

# BlackBerry Mobile Data System

Version 4.1

## Technical Overview

## Contents

BlackBerry Mobile Data System.....	3
Application development flexibility .....	3
Centralized application management .....	3
Lower cost of ownership .....	3
BlackBerry MDS Application runtime environment.....	4
Mobilizing enterprise systems.....	5
Application development and management features .....	5
Application models and development environments .....	7
Choosing a development environment.....	8
Making web content accessible wirelessly with the BlackBerry Browser .....	8
BlackBerry Browser features.....	9
Pushing content to the BlackBerry Browser.....	10
Optimizing web content for wireless browsing .....	11
Creating BlackBerry MDS Studio Applications .....	11
Development tools and functional framework.....	11
BlackBerry MDS Studio application features.....	12
Creating BlackBerry MDS Java applications .....	15
Java development tools.....	15
BlackBerry MDS Java application features.....	15
Getting started with BlackBerry MDS .....	18
Information resources .....	19

## BlackBerry Mobile Data System

This document describes how to extend the BlackBerry Enterprise Solution™ using the BlackBerry Mobile Data System™ (BlackBerry MDS™) to provide a mobile workforce with access to a wide range of corporate data and applications.

Unless otherwise stated, the information in this document applies to the following product versions:

- BlackBerry® Device Software, version 4.1 or later
- BlackBerry Enterprise Server™ with BlackBerry MDS Services, version 4.1 or later
- BlackBerry Java Development Environment, version 4.1 or later
- BlackBerry MDS Studio™, version 4.1 or later
- Plazmic Content Developer's Kit™ for BlackBerry, version 4.1 or later

### Application development flexibility

The BlackBerry MDS is an application development framework that provides tools to build and deploy applications for the BlackBerry Enterprise Solution. The BlackBerry MDS provides multiple development options and developer tools, and it uses standards-based mechanisms and protocols to simplify integration with existing applications and systems. Corporate and third-party application developers can also take advantage of a range of development support services and programs.

### Centralized application management

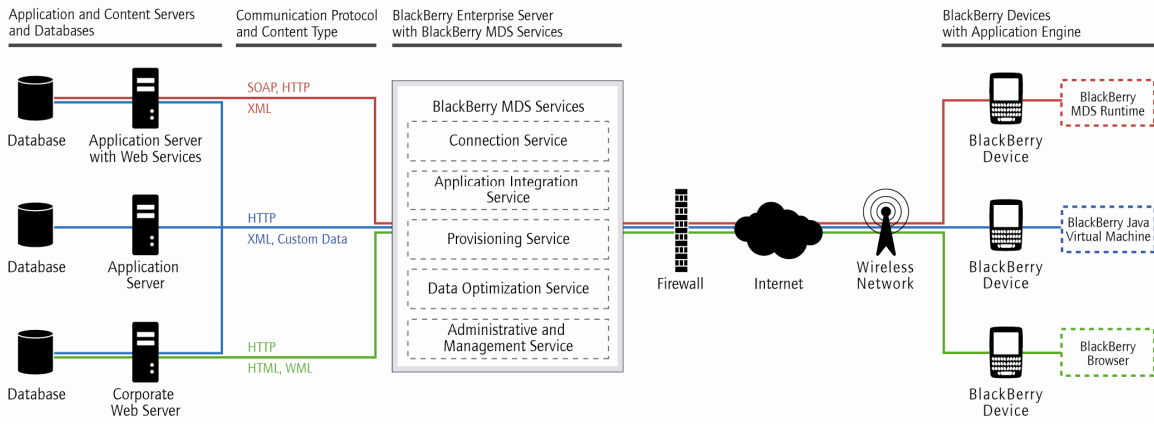
The BlackBerry MDS enables system administrators to deploy and manage applications using familiar BlackBerry Enterprise Server administration tools and to install, deploy, upgrade, and remove applications wirelessly.

### Lower cost of ownership

The BlackBerry MDS lowers the total cost of ownership by

- making sure that technologies and systems are reusable
- reducing development time and complexity
- optimizing wireless data transmissions for increased performance and lower operating costs
- providing centralized, wireless application management

## BlackBerry MDS Application runtime environment



Runtime environment

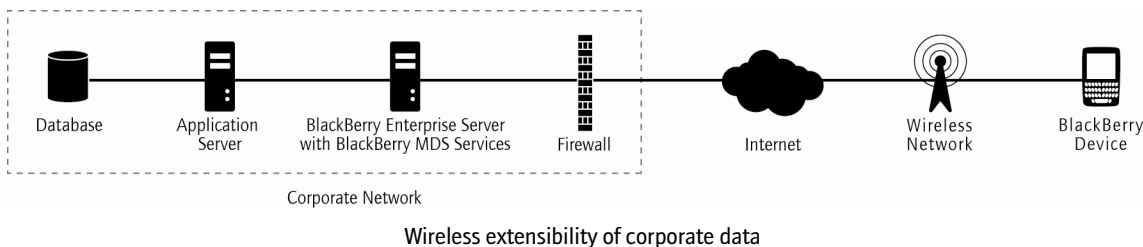
### BlackBerry MDS application runtime environment components

Runtime component	Description
Application and content servers and databases	Applications and content reside on servers behind the corporate firewall. The BlackBerry MDS Services manage connections between the application and content servers and BlackBerry devices.
Communication protocol and content types	The BlackBerry MDS Services communicate with application servers and content servers using the following protocols: <ul style="list-style-type: none"> <li>• SOAP/HTTP</li> <li>• Custom data/HTTP</li> <li>• XML/HTTP</li> <li>• HTML/HTTP</li> <li>• WML/HTTP</li> </ul>
BlackBerry Enterprise Server with BlackBerry MDS Services	On the BlackBerry Enterprise Server, the BlackBerry MDS Services are designed to extend enterprise systems to BlackBerry devices. The BlackBerry MDS Services encompass the following services: <ul style="list-style-type: none"> <li>• The BlackBerry MDS Connection Service provides TCP- and HTTP-based connectivity between mobile applications on BlackBerry devices and enterprise applications that reside behind the firewall.</li> <li>• The BlackBerry MDS Application Integration Service supports web services and other standard mechanisms for integrating mobile applications with enterprise applications. The application integration service also manages transmitting application data messages between BlackBerry MDS Studio applications and back-end systems.</li> <li>• The BlackBerry MDS Provisioning Service controls which applications users can download to BlackBerry devices and manages installing wireless applications on BlackBerry devices.</li> <li>• The BlackBerry MDS Data Optimization Service transforms existing server-side content and data into a format that is optimized for efficient wireless transmission and for use on mobile devices.</li> <li>• The BlackBerry MDS Administration and Management Service manages policies,</li> </ul>

Runtime component	Description
	such as application availability to users and services availability to applications. It also centralizes application lifecycle management.
BlackBerry Mobile Data System device software	<p>The BlackBerry MDS uses the following device software to run BlackBerry MDS Applications on the device:</p> <ul style="list-style-type: none"> <li>• The BlackBerry MDS Runtime™ provides runtime services for applications that are developed with BlackBerry MDS Studio. Users must download the BlackBerry MDS Runtime to use BlackBerry MDS Studio applications on their BlackBerry devices. To download the BlackBerry MDS Runtime, visit <a href="http://www.blackberry.com">http://www.blackberry.com</a>.</li> <li>• The BlackBerry Java Virtual Machine™ (BlackBerry JVM) provides a secure environment on BlackBerry devices for running custom Java™ applications that are created with the BlackBerry Java Development Environment (JDE).</li> <li>• The BlackBerry Browser enables access to web-based applications and supports Internet standards, such as HTML, Wireless Markup Language (WML), Common Gateway Interface (CGI), Microsoft® Active Server Pages (ASP), and JavaServer Pages™ (JSP). The BlackBerry Browser is included with the BlackBerry Enterprise Solution and runs on top of the BlackBerry JVM.</li> </ul>

### Mobilizing enterprise systems

The BlackBerry MDS Services simplify wireless application development by making the complexities of wireless networking transparent to application developers. The connection service provides the connection between the corporate environment and BlackBerry devices on multiple wireless networks; BlackBerry devices appear as clients on the corporate LAN.



The connection service supports standard protocols, such as HTTP, to provide access to existing web and application servers. Application developers can use standard enterprise programming, such as Microsoft .NET and Java Platform, Enterprise Edition (Java EE), to enable both push-based and pull-based access to a wide range of corporate systems and databases, while using existing back-end architectures.

### Application development and management features

Feature	Description
Corporate connectivity	The connection service provides access to corporate web and application servers, including web services, using standard protocols, such as HTTP, HTTPS, and Simple Object Access Protocol (SOAP).
Security	<ul style="list-style-type: none"> <li>• Communication between BlackBerry devices and the BlackBerry Enterprise Server in the corporate network is encrypted using Triple Data Encryption Standard (DES) or Advanced Encryption Standard (AES). This encrypted communication channel is available for BlackBerry MDS Browser Applications, BlackBerry MDS Java applications, and BlackBerry MDS Studio applications.</li> <li>• If the web service has access to a Certificate Authority (CA), messages between BlackBerry MDS Studio applications and web services also encrypt data using Rivest Shamir Adleman (RSA) or Digital Signature Algorithm (DSA) keys, which provide two-factor authentication.</li> </ul>

Feature	Description
	<ul style="list-style-type: none"> <li>The BlackBerry Enterprise Solution also supports other security standards, including Transfer Layer Security (TLS), Secure Socket Layer (SSL), Secure Multipurpose Internet Mail Extensions (S/MIME), IT security policies, code signing, and certificates.</li> <li>System administrators can also set IT policies to enforce corporate security policies, such as a minimum password length requirement (see the <i>BlackBerry Enterprise Server IT Policy Reference Guide</i> for more information on IT policies). Additionally, if a BlackBerry device is lost or stolen, system administrators can send IT commands wirelessly to lock the BlackBerry device or to delete user and corporate data from it.</li> </ul>
Data push	The architecture that is used for BlackBerry wireless email is available for custom wireless application data. For Browser and Java application models, server-side applications, written in a variety of programming languages, retrieve content from a corporate web server, an application server, or a database. The applications then send HTTP POST or Push Access Protocol (PAP) requests to the connection service to send the content proactively to specific BlackBerry device users. BlackBerry MDS Studio applications use web services eventing (WS-Eventing) to provide similar functionality.
Flexibility	Organizations can choose every component of a mobile wireless environment, including BlackBerry devices, networks, applications, and vendors, and they can support a diverse array of corporate data, applications, and legacy systems.
Wireless interoperability	The BlackBerry MDS solution provides connectivity to multiple wireless networks globally on a common architecture.
Management	System administrators can use centralized tools to track and control BlackBerry devices, to control network and server access, and to deploy applications to help maintain the integrity of enterprise systems in a wireless environment.

### Pushing content to users

Instead of waiting for users to access data, application developers and system administrators can proactively send the data that users need. Server-side applications can send automatic updates and alerts when data changes, without users requesting the new content. For example, corporations can enable sales people to register for a service that notifies them when they can complete their customers' orders.

Push services can be used with any of the BlackBerry MDS application models. The BlackBerry Browser includes a listener for push connections. Application developers can also design BlackBerry MDS Java or BlackBerry MDS Studio applications that listen silently in the background for push requests.

Server push applications provide several advantages:

Advantage	Description
Use the network efficiently	Applications use the network efficiently because they send data only when it has changed. BlackBerry device users do not have to retrieve information periodically, and applications do not have to poll for updates.
Increase user productivity	BlackBerry device users can be productive because they do not have to check for new information. System administrators can configure applications to send updated content or alerts immediately and to notify users when content arrives.
Increase information availability and timeliness	BlackBerry device users can access the most current information. This information can be cached on the BlackBerry device, so users can retrieve it even when they are outside a wireless coverage area.

All push application content is compressed and encrypted over the network in the same way as all other BlackBerry communication, and content can also be encrypted on the BlackBerry device if content protection is enabled. The BlackBerry Infrastructure manages the connection to the wireless network and verifies that content is delivered to users as soon as they are in a wireless coverage area.

For examples of browser push services, see "Pushing content to the BlackBerry Browser" on page 10.

## Application models and development environments

Application model	BlackBerry device software	Development environment
Browser model: BlackBerry MDS Browser applications	BlackBerry Browser	<ul style="list-style-type: none"> <li>To provide mobile access to intranet content and to create web-based wireless applications that BlackBerry users can access through the BlackBerry Browser, use existing web content development tools. Extend existing web-based applications wirelessly with little custom development. See "Making web content accessible wirelessly" on page 8 for more information.</li> <li>To learn how to optimize new and existing web applications for the BlackBerry Browser using standard web development tools, use the <i>BlackBerry Wireless Handheld Browser Content Developer Guide</i>.</li> <li>To create and test vector graphics and animations for BlackBerry devices, use the tools and simulators that the Plazmic Content Developer's Kit for BlackBerry (Plazmic CDK) provides.</li> </ul>
Web service model: BlackBerry MDS Studio applications	BlackBerry MDS Runtime	To create lightweight applications that provide mobile access to enterprise web services, use the BlackBerry MDS Studio. The BlackBerry MDS Studio is a powerful visual application design and assembly tool that enables application developers to quickly create rich-client applications that integrate with enterprise web services using a component-based drag and drop approach. Application developers can create robust functionality without Java programming using the BlackBerry MDS Studio. See "Creating BlackBerry MDS Studio Applications" on page 11 for more information.
Traditional client/server model: BlackBerry MDS Java applications	BlackBerry JVM	To create custom Java applications for the BlackBerry device that provide a sophisticated user interface and navigation, robust data management, and flexible support for custom data formats, use the BlackBerry JDE. The BlackBerry JDE provides development and simulation tools that enable application developers to build rich-client Java Platform, Micro Edition (Java ME) applications, which integrate with standard application servers, for BlackBerry devices. See "Creating BlackBerry MDS Java applications" on page 15 for more information.

## Choosing a development environment

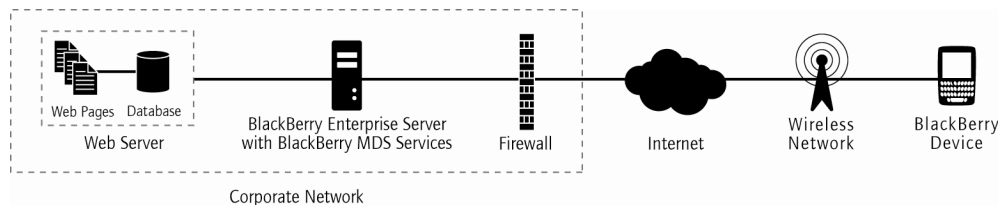
Development consideration	BlackBerry MDS Browser applications	BlackBerry MDS Studio applications with web services	BlackBerry MDS Java Applications
requires little development effort	X	X	
enables developers to use HTML or WML to create the user interface	X		
simplifies data synchronization and reliability	X	X	
enables developers to create applications that are portable to other devices	X		X
provides a robust and customizable user interface		X	X
supports complex applications or data structures		X	X
requires research and development time		X	X
enables developers to create applications that are useful when the BlackBerry device is turned off or is outside a wireless coverage area		X	X
provides a drag and drop development environment		X	

Regardless of an organization's development approach, several options are available for developing and deploying wireless applications. Organizations can develop the applications in-house, use third-party development platforms and tools, or work with independent software vendors and systems integrators to assist with application development and integration.

Organizations can also purchase a wide variety of off-the-shelf third-party solutions. See the *Enterprise Solutions Guide for BlackBerry 2005 - 2006* at [www.blackberry.com/ThirdParty](http://www.blackberry.com/ThirdParty) for information on the third-party solutions that are available.

## Making web content accessible wirelessly with the BlackBerry Browser

A browser-based, thin-client approach is a straightforward model for wireless applications. System administrators can make a wide variety of intranet content available to BlackBerry device users through the BlackBerry Browser without any custom application development. Many existing intranets can be made available wirelessly without modification, and web developers can use standard web development software to create web content and server-side scripts.



Web access to corporate networks

The BlackBerry MDS Connection Service provides an encrypted HTTP connection between BlackBerry devices and the corporate network. Users browse web content using the same encrypted communication channel that is used for BlackBerry messaging.



## BlackBerry Browser features

The BlackBerry Browser provides features that can accommodate the constraints of mobile devices and wireless networks to make mobile browsing efficient and user-friendly.

Feature	Description
Web content support	<p>The BlackBerry Browser supports a wide range of web content, including</p> <ul style="list-style-type: none"> <li>• Markup: Compact HTML (cHTML), HTML, XHTML Mobile Profile, WML, and SVG</li> <li>• Images: GIF (GIF87a and GIF89 – static only), WBMP, PNG, and JPEG<sup>1</sup></li> <li>• Scripts: WMLScript and JavaScript™ (JavaScript 1.3 and earlier; subsets of JavaScript 1.4 and 1.5; and the ECMA-262 ECMAScript Language Specification)</li> <li>• Media: SVG-based interactive media and animations</li> </ul>
Background requests	<p>Browser requests can run in the background, so users can continue to view other web pages or use other applications while the web page is loading.</p>
Pending or offline content	<p>If users are outside of a wireless coverage area, they have a number of options for managing web content requests:</p> <ul style="list-style-type: none"> <li>• When a web page request cannot be completed, the user can save the pending request to the Messages screen. The BlackBerry Browser resends the request when the BlackBerry device is in a wireless coverage area and can notify the user when the page is available.</li> <li>• Users can define bookmarks for offline use, so they can view cached content without retrieving it from the server again.</li> <li>• Users can fill out offline forms and have the BlackBerry Browser queue and submit the forms in sequence when the BlackBerry device is in a wireless coverage area.</li> </ul>
Integration with BlackBerry device applications	<p>The BlackBerry Browser integrates with other BlackBerry device applications to provide a consistent user experience. Users click a URL in an email message to view that web page in the BlackBerry Browser. The BlackBerry Browser recognizes URLs, email addresses, and phone numbers in web pages, so users can click a link to open a new web page, compose an email message, or place a phone call.</p>
Content optimized for wireless browsing	<p>The optimization service optimizes web content for wireless browsing:</p> <ul style="list-style-type: none"> <li>• Image optimization: Depending on BlackBerry device capabilities, the optimization service converts .jpeg, .gif, .ppm, and .pnm images to .png images, scales images to fit the BlackBerry device screen dimensions and reduces color depth.</li> <li>• Content filtering: The optimization service processes HTML content to remove unsupported tags, converts data to a tokenized format, and compresses the data for efficient delivery over the wireless network.</li> <li>• Page rendering: The optimization service retrieves images while it is processing HTML or XHTML content. It includes the images with the pages that it sends to the BlackBerry device for faster browsing.</li> </ul>
Data security	<p>All web browsing between the BlackBerry device and the corporate network occurs over the standard encrypted connection through the connection service. The BlackBerry Enterprise Server provides this data security out-of-the-box, without substantial additional setup.</p> <p>The browser supports the standard SSL and TLS protocols for additional security, especially to servers on the Internet. By default, if SSL or TLS is requested, the connection service creates a proxy SSL connection on behalf of the BlackBerry device to make browsing faster. Users can choose an end-to-end SSL connection. System administrators can set a policy to enforce end-to-end SSL.</p>

<sup>1</sup> The BlackBerry Browser supports JPEG images only on BlackBerry devices with color screens. For BlackBerry devices with monochrome screens, the BlackBerry MDS Data Optimization Service converts JPEG images to PNG format.

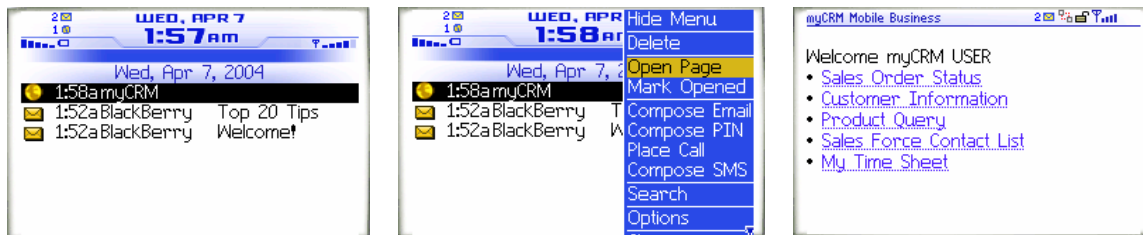
Feature	Description
Web access control	<p>System administrators control wireless access to resources on the corporate network.</p> <ul style="list-style-type: none"> <li>• Network authentication: The connection service supports several types of network authentication, including HTTP Basic Authentication, NT LAN Manager (NTLM), and Kerberos, so system administrators can control wireless access to web content using existing network security mechanisms. The connection service also supports Lightweight Third-Party Authentication (LTPA) if cookie storage is enabled.</li> <li>• Access control: System administrators can assign roles to BlackBerry devices and push initiators to control their activity through the connection service. Push access control roles enable system administrators to limit push requests from push initiators to specific BlackBerry device users. Pull access control roles enable system administrators to permit or deny access to URLs that are requested by BlackBerry device users.</li> </ul>

## Pushing content to the BlackBerry Browser

The BlackBerry Browser provides built-in support for various types of push services, which provide different notification options when the BlackBerry device receives pushed content. Each push service uses the same push mechanism through the connection service.

### Browser messages

Applications can send web pages or alerts to the BlackBerry device so that they appear as browser message in the BlackBerry device messages list. The browser message includes the content to display or the URL of the page to fetch when the user requests it. This push method is useful for alerts to important information updates. Users set notification settings through the BlackBerry device profiles list.



Browser message from a Customer Relationship Management (CRM) system

### Browser channels

Applications can push web pages to the BlackBerry device that create or update *channels*, which appear on the BlackBerry device Home screen with a custom icon. An updated icon appears when new content is available. This push service type effectively creates a browser-based application on the BlackBerry device that enables users to receive updates to certain types of data. A browser channel is an effective way to place a permanent icon on the Home screen that acts like a browser bookmark to important content.



Browser channel push from a CRM system

### Browser cache updates

Applications can push web pages directly to the browser cache. The user receives no indication that the content is updated, but the next time that the user visits the specified URL, the browser retrieves the updated content.

from the cache. Browser cache updates can provide users with quick access to current data on their BlackBerry devices, even when they are not in a wireless coverage area.

## Optimizing web content for wireless browsing

Web developers can optimize wireless browsing on BlackBerry devices by using simple page layouts that do not use frames, minimizing the use of scripts and embedded objects, such as applets, and avoiding reliance on images and colors. Web developers should design web pages to display on the small screens of mobile devices and them small so that they download quickly over wireless networks.

For server-side coding, web developers can use any language that can communicate with back-end applications or databases from a web interface, such as JSP, ASP, or Hypertext Preprocessor (PHP). The same back-end scripts can be used for both wireless device and computer browsers.

## Creating BlackBerry MDS Studio Applications

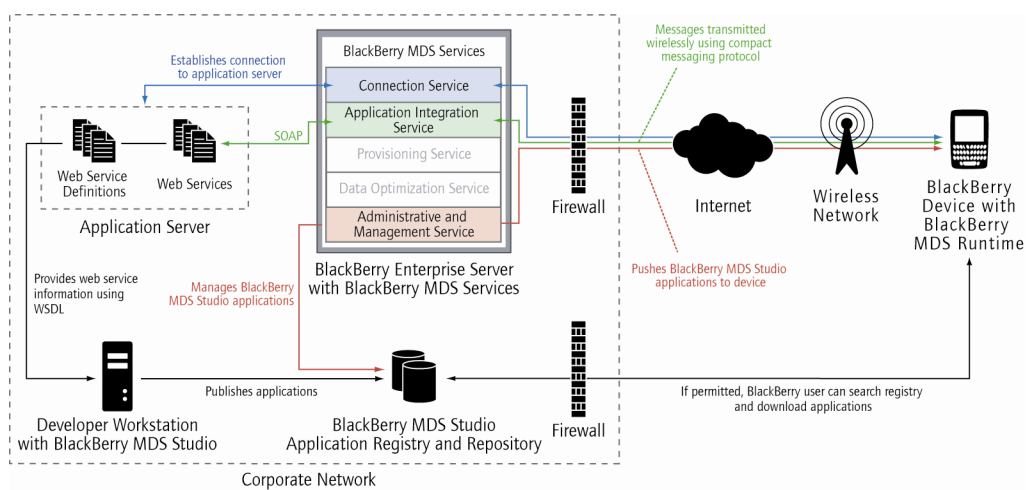
BlackBerry MDS Studio applications combine the light-weight, programmatic simplicity of BlackBerry MDS Browser applications with the functional sophistication of BlackBerry MDS Java applications. BlackBerry MDS Studio applications enable BlackBerry device users to access the functionality of remote web services from their BlackBerry devices. Web services can be located on a server that resides either inside or outside of a corporate firewall; they are web-accessible application components that provide a set of well-defined operations (for example, a conversion utility). BlackBerry MDS Studio applications access these web services wirelessly through HTTP or HTTPS connections and communicate with them using SOAP.

BlackBerry MDS Studio applications use the operations performed by web services. Applications can be designed to access some or all the operations of a single web service, or they can be designed to access operations from multiple web services from within a single BlackBerry MDS Studio application.

The web service development model gives application developers design flexibility. BlackBerry MDS Studio applications also require less coding sophistication than traditional client/server application models because the web service, the BlackBerry MDS Runtime, and the BlackBerry MDS Services provide most of the complex programmatic functionality.

The reduced development complexity and the connection service push capabilities enable application developers to produce applications with the same performance, responsiveness, and user experience of traditional Java client applications, but in less time, without the need for extensive coding knowledge, and with fewer demands placed on the processing and memory constraints of the BlackBerry device.

## Development tools and functional framework



BlackBerry MDS Studio application development and functional architecture

### BlackBerry MDS Studio application and functional architecture components

Item	Description
BlackBerry MDS Studio	<p>The BlackBerry MDS Studio is a graphical development tool in which application developers design screen layouts, data elements, and application messages using a visual drag-and-drop approach. Application developers can connect graphical components using wizards and editors. Application developers can also connect to enterprise web service applications, visualize supported operations, and generate a set of messages that they can use to interact with enterprise data sources. The BlackBerry MDS Studio generates the required code to transmit messages between BlackBerry MDS Studio applications and web services applications.</p> <p>Application developers can also use BlackBerry MDS Studio to customize application workflow logic using JavaScript. When they complete an application's design, the BlackBerry MDS Studio automatically generates an Extensible Markup Language (XML) metadata representation of the application.</p>
Application registry and repository	<p>Application developers publish completed applications from the BlackBerry MDS Studio to an application repository, and system administrators register the applications with the BlackBerry MDS Services on the BlackBerry Enterprise Server. After the applications are published and registered, System administrators can make them available to BlackBerry device users. Organizations can distribute the applications using one of the following methods:</p> <ul style="list-style-type: none"> <li>• pushing BlackBerry MDS Studio applications to devices from a central console</li> <li>• enabling BlackBerry device users to search the registry through a device-side console and download applications</li> </ul>
BlackBerry MDS Services	<p>The BlackBerry MDS Services manage interactions between corporate applications and BlackBerry MDS Studio applications on BlackBerry devices:</p> <ul style="list-style-type: none"> <li>• The connection service provides connectivity between the BlackBerry device application and the application server.</li> <li>• The application integration service supports web services.</li> <li>• The provisioning service controls which applications users can download to their BlackBerry devices and manages the installation of BlackBerry MDS Studio applications on BlackBerry devices.</li> <li>• The administration and management service manages the policies that are associated with the BlackBerry MDS Studio applications, and it centralizes application lifecycle management.</li> </ul>
BlackBerry device runtime	<p>The BlackBerry MDS Runtime must be installed on the BlackBerry device before BlackBerry device users can use BlackBerry MDS Studio applications. The BlackBerry MDS Runtime provides the set of services necessary to interpret the XML that is produced by BlackBerry MDS Studio and translate it into screen, data, and message components.</p>

### BlackBerry MDS Studio application features

Feature	Description
Distributed processing resources	<p>BlackBerry MDS Studio applications do not perform operations themselves; they define what to do. The programmatic behavior is distributed among multiple external components.</p> <ul style="list-style-type: none"> <li>• On the application server, one or more web services contain the code to complete the user tasks that the BlackBerry MDS Studio application provides and to support operations such as binding, discovery, provisioning, and notification.</li> <li>• On the BlackBerry device, the BlackBerry MDS Runtime provides a generic set of services such as screen handling, persistent data storage, and messaging for all of the BlackBerry MDS Studio applications that run on a BlackBerry device.</li> </ul> <p>This distributed processing model has several advantages.</p>

Feature	Description
	<ul style="list-style-type: none"> <li>• Applications can use operations offered by existing web services, which reduces the amount of coding required and the time that is necessary to create functional applications.</li> <li>• It reduces code duplication between applications, which reduces the incremental memory footprint that is associated with individual applications. It also reduces complexity for application developers.</li> <li>• Optimized services for common functionality improve the performance and responsiveness of BlackBerry MDS Studio applications. A common screen-handling service enables all BlackBerry MDS Studio applications to have a consistent look and feel.</li> </ul>
Optimized memory usage	BlackBerry MDS Studio applications are designed to be light-weight. Because web services or the BlackBerry MDS Runtime manage data processing and storage, a BlackBerry MDS Studio application is essentially an XML definition of the application components and the cross-component mappings, plus any scripts or image resources.
Reduced CPU usage	Because the BlackBerry device performs few of the processing duties that are required by the BlackBerry MDS Studio application, the burden on the BlackBerry device is much lighter than in a standard client-server application design model.
Reduced network traffic	<p>BlackBerry MDS Studio applications are designed to use the limited bandwidth available to them efficiently. Messages are transmitted between the BlackBerry Enterprise Server and the web services server using SOAP.</p> <p>Wireless messages are transmitted between the BlackBerry device and the BlackBerry Enterprise Server using a compact messaging protocol that is optimized for a wireless environment. The BlackBerry MDS Runtime and the application integration service contain the required metadata, which reduces the size of the data that is transmitted wirelessly. The application integration service manages the mapping between SOAP and the compact messaging protocol.</p>
Asynchronous communication	<p>The communication model that is used to transmit application messages between the BlackBerry device and the remote web service is asynchronous. If an outbound message is generated when the BlackBerry device is outside of a wireless coverage area, the message is placed in an outbound queue until a wireless network connection is available. When the message is placed in this queue, the application continues to function, regardless of whether the message has been sent. Messages are transmitted from the queue in the background as soon as the network connection is available.</p> <p>Similarly, BlackBerry MDS Services are designed to queue inbound messages and send them to the BlackBerry device when a wireless connection is available. The asynchronous communication model supports applications that are tolerant to sudden or unpredictable connection loss. Because BlackBerry MDS Studio applications can store and process data locally, and because BlackBerry MDS Studio application functionality is designed to be continually available, BlackBerry device users should be able to access enterprise data at almost any time.</p>
Pushing content to users	<p>BlackBerry MDS Studio applications use WS-Eventing to send information proactively to the device.</p> <p>For push events, an outbound message component is designed to be bound at the time of design to the subscription web service that is associated with the event. An inbound message is also designed to be bound to the web service event. At runtime, the application can subscribe to receive the web service event (for example, through BlackBerry device user input that results in the outbound subscription message being sent). Web service events cause inbound messages to be sent to the application.</p> <p>BlackBerry MDS Studio applications can notify BlackBerry device users of inbound messages in several ways, including a flashing LED, a tune, or a vibration.</p>

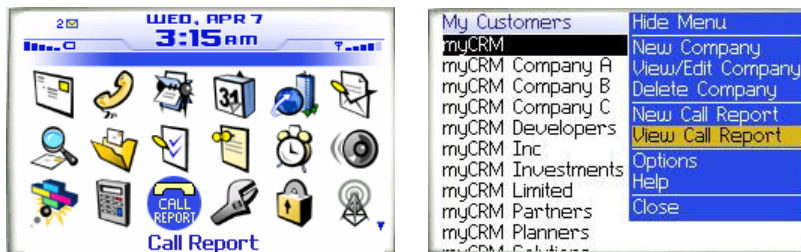
Feature	Description
Integration with BlackBerry device programs	<p>Application developers can design BlackBerry MDS Studio applications to access data from the BlackBerry device messages list, calendar, and address book. The device program data is accessed using special built-in data components that are predefined and available in the BlackBerry MDS Studio.</p> <p>Users can also invoke BlackBerry device programs directly from a BlackBerry MDS Studio application by following embedded links such as email addresses, phone numbers, or URLs. For example, if a BlackBerry device user types a phone number in a field, the phone number is designed to become a link that the user can click to open the BlackBerry device phone application.</p>
Security	<p>BlackBerry MDS Studio application data messages are sent using the data encryption technologies that are used by the BlackBerry Enterprise Server. Application data can also be encrypted on the device using the content protection mechanisms that are available on BlackBerry devices.</p> <p>See the <i>BlackBerry Enterprise Solution Security Technical Overview</i> for more information on BlackBerry security features.</p> <p>In addition to message and data content security, BlackBerry MDS Studio applications provide the following security-related features:</p> <ul style="list-style-type: none"> <li>• <b>Application signing:</b> The BlackBerry MDS Studio applications can be signed using the industry-standard (RSA) security certificate. Access to the BlackBerry MDS Studio repository is password-protected.</li> <li>• <b>Container-based execution environment:</b> The BlackBerry MDS Runtime is a container-based execution environment that is designed to prevent unauthorized access to native APIs on the BlackBerry device. BlackBerry MDS Studio applications are prevented from accessing other BlackBerry MDS Studio application data, and one BlackBerry MDS Studio application cannot run or load another.</li> <li>• <b>Secure connectivity to back-end systems:</b> BlackBerry MDS Services support HTTPS for secure access to back-end web services. When this access is combined with the triple DES or AES encryption between the BlackBerry Enterprise Server and the BlackBerry device, a secure end-to-end link from the BlackBerry MDS Studio application to its related web services results.</li> </ul>
Deploying and managing applications wirelessly	<p>System administrators can wirelessly provision, upgrade, and remove BlackBerry MDS Studio applications using the BlackBerry Manager, which is the administration tool for the BlackBerry Enterprise Server. They can send a new application to BlackBerry device users or upgrade an existing application on BlackBerry devices in the field, without physically handling the BlackBerry devices. System administrators can also view the BlackBerry MDS Studio applications that are installed on individual BlackBerry devices.</p> <p>Depending on IT policy settings, BlackBerry device users can use the Control Centre application, which is part of the BlackBerry MDS Runtime, to search the BlackBerry MDS Studio application registry for applications (or application upgrades) that are available for download. Users can select these applications and provision them to their BlackBerry devices.</p>

## Creating BlackBerry MDS Java applications

BlackBerry devices provide a Java ME wireless Java environment that is designed to enable developers to create sophisticated custom applications within the standard client/server model.

Application developers can create custom Java applications with sophisticated user interfaces for data entry and searching, multithreading, internationalization, network communication, and local data storage. Applications can communicate with networks using standard TCP and HTTP connections, regardless of the underlying wireless network. The BlackBerry MDS Connection Service typically sets up the TCP connection on behalf of the application.

Application developers can also create custom applications that integrate tightly with core BlackBerry device programs, such as the messages list, personal information management (PIM) programs, phone, and browser, for an essentially seamless user experience.



BlackBerry MDS Java application that accesses a CRM system

## Java development tools

The BlackBerry Java Development Environment (JDE) includes

- graphical integrated development environment (IDE)
- BlackBerry device simulator
- BlackBerry server simulation tools
- CLDC, MIDP, and BlackBerry APIs
- sample applications

The IDE includes a full suite of editing and debugging tools that are optimized for developing BlackBerry applications. In addition, the IDE includes simulation tools that provide a complete Windows type environment, which is designed to simulate user interfaces and user interaction, network connections, email services, and wireless data synchronization.

## BlackBerry MDS Java application features

Feature	Description
Java standards support	<p>With BlackBerry Device Software version 4.0 or later, the BlackBerry Java implementation supports the following Java Specification Requests (JSRs):</p> <ul style="list-style-type: none"> <li>• JSR 185: Java Technology for the Wireless Industry (JTWI)</li> <li>• JSR 139: Connected Limited Device Configuration (CLDC) version 1.1</li> <li>• JSR 118: Mobile Information Device Profile (MIDP) version 2.0</li> <li>• JSR 75: Portable Digital Assistant Profile (PDAP) – PIM APIs only</li> <li>• JSR 120: Wireless Messaging API (WMA) version 1.1</li> <li>• JSR 135: Mobile Media APIs (MMA) version 1.1 – subset defined in MIDP version 2.0</li> <li>• JSR 179: Location API for Java ME</li> </ul> <p>BlackBerry Device Software version 4.0 or earlier supports CLDC version 1.0 (JSR 30) and</p>

Feature	Description
	MIDP version 1.0 (JSR 37).
User interface	<p>The BlackBerry JDE provides two sets of APIs for creating application user interfaces (UI): standard MIDP APIs and BlackBerry APIs. The BlackBerry UI APIs are a library of pre-built user interface components, which provide default layout and behavior that is consistent with core the BlackBerry programs.</p> <ul style="list-style-type: none"> <li>• Screen components provide a standard screen layout, a default menu, and standard behavior when the user presses the Escape button or clicks the trackwheel.</li> <li>• Field components provide standard user interface elements for date selection, radio buttons, check boxes, lists, text fields and labels, and gauge slider controls.</li> <li>• Layout managers provide the ability to arrange components on a screen in standard ways, such as horizontally, vertically, or in a left-to-right flow.</li> </ul> <p>The BlackBerry UI APIs also provide flexibility for application developers to create custom user interfaces with specialized layouts such as tables or grids and custom user interaction.</p> <p>The BlackBerry Java implementation uses a standard Java event model to receive and respond to specific types of events. For example, applications can receive and respond to both user events, such as the user clicking the trackwheel or typing on the keyboard, and system events, such as global alerts, real-time clock changes, and USB port connections.</p>
Data storage	<p>The BlackBerry JDE provides two sets of APIs to store persistent data across BlackBerry device resets: standard MIDP APIs and BlackBerry APIs. The BlackBerry Persistence APIs enable applications to store entire objects in the file system and provide features to optimize data grouping, searching, and performance and store structures such as hash tables, ordered arrays, and trees, to provide faster searching.</p> <p>Application developers can add the capability for users to back up and restore application databases either wirelessly or through the BlackBerry Desktop Software.</p> <p>System administrators can set an IT policy to determine whether applications can store data in persistent storage.</p>
Network transport	<p>Depending on the environment and the application requirements, BlackBerry devices can connect to both corporate intranets and the Internet through various gateways, including the BlackBerry Enterprise Server hosted by the enterprise or a gateway hosted by the wireless service provider<sup>2</sup>.</p> <p>BlackBerry devices are designed to support a wide range of network transport protocols<sup>3</sup>, including:</p> <ul style="list-style-type: none"> <li>• HTTP and HTTPS</li> <li>• TCP, SSL, and TLS sockets</li> <li>• email messages</li> <li>• User Datagram Protocol (UDP) datagrams</li> <li>• Short Message Service (SMS)</li> <li>• Multimedia Messaging Service (MMS) is supported on some BlackBerry devices</li> </ul>
Access to system resources	<p>Custom applications can access system-wide resources on the BlackBerry device. For example, applications can</p> <ul style="list-style-type: none"> <li>• retrieve information on the state of the BlackBerry device radio and current signal level</li> <li>• retrieve BlackBerry device information, such as the battery power level</li> <li>• notify users when an event occurs by generating an audio tone or a vibration</li> </ul>

<sup>2</sup> The security features that this document describes might not be available when using network gateways that are hosted by the wireless service provider.

<sup>3</sup> Each type of network transport depends on the wireless service provider's specific capabilities. Application developers must work closely with wireless service providers to determine service availability.



Feature	Description
	<ul style="list-style-type: none"> <li>• retrieve statistics on memory use in the BlackBerry JVM</li> <li>• log events into the persistent file system</li> </ul> <p>System administrators control the resources that specific applications can access.</p>
Advanced utilities	<p>BlackBerry MDS Java applications can use several advanced BlackBerry Java APIs:</p> <ul style="list-style-type: none"> <li>• Multilanguage support: An internationalization API provides discrete language resources.</li> <li>• XML parser: An XML API, which is compatible with the Simple API for XML (SAX), provides integrated XML and Wireless Application Protocol Binary XML (WBXML) parsing and serialization.</li> <li>• Cryptography: A robust set of APIs provides applications with a range of cryptographic functions.</li> <li>• Content protection: An API encrypts application-specific content on the BlackBerry device.</li> </ul>
Pushing content to users	<p>BlackBerry MDS Java applications can use HTTP POST or PAP requests to send information proactively to the BlackBerry device.</p> <p>The request headers include information about the content to be pushed, the destination BlackBerry device or user, and the BlackBerry device application for which the data is intended (such as the BlackBerry Browser or a custom application). The request body contains the content. When the connection service on the BlackBerry Enterprise Server receives the HTTP POST message, it initiates the connection to the BlackBerry devices.</p>
Integration with BlackBerry applications	<p>The BlackBerry JDE provides APIs that enable custom applications to interact with standard BlackBerry device applications:</p> <ul style="list-style-type: none"> <li>• Messages: Applications can send and receive email messages through the BlackBerry Enterprise Server or BlackBerry Internet Service™.</li> <li>• PIM: Applications can access and store PIM data, including calendar appointments, address book contacts, and tasks.</li> <li>• Phone: Applications can receive and make phone calls, and read and write phone logs.</li> <li>• Browser: Applications can display web pages using the BlackBerry Browser.</li> <li>• Invocation: Applications can open the address book, calendar, memos list, messages list, phone, or tasks list.</li> <li>• Menu item: Applications can add custom menu items to BlackBerry applications.</li> </ul>
Security	<ul style="list-style-type: none"> <li>• Application control: System administrators can control whether users can install and run third-party applications, and they can view which applications have been installed on specific BlackBerry devices.</li> <li>• Access to memory: The BlackBerry Java implementation is designed to inhibit applications from causing problems accidentally or maliciously in other applications or on the BlackBerry device. Java applications can write only to BlackBerry device memory that is allocated specifically for use by the BlackBerry JVM, and they cannot access the virtual memory or the persistent storage of other applications (unless they are specifically granted access to do so).</li> </ul> <p>Custom applications can only access persistent storage or user data, or communicate with other applications, through specific APIs. Research In Motion (RIM) must digitally sign applications that use certain BlackBerry APIs to provide an audit trail of applications that use sensitive APIs.</p>
Deploying applications	<p>System administrators can install applications on behalf of users, or they can permit users to install applications themselves. In both cases, system administrators make applications available wirelessly or through the desktop software.</p> <ul style="list-style-type: none"> <li>• Wireless: System administrators can mark applications as required for specific users, and send these applications wirelessly to users for automatic installation. System</li> </ul>

Feature	Description
	<p>administrators can also maintain a list of approved applications on an intranet site where users can download them wirelessly using the BlackBerry Browser. Upgrades to core BlackBerry device programs cannot be performed wirelessly.</p> <p>To install applications wirelessly, application developers must make two files available:</p> <ul style="list-style-type: none"> <li>○ an application descriptor (.jad) file</li> <li>○ the .jar or compiled .cod files for the application; in the BlackBerry Browser, the user selects the .jad file to download the application</li> </ul> <ul style="list-style-type: none"> <li>• Desktop: System administrators can use the standalone BlackBerry Application Loader to install and provision approved applications for users from a central location. System administrators can provision multiple BlackBerry devices simultaneously. Users can also use optional BlackBerry Desktop Software to install applications.</li> </ul>
Managing applications	<p>System administrators can control how each application is implemented and used in the enterprise through the BlackBerry Manager.</p> <p>System administrators can control the BlackBerry device and network resources that each custom application can access, including whether an application can</p> <ul style="list-style-type: none"> <li>• store and access persistent storage on the BlackBerry device</li> <li>• communicate with other applications (interprocess communication)</li> <li>• open various types of wireless connections behind the corporate firewall, outside the corporate firewall, or both</li> </ul> <p>These application-specific policies enable system administrators to maintain corporate data security on the BlackBerry device and on the corporate network.</p> <p>System administrators can also define globally which applications users are permitted to install. System administrators can prevent users from using third-party applications that they have already installed on the BlackBerry device, effectively disabling the applications.</p>

## Getting started with BlackBerry MDS

Consider your wireless enterprise requirements, as well as your in-house development expertise, and choose the appropriate application development approach.

- If you have little in-house development expertise or need to integrate a common system, consider buying a third-party solution from an independent software vendor (ISV). Many complete solutions provide both the BlackBerry device client and the server middleware to deploy a wireless application.
- If you need to make web-based content available or you can convert data to a web markup format, consider using the BlackBerry Browser on the BlackBerry device. By using the browser, you avoid having to do any custom Java development on the BlackBerry device, and you do not have to provision or manage custom BlackBerry device applications.
- If the browser approach is insufficient, consider creating a custom Java application or BlackBerry MDS Studio application. One of these application strategies might be an appropriate choice for several reasons:
  - User interface: Your application requires additional functionality for data entry and navigation.
  - Data storage: Users require access to data even when they are outside a wireless coverage area.
  - Local processing: Some data processing must be performed on the BlackBerry device instead of on the server.
  - Data management: Users need to add or manage data on the BlackBerry device.
- If existing public or private web services offer functionality that you can use, consider creating a BlackBerry MDS Studio application to make that functionality available on the BlackBerry device.
- Whatever strategy you choose, consider adding push services to your application through the connection service. Push services are a good choice if most of the data originates on the server, and users need to know when data is added or changed.

- Decide how to integrate your legacy systems and databases. Use standard enterprise programming to create the middleware that provides access to legacy systems through the connection service, or consider buying a third-party middleware solution.
- Consider the security level that your organization requires, and determine the most appropriate development approach to make sure that your security concerns are met.
- Sign up for the appropriate RIM developer support program. Go to [www.blackberry.com/developers](http://www.blackberry.com/developers) for details.

### Information resources

Resource	Description
<i>BlackBerry Enterprise Solution Security Technical Overview</i>	BlackBerry security
<i>Enterprise Solutions Guide for BlackBerry 2005 - 2006</i>	third-party solutions
<i>BlackBerry Wireless Handheld Browser Content Developer Guide</i>	creating wireless web content
<i>BlackBerry MDS Studio Getting Started Guide</i>	making web services available on BlackBerry devices
<i>BlackBerry Application Developer Guide</i>	<ul style="list-style-type: none"> <li>• creating custom BlackBerry device applications</li> <li>• integrating enterprise applications</li> </ul>
<i>BlackBerry Enterprise Server Feature and Technical Overview</i>	BlackBerry Enterprise Server features
<i>BlackBerry Enterprise Server System Administration Guide</i>	deploying and managing applications
<i>BlackBerry Enterprise Server IT Policy Reference Guide</i>	<ul style="list-style-type: none"> <li>• IT security policies</li> <li>• IT commands</li> </ul>

For BlackBerry technical documentation, go to [www.blackberry.com/go/docs](http://www.blackberry.com/go/docs).

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