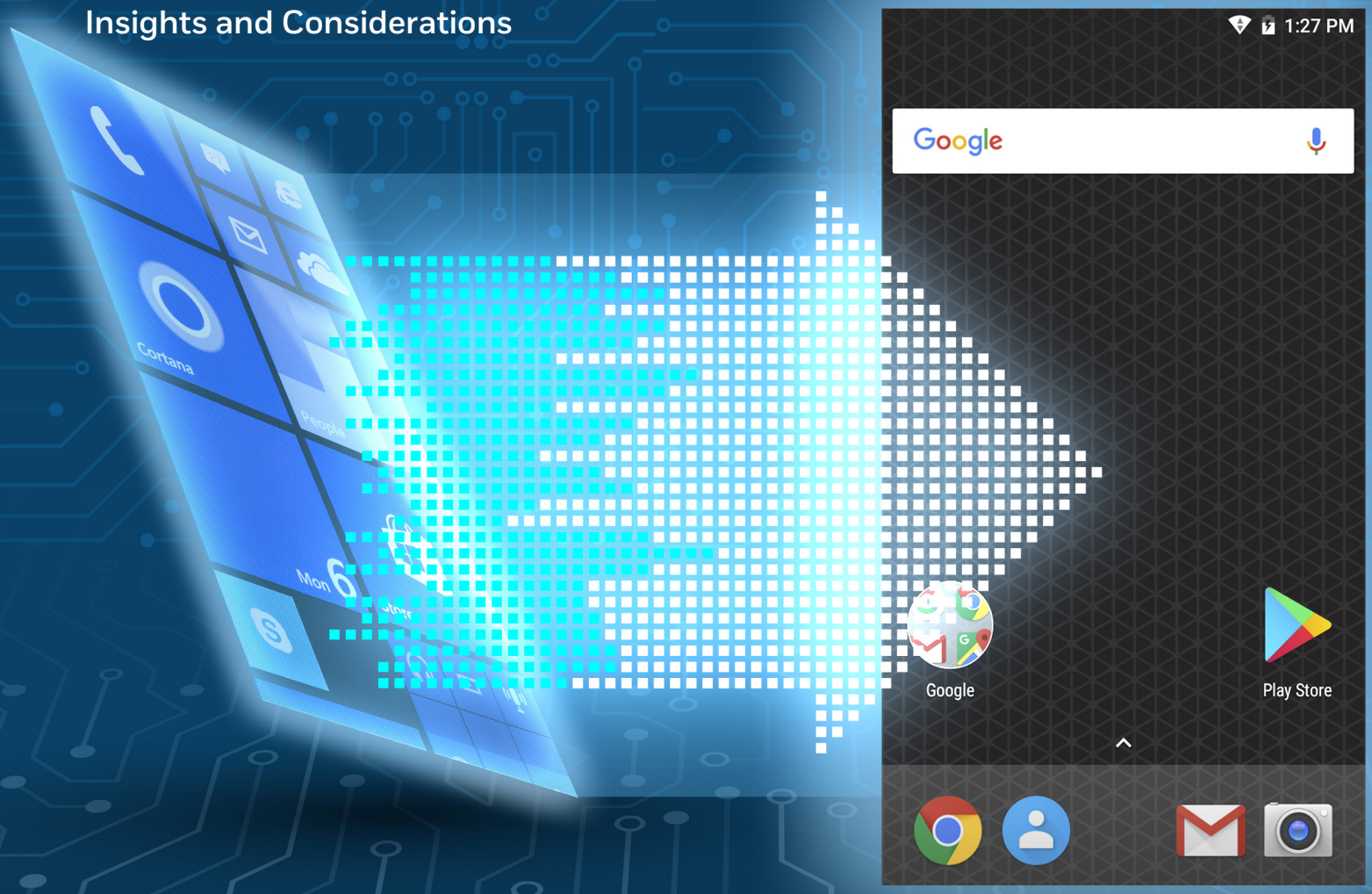
MOBILE OPERATING SYSTEM TRANSITION

Insights and Considerations



TAYLOR DATA SYSTEMS, INC

Honeywell

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INTRODUCTION

A shift in the mobile operating system landscape has occurred over the last several years. The transition from legacy Windows® is well underway. While there remain several distinct choices on the roadmap, the tradeoffs and compromises associated with each have become clearer. This paper will elaborate on these points and provide the reader with guidance on recommended solutions.

LEGACY OPERATING SYSTEMS

1

Customers currently running applications that require a legacy Microsoft® operating system (Windows CE 6 or Windows Mobile/ Windows Embedded Handheld 6.5) will soon face the end of support for their platform. Mainstream support, which includes regular updates, has ended for both legacy systems.

Microsoft extended support (security fixes) ended for Windows CE 6 in early 2018 and will end for Windows Embedded Handheld 6.5 in early 2020. After those dates, vendors will be unable to provide patches should a vulnerability or error be found in Microsoft code. For this and other reasons, many customers have begun planning a transition to new applications running under Android™.

As end of support dates for legacy operating systems approach, customers need to make decisions and plans to move forward, as application development can require considerable time and effort.

Android's large market presence supports a broad variety of OEMs and hardware form factors, making it more likely that a device is available to meet the customer's use case and cost requirements, including devices that offer integrated physical keypads.

ANDROID ENTERPRISE EVOLUTION

2

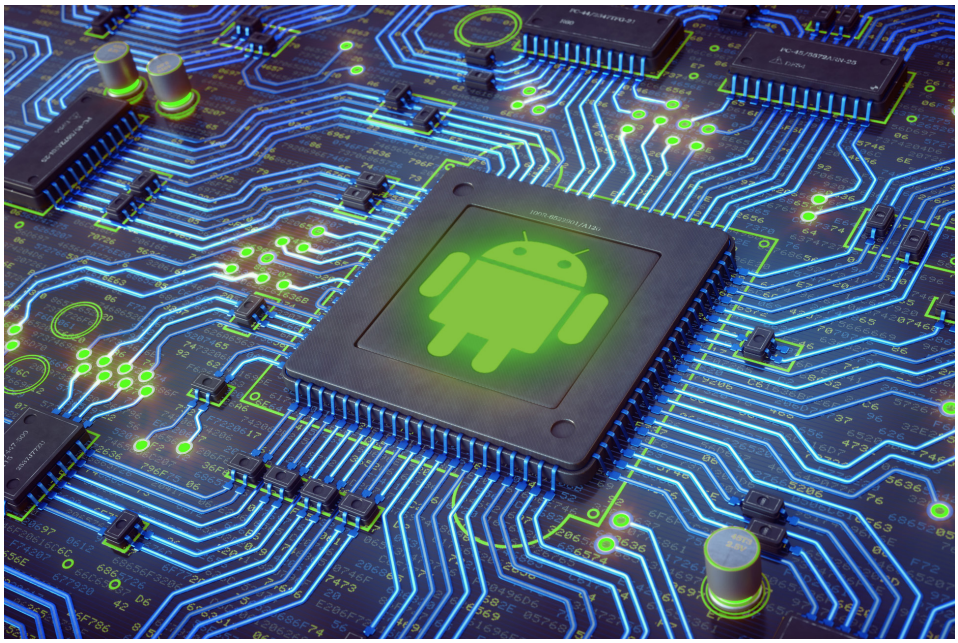
Prior to 4.0 Ice Cream Sandwich, Android offered little in the way of enterprise features. The consumer-focused operating system was augmented by OEM extensions and third-party software to allow it to be controlled and managed in the enterprise environment.

Enterprise features gradually began appearing in the 4.2 Jelly Bean and 4.4 KitKat releases, culminating with the introduction of Android for Work in 5.0 Lollipop. Android for Work provided an extended set of management APIs and a container system for separating and independently managing personal and work apps and data.

Google® has continued investing heavily in enterprise capabilities in each of its last several versions, renaming Android for Work to Android Enterprise.

Added features include bulk provisioning to speed device setup, Device Owner (Android Enterprise) mode to allow fully managed devices at the corporate level, always-on VPN, and encryption enabled by default to protect personal and corporate data.

Popular mobile operating systems such as Android enable companies to access a large ecosystem of applications, development tools, and resources, but also involve security risks that must be addressed and mitigated. Google has steadily evolved its approach to security



As its market share has grown, Android has become a target for exploits and malware attacks. Google has responded by increasing the protections to prevent the introduction of Potentially Harmful Apps (PHAs), as well as implement defenses inside the OS that limit the ability of the system to be compromised should a PHA be installed. A few of those protections are discussed below.

Detailed information is available in Google's *Android Security 2018 Year in Review* report located here:

https://source.android.com/security/reports/Google_Android_Security_2018_Report_Final.pdf

HOW HONEYWELL HELPS

3

Honeywell is strongly committed to cybersecurity. Our global businesses include aerospace and process solutions that demand a very high degree of security in all aspects of operations.

A corporate-level cybersecurity task force sets and maintains security policies and standards, including test procedures used during product development that specifically identify software issues that could make systems more vulnerable to exploits. This approach eliminates potential vulnerabilities before products are even released.

The cybersecurity team monitors multiple information sources to learn of potential system security issues as early as possible (typically well before the mainstream media) and has implemented an escalation protocol that mobilizes resources company-wide on a priority basis to address these issues.

Once an Android vulnerability is revealed and a corrective action posted by Google, Honeywell's Android security experts implement the fix and deliver it to customers. Direct distribution of patches and updates enables Honeywell to reduce response time compared to OEMs who must go through secondary channels to deliver their updates.

Security Manuals are published for all Honeywell products to guide customers in implementing best practices to secure their environment and devices. Guidance is provided in configuration of device settings, network settings, and maintaining a secure IT environment. These preventative measures are intended to reduce the avenues through which threats can enter the customer environment.

Many enterprise customers will choose to restrict end users further by "locking down" the device through the use of an Enterprise Mobility Management (EMM) agent or app such as Honeywell Enterprise Launcher. These tools control user access to system resources and can restrict the system to execute only designated apps. Removing the user's ability to install or run unauthorized apps makes the system far less vulnerable to security exploits caused by user actions.

Honeywell offers tools that enable customers to establish application white lists or black lists, control availability of a wide range of device features, and control which IP addresses are accessible through the firewall. Honeywell Launcher replaces the standard Android home screen with a kiosk experience that allows the user to see and execute only the apps needed to perform their job. Honeywell also offers an Enterprise Browser that enables web page rendering using standard Android controls, but controls the sites that users are allowed to access. By limiting what the user can do with the device, IT support becomes easier and opportunities for the introduction of malware into the system are substantially reduced.

Another important aspect of security is maintaining an updated system. Researchers are constantly discovering and responsibly reporting vulnerabilities in the Android code base that could potentially be subject to malicious exploits. Google even offers a bounty program to encourage researchers to find and report potential issues.

Google and chipset providers such as Qualcomm® provide security patches to OEMs on a regular basis for incorporation into their software builds. Honeywell updates its Android system images on a regular 60-day cadence, with patches for extremely critical exploits available within just a few days (as necessary). Patches are delivered as incremental updates to baseline images, minimizing the size of the update package for easier deployment across the customer's network. Unlike consumer OEMs, Honeywell packages are downloadable from a web portal to allow for customer acceptance testing prior to full-scale deployment. An email notification subscription is available so customers will be informed as soon as new updates are posted.

ANDROID LIFECYCLE MANAGEMENT

4

Customers deploying mobile computer solutions in the rugged enterprise environment expect a longer usage cycle than consumers. Where smartphones in consumer use cases generally turn over in 2–3 years, enterprises are expecting their systems to last 3–5 years or longer.

Historically, embedded operating systems used in rugged mobile computers had a lifecycle corresponding to enterprise use cases. Windows CE and Windows Embedded Handheld were supported by Microsoft for 10 years after initial introduction.

Although Android has been augmented by Google with a variety of new enterprise features with each major release, extended support is not among them. Android major versions (or "dessert releases") occur on a roughly annual basis and are generally supported with security patches from Google and chipset vendors for a period of 3 years thereafter. This creates a gap in support coverage relative to enterprise expectations. Selecting OEM chipsets that are supported for subsequent dessert releases will help extend the timeline, but ultimately Google support policy stops short of enterprise customer expectations.

Honeywell offers the Sentinel™ program to provide patches for severe security vulnerabilities applicable to the supported operating system on a periodic basis for 2+ years after Google security patch support ends.

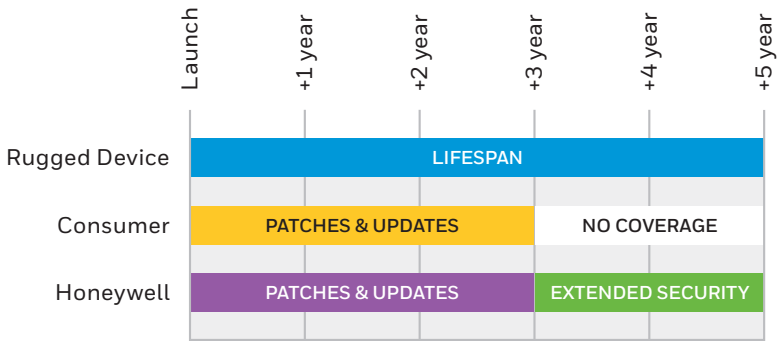
TIMING OF DELIVERY TO CUSTOMERS WILL BE QUARTERLY, or less if no severe patches applicable to the supported operating system version are reported. Applicable patches will generally be delivered within 90 days of public disclosure with exceptions possible for imminent threats.

CUSTOMERS UTILIZING THIS SERVICE WILL BE EXPECTED to apply all previously released patches in order to apply the most recent patch. In other words, patches are cumulative. Specific patches cannot be applied individually.

SECURITY PATCHES WILL BE TESTED FOLLOWING Honeywell standard test procedures applicable to all software releases. It remains the responsibility of the customer to test any software updates received from Honeywell to their satisfaction prior to rolling out an update to their estate.

CUSTOMERS CAN RECEIVE THESE BENEFITS under the terms of a service contract, either standalone or incorporated into another type of service agreement. Customers without a contract will not receive security patches after Google security patch support ends.

This program is available on Honeywell devices running Android 6.0 Marshmallow and later versions, upon expiration of Google security patch support.



CONCLUSION AND RECOMMENDATIONS

Android is a secure operating system, utilizing application isolation and exploit mitigation techniques to provide a high level of security to the user. Implementing lockdown techniques via an EMM or Honeywell Enterprise Launcher can further reduce the risk of malware intrusion by limiting what the user can do and what apps can run on the system.

Honeywell's products are designed from the start to meet Honeywell's rigorous security standards. Security is evaluated throughout the development process, identifying and mitigating vulnerabilities even before products are released.

Education of customers and constant monitoring of security vulnerabilities and exploits, with defined processes for addressing those issues that are discovered, further protect our customers' systems from compromise. A subscription-based notification model enables customers to take immediate action to mitigate risk while software is being patched and tested. Customers can be assured that their systems are designed and supported to the highest standards and they can operate their businesses with confidence knowing Honeywell is working to help them maintain the security of these systems.

With its large market share and extensive ecosystem of apps, developers, and VARs, Android has become the clear choice for many enterprises in a variety of industries. Transitioning to Android involves writing new apps, adapting workflows, and changing the mobile devices workers use. This can be a costly and complicated endeavor.

MOBILITY EDGE

One way businesses can simplify the migration process is by selecting devices that are built on a unified mobile platform, like Honeywell's Mobility Edge™. Devices built on this common hardware and software platform are easier and less costly to deploy and manage, and have longer lifecycles than similar competitive devices.

Mobility Edge devices feature a common hardware System On Module, or SOM, which is a single, certified module that includes the device's CPU, memory, WWAN (in selected devices), WLAN, Bluetooth®, near-field communication (NFC), and Zigbee (in selected devices). They also feature a common OS software image and a common software ecosystem, which includes not only Honeywell software, but also software from Honeywell-approved independent software vendors (ISVs).

Having a common SOM and OS software image provides flexibility and reduces costs for businesses to deploy additional device form factors, because there are no added development or certification costs. Companies can validate all their mobile devices, use cases, and software once, and then deploy across multiple devices in multiple form factors, more rapidly and at a lower cost than typical mobile deployments.

Businesses wishing to extend product lifecycle and gain a better return on their technology investment will be assured by the fact that Mobility Edge platform devices can be upgraded through Android R. Honeywell also provides critical security updates for up to two years past Google's last security patch through its Honeywell Sentinel service, giving customers a product lifecycle through at least 2025.

HONEYWELL MARKETPLACE

For businesses needing help with their Android transition strategy, the Honeywell Marketplace offers a helpful resource. Honeywell Marketplace is an enterprise app store that provides businesses with direct access to software and solutions developed by Honeywell and third-party independent software vendors. Companies can search for solutions by industry, by solution type (developer tools, ERP, etc.), or by technology (mobile computer, wearables, etc.) and find a diverse set of applications to help ease their mobile transitions.

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THE FUTURE IS WHAT WE MAKE IT

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