

Mobile Device Platforms

A Comparison of RIM Blackberry 4.0 and Microsoft Windows Mobile 5.0 Messaging and Security Feature Pack Enterprise Mobile Solutions

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Authors

Richard Goggin Richard.goggin@wipro.com

Rajat Mittal Rajat.mittal@wipro.com

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In addition to consulting to technology vendors, practice consultants and technologists work with global enterprises and service providers in architecting and implementing large-scale systems. This practical hands-on experience gives Wipro's PSA Practice consultants and technical architects first-hand knowledge that informs their business analysis work.

For more information about Wipro's PSA Practice, please contact Theo Forbath at theodore.forbath@wipro.com.

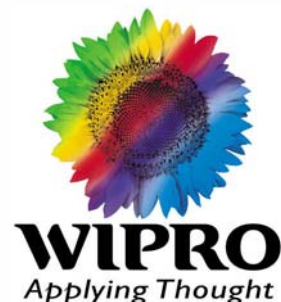


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Executive Summary

IT managers are increasingly being asked to provide mobile access to corporate email, business applications and other critical network resources. The cost of providing and supporting access to these resources is significant and IT managers should give careful consideration to the associated costs and capabilities before deploying an enterprise mobile solution.

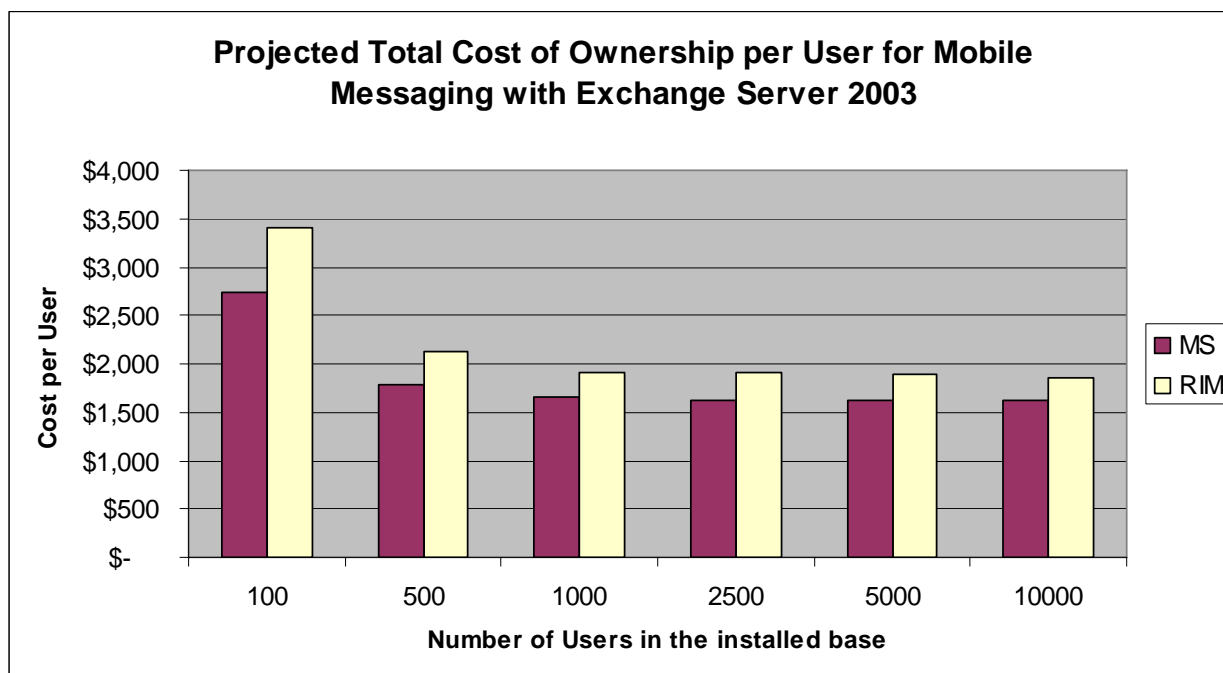


Figure 1: Mobile Platform 3-Yearly Projected Total Cost of Ownership per User

Wipro Technologies, a leader in the IT services and consulting industry, conducted a comparative lab based study of mobile platforms by benchmarking the Microsoft Windows Mobile 5.0 Messaging and Security Feature Pack coupled with Exchange Server 2003 SP2 solution against the RIM Blackberry Handheld 4.0 and Blackberry Enterprise Server 4.0.

Wipro conducted detailed testing of both environments in a simulated production environment and extrapolated the efforts and costs obtained from the lab environment to project the total cost of ownership (TCO) of managing each mobile platform in an enterprise production setting. To validate the lab data, Wipro also conducted interviews with enterprise organizations with large RIM Blackberry deployments.

The purpose of the study was to quantify the costs of deploying and supporting a mobile environment and to provide a comparison of functional differences of IT administration, user functionality and security features. The results of the study highlight a number of distinct advantages of Microsoft Windows Mobile 5.0 MSFP solution.

- **Lower TCO:** The TCO of the Windows Mobile platform is 15-24% lower than that of an equivalent RIM Blackberry platform over a three-year period.

- **Less Infrastructure:** There is a significant difference in fixed cost between the Windows Mobile 5.0 MSFP and the Blackberry environment, due to the additional infrastructure required for the BES Servers as well as the supporting database.
- **Lower Support Costs:** The additional infrastructure necessary for the RIM Blackberry environment requires additional support and IT management effort.
- **Tighter Integration:** Windows Mobile 5.0 MSFP takes advantage of Exchange 2003's mobile support technology providing IT administrators a single environment to manage.
- **Larger Application Selection:** Numerous 3rd Party application vendors and a familiar .Net development environment provide Windows Mobile 5.0 MSFP customers with a wide variety of choices when expanding the mobile platform to support line-of-business functions.

Introduction

Mobile phones have evolved from audio only devices to multi-function handsets capable of supporting email, Internet connectivity and access to line-of-business applications. As phone features have improved, employee demand for mobile access to corporate email, applications, and other critical business information has increased dramatically.

The benefits of providing mobile access to corporate email and applications are not without risk or cost implications. IT managers must evaluate the decision to invest in mobile access based on the usability and administration features of the mobile devices, and the administration and security capabilities of the underlying environment. From a device perspective, the features must support user access to data sources, personal customization options for ease of use and administrative functions to coordinate enterprise policies with device usage. While the administration capabilities must provide IT resources with the proper tools to support and control mobile devices, most importantly, the security capabilities of the mobile environment must protect the sensitive corporate information which will be stored on and transmitted by mobile devices. Businesses must find an acceptable balance between low cost, ease of use for both end-users and IT staff, and security capabilities provided by the mobile platform.

To ensure that the mobile device and platform investment is effective enterprises must examine competing products in detail to understand what drives costs, how to manage the mobile environment effectively, and how to minimize exposure to security risks. To support enterprises in making this investment decision Wipro Technologies' Product Strategy & Architecture (PSA) practice performed a total cost of ownership (TCO) and feature and function comparison of both the RIM Blackberry 4.0 and Microsoft Windows Mobile 5.0 MSFP platforms.

This report presents the results of the TCO and feature/function comparison completed during the summer of 2005. The comparison focused on a number of critical areas, including:

- Platform infrastructure requirements
- IT administrative efforts
- Server performance metrics
- Platform security capabilities
- Device usability

Methodology

To capture the appropriate metrics and data of running both environments, Wipro provisioned a test lab running both the Windows Mobile 5.0 MSFP and the RIM Blackberry 4.0 environments. The lab was managed and run by dedicated Wipro IT and mobile engineers over a two-month period in the summer of 2005. The lab provided the critical base data to project the TCO of both environments over a large mobile user population. To augment and validate the test lab data Wipro conducted interviews with ten enterprises that maintain large Blackberry deployments.¹

¹ Microsoft Windows Mobile 5.0 MSFP beta was used in the lab. This beta version had yet to be deployed in significant numbers by enterprise customers. This paper will be updated as data from Windows Mobile 5.0 MSFP enterprise customers becomes available.

Total Cost of Ownership

Overview

This section provides a summary of the financial investment required to deploy and support both the RIM Blackberry 4.0 and Windows Mobile 5.0 MSFP enterprise mobile platforms. These costs include:

- Infrastructure acquisition
- Infrastructure setup
- IT support
- Data center server administration
- Help desk
- Infrastructure software maintenance
- Technical support²
- User phone plans

For purposes of the analysis, the test lab data and the data provided by interview participants was used to create a model of the costs that enterprises can expect given six user volume scenarios: 100, 500, 1000, 2500, 5000 and 10,000 users.

Figure 2 below shows our projected TCO for each of the user base scenarios identified above.

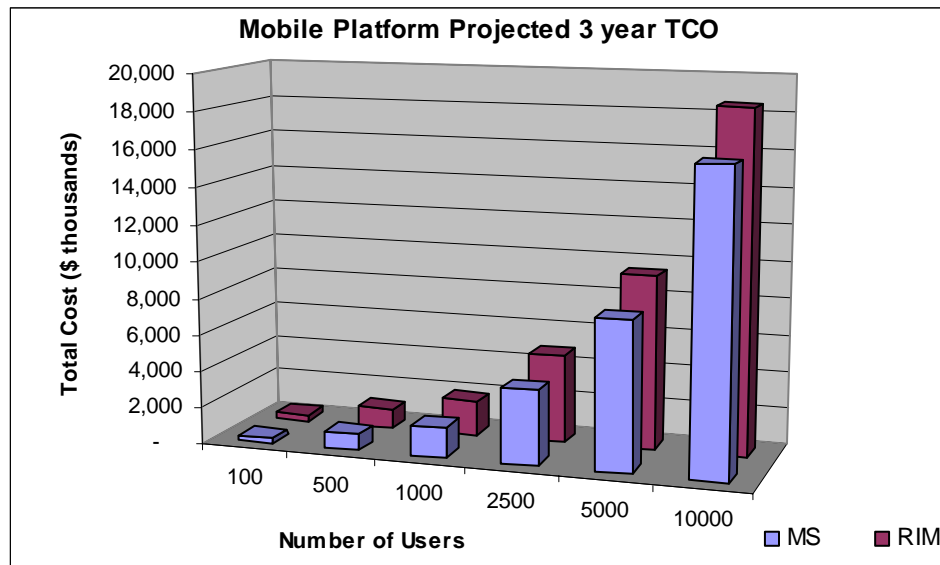


Figure 2: Mobile Platform Projected 3 Year Total Cost of Ownership

² Detailed descriptions of categories are included in the methodology section of the appendix

The table below provides the cost details depicted in the chart above.

Mobile Platform 3 Year Projected Total Cost of Ownership						
Number of users	100	500	1,000	2,500	5,000	10,000
Microsoft	\$274,350	\$888,270	\$1,655,670	\$4,038,396	\$8,076,792	\$16,153,584
RIM	\$340,300	\$1,060,638	\$1,913,618	\$4,789,555	\$9,437,592	\$18,502,108
% Difference	24%	19%	16%	19%	17%	15%
Projected Additional Cost to support the RIM Mobile Solution						
Total	\$65,950	\$72,368	\$257,948	\$ 51,159	\$1,360,800	\$2,348,524
Per user	\$659	\$345	\$258	\$300	\$272	\$235

Figure 3 below graphically displays the projected additional total costs of the RIM Blackberry solution compared to the Microsoft Mobile 5.0 MSFP solution.

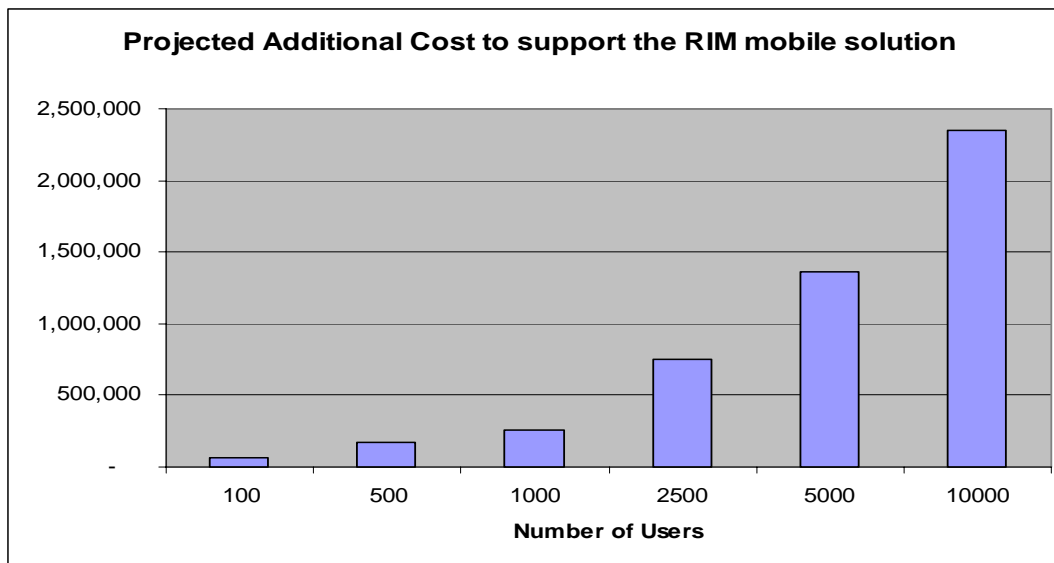


Figure 3: Projected Additional Cost to support the RIM Mobile Solution

Deployment Costs

This section provides a summary of the effort and investment required to deploy either a RIM Blackberry 4.0 or Windows Mobile 5.0 MSFP environment.

All infrastructure costs in our TCO calculations are based on publicly available list prices of the hardware and software components.

Infrastructure Acquisition

Most enterprises already have appropriate Exchange infrastructure deployed to support corporate Outlook and Outlook Web Access (OWA) email clients from outside the corporate network. However, deploying a RIM mobile solution requires additional hardware and software

infrastructure components to be deployed and maintained throughout the life of the mobile platform solution.

Additional infrastructure components necessary for a RIM mobile solution deployment include:

- BES server hardware
- BES server software
- SQL Server hardware
- SQL Server Enterprise Edition software

Figure 4 below shows the initial investment required for the additional infrastructure to deploy the RIM Blackberry 4.0 environment.

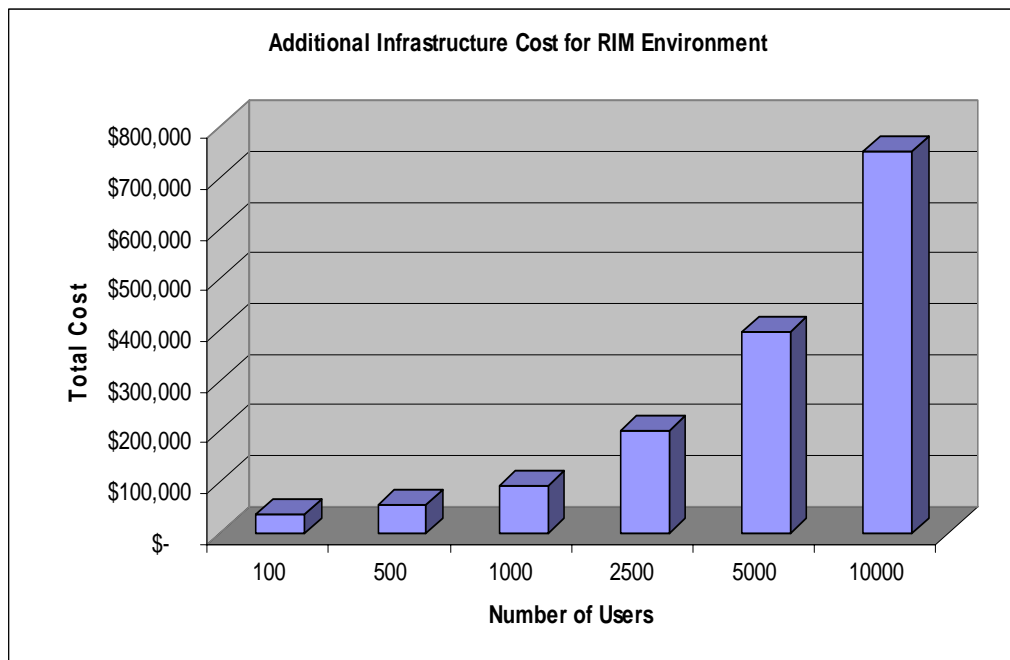


Figure 4: Additional Infrastructure Cost for RIM Environment

There are no infrastructure acquisition costs associated with Windows Mobile 5.0 MSFP deployment. With the release of Exchange 2003 SP2, Microsoft has enhanced the standard Exchange 2003 solution to include built-in support for the Windows Mobile 5.0 MSFP platform. The Exchange SP2 upgrade is available at no charge to Exchange customers and is easily installed into existing Exchange environments.

Infrastructure Setup

Setup time for the additional infrastructure associated with the RIM Blackberry 4.0 environment involves hardware server setup, BES software installation and configuration and the effort to test and integrate the components into the existing Exchange production environment. Figure 5 below shows the costs enterprises can expect in setting up the RIM environment.

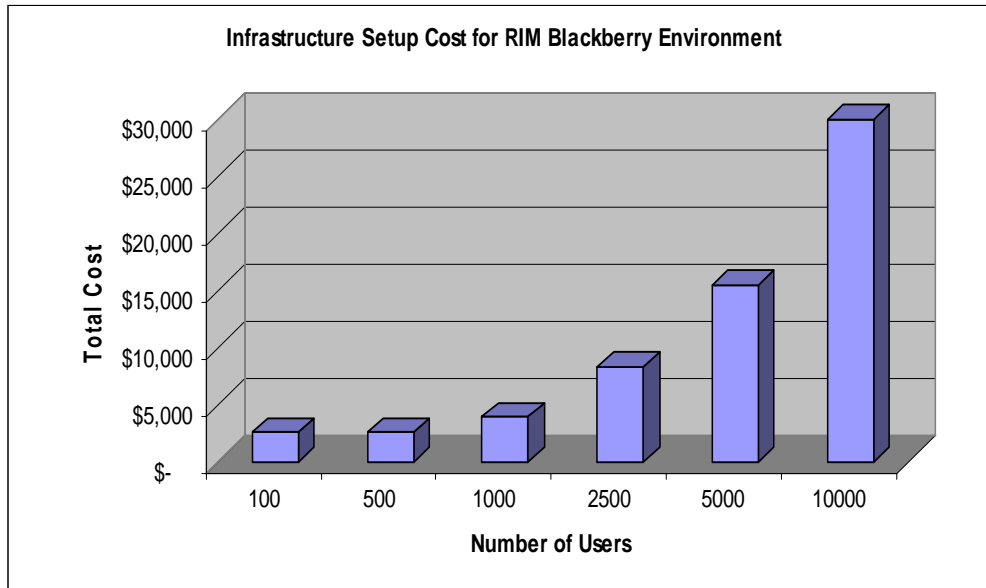


Figure 5: RIM Blackberry 4.0 Environment Setup Costs

The cost of handsets varies significantly based on features selected by the enterprise or the end-user and on the enterprises agreement with mobile operator and/or OEM. The cost of handsets is a significant component of the mobile platform TCO; for the purposes of this analysis, it has been included in the calculations for *both* environments at an average cost of \$275 for each mobile device.

Operating Costs

This section provides a summary of the effort and costs required to support RIM Blackberry 4.0 and Windows Mobile 5.0 MSFP environments. All operating costs are based on effort measured in our lab environment and average IT support wages are taken from our internal Wipro benchmark database.

IT Support

IT support includes day to day effort to maintain the mobile solution’s infrastructure components and to solve user problems escalated beyond the Level 1 help desk support calls. Based on lab and survey data, enterprises can expect IT support costs to be 20% to 30% higher for the RIM Blackberry 4.0 mobile solution than for the Windows Mobile 5.0 MSFP solution (Figure 6). The higher costs are due to four factors:

- Additional infrastructure components in the RIM Blackberry 4.0 environment require more IT staff effort to operate and support. These components include hardware servers, BES software servers and the associated database server such as Microsoft SQL Server
- Coordination of the RIM and Exchange environments for user provisioning, messaging performance and scalability
- Increased IT Level 2/3 effort to resolve user support calls escalated beyond Level 1
- Vendor service contracts (i.e. RIM TSupport vs. MS Premier) – details of this support category are available later in this section

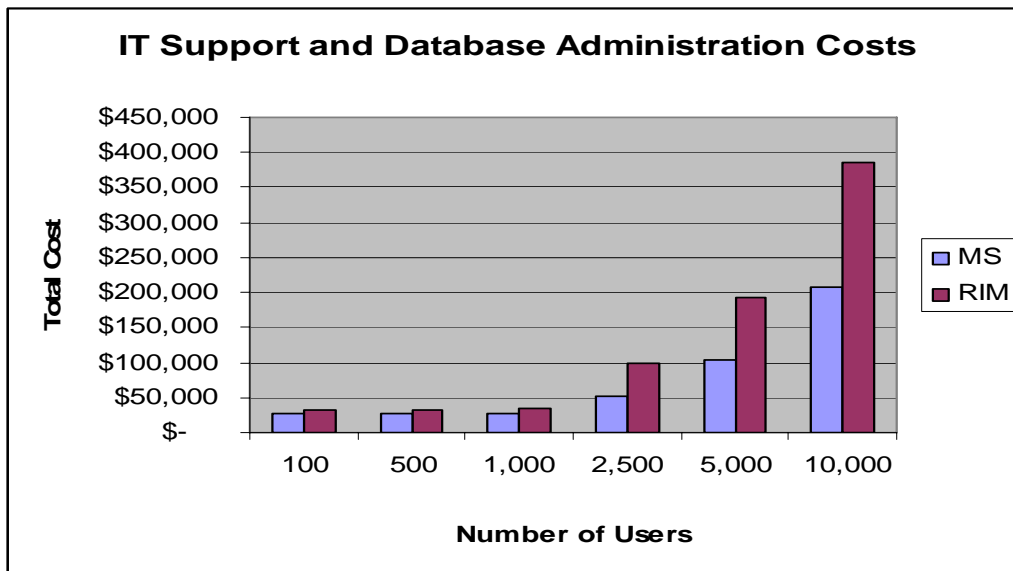


Figure 6: Yearly IT Support and Database Administration Costs

Data Center Server Administration

Data center server administration includes the cost of running and managing the hardware servers and operating system infrastructure. There is no additional cost associated with maintaining a Windows Mobile 5.0 MSFP environment as it utilizes the same Exchange servers that organizations use for operating their email systems. For the RIM environment there are administration costs associated with the additional BES and database servers required to support that solution. These costs are not significant but are included in the TCO analysis.

Help Desk

Help desk costs include the total effort expended by help desk staff to handle the incoming calls from mobile users and is dependent both on the number of incoming calls and the effort required to resolve each call. Survey data collected indicated that the number of calls and call duration were similar for each mobile platform. For each environment, the number of calls averaged slightly less than 1 call per user per month and required approximately 30 minutes per call in resolution effort.

Infrastructure Software Maintenance

Microsoft’s software maintenance cost for the mobile platform is included in the customer’s existing licensing agreement for its Exchange server environment.

In the case of RIM however this cost increases linearly with the number of copies of BES and SQL Server the enterprise purchases. Currently, each copy of BES supports a maximum of 500 end users and requires a yearly maintenance agreement to assure the latest version of BES is available to the enterprise customer. Enterprise customers may also need to include the cost of Microsoft’s SQL Server and related yearly maintenance in addition to the costs associated with the BES copies.

Technical Support

Technical support for the RIM Blackberry 4.0 environment is provided through a purchased TSupport contract with RIM. The cost of the contract is based on the number of RIM licenses the enterprise has purchased, the time of day that technical support calls are allowed and the number of enterprise IT staff authorized to contact RIM's technical support group. The cost of RIM technical support ranges from 5% to 7% of an enterprise's mobile platform TCO.

Technical support for the Windows Mobile 5.0 MSFP platform is provided through Microsoft Premier Support Agreements already in place for many large existing Exchange 2003 environments. The technical support costs for the RIM Blackberry 4.0 platform are modeled below.

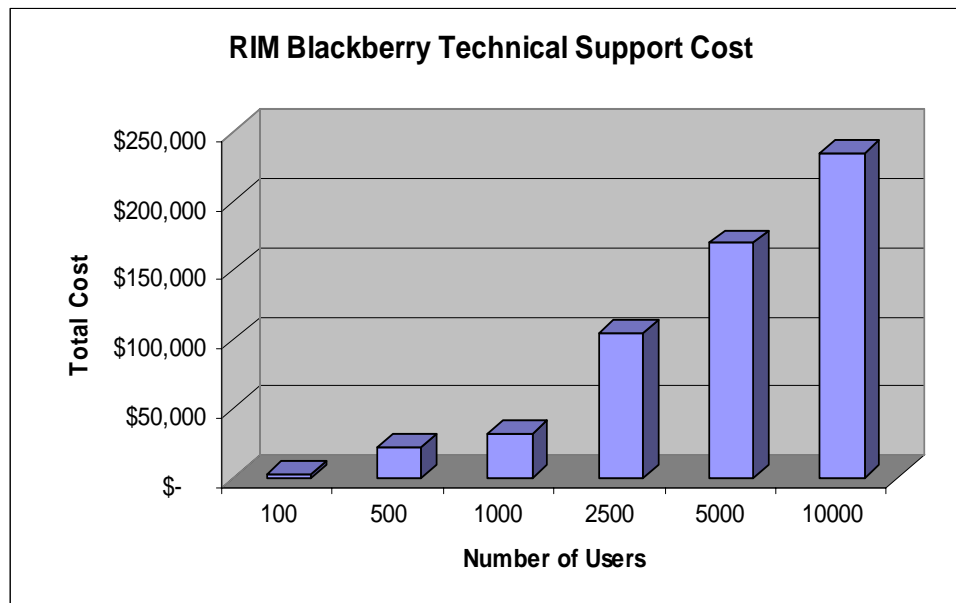


Figure 7: RIM Blackberry 4.0 yearly Technical Support Cost

User Phone Plans

Phone plans vary widely based on voice minutes, data volumes and agreements between enterprises and mobile operators. As with the mobile device, our TCO model assumes the same cost for each solution's mobile data usage, \$40/month for each user. The monthly subscription fee for the dedicated RIM data plan and for a flat rate data plan for Windows Mobile can vary significantly.

Comparative Analysis

The Total Cost of Ownership for any enterprise IT solution will include initial deployment costs to acquire and configure appropriate infrastructure components in addition to the ongoing operational costs to maintain the infrastructure and support the user base. Analysis indicates that the TCO of the RIM Blackberry 4.0 environment will be consistently higher than for a similar Windows Mobile 5.0 MSFP solution. This difference will range from 24% more expensive for a 100 user base to 15% higher for a 10,000 user base. Figure 8 below depicts the cost differential for a 3-year TCO as the user base grows from 100 to 10,000 users. The accompanying table provides the cost details.

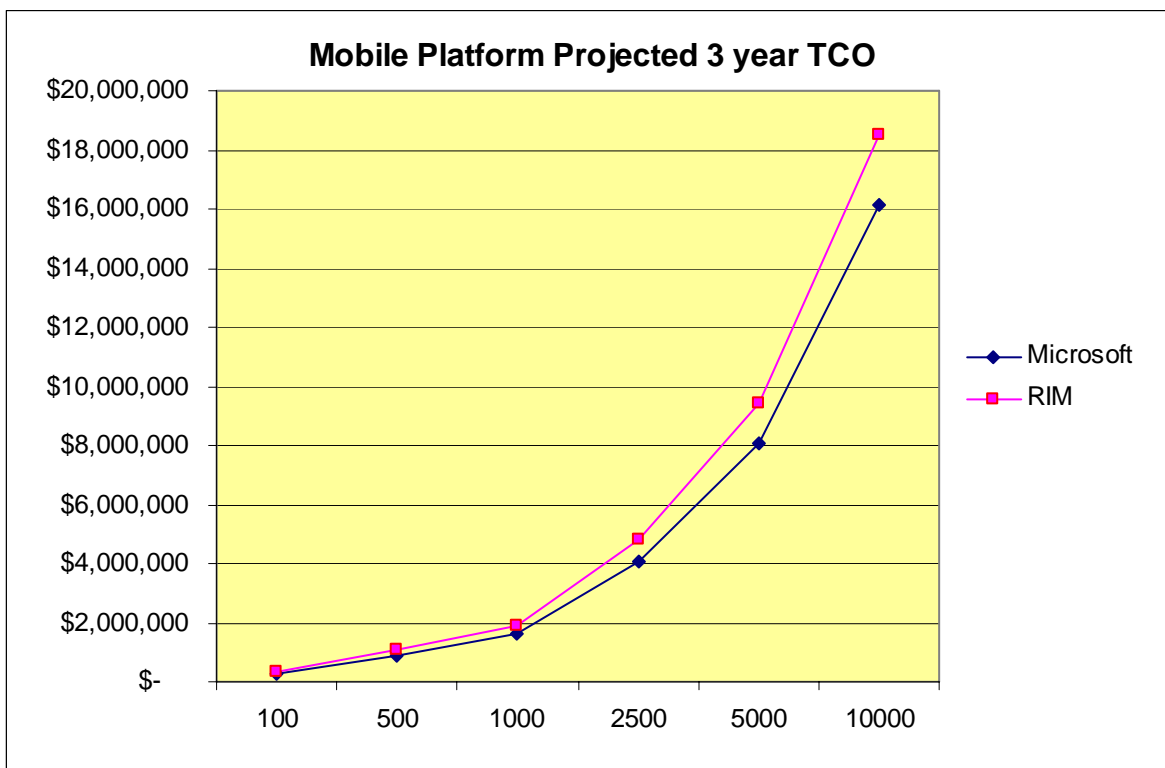


Figure 8: 3 year Projected TCO Cost for 100 to 10,000 users

Projected Additional Cost to support the RIM Mobile Solution						
Total	\$65,950	\$72,368	\$257,948	\$ 51,159	\$1,360,800	\$2,348,524
Per user	\$659	\$345	\$258	\$300	\$272	\$235

Initial acquisition and deployment costs per user differ significantly between the two mobile platform solutions. For small user deployments, for example, the RIM Blackberry 4.0 infrastructure acquisition and deployment will be twice as expensive as the Microsoft Windows Mobile 5.0 MSFP solution. Figure 9 below depicts the infrastructure/deployment cost per user for our six enterprise scenarios.

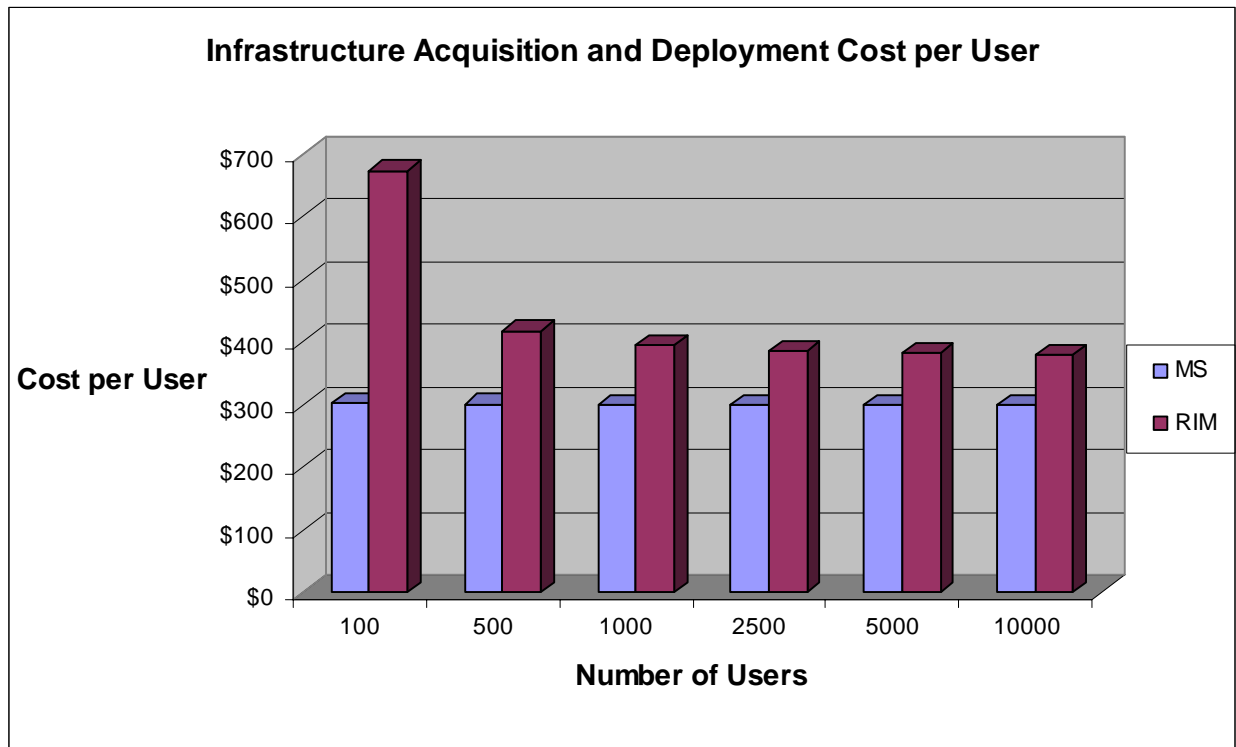


Figure 9: Infrastructure Acquisition and Deployment Cost per User

Wipro Lab results indicate that in addition to the costs associated with deploying and managing a new BES platform, the Blackberry solution also puts an additional load on the back end Exchange infrastructure. Our ability to estimate this additional load was inconclusive since we were unable to simulate a large number of active RIM mobile devices. RIM’s proprietary architectural implementation of BES only accepts transactions from physically activated mobile devices. Our lab environment did not have the capability to activate the thousands of devices necessary to complete a formal performance test.

Enterprises with 500 or fewer Blackberry users will probably not require additional Exchange capacity. Enterprises deploying a RIM solution with greater than 500 users should closely monitor Exchange performance and be ready to add Exchange server capacity in order to maintain the same Exchange performance/capacity ratios that existed prior to the Blackberry deployment.

From an ongoing operations perspective significant cost differences emerge as well. As the user population grows, the cost of managing the RIM environment increases significantly and the effort devoted to the day-to-day management and upkeep of the solution is considerably higher when compared the Windows Mobile 5.0 MSFP environment. Figure 10 below shows the operating costs per user at various user base levels.

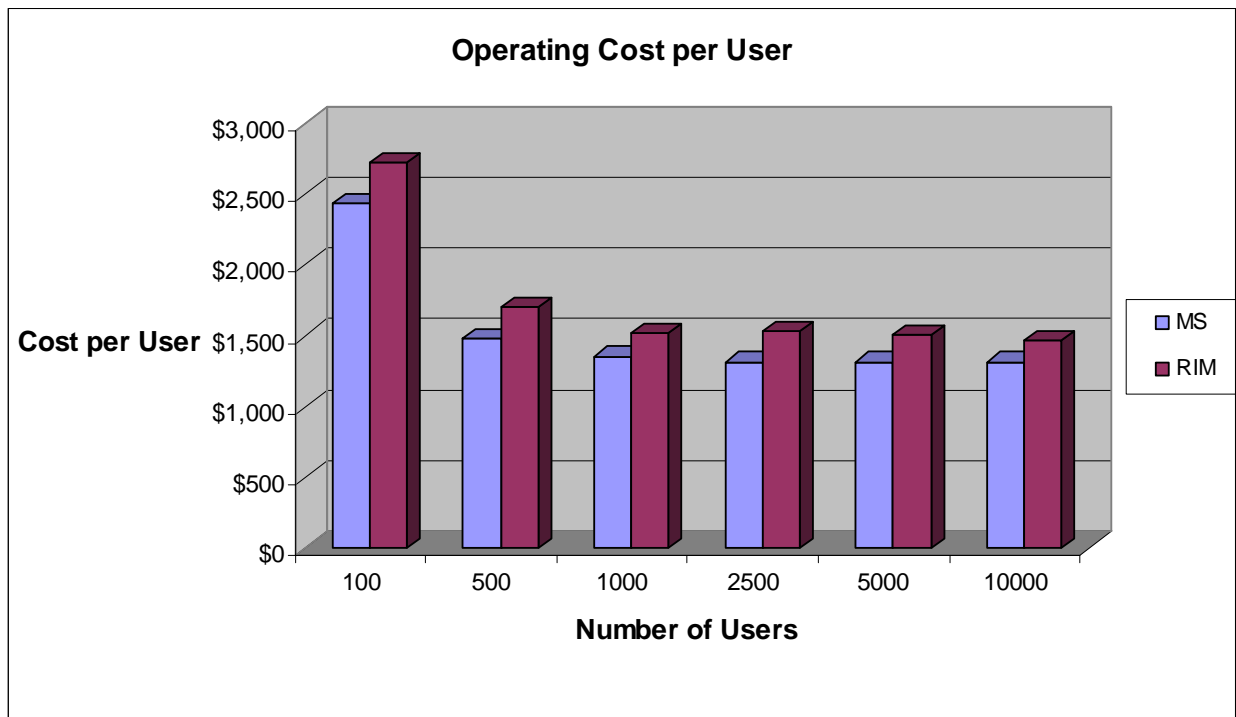







Figure 10: Operating Costs per User

The difference in operating cost between the two environments is the result of higher IT support demands and the additional software maintenance agreement required with the RIM Blackberry 4.0 solution.

Functional Comparison

In addition to the TCO analysis of the RIM Blackberry 4.0 and Windows Mobile 5.0 MSFP solutions, Wipro deployed each of the mobile solutions in a lab environment to evaluate the major features and functions of each platform. The analysis focused on the features and functions most critical to mobile device users, IT security staff, and IT infrastructure administrators. In each of these areas we list the major functions, describe the capabilities and rate how well the function is implemented in each environment. At the end of each section, Wipro provides a summary opinion on how well each vendor has implemented those functions and the potential implications of their approach to IT support staff.





For each feature or function a graphical icon is used to rate overall performance. The rating classification includes the following:











-  - Function is fully supported
-  - Function is supported but lacks non-critical features
-  - Function is partially supported and lacks important features
-  - Function is partially supported but lacks critical features
-  - Function is not supported

Mobile Platform IT Administration Features

Management tasks will include setup and configuration, user/device provisioning, security rules, messaging/connection rules and activity/performance monitoring. Given the mobile nature of these devices, management tasks must take advantage of the mobile network and not require the device to be docked or cradled to be controlled by the IT administrative group.

User/Device Management

Feature	RIM	Microsoft	Comments
Manage Mobile Users: Ability to define users for mobile access and to manage mobile user access functions.			Each Blackberry user must be explicitly identified to the BES environment. BES interfaces to the Exchange Global Address List to facilitate adding existing Exchange users to the BES. BES user management is independent of the user's Active Directory account. Windows Mobile user properties are integrated into each user's Active Directory account allowing administrators to manage user email activity from a single management console.
Access User Status and Statistics: Ability to review mobile user and mobile environment activity.			BES provides basic statistics on message volumes, device status and message status at user and server level. Windows Mobile statistics are not available directly but must be extracted and formatted from Exchange activity logs.

Feature	RIM	Microsoft	Comments
Device Synchronization: Ability to control direction of data transfer and which data participates in the mobile device to Exchange synchronization process.			BES synchronization can be set to on/off globally or at a specific user level. The synchronization of each PIM data category can also be specified. Windows Mobile administrators enable/disable synchronization at a global level but delegate PIM category synchronization to each user.
Message Filtering: Ability to intercept and redirect email messages prior to delivery to mobile device.			BES provides global and user level message filtering for its mobile devices to prevent unwanted messages from being delivered to mobile devices. Windows Mobile users can select which folders in their mailbox that they wish to synchronize to the device and users can also set server-side rules which copy or move mail messages to specific folders.
IT Policy Management: Ability to control mobile user account and device functions through a centrally defined and administered set of rules.			BES administrators control all device functions through its IT Policy feature. IT Policy areas include device and user security settings, browser settings, message and connection options. Policies are defined centrally and associated with individual or groups of users. All IT Policies are transmitted wirelessly to the device immediately. Windows Mobile devices use IT policies set by Exchange administrators in conjunction with the mobile operator controlling device connections, message security and application installation.
Attachment Management: Ability to control email attachments sent and received from the mobile device.			The BES Attachment server preprocesses all email attachments prior to sending them to the mobile device. Controls for administering email attachments include defining file types, file sizes and attachment server performance parameters. Windows Mobile allows or disallows attachments sent to and from mobile devices via the Exchange front-end server. Attachment filtering is controlled by the URLScan utility for Exchange
Internet Access Management: Ability to manage internet access from mobile devices.			The BES Mobile Data Service component (MDS) manages all aspects of internet access from RIM's mobile devices. MDS features include direct or proxy connections, SSL configurations, LDAP and certificate authentication, and push/pull controls for internet sites and users. Note that MDS is a separate component from RIM that runs via BES. Windows Mobile devices access internet resources via the Exchange Front End server where IT administrators manage mobile to internet connections.





Wipro Opinion: The RIM mobile solution requires a separate server, Blackberry Enterprise Server (BES) that interfaces with the corporate Exchange environment on one side and Blackberry mobile devices on the other side. BES includes the Blackberry Manager application which is the administrative console for all Blackberry devices connected to that server. All IT management tasks for Blackberry devices use the Blackberry Manager and are independent of the Exchange and Active Directive backend environments.

Microsoft’s mobile solution is integrated into the corporate Exchange environment and does not require additional hardware or software servers to enable or manage Windows Mobile 5.0 MSFP users. Administrative tasks for mobile users and devices are integrated into the Active Directory and Exchange management applications already used by IT to manage the existing environment.

Both solutions provide IT administrators with the appropriate tools necessary to manage the mobile environment. RIM’s management solution for Blackberry devices provides very granular control of all aspects of mobile user and device activity. Although IT administrators must deal with a separate ‘management console’ for the Blackberry environment, the management process is straightforward and requires only a small amount of training. Microsoft takes a more global approach to managing the mobile environment and does not provide the granular level of control on user synchronization direction, attachment processing, email filtering and IT policy definition.

In small mobile device deployments (< 300 users), either management environment will be sufficient. In larger deployments, Microsoft’s global management approach and their integrated management tools will most likely require less IT administrative effort to manage the solution.

Security Administration

Feature	RIM	Microsoft	Comments
Security Administration Approach: Process by which IT administrators define, control and monitor mobile device security.			All Blackberry security functions are managed through the Blackberry Manager application within BES. This application allows the IT administrator to define, deploy and monitor mobile device security policies. Windows Mobile device security administration is performed using the Exchange System Manager application for global security settings and Active Directory for individual user security settings.
Security Policies: The rules which are applicable to mobile device general use and the device’s interaction with internal corporate resources and external entities.			RIM provides a rich set of security rules for securing access, data and connections on the mobile device. Rules are organized into Policies and mobile users are assigned to the Policy that best matches their mobile access needs. Windows Mobile provides a more focused set of security rules for mobile devices. These rules are based on the key mobile security areas identified by the average business IT staff. The rules are applied globally using Exchange System Manager with the provision for excluding specific users.

Feature	RIM	Microsoft	Comments
Security Settings on Mobile Device: Security rules reside on the mobile device whether defined by the user or IT administrators and are refreshed based on IT policy.	●	●	IT Policy changes are immediately sent to RIM devices over the wireless network. The RIM IT administrator can check each devices Policy status and resend the Policy if necessary. Windows Mobile security policies are sent to mobile devices based on the schedule set by the Exchange and are verified prior to each synchronization activity

Wipro Opinion: RIM provides IT administrators with a comprehensive set of tools through the Blackberry Manager application to define and manage security policies for its mobile devices. BES comes with over 150 predefined customizable rules allowing IT administrators to manage all aspects of the mobile device access, activity and connectivity. BES IT Policies contain any number of customized rules. Users (via their device) are assigned to an IT Policy and the policy is transmitted to the device over the wireless network.

The device security rules of Windows Mobile focuses on ensuring that only the authorized user has access to the device. Device activity such as Email, line of business application use and connectivity to network resources is managed through the user's Active Directory profile.

RIM has taken a very proactive approach to ensuring that its mobile devices can be tightly locked down by IT administrators. BES provides the proper tools to effectively define, distribute and manage security aspects in its mobile device environment.







The IT security policies of the Windows Mobile platform are not as granular as those of the RIM platform. The Windows Mobile platform is an extension of the corporate Windows platform and its security management is integrated into Microsoft's other management tools: Exchange System Manager, Active Directory and Systems Management Server. Security settings apply to the network user regardless of the device used to access the corporate network. Defining security levels for a user rather than a device will ensure consistency of security definitions and lessen the effort required by IT administrative staff to secure the corporate network.

Mobile Platform User Features

User features vary widely across mobile devices based on device manufacturer, mobile operator, and device OS and the solutions installed on the mobile device. In this section we look at the features available from RIM and Microsoft on the mobile devices supported by each.

General Features

Feature	RIM	Microsoft	Comments
Email Accounts: Users may have several email accounts housed on different platforms.	●	●	Both RIM and Windows Mobile devices support multiple email accounts simultaneously including Exchange, POP3 and IMAP4.
SMS Messaging: Ability to send and receive SMS messages	●	●	RIM and Windows Mobile both support SMS messaging from their mobile devices

Feature	RIM	Microsoft	Comments
<p>Activation: Several activation approaches are available from both RIM and Microsoft involving mobile operator, OEM, IT or just the user.</p> <p>Some enterprises will choose to activate the device internally prior to distribution; others may allow the user to independently activate the device.</p>			<p>With BES 4.0, RIM has introduced their over the air (OTA) Enterprise Activation feature. Users simply enter their email address and a one-time setup password defined by IT and the device contacts the BES server, downloads required applications and configures itself based on policy settings defined by the enterprise IT administrators.</p> <p>Windows Mobile provides a similar over the air activation approach and may require the user to enter additional information pertaining to carrier and protocol. Organizations can provide a user provisioning website; send provisioning information via self-running SMS cab file; or via self-running provisioning file on removable media card. Application provisioning of the mobile device is not included in the activation but can be accomplished in the same fashion as per above.</p>
<p>Synchronization: How a user synchronizes Exchange data with the data on the mobile device.</p>			<p>Both vendors support always up to date OTA synchronization of email and PIM components. Users can select which PIM components are synchronized.</p> <p>RIM's BES 4.0 server controls the OTA synchronization between mobile device and Exchange backend servers.</p> <p>Windows Mobile uses the ActiveSync 4.0 application for synchronizing the mobile device and the Exchange server. GZIP data compression, available on IIS 6.0; compresses over the air data sent between Windows Mobile devices and the Exchange Server. GZIP also compresses data sent between Outlook Web Access clients and Exchange Server.</p>
<p>Add-in 3rd Party Applications: Variety of 3rd party applications available for enterprise customers.</p>			<p>Both platforms have attracted a wide variety of 3rd party application development for business, entertainment and personal use. Enterprise level customers will see a larger selection of business and industry focused applications on the Windows Mobile platform than on the Blackberry platform.</p> <p>The Windows Mobile Operating System provides 3rd Party applications with flexible features including support for storage devices such as SD/XD/MMC, CF, internal hard drives and simultaneous Voice and Data Connections allowing mobile devices to take advantage of 3G technology etc. (feature availability is on a per device).</p>







Wipro Opinion: Both vendors provide support for mobile device features that allow users to easily activate their devices, manage multiple email sources and automatically synchronize with their Exchange back-end environment to maintain 'always-up-to-date' data on the mobile device.













Configuring mobile devices for use in an enterprise environment requires careful planning by







enterprise IT administrators. Manual configuration by IT staff should only be considered when dealing with a few hundred devices. Automated configuration is preferred for greater numbers of mobile devices. RIM's Enterprise Activation feature has the potential to eliminate IT manual intervention by allowing the user acquire the Blackberry device from a number of sources and then activate the device in the field. BES policy settings for the user control all aspects of device content and configuration through a service book concept that is remotely sent to the device. Configuration and activation of a Windows Mobile device requires the combined efforts of IT administrators, end-users and in some cases device distributors. Centralizing the control of device activation and management with the enterprise IT department allows for more consistent configuration of mobile devices and fewer problems with device interaction with corporate resources.

Email/PIM/Browser

For most users, mobile access to email is the prime driver for their initial investment in a mobile platform. Below we look at the major email/PIM functions available on the Blackberry and Windows Mobile5.0 MSFP devices.

Feature	RIM	Microsoft	Comments
Send/Receive E-mail: Functions for managing inbox, outbox email messages.			Both vendors provide the same send/receive functionality as the desktop Outlook client including: compose, reply, forward, addressing from stored contact data, message priority, notification of new messages, email signatures. Context sensitive shortcuts are provided to quickly see and work on recently received email.
Organize: Storing and organizing email and PIM data on the mobile device.			Both vendors use a folder concept for organizing data. Microsoft's Outlook Mobile mimics the desktop layout of Outlook folders. Changes to either environment's folder layout are synchronized with the other environment.
Attachments: Viewing, creating and managing email attachments.			RIM's BES server preprocesses all email attachments, creates a text version of the attachment, separates out any images and sends the processed attachment to the mobile device. Attachments cannot be created or edited from the Blackberry device without the use of 3 rd Party addins. Microsoft Exchange treats the mobile device like any other Outlook client and sends the actual attachment with the email message. Mobile versions of Microsoft Word and Excel allow create, edit, view, and delete capabilities, PowerPoint Mobile allows view capabilities on Windows Mobile Pocket PC and Pocket PC Phone Edition devices. Windows Mobile's voice integration feature supports creating and adding voice attachments to email messages, allowing users to respond via voice rather than keying in text in email messages.

Feature	RIM	Microsoft	Comments
Calendar: Functions supporting setting up calendar events, inviting other participants, responding to calendar invitations and reminders of calendar events.			The Blackberry device calendar replicates the Outlook calendar events. Limitations include not allowing a Blackberry user to respond to calendar invitations. The Microsoft Windows Mobile calendar functions much the same as the desktop version allowing accept, decline, edit and create activities.
Tasks: Functions supporting tasks created by the user including due dates, status, priority, and categorization.			Both vendor solutions support the basic task creation and management on the mobile devices. All task activity is synchronized with the user's Outlook Task list.
Contacts: Features that support contact data on the mobile device.			The Blackberry contact list replicates in both directions from and to the user's Outlook contact folder minus any distribution lists. Email distribution lists are supported using the Blackberry Group feature but these Groups are not replicated to the desktop Outlook contact folder. Contact data on the Blackberry device includes only a subset of the Exchange contact properties. The Windows Mobile contact list also replicates in both directions to and from the user's Outlook Contact Folder and supports 80+ more Outlook contact fields than the Blackberry. Both solutions support access to Exchange's Global Address List.
Memos/Notes: Features that support the creation, editing and management of memo's and personal notes.			Blackberry devices allow the user to create, edit and categorize personal memos that are synchronized as Exchange Notes in the users Outlook environment. Windows Mobile provides a notes feature based on the Microsoft OneNote concept rather than the Outlook Notes concept. OneNote Mobile allows creating, editing, deleting, modifying, etc. notes. These notes are synched via OneNote on the desktop rather than via ActiveSync.
Instant Messaging: Support for instant messaging applications.			There are several instant messaging applications that are available for Blackberry devices but they must be downloaded and installed by the device user. MSN Messenger is built into the Windows Mobile platform allowing the same instant messaging experience as on the desktop. Also, Microsoft Office Communicator Mobile is in late trial stages; when released, this SIP-based client will connect to Microsoft Office Live Communications Server from inside or outside the firewall
Offline Usage: Functions allowed when the device is not connected to the mobile network.			Both vendor solution support offline email and PIM data manipulation. Synchronization occurs as soon as the device is connected to the mobile network.

Feature	RIM	Microsoft	Comments
Multi Media: Multi media features include pictures, music and video viewing.			The Blackberry device supports device display personalization using picture images but does not support other multimedia functions. MS Windows Mobile comes with Microsoft's Media Player 10 Mobile allowing the user to listen to music and play video clips.
Phone Integration: How the phone integrates with other device features.			Both vendors have integrated the phone dialing and caller ID with the mobile device contact data. Windows Mobile voice recordings can be used as email attachments.
Browser: Ability of the device to view and interact with internet web pages.			Both RIM and Microsoft support HTML and WAP browsing.

Wipro Opinion: User features on each device are very similar although implemented in different ways. For instance, Blackberry's trackball and built-in QWERTY keyboard on some of its more popular models provide a simple to use and relatively intuitive interface to manipulate email and PIM data.

On the other hand, Windows Mobile 5.0 MSFP devices utilize a mobile version of Outlook for email and PIM information. The mobile interface of Outlook is very similar to the desktop version so the user's learning curve will be minimal. With Windows Mobile 5.0 MSFP being supported on a variety of mobile devices, the user input process will vary based on the device. Smartphones generally use a combination of soft key menus, a 5-way navigation button and the telephone numeric keypad for character data entry. PocketPC devices use a combination of tap screens, character recognition and QWERTY keypads for input.

Although the Blackberry QWERTY keyboard is somewhat easier for text data entry, such as when composing and replying to SMS messages, the Smartphone's use of the standard phone number/letter keypad provides an acceptable text entry capability after some initial user practice. Composing lengthy or textually complicated emails on mobile devices is not the norm for mobile users.

The Blackberry solution is specifically tailored for email and PIM data usage. The mobile device and the handheld software work well together to optimize user access to email and PIM data. The Windows mobile platform is designed for more than just email. The mobile version of its familiar Outlook application integrates seamlessly onto the mobile platform and provides the user with a simple yet effective interface to email and PIM functionality. Microsoft's mobile platform is designed to facilitate integration of complementary applications. Outlook's inclusion of contact photos and voice attachments to email is an example of how discrete functions can come together to enhance overall user effectiveness.







If email will be the primary (and possibly the only) application used in the mobile environment, both solutions perform very well. If enterprises are intent on moving more business functionality to the mobile phone platform, Microsoft offers the superior solution due to the larger number of applications available and the full featured development platform available for custom application development.



Mobile Platform Security Features

Security is a key component of mobile devices, especially for those devices that contain corporate data. Today’s mobile devices can store the same level of information as personal computers including personal information data, email, contacts, Microsoft Office documents and application data, all of which may contain corporate data that is sensitive, private or contains intellectual property information. The size and utility of the mobile device, unlike its cousin, the personal computer, makes the mobile device much more susceptible to loss or theft. It is therefore essential that corporate security policies extend to mobile devices and that those policies are comprehensive enough to protect any corporate assets contained on the mobile device. At the same time, if these security requirements impart unacceptable overhead to the end user—such as necessitating onerous tasks before accessing the device user interface, or making device performance sluggish—end users will complain, and some will attempt to bypass the security requirements.

Device Access

The simple concept of mobile phone for anywhere voice communication has quickly evolved into a mobile device capable of voice and complex data communication with any network and/or data store in the world. This advance in functionality for the mobile device has been a boon to users and a bane to corporate security officials charged with maintaining control over corporate digital assets. Device protection must balance the needs of corporate requirements and ‘usability’.





Feature	RIM	Microsoft	Comments
Device Locking: Locking prevents the device from being use by unauthorized users. Locking may occur on power up, after a time of inactivity or by user request. Unlocking the device requires a user password to be entered.			Device locking parameters can be set by the user but in each case, IT Policy settings can override user settings. Devices from both vendors support device locking on power up and automated locking after a defined period of inactivity.
Device Password: Password attributes define the breadth and depth of the phrases used to access the device. Attributes may include length, strength, number of saved previous passwords and words not acceptable as passwords			Blackberry devices and BES IT Policy settings support a variety of device password options for protecting the mobile device including password length, strength and previous/excluded passwords. Windows Mobile devices support the basic password attributes of length and strength controlled by the user or IT Policy.
Password Protection: Preventing unauthorized access to the device password and protecting against password cracking are important device security features protecting the mobile device contents.			RIM devices encrypt the local password while Microsoft devices use a hash method when saving the local password on the device. Both vendors support an automatic ‘contents deletion’ if the device password is repeatedly entered incorrectly. The number of incorrect entries is controlled by IT Policies.





Feature	RIM	Microsoft	Comments
Device Reset: : Device content can be erased by the user or remotely by IT administration if the device is transferred to another user or if the device is lost or stolen			Both solutions support erasing device contents remotely via an IT command or locally if incorrect password entries exceeds an IT defined limit. The Exchange Server remote wipe webtool reports when the device has successfully reset itself; the BES reset process does not.

Wipro Opinion: RIM and Microsoft have provided users and IT administrators with the ability to secure the mobile device from unauthorized access. Both vendors have done well to provide the user with the ability to personalize the device access options but place the final authority in the hands of the IT administrator where corporate policies can be defined and pushed to the devices.

Securing Data on the Mobile Device

As mobile device data capacity grows the potential for corporate data theft and misuse increases dramatically. Policies for securing corporate data must be extended to the mobile device in such a way that the policies are manageable by the IT security staff. But at the same time these policies must be careful not to hinder the productivity of end-users.

Feature	RIM	Microsoft	Comments
Email and PIM Data: Email and PIM data is stored on the mobile device.			Blackberry devices support email and PIM data encryption initiated by the users or through an IT Policy. The encryption process uses either a 256-bit AES bulk key or ECC key pair. Encrypted keys are stored in the device's non-volatile memory which is inaccessible to 3rd party applications Encrypted data is dynamically decrypted as needed. Microsoft does not provide Email/PIM encryption directly, unless the organization uses industry-standard S/MIME email messaging. Several 3rd party products are available that provide a wide variety of mobile device encryption options for Email, PIM and other local data.
Digital Certificates: electronic certificates required for a variety of secured applications.			Each vendor' solution provides support for digital certificate management and processing enabling secure communication between the mobile device and a remote application. In both vendor solutions, certificate installation requires that the mobile device be cradled. RIM devices connect to the Certificate Synchronization Manager desktop application while Windows Mobile devices download digital certificates from Active Directory.



Feature	RIM	Microsoft	Comments
Corporate Credentials: Credentials include identity information such as name/password combinations for Email, Web or LOB applications.			RIM provides a built in password keeper application that stores and encrypts user defined passwords eliminating the need to store passwords in a text based document. A password copy/paste option is available for entering password data into application entry fields. Windows Mobile devices include the Credential Manager application which provides storage and encryption of user credentials and private keys. Encrypted credentials are stored in a protected registry area and are accessed via application APIs. Access to stored credentials can be configured to require user verification prior to use of credential data.
Application Data: Data associated with 3 rd party applications and stored on the devices local or removable storage.			Neither vendor directly provides encryption protection for any application data stored on the mobile device. Application data can be encrypted via 3 rd party mobile encryption products, within the application (e.g. SQL CE uses 128 bit encryption for its database) or via APIs available on each vendor's platform. RIM provides API access to the Blackberry content protection process and Microsoft provides encryption capabilities using its Crypto API tool set.







Wipro Opinion: Enterprises should strongly consider deploying a single mobile device security solution such as that offered by Pointsec, controlled by IT security administrators to manage all resident mobile device data. Mixing and matching built-in options, API level and 3rd Party data protection schemes will be costly to deliver and maintain given the volatility and relatively short life expectancy of each mobile device.

Neither vendor provides a total solution in this area. RIM's built in encryption for email and PIM data can be activated by the user or IT Policy and is an adequate solution if the mobile device is used only for email activities. Although Microsoft does not provide a built-in email encryption option (other than S/MIME as noted above), several 3rd party vendors provide installable data protection solutions that go beyond email and integrate into the overall IT security administration of the mobile environment.

Secure Data Transactions

As the data format increases in complexity, the content becomes more capable of carrying sensitive corporate and personal information. Securing the mobile data content is a corporate necessity and needs to be seamlessly incorporated into the mobile user's experience.

Feature	RIM	Microsoft	Comments
VPN Support: Ability to connect to corporate network sources using VPN technology			Some RIM devices such as the 7270, have a built in VPN client for WLAN connections. Windows Mobile includes a VPN client that supports PPTP/MSCHAPv2, Layer2 Tunneling and multiple 3 rd Party VPN solutions.





Feature	RIM	Microsoft	Comments
Message Path: The path a message traverses between mobile device and corporate environment.			In addition to mobile messages interfacing with the mobile operator and the internet, the RIM architecture requires all Blackberry message traffic to pass thru the RIM Network Operations Center (NOC) in Ottawa Canada Microsoft's messaging architecture requires no intermediate processing between mobile device and corporate network.
Data Transmission Security: Mobile messages traverse the airwaves to and from the mobile operator and the internet from mobile operator to corporate environment. Both air and wire media are open environments where data interception is easily accomplished.			By default all RIM messages to and from the mobile device are encrypted using Triple-DES or AES-256 bit bulk key technology. SSL encryption is supported for web and application messaging with or without the Triple-DES and AES approach. Microsoft Windows Mobile encrypts all Email/PIM data to and from the Exchange environment using the RC4/SSL 128-bit encryption technique. SSL encryption is supported for access to secure web sites and is available to mobile applications through APIs. RC4 encryption algorithm can be substituted with 3DES if desired through a setting on the Exchange 2003 server.
S/MIME Support: Secure email communication insuring message privacy and sender/receiver authentication.			S/MIME messaging and mobile certificate management is supported using RIM's S/MIME Support Package (separate installation on mobile device and desktop). Windows Mobile provides native support for S/MIME messaging including certificate management via desktop Active Directory connection.

Wipro Opinion: RIM and Microsoft have adopted different approaches to secure data as it moves from the mobile device to the corporate network. The data path taken in each case uses the Mobile Operator and the Internet to route mobile messages back and forth to the corporate internal network. Specifically for RIM, all email and business application data (inbound to the corporate network and outbound from the corporate network) must pass thru the RIM Network Operations Center (NOC) in Canada. This single point-of-failure in the RIM data delivery system is worrisome to us. Email alone, has become a critical element in the corporate communications hierarchy. A delay or outage in email processing is becoming less and less tolerable in today's fast moving environment. As more and more data (email, browser and line of business application) is moved over the mobile network any level of service interruption will become less palatable to the corporate user.

Application Security

Corporate enterprises are quickly realizing the value of deploying custom developed and/or 3rd Party packaged applications to support line of business requirements. Applications running on the mobile platform potentially have access to corporate assets on the device or on the corporate

network. The same security policies controlling desktop application installation and data access must also be applied to applications in the mobile environment.

Feature	RIM	Microsoft	Comments
<p>Application Installation: Includes the controls defining application installation rules and how users and /or applications meet those rules.</p>			<p>Using IT Policies, RIM IT Administrators control the user's ability to initiate the download/install process and also control which specific applications are installable on each device.</p> <p>Windows Mobile devices use a combination of security levels defined by the mobile operator, OEM, corporate IT, application digital certificates and user approval to control which applications can be installed on a mobile device.</p>
<p>Device Component Access: Which device components are available to mobile applications and how access is controlled</p>			<p>RIM controls each application's access to mobile device components (e.g. ports, persistent memory, phone, data stores etc.) through application control policies defined by IT administrators and pushed to the mobile device.</p> <p>Windows Mobile uses the same combination of security options defined above to classify an application as trusted or normal. Trusted applications have access to all mobile device components. Normal applications have limited access to device components.</p>

Wipro Opinion: RIM's application security approach allows for very granular control of application installation and execution. If applied, this granular control ensures that RIM devices will execute only those applications specifically named and approved by the IT administrators.

Microsoft uses a more generic approach for allowing deployment of applications onto their mobile devices. By allowing enterprises to predefine the application security level required to the mobile operator or OEM, the mobile devices and the user control application installation and execution based on the type of digital certificate included with a particular application. Digital certificates may be from the enterprise, trusted vendors or approved by the mobile operator.

The granular control provided by RIM allows IT to fully control application installation and execution on their mobile devices. The administrative effort could become overwhelming as the mobile community expands and moves beyond using the mobile device for just email and PIM activity. Microsoft's approach delegates this responsibility primarily to the end user using the presence and source of a digital certificate to allow an application onto the mobile device. Although initially less burdensome to enterprise IT administrators, application incompatibility or user application overload on the device could require IT intervention at a later time.

Conclusions & Recommendations

The enterprise wireless mobile solution market will continue to grow in the years to come. In addition to the strong market demand for enterprise mobile solutions the technology that enables mobile access to email and corporate network resources continues to mature and become more powerful. Email access from mobile devices has been the gateway to the mobile environment for many enterprises. In the years to come, the focus will move beyond email to mobile applications that leverage corporate network resources; applications which will deliver information to mobile workers where and when they need it.

The RIM Blackberry 4.0 solution provides users with the appropriate functionality to manage email and PIM data from a mobile device. The RIM BES application includes a comprehensive set of functions and controls for deploying and managing Blackberry devices and users. The functionality and manageability of this platform enabled the RIM Blackberry 4.0 solution to take the early lead in mobile email technology.

However, with the introduction of Windows Mobile 5.0 MSFP and the Exchange 2003 SP2 release, Microsoft has leveled the technology playing field. Test lab and primary research data indicate that the RIM Blackberry 4.0 and Windows Mobile 5.0 MSFP solutions are similar in terms of both features and functionally. Specifically, Microsoft has successfully addressed the major shortcomings of previous versions of their mobile solution, including:

- **Synchronization:** Exchange 2003 SP2 and Windows Mobile 5.0 MSFP now provide a bi-directional ‘push’ approach for synchronizing email and PIM data. Users no longer have to wait for a scheduled or manually initiated synchronization to occur. Data is synchronized as soon as a change occurs.
- **Security:** Enhanced security features have been added to the IT administrator’s management console to ensure mobile devices and their message activity adheres to enterprise security policies.
- **Infrastructure:** Mobile server functions have been merged into the Exchange 2003 environment rather than as a stand-alone server. IT configuration, monitoring and user management functions have been integrated into existing Microsoft management processes that are familiar to IT staff resulting in an infrastructure extension rather than an infrastructure addition.

Given the upgrade in the Microsoft platform, enterprises planning to deploy mobile solutions should consider the following:

- The Microsoft solution will minimize both startup and ongoing operational costs as it leverages existing Exchange 2003 infrastructure and IT knowledge .
- Both Microsoft and RIM provide functional mobile email solutions.
- The Microsoft solution provides more options from third party applications and enables more rapid application development leveraging the .Net environment.
- The Microsoft solution will scale up to support the growth of mobile users within the existing Exchange 2003 environment without the need to continually acquire, install and manage additional infrastructure components.

Appendices

Methodology

During the summer of 2005, the Wipro Product Strategy and Architecture (PSA) practice performed comparative analysis of the Windows Mobile 5.0 MSFP and the RIM Blackberry 4.0 platforms in a test lab environment. The test lab employed all infrastructure components which a typical enterprise would be required to deploy and was managed and supported and by dedicated Wipro IT resources for a two month period.

Lab resources recorded all key effort and cost metrics including hardware and software acquisition, infrastructure setup and configuration, service roll out and ongoing maintenance and support. In addition, Wipro performed high-level performance testing and a capacity planning assessment to capture high-level infrastructure requirements and costs.

To validate the cost data from the lab, the Wipro PSA team conducted 10 in-depth interviews with senior IT managers of enterprises which had already deployed RIM Blackberry 4.0 solutions. We also conducted an in-depth interview with Microsoft which had deployed Windows Mobile 5.0 MSFP solution internally to over 10,000 users. Each interviewee managed the processes discussed in the survey for some or all of their organization's mobile deployments. Each study participant was given a 12-page survey covering all the effort and costs associated with running the RIM Blackberry 4.0 environment. After the survey was completed and returned, Wipro conducted 60-minute follow-up telephone interviews with each respondent. Data gathered during the interviews was used to validate test lab data. Based on the test lab and interview data, Wipro developed a detailed financial model the results of which drove the analysis presented in this paper.

The key cost categories included as a part of our analysis are:

- **Deployment Costs**
 - **Infrastructure Acquisition:** includes the procurement cost of all the infrastructure components required for the mobile environment including hardware servers, OS software, mobile platform software, database software and any user licenses associated with any of the deployed software.
 - **Infrastructure Setup:** labor effort and resulting cost involved in the setup and configuration of the infrastructure components
 - **IT, Helpdesk Training:** includes the cost associated with training IT and Help Desk staff to administer and support the mobile platform
 - **Handsets:** includes the cost of comparable Windows Mobile 5.0 MSFP and Blackberry devices
- **Operations Costs**
 - **IT Support and Database Administration:** includes the cost of ongoing IT labor for infrastructure maintenance, database administration and escalated help desk support
 - **Help Desk:** cost associated with number of help desk FTEs needed to manage comparable sizes of mobile environments

- **Data Center Server Chargeback:** the cost of hosting, running and managing the server infrastructure
- **Infrastructure Maintenance:** cost of maintenance contracts for hardware and software components of the mobile solution
- **Technical Support:** cost of vendor technical support for the mobile platform
- **User Phone Plans:** what an organization will pay its service provider to provide over the air connectivity for the handset devices to the corporate environment

Demographics of Participant Companies

RIM Blackberry Customer Industry	# of Exchange users	# of RIM Blackberry users	RIM Blackberry deployment experience	Mobile features used
Military	10,000	2,000	> 2 years	Email only
Education	20,000	1,000	> 2 years	Email only
Financial Services	6,400	640	> 2 years	Email only
General Building Materials	10,000	820	> 2 years	Email only
General Building Materials	2200	678	> 2 years	Email only
Government	10,000	2,000	> 2 years	Email only
Healthcare	2,100	1500	> 2 years	Email only
Law	2,000	600	1 – 2 years	Email only
Technology	3,550	500	> 2 years	Email only
Telecommunications	1,000	300	> 2 years	Email only

Windows Mobile 5.0 MSFP Customer Industry	# of Exchange users	#Windows Mobile 5.0 MSFP users	Windows Mobile 5.0 MSFP deployment experience	Mobile features used
Software	60,000	10,000+	> 1.5 years	<ul style="list-style-type: none"> • Email Browser • LOB Applications