



National Computer Board

Mauritian Computer Emergency Response Team

Enhancing Cyber Security in Mauritius

Guideline on Mobile Devices Security (Updated)



**National Computer Board
Mauritius**

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1.0 Introduction

1.1 Purpose and Scope

The previous guideline offered an insight into the risks associated with mobile devices and provided the countermeasures available to minimise them. This guideline had been updated, keeping in mind that technology keeps getting sophisticated and hence risks keep on changing. The aim of this document is to provide a clear demarcation of the different mobile operating systems available, their shortcomings and their security posture when connected into the working environment.

1.2 Audience

This document, while technical in nature, provides the background information to help readers understand the topics that are discussed. The intended audience for this document include users of mobile devices, security professionals, IT managers, system and network administrators involved in the support of mobile devices.

1.3 Document Structure

This document is organised into the following sections:

Section 1 provides a brief overview of the document's content.

Section 2 gives a background on mobile devices and BYOD.

Section 3 presents the security concerns associated with mobile devices.

Section 4 elaborates on the countermeasures available to mitigate the risks, threats and vulnerabilities discussed in the previous section.

Section 5 concludes the document.

Section 6 contains a list of references used in drafting this document.

2.0 Background

Mobile devices such as smartphones and tablets are a must nowadays. They are generally small and have a variety of attractive functionalities, including sending and receiving e-mails, storing documents, delivering presentations, and remotely accessing data. These devices are useful to practically everyone; however, they also pose security risks to organisations as well as everyday users.

An increasing number of companies are opening corporate networks and data to consumer mobile technology. The resulting trend, usually referred as the consumerization of enterprise mobility, assumes even more disruptive connotations when the employees are allowed to use their own smartphones and tablets to work - commonly referred as BYOD or Bring Your Own Device.

Consumer technology is convenient, easy to learn, and fun to use. However, consumer technology is generally not as secure and manageable as required by the enterprise. Consumer technology brings real business value in terms of productivity and business agility. However, the lack of a strategic approach to the consumerization of IT creates security risks, financial exposure, and a management nightmare. Rather than resist it, organizations should embrace consumerization to unlock its business potential. This requires a strategic approach, flexible policies, and appropriate security and management tools.

A strategic approach to consumerization starts with a clear understanding of the security and management capabilities of each mobile platform. While no mobile platform is immune from security vulnerabilities and management limitations, some platforms are more mature than others with regard to supporting the most appropriate set of policies required by the different mobile roles within the organization.

2.1 The Major Smartphone Operating System Complete Comparison

Individual employees carry along mobile devices into the enterprise, contrary to desktop computers. The tables on the following pages show the comparison between the major OSs which are dominating the smartphone market today, these are namely iPhone iOS, Android, Blackberry OS and Windows Phone 8.

General



iPhone iOS
6.1



Android
4.2 Jelly Bean



Blackberry OS
10



Windows Phone
8

OVERVIEW

OVERVIEW

OVERVIEW

OVERVIEW



Beginner Friendly Power User Friendly Completeness



An excellent all rounder that provides a polished and user friendly smartphone experience

iOS provides a controlled smartphone experience. Time, effort, and tech knowhow is required if you want to jailbreak your device to remove its restrictions

iOS has the best apps and supporting ecosystem

Apple controls the hardware and software, which allows them to ensure that they work well together



Beginner Friendly Power User Friendly Completeness



Android is supremely customizable

The more you use Google's services, the more Android will shine

Android has the majority of the market and the user experience is improving quickly

Time and technical knowhow is needed to get the most out of Android

Updates are a problem - most Android handsets remain several versions behind



Beginner Friendly Power User Friendly Completeness



Blackberry 10 finally makes BlackBerry a strong touchscreen OS, with innovative gesture controls

Great for business, with security, management features, excellent email and messaging

Hub integrates messaging, contacts, calendars and social media in a superior way

Blackberry 10 is a brand new OS, and it shows in missing features, rough edges, and a lack of top apps



Beginner Friendly Power User Friendly Completeness



Elegant, fun to use, and powerful, Windows Phone 8 offers an excellent smartphone experience

It's similarity to Windows 8 on desktops and laptops should start becoming an asset

Small market share means that it is still poorly supported when it comes to apps

APPS

APPS

APPS

APPS



Quantity Quality



Huge selection and good quality apps

iOS still tends to get new apps first, especially games

Can buy an app once and install it over several iDevices

Some desirable apps like Swype and Grooveshark are blocked by Apple



Quantity Quality



Huge app selection, many free apps, and freedom from any approval process

Malware and spyware protection

Apps can work together with other apps

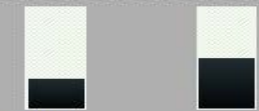
Apps tend to be cheaper than iOS equivalents

No barriers means no quality control. Care is required

Difficult for app developers to ensure compatibility due to variety of handsets and OS fragmentation

Non-Google handsets tend to have bloatware apps installed by networks

Much fewer apps optimized for tablets than iOS



Quantity Quality



Can run Android apps on a built-in emulator based on an older version of Android

Ease of porting apps from Android should mean that the selection improves quickly

Limited selection of quality apps - e.g. no good Youtube app. Android apps don't all work smoothly

Very poor app browsing and discoverability

Apps from earlier BlackBerry versions are not compatible with BlackBerry 10



Quantity Quality



Apps can work together with other apps

New app library is growing quickly but still missing many good apps - e.g. no good Youtube or Facebook app, Google apps

Apps tend to be more expensive than iOS and Android equivalents

USABILITY & DESIGN



Usability



Design



Excellent usability and responsiveness, intuitive and consistent interface

Siri allows you to search and launch apps with natural voice commands and replies with natural speech

Good accessibility features



Interface feels stale, needs a refresh

USABILITY & DESIGN



Usability



Design



Google Now checks your location and calendar to automatically show you relevant info e.g. traffic to work, cafes, flight details

Google Now lets you search with natural voice commands and replies with natural speech

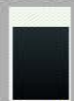
Good accessibility features

Quick access to settings



Usability is improving but it's still a complex system. Many aspects need improving e.g. difficult to browse widgets, back button is inconsistent

USABILITY & DESIGN



Usability



Design



Good at calling, email, and messaging

New Flow interface looks and feels great, with a nice focus on gestures

Glance at your messages and notifications and return to your current app with a single gesture



Flow interface takes a while to get accustomed to

Voice commands quite limited

When using an app, the status bar showing battery, time, signal etc is not visible

USABILITY & DESIGN



Usability



Design



Intuitive usability, smooth, and fun to use. Design that looks beautiful and makes other OSes look dated

Flagship Nokia 920 handset is usable when wearing gloves

Voice commands can launch apps and run functions within apps



No universal status bar showing battery life

WIDGETS



Widgets



No widgets apart from a couple of native ones like Weather

WIDGETS



Widgets



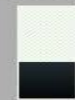
Live, resizable widgets allow great flexibility

Multiple lockscreens with customizable widgets



Widgets don't have a unified design sense, so the screen can end up looking messy

WIDGETS



Widgets



Most recently used apps are shown as 'Active Frames', which are similar to widgets



No proper widgets or ability to show dynamic info on the homescreen

WIDGETS



Widgets



Live Tiles displays live info on icons in different sizes. Looks and feels great. Works with apps, features, and contacts

Lock screen can show notifications and pictures from apps



Live Tiles are not as flexible as full widgets

CUSTOMIZATION



Customization



Consistent user experience means less potential confusion and simpler support



Apple decides what you can do. If you're a techie you can jailbreak your iPhone but you're always jumping through hoops

CUSTOMIZATION



Customization



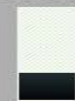
With some effort you can personalize things to work exactly as you want it to

Android is an open platform, in terms of 3rd party apps, custom ROMs, file formats, file storage/transfer



Severe fragmentation, with different versions of Android from each manufacturer and the many custom ROMs

CUSTOMIZATION



Customization



Consistent user experience means less potential confusion



No more custom themes

CUSTOMIZATION



Customization



Consistent user interface and hardware guidelines across manufacturers.

Many possibilities with resizable Live Tiles



Not open to deep customization

Media & Gaming



iPhone iOS
6.1



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4.2 Jelly Bean



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WEB BROWSING



Browsing

+
Excellent browsing experience

Reader feature shows just article text, removing clutter and reducing data use

Full screen browsing, tab syncing over iCloud

-
No Adobe Flash support (Adobe is abandoning mobile Flash anyway). iSwifter is recommended as a usable Flash browser on iOS

WEB BROWSING



Browsing

+
Google Chrome gives a fast and excellent browsing experience

Browsing can be synced across phone and desktops

Default browser can be changed

-
No longer supports Adobe Flash (Adobe is abandoning mobile Flash anyway), though it can be enabled with some tech expertise

WEB BROWSING



Browsing

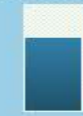
+
HTML5 browser offers smooth, very fast browsing, and good navigation

Supports Adobe Flash

Reader feature shows just article text, removing clutter and reducing data use

-

WEB BROWSING



Browsing

+
Excellent browsing experience, full HTML5 browser

Internet Explorer 10 compresses web pages to reduce your data usage

Data Sense feature monitors data usage in detail, with notifications when approaching your quota

-
No Adobe Flash support (Adobe is abandoning mobile Flash anyway)

Search hotkey cannot be linked to Google

Many websites don't run well on Internet Explorer 10

CAMERA & PHOTOS



Quality



Apps



Features

+

Excellent quality, lots of apps to enhance the experience

Physical shutter release button, take photos from lock screen

Rapid shooting

Shared Photo Streams easily shares photos between multiple iDevices and desktops

-
Colours are quite saturated. Many will like this, but for the purist or advanced photographer, this may be an issue

CAMERA & PHOTOS



Quality



Apps



Features

+
Settings menu pops up wherever you tap

Very good quality, cool features like panorama shots, time-lapse films

Excellent photo editing features

Automatic, unlimited photo uploads to Google+

No shutter lag, rapid shooting

-
Some menu options are obscured by your thumb

CAMERA & PHOTOS



Quality



Apps



Features

+
Time shift feature allows you to rewind or fast forward certain sections of your photo, to capture the perfect moment

Good editing and effects suite for photos as well as videos. Story Maker can quickly make a fun slideshow combining photos and videos

Physical camera button

-
Short on camera features like a timer, white balance, ISO, silent mode, HDR

Can't create albums on the phone, need to use desktop software

Photo quality could be better

CAMERA & PHOTOS



Quality



Apps



Features

+
'Lens' feature lets you select from 3rd party filters to customize your camera

Physical camera buttons

Nokia handsets tend to have excellent cameras

Auto-fix option improves photo quality

Text recognition in photos with Bing Vision

-
Can't upload videos to Youtube easily

MUSIC & VIDEO



+ Excellent for music with its iPod influences

iTunes gives you access to a huge library of apps, movies, tv, music, and books

Dedicated Podcasts app with iCloud sync

iTunes Match scans the music you have in your desktop and makes it available online to your Apple devices for a fee

Easy streaming of media via Airplay to Airport Express, Apple TV, etc

- No HDMI TV output

Few file formats supported natively

MUSIC & VIDEO



+ Alternative player apps are available

Supports many music and video file formats

Google Music adds up to 20,000 songs that you own, and makes them playable anywhere for free

Automatically generate playlists based on recently played songs

Some handsets have Beats Audio technology for improved headphone sound

Share fully playable songs with friends via Google+

- Google Music is not intuitive to use, with inconsistent menus and layouts from screen to screen

No native podcast app, but there are many options in the store

MUSIC & VIDEO



+ Blackberry Link allows syncing music with iTunes and Windows Media Player

Large selection of music, TV and movies, though they seem pricier than on other stores

Easy streaming to DLNA players e.g. PS3, DLNA TVs

- 7Digital music store is difficult to browse

No native Podcast app (Nobex looks promising)

MUSIC & VIDEO



+ Songs bought from the Music store are automatically stored on the cloud and available across your Microsoft devices

Xbox Music Pass subscription is a great way to try out songs

SmartDJ plays music that goes together

Listen to and automatically identify a song that's playing, and buy it from the store

Some handsets have Beats Audio technology for improved headphone sound

- Music player and management need improving - no direct navigating to a specific place in a song, difficult to manage playlists

No gapless playback

Podcast management is poor

Music volume is tied to ringer volume

No Wi-Fi syncing to podcasts on a PC

GAMING



+ Great selection of fun, high quality games with more added rapidly

Game Center is a popular social gaming platform

GAMING



+

- Still behind iOS on top quality games. Fragmentation between devices makes Android 2nd choice to iOS for most developers

No native social gaming platform

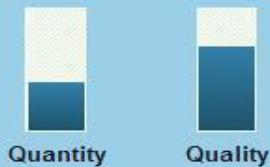
GAMING



+ Android games can be quickly ported over

- Small game library. Performance issues when running Android ports

GAMING



+ Windows Phone 8 allows game developers to easily port over games from Windows 8, so the game library could expand quickly

Xbox Live gaming platform

- Small game library. Usually still an afterthought for game developers

Hardware



iPhone iOS
6.1



Android
4.2 Jelly Bean



Blackberry OS
10



Windows Phone
8

HANDSETS



- +** Top hardware build quality
iPhones and iPads have high resale value
- Only 1 device to choose from per 12-18 months
Smaller screen size is starting to feel limiting
Design has not changed much in years
Expensive unless you go for an old model. But older models don't include features like Siri

HANDSETS



- +** Lots of phones to choose from, ranging from average to excellent build quality, offering different features such as physical keyboards
Handsets with large screens available
-

HANDSETS



- +** Blackberry controls the hardware and software, which allows them to ensure that they work well together
- Just launched, only the Blackberry Z10 currently available, though 2 more should be arriving soon

HANDSETS



- +** Great looking colorful handsets, good specs and build quality, with Nokia leading the way
Handsets with large screens available
- Just launched, small selection of phones
Microsoft's strict hardware requirements mean there will be less handset variety than Android

PERFORMANCE



Performance

- +** Good performance and stability
- Performance issues for older models when running the new OS versions

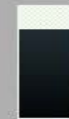
PERFORMANCE



Performance

- +** Generally good performance
Some devices allow 2 apps to run on a split screen
Detailed reports let you monitor performance closely
Detailed reports let you monitor performance closely
- Performance and lag issues with some cheaper phones

PERFORMANCE



Performance

- +** True realtime multi-tasking lets you see the status of multiple running apps at once
QNX technology should provide a more stable and secure foundation to build on compared to competitors
- Some bugs with the new OS, and when running Android apps

PERFORMANCE



Performance

- +** Good performance - Microsoft has strict hardware requirements
-

BATTERY



Battery Life



Battery is not user-replaceable

BATTERY



Battery Life



Many phones have poor battery life unless you spend time tweaking the settings

BATTERY



Battery Life



Blackberry no longer has the excellent battery life that it had in the past

The Blackberry Z10 launch handset has battery issues

BATTERY



Battery Life



Battery saving mode
Flagship Nokia 920 handset comes with wireless charging

STORAGE



Storage



No expandable memory

STORAGE



Storage



Expandable memory available on most handsets

STORAGE



Storage



Expandable memory, good memory management

STORAGE



Storage



Expandable memory available on most handsets

Connectivity



iPhone iOS
6.1



Android
4.2 Jelly Bean



Blackberry OS
10



Windows Phone
8

MAPS



Maps



The new Google Maps app is excellent - with better usability than the Android version



Apple Maps is missing data and features

Apple Maps features a great 3D 'flyover' view in certain cities

MAPS



Maps



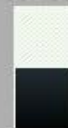
Google Maps is speedy and has deep integration with other Google services



Google Maps uses outdated and inconsistent design, not as good as the iOS version

Offline maps are available, as well as terrain maps and cycle route overlays

MAPS



Maps



Slow, lacking information on locations, 3D or satellite views, and directions via foot or public transport



Maps can be downloaded for offline use

Nokia Maps has fantastic map data from Navteq, a leading Satnav mapping company

'For You' panel shows places based on your friends' preferences and popular local venue

MAPS



Maps



Maps can be downloaded for offline use

Nokia Maps has fantastic map data from Navteq, a leading Satnav mapping company

'For You' panel shows places based on your friends' preferences and popular local venue



Non-Nokia handsets don't have turn by turn navigation

SYNCING & BACKUP



Syncing & Backup



iCloud comes with 5GB free and auto syncs photos, books, music, docs, calendar, contacts, and email. Does wireless backups automatically



SYNCING & BACKUP



Syncing & Backup

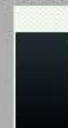


Wireless automatic syncing via 3rd party apps.



Excellent syncing with Google services Google sync, drive

SYNCING & BACKUP



Syncing & Backup



Wireless syncing via BlackBerry Link

Blackberry Protect auto backs up contacts, texts, calendar and bookmarks



SYNCING & BACKUP



Syncing & Backup



Syncing via drag and drop, can sync songs and playlists via Windows Media Player or iTunes

Automatic cloud backup, and 7GB free storage with SkyDrive



Syncing app that replaces Zune is inferior and incomplete, e.g. no Wireless syncing, poor music management

UPDATING



Updating



Standardized over-the-air updates



New OS versions tend to remain compatible with older handsets

UPDATING



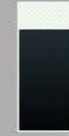
Updating



Fragmentation leads to long delays and disorganized updates. It's best not to expect an OS upgrade when you buy an Android phone, unless it's a Google Nexus



UPDATING



Updating



Standardized over-the-air updates



UPDATING



Updating

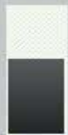


Standardized over-the-air updates



Microsoft has abandoned Windows Mobile and Windows Phone 7 in recent years, which is worrying if you're looking for long term support

WALLET & NFC



Wallet & NFC



Passbook stores personal info, membership cards, coupons, tickets etc



No NFC technology for exchanging data or making payments by touching devices

WALLET & NFC



Wallet & NFC

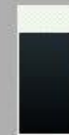


Google Wallet lets you store credit card and payment info



Android Beam allows simple sharing of content between Android phones

WALLET & NFC



Wallet & NFC



Blackberry has partnered with Visa to make card payments via NFC



WALLET & NFC



Wallet & NFC



Wallet stores financial data, tickets, allows wireless payments over NFC, and supports Paypal and in-app purchases

Communication



iPhone iOS
6.1



Android
4.2 Jelly Bean



Blackberry OS
10



Windows Phone
8

EMAIL & MESSAGING



Email



Messaging



Very good email implementation

iMessage sends free texts, pictures, and video between iDevices and supports group chat



EMAIL & MESSAGING



Email



Messaging



Excellent keyboard with gesture typing for faster single-handed typing. Also replaceable, so you have a lot of flexibility

Very good email implementation. Full Gmail integration

Accurate voice input

Google Talk is widespread and cross-platform



EMAIL & MESSAGING



Email



Messaging



Hub unified inbox brings together all communication from different sources - even 3rd party apps like Whatsapp

Innovative keyboard. Select predicted words with a swipe, swipe to delete. Supports 3 languages simultaneously

Top notch email interface

BB Messenger service is still excellent, and now has voice/video chat, screen sharing, and can be integrated into other apps



Physical keyboards are no longer standard, which may be a big adjustment for seasoned BlackBerry users

No push email, contacts or calendar except for Exchange accounts

EMAIL & MESSAGING



Email



Messaging



Voice input for texting and messaging

Excellent keyboard

Multiple conversations across Twitter, Facebook, Windows Live Messenger, texts, and emails are merged smoothly

Contacts can be grouped into 'Rooms', with separate calendars and messages

Multiple inboxes can be linked together



Can't flag IMAP emails

Poor Gmail integration

Landscape keyboard leaves wasted space

CONTACTS & SOCIAL MEDIA



Contacts & Social Media

+

Sync contacts and calendars, and easily post to Facebook and Twitter

Facebook is closely integrated, allowing easy sharing of content

-

CONTACTS & SOCIAL MEDIA



Contacts & Social Media

+

Social media apps will integrate with the OS when installed

-

No integration by default

CONTACTS & SOCIAL MEDIA



Contacts & Social Media

+

Contact manager combines all updates from social media

Hub pulls in social media

Pulls in relevant info for a contact, such as company news

-

CONTACTS & SOCIAL MEDIA



Contacts & Social Media

+

Facebook, Twitter, LinkedIn are well integrated with contacts, photos, status updates, events, etc

Categorize contacts in groups

-

Rooms group messaging feature only works with Windows Phones, which makes it rather unusable in practice

VOIP



VoIP

+

Many apps available including Skype

-

No integrated voice-only VoIP

VOIP



VoIP

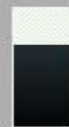
+

Google Talk has voice chat

3rd party apps can be integrated into the dialer

-

VOIP



VoIP

+

Blackberry Messenger has voice chat

-

VOIP



VoIP

+

Skype is integrated, and other VoIP apps can do the same

-

VIDEO CALLS



Video Calls

+

Facetime video calling to Apple devices

Plenty of video calling apps like Skype

-

VIDEO CALLS



Video Calls

+

Google Talk allows multi platform video chat via Gmail

Google Hangouts allows group video chat

Plenty of video calling apps like Skype

-

VIDEO CALLS



Video Calls

+

Blackberry Messenger has video chat and screen sharing

-

VIDEO CALLS



Video Calls

+

Skype is fully integrated and allows cross platform video chat

-

Productivity



iPhone iOS
6.1



Android
4.2 Jelly Bean



Blackberry OS
10



Windows Phone
8

NOTIFICATIONS

NOTIFICATIONS

NOTIFICATIONS

NOTIFICATIONS



Notifications



Notifications



Notifications



Notifications



Slick, easy to use notifications

Do Not Disturb switch

Facebook and Twitter sharing



Slick, easy to use notifications

Act directly on notifications, e.g. snooze an alarm



Very customizable notification system in the Hub, which you can glance at from anywhere using a gesture

When the screen is off, you can still see notifications via the LED light



No visual preview when you receive a message, email, etc - only LED or audio



Apps that have been placed as Live Tiles can show notifications

No central hub for notifications

DOCUMENTS

DOCUMENTS

DOCUMENTS

DOCUMENTS



Documents



Documents



Documents



Documents



iWork is a paid productivity suite that works seamlessly with the desktop versions

Google Drive app allows seamless editing of docs and spreadsheets with automatic syncing



Google Drive allows seamless editing of docs and spreadsheets with automatic syncing



Docs to Go provides flexible editing of documents, PDFs, spreadsheets and presentations



Excellent Microsoft Office integration, with automatic syncing to SkyDrive

NOTES



Notes



There is a good selection of excellent note apps in the App Store



Built-in Notes app is very basic

NOTES



Notes



There is a good selection of excellent note apps on Google Play



No default Notes app

NOTES



Notes



'Remember' app can store text, images, video, audio, and voice notes, integrate with Everlook and Outlook

Evernote integration

Can categorize notes

Add content to Remember from anywhere in the OS



NOTES



Notes



OneNote is fast, syncs automatically to SkyDrive, and handles notes, voice, and photos



CALENDAR



Calendar



Full featured calendar, intuitive to use, integrates with Facebook events



CALENDAR



Calendar



Google Calendar is excellent, and is integrated into Android



CALENDAR



Calendar



Full featured calendar that also syncs events from Facebook and LinkedIn

Conference call info from the calendar pops up automatically



CALENDAR



Calendar



Color coded sub-calendars



No weekly view of calendars

FILE MANAGEMENT



File Management



Can't use phone as a USB drive
Can't manage files directly
No built-in bluetooth file transfer



FILE MANAGEMENT



File Management



Manage files on the phone, like a USB drive



FILE MANAGEMENT



File Management



Manage files on the phone, like a USB drive

Dropbox and Box.net are integrated into the file management system

Zip files easily



FILE MANAGEMENT



File Management



Manage files on the phone, like a USB drive



Other Pros & Cons







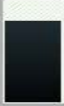

 iPhone iOS 6.1	 Android 4.2 Jelly Bean	 BlackBerry OS 10	 Windows Phone 8
<p>PROFILES</p>  Profiles	<p>PROFILES</p>  Profiles	<p>PROFILES</p>  Profiles	<p>PROFILES</p>  Profiles
<p>OTHER PROS & CONS</p> <p>+</p> <ul style="list-style-type: none"> Huge ecosystem of accessories Slick magazine integration with Newsstand Reminders feature has to-do lists and alerts based on time or location Good tech support <p>-</p> <p>None</p>	<p>OTHER PROS & CONS</p> <p>+</p> <ul style="list-style-type: none"> Multiple user profiles available, but only on tablets Several security options including Face Unlock which lets you unlock the phone by looking into the camera Live animated wallpapers look great Flexible screen saver options including slideshows and news <p>-</p> <ul style="list-style-type: none"> Free marketplace can lead to security issues No default feature for handling lost handsets 	<p>OTHER PROS & CONS</p> <p>+</p> <ul style="list-style-type: none"> 'Balance' feature lets you have different work and personal profiles, with separate logins, apps, contacts, and themes. Companies can limit and control the Work section, and remotely wipe it Excellent security and encryption BlackBerry Enterprise Services integrates seamlessly into businesses Business-related perks like auto dialling of phone extensions <p>-</p>	<p>OTHER PROS & CONS</p> <p>+</p> <ul style="list-style-type: none"> Kids Corner puts your phone in a safe mode so that your kids can play with it without messing everything up Data is encrypted Hubs provide areas for related features e.g. Photos hub combines your photos as well as photos from social media, and features from photo apps Text in photos can be translated <p>-</p> <ul style="list-style-type: none"> Hasn't managed to make a dent in iOS/Android's market share, though with Windows Phone 8 being closely integrated to Windows 8 on desktops and tablets, it now has a better chance of picking up momentum

Table 1 Mobile Operating System Comparison

3.0 Mobile Role-based Methodology

The role-based methodology by which a device's management and data protection are dictated by the role of its user or owner is a trend taking place in many organizations that are thinking of new ways to profile the risk of mobile devices and their users.

Mobile device management tools have centered, to date, on device remediation. In many cases, the ability to lock or wipe a lost device, while important, does not do much to protect the data on the device or restrict the way in which the device can be used in terms of capture, storage, and transmission of information.

Roles such as general knowledge worker, contractors, occasional users, and, to a certain extent, managers are often exempt from the toughest controls which require complex device authentication and encryption. That said, there are managerial roles that require ready access to highly sensitive information such as compensation/salary, details which, when stored on the mobile device of a manager, requires a more strict set of controls. In the case of the contractor or occasional user, device risk profile may be sensitive due to the sharing of devices among multiple, occasional users or the introduction to a personal or other organization's owned device in the case of a contractor.

Role	Description
Key Executive	Due to the high visibility of this user, they are susceptible to targeted attacks and planned device compromise. Of highest value may be email and contact data stored on the device for the launch of further spear-phishing attacks and blackmail efforts.
Manager	Handling employee personnel data and substantial amounts of product Intellectual Property, managers should be viewed in a similar light to compliance-centric workers.
Compliance-subject Worker	Working in operations areas such as HR and Finance, these users are regularly in possession of data subject to security controls dictated and enforced by various compliance requirements.
General Knowledge Worker	Due to the nature of their work, general knowledge workers like to have access to basic PIM functionality on their devices.
Field Worker	Similar to general knowledge workers, field employees may store data on devices when they are out of cellular network range. These users may require additional security controls as a result.
Contractor/ Occasional User	Contractors and other trusted non-employees have access to company data but are not subject to the same controls and policies due to their third-party status. While requiring data to perform their jobs, these users present a management challenge.

Table 2 Mobile Roles Definition

It is also possible for a user to be a member of multiple groups. For example, many key executives also function in a manager role and many managers or even general knowledge workers, because of their industry may be compliance-subject, in the cases of multiple group membership, an employee’s device security posture should default to the most stringent level of controls.

The table below is intended to serve as a mechanism towards, and not a substitute for policy generation. Detailed profiles of the various user groups inside of any organization will likely resemble many of the groups outlined here but also differ in many ways and require more granular, less binary policy decisions. The granularity in decisions around device policy should also be driven by any relevant compliance standards that are likely to be far more prescriptive (with associated penalties for lack of compliance to the letter of the specification) in their demands.

Role	Device Encryption	Multi-factor Authentication	Local Storage Access	Data Filtering (DLP)	Complex Passwords	Attachment Access	Non-cellular Radio Use	Connection Encryption
Key Executive	■	■	○	●	■	■	■	■
Manager	■	●	■	■	●	■	○	■
Compliance-subject Worker	■	■	○	■	■	○	○	■
General Knowledge Worker	●	○	○	○	○	○	○	■
Field Worker	■	○	■	●	○	■	■	■
Contact/ Occasional User	●	■	○	●	■	○	○	●

Policy Coverage	
Required	■
Nice-to-have	●
Not Required	○

Table 3 Mobile Roles Matrix

4.0 Mobile Platforms Ratings

The analysis of the mobile security experts reveals that today's mobile platforms widely differ in terms of security and manageability capabilities. As a group, modern mobile platforms provide substantially better security than traditional desktop operating systems when it comes to built-in security mechanisms, authentication, and data protection; even though they are vulnerable to attacks that don't affect desktop PCs. Application security, device management, and corporate email support are somehow sufficient although they still have room for improvement. The feature sets that IT managers should give high consideration to include: security certifications, device firewall, and support for virtualization, which are largely still missing.

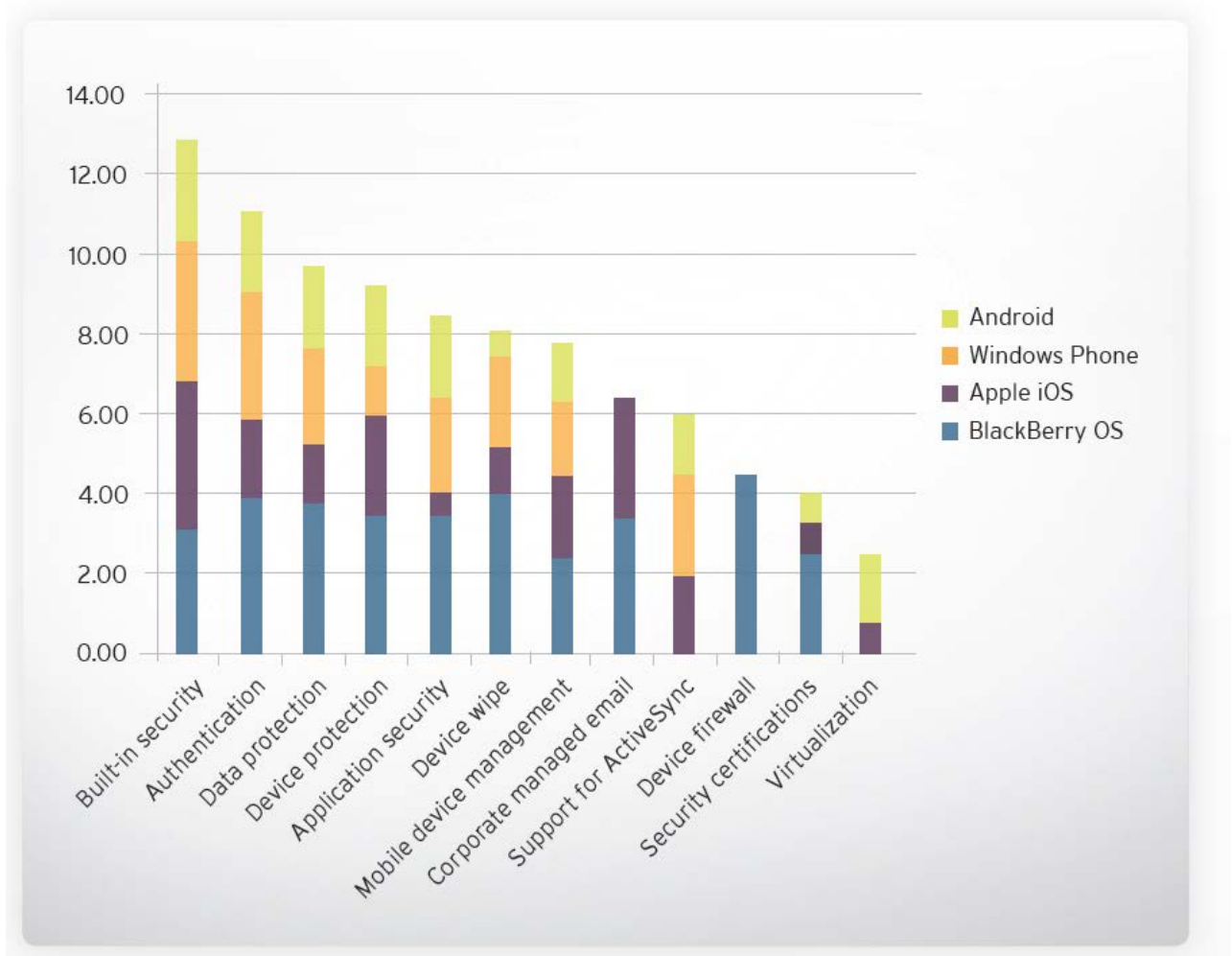


Figure 1 Ratings by Category

4.1 Apple iOS

Now at its fifth iteration, the leading challenger is Apple iOS. Apple's proprietary approach has become more enterprise-friendly: the strict control exerted by Apple on the overall ecosystem from hardware to operating system to applications makes this platform more secure and manageable in the consumer mobile segment. However, in contrast to RIM's fully integrated approach, the back-end components required to secure and manage Apple mobile devices are not provided directly by Apple but by a multitude of third-party vendors usually positioned in the Mobile Device Management segment. When complemented by third-party infrastructure, Apple iOS security and manageability are already good enough to be considered for mobility roles requiring device encryption and policy control.

4.2 Android

Despite its impressive market performance, Android security and manageability are the lowest in the segment. The Google Android operating system is at its fourth commercial iteration and has recently seen some important security additions, such as device encryption support, however good Mobile Device Management APIs and a reliable control of the overall operating system versioning and application ecosystem are still conspicuous by their absence. The system is widely exposed to malware and data loss, and the platform fragmentation resulting from the rich OEM ecosystem has proved quite challenging for enterprise adoption. IT managers should definitely consider adding Android to their set of flexible policies but should probably limit its use to the least sensitive mobile roles.

4.3 Blackberry OS

When it comes to individual platforms, the experts' analysis clearly points out that some operating systems are more mature than others. BlackBerry OS scores very highly across the board, clearly separated from the group of the three emerging consumer mobile platforms. Corporate-grade security and manageability make this platform the option of choice for the most stringent mobile roles.

4.4 Windows Phone

Although last to enter this segment, Microsoft Windows Phone performs quite well across the board especially considering that version 7.5 has only been out for less than 18 months. The system is too new to show a reasonable track record for enterprise adoption, and

corporate policies should take this reality into consideration when considering Windows Phone devices for mobile roles other than for general knowledge workers.

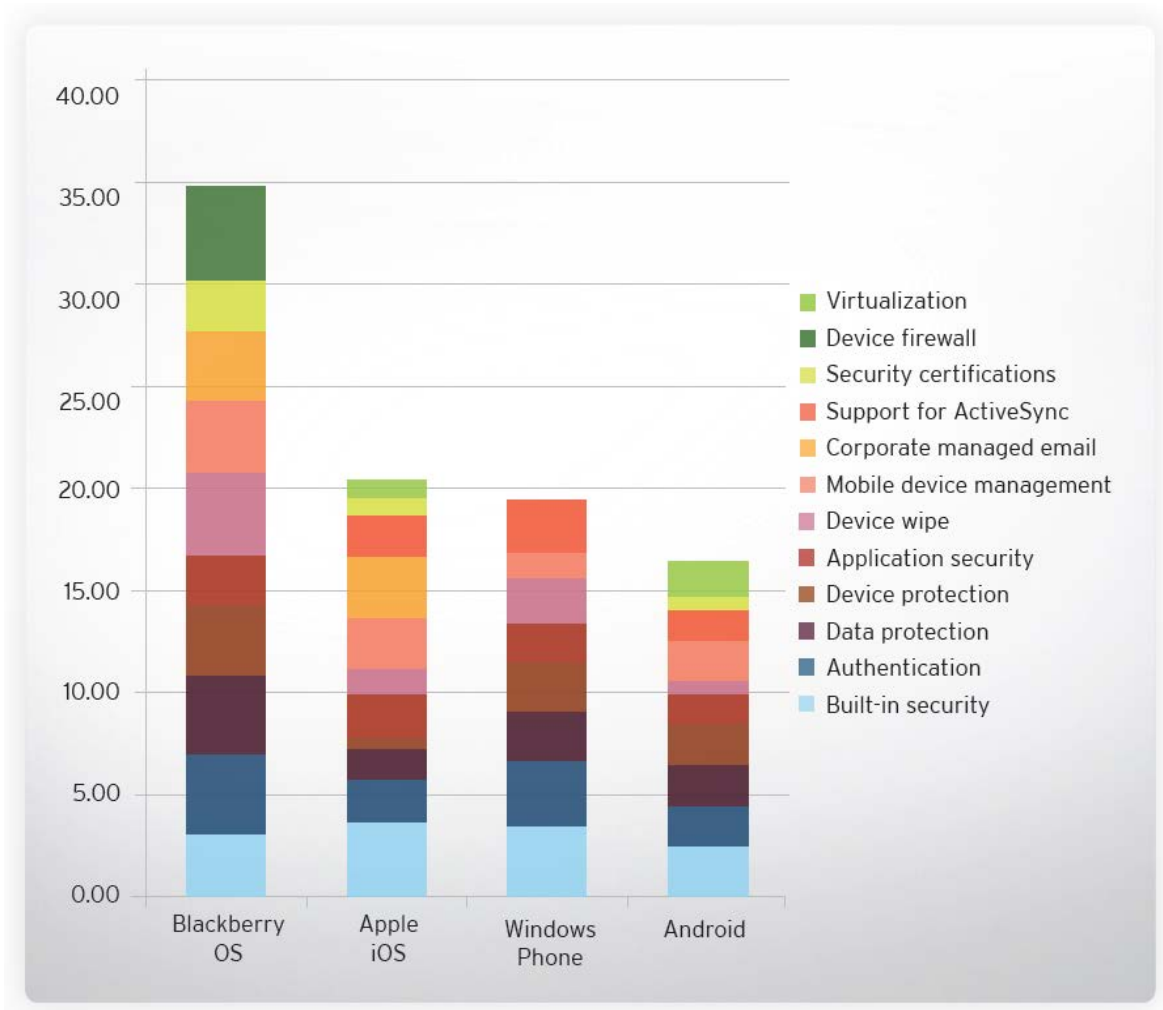


Figure 2 Ratings by Mobile Platform

5.0 The Security Posture of Major Mobile Operating Systems

5.1 Apple iOS

User experience for Apple includes the quality of the applications that are provided to users in the App Store. Apple has very strict guidelines for the approval process of the applications that third parties develop. This goes beyond user interface guidelines, but also to application performance management and in that, they include security. The iOS application architecture natively provides users much protection in terms of the fact that all applications are “sandboxed” in a common memory environment. The downside of this architecture is that theoretically you are only as strong as your weakest app. Security in iOS also extends to the physical attributes of the iPhone and iPad. There are no options for adding removable storage, which in effect provides another layer of protection for users.

Security within iOS takes on other levels, specifically where no application can be installed or updated without the express consent of the user. Even if a company uses a mobile application management solution to “push” applications to an employee, the user still has to approve the installation request for the application to be on the device. This is because iOS is a user-centric mobile operating system.

One historical complaint of the iOS platform was that it did not have the same levels of security as the BlackBerry operating system. That was a very fair comment given that when iOS first came out, it had zero IT management policies, versus BlackBerry’s 500+ (at that time). Today, iOS provides third-party mobility management Independent Software Vendors (ISVs) for a number of native APIs that provide very competent “device management” capabilities (albeit nowhere near the 700+ that BlackBerry has). Again however, there is a difference in terms of the fact that with the BlackBerry platform, the IT administrator has complete control over the device, whereas in an iOS world, the IT department can configure certain things, but only once the user has provided certain permissions to the IT administrator.

Apple has radically changed the world’s views on mobile security, moving it from a world where all policies were dictated by the IT department (regardless of how that impacted the actual users) to a model where the IT department has to now balance the needs of both the workplace and the workforce.

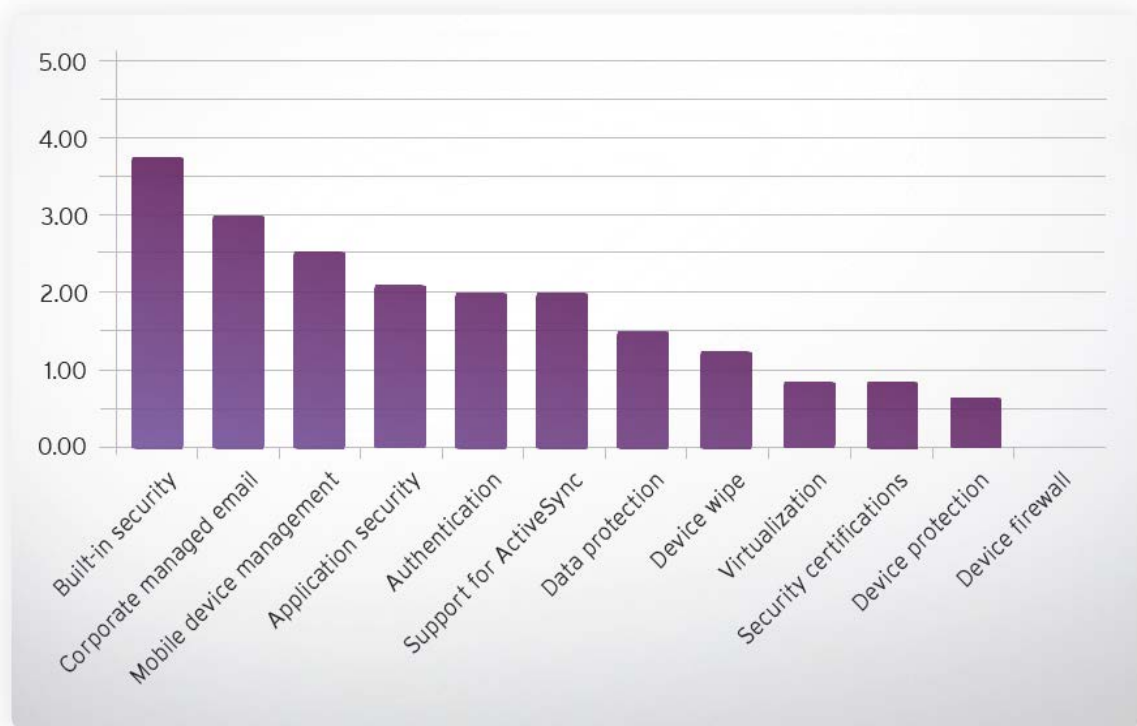


Figure 3 Apple iOS Ratings

5.3 Google Android

Android has been designed from scratch, with security in mind. It is a privilege-separated operating system and applications cannot access the network without prior consent. Apps run in their individual sandboxed environment, and permissions are granted by the user on a per-app basis. Unfortunately, the end user often fails to closely inspect the permissions request dialogue in their haste to use the app and, for the average end user, it is unclear when permissions are given and what the application is actually capable of. Once the application is installed, the OS does not recheck with the user and goes on to use the permissions without prompting the user again.

This model, while theoretically more secure than the common sandbox on Apple iOS, has the net effect of putting each user in charge of their own security, rather than the operating system. The latest version of Android 4.x does include full device encryption for data protection and Address Space Layout Randomization (ASLR) for buffer overflow protection; however the fragmentation of the handset market means that Android 2.x is still the most widely deployed and provided on the majority of new handsets. Another side effect of this market fragmentation is that there is no central means of providing operating system updates. Security patches are provided to customers by individual carriers or handset manufacturers.

There is an unacceptable delay in this process, meaning that many consumers remain unprotected from critical vulnerabilities for a prolonged period.

Android is currently the preferred platform by cybercriminals. With clever social engineering, they convince a victim to install a “useful” application. The user willingly gives permission and this causes the device to be compromised. Premium SMS fraud Trojans are a costly reminder of unfriendly apps, but what is worse is the data exfiltration function of some of the digital nightmares, malware can copy SMS, intercept calls, remotely activate the microphone, or conduct other threatening tasks.

Attackers are using Android app stores as distribution mechanisms; they promote their apps through online marketing activities, which include sending out spam messages. This is facilitated through the lack of up-front validation of apps after they are submitted to app stores and before they are made available for download. It is compounded by the third-party app store functionality inherent in the Android app model. This open ecosystem is abused by the bad guys, and this will not stop until app store providers themselves establish strict reputation checking. Advising the user to only download from a trusted source does help to mitigate some of the risk, but this also has a downside.

Users tend to see the official Android Market, now called Google Play, as a trusted source, yet multiple examples of malicious code are regularly found being distributed through this official channel. Effective social engineering often makes it complex to figure out if the publisher is a good one or a bad one. The responsibility is with the app store provider, and we hope to see stricter controls there. Google recognized this, and introduced Google Bouncer on the 2nd of February 2012 to “bounce” malicious apps, but there are still unfriendly apps in their store.

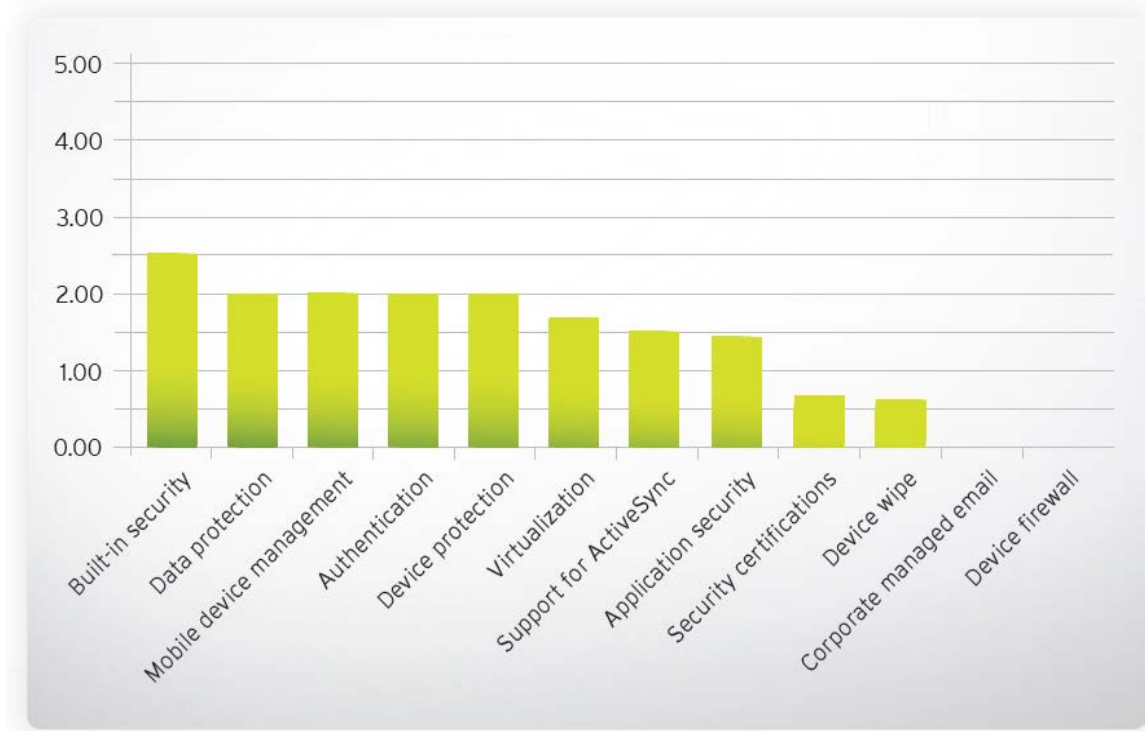


Figure 4 Google Android Ratings

5.4 BlackBerry OS

The BlackBerry 10 OS is distinct from any previous BlackBerry OS in that it provides a way to separate out personal applications from corporate-designated ones by using a capability built directly into the OS called Balance. This causes the phone to be partitioned into two spaces, a workspace 100% controlled by IT, which can delete it without interfering in the personal side and represents a way that businesses can support the BYOD trend by allowing employees their personal space on BlackBerry, too.

Although this BlackBerry Balance dual-partition capability for BYOD is not available for Google Android or Apple iOS devices, BlackBerry management can support these non-BlackBerry devices. It simply involves adding a specialized app to iOS and Android devices to do that. Through use of the server-based BlackBerry Device Service software for BlackBerry 10, businesses can manage Android and iOS devices as well, though not Microsoft Windows Mobile. Management capabilities include features such as lock, track and wipe.

BlackBerry is also working on what's known as a "containerization" type of technology for applications that could also be used for iOS and Android that would allow IT managers to place something similar to a container wrap around an app based on IT-based policy decisions.

BlackBerry 10 is also supporting data at rest and in transit through encryption, with the ability to swap out encryption algorithms.

In addition to new features like Balance, the advent of the BlackBerry 10 OS has set the stage at BlackBerry to evolve the basic security strategy related to present and future smartphones

and tablets. For example, BlackBerry recently established a partnership with security firm Trend Micro to assist in vetting apps against malware through the cloud-based Trend Micro Mobile Application Reputation Service. In another partnership with Germany-based Secusmart GmbH, BlackBerry is creating a specialized encrypted mobile voice capability for BlackBerry that would be used by the German government.

These kinds of projects are widening the perspective on what BlackBerry might undertake in the future as pertains to the BlackBerry 10 OS as a platform, including potentially coming up with a set of security APIs that third-party vendors could build to, such as the kind of anti-malware hooks which they do not have today. There has historically been very little malware aimed at BlackBerry because of its core design being highly virus-resistant, but it is growing.

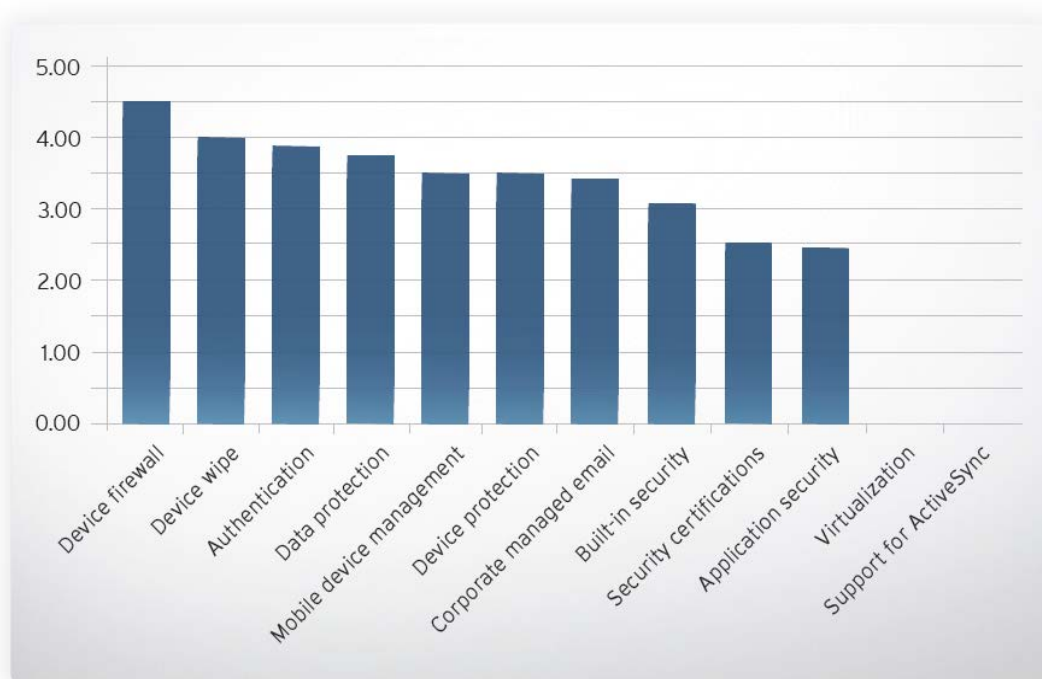


Figure 5 BlackBerry OS Ratings

5.4 Microsoft Windows Phone

In many respects, it seems that Microsoft has learned the lessons of the past and created a reasonably robust and secure smartphone operating system with Windows Phone.

The OS uses a security model similar to the Android platform, in that minimum privileges and isolation techniques are used to sandbox processes or, in Windows Phone terminology, to provide chambers that act as individual process spaces. These chambers are created and implemented based on a policy system that, in turn, defines what system features processes operating in a chamber can access.

Features that may reveal a user's location or provide a source of private information are called capabilities on the Windows Phone. The Least Privilege Chamber has a minimal set of access rights that are granted by default but these rights are dynamic and can be expanded by using capabilities during the application install. These capabilities are granted during the install process for an application and cannot be elevated during runtime. This reduces any likely attack surface area and ensures that an application discloses all of its capabilities to a user. It achieves this by publishing its capabilities on the application details page in the Windows Phone Marketplace, prompting the user during the process of purchasing the application and when the user is about to use the location capability of the application and device for the first time.

Windows Phone does not support the use of removable data storage media, and the SD slot in the device is only for use by the original equipment manufacturer (OEM). If a hardware manufacturer does provide removable media then the phone will lock the media using an built-in 128-bit key that, in turn, will pair the phone with the removable media, preventing its use in another phone or PC.

The Microsoft Marketplace Hub contains applications that have been submitted by developers who have registered with the application development program. Windows Phone and the Xbox games systems are the only platforms from Microsoft that require the pre-approval of applications before users can run them, despite developers trying to create unofficial apps for the platform. These attempts were subsequently thwarted by Microsoft as they persuaded the developers of ChevronWP7 to withdraw their tool. Developers receive a certificate as part of the registration process as all applications are signed by VeriSign. Unsigned applications are unable to run on a Windows Phone. The registration process includes an identity check for each developer registering with the program. During upload of applications to the Marketplace Hub, content, function, and compliance checks are made on each application against Marketplace policies that maybe in place.

Applications can be revoked in cases of serious security issues or in less severe cases updates can be sent out to users. Applications are developed using managed code, which combined with isolation of applications and the use of a least privilege model, supports the Windows Phone security model. The application security model prevents the Windows Phone Internet Explorer from installing applications and bypassing this model.

None of the major anti-malware vendors were reported seeing any significant malware targeting Windows Phone.

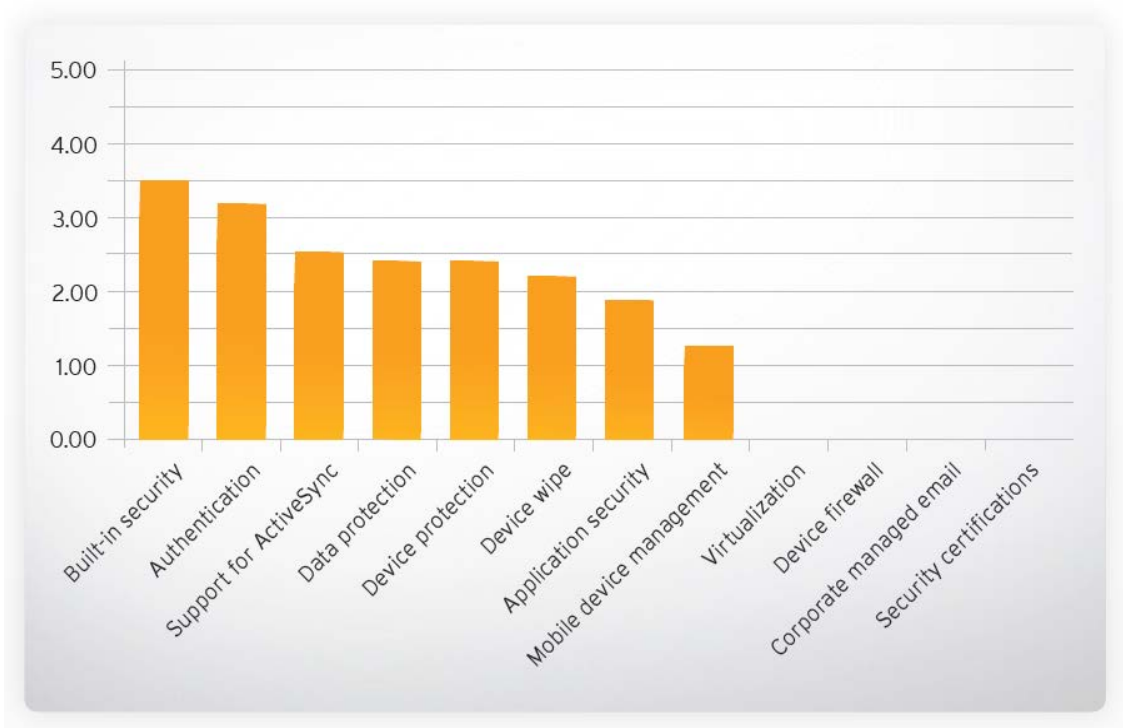


Figure 6 Microsoft Windows Phone Ratings

6.0 Conclusion

This document is not intended to forecast adoption or market fate of individual platforms, because these are irrelevant to the IT managers who will likely have to consider some level of support for all of them anyway. Instead, the analytical framework and the experts' ratings are intended to provide a valuable tool for the definition of sound mobile policies. This allows IT managers to embrace consumerization with confidence and to turn it into a competitive advantage for their organizations.

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