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Chapter 2

Methods of application development for mobile devices

Objectives

- List and briefly describe three methods for developing mobile device applications
- Describe how Java®, web, and widget applications differ in the areas of development environment, application and data storage location, offline use, flexibility, ease of use, standards, and background threads
- Cite examples of Java, web, and widget applications
- Describe application design considerations and limitations for the Java, web, and widget application development methods

This chapter introduces three different methods of developing applications for mobile devices. The main features of each development method (Java, web, and widgets) are discussed, as well as the advantages and disadvantages of each. This information can help you decide which method to use when designing your own mobile device applications.
Applications that reside and run on the BlackBerry® smartphone are written in Java® ME. Contrast this with web applications, which are hosted on external servers and accessed using browsers. With Java, you can create standalone applications, applications with desktop synchronization, or applications with wireless features.

Standalone applications, such as games and static reference guides, run offline. Users can install the application over the wireless network or with the BlackBerry® Desktop Software, and after an application is installed, it does not need to connect to the wireless network or to a computer.

Applications with desktop synchronization, such as dynamic reference guides and organizer applications, let the user connect the BlackBerry smartphone to a computer (using a serial, USB, or Bluetooth™ connection) to manage and synchronize data located on the computer.

Applications with wireless features reside on the BlackBerry smartphone and use a wireless connection to the Internet to obtain remote data (such as news updates, GPS information, or alerts) or to access remote networks (using BlackBerry MDS, TCP, WAP, or the BlackBerry® Internet Service). Java applications can use a variety of connection types, including HTTP and UDP.

Research in Motion® provides an updated BlackBerry® Java® Development Environment and development tools with each major release of the BlackBerry® Device Software. The BlackBerry JDE includes Java ME and BlackBerry APIs, editing and debugging tools, a simulator, and sample applications to get you started.

Advantages of developing Java applications

There are many advantages to developing mobile device applications in Java. In general, Java lets you create truly customized applications that can take full advantage of BlackBerry smartphone features and capabilities.

Flexibility

Java offers excellent flexibility for the style, look, and function of applications. While there are commonly used conventions for key usage and the look of the UI, there are no standards that you must follow regarding the look and behavior of the application or where and how you store data.

BlackBerry smartphone features

Developing in Java also lets you take advantage of BlackBerry smartphone features (including the camera and phone) and integrate with core BlackBerry applications (such as the address book, media player, and BlackBerry® Maps).
Peripheral devices

Java applications can communicate with and make use of devices with Bluetooth functionality, such as headsets, printers, writing devices, and GPS transmitters. Both the Java environment and Bluetooth protocols follow industry standards, so incorporating Bluetooth functionality is typically quite easy.

Application storage

Java applications reside on the BlackBerry smartphone. This means the user can use the application at any time. Contrast this with web applications, which are stored on the web server and require an Internet connection for access.

Location-based services

Java applications can incorporate location-based services, which detect the location of the BlackBerry smartphone and provide the most appropriate information for that location. For example, you can create a Java application that lets users view the menus of restaurants within two miles of their current location.

Background Threads

You can use Java to design applications that use background threads. Mobile devices can only display one application at a time, so using background threads lets users run other applications uninterrupted while your application continues to listen for events or update information in the background.

Bandwidth

Standalone Java applications require no Internet connectivity, and therefore require no bandwidth. Java applications with wireless features, however, do require Internet connectivity for some tasks. To reduce or eliminate the amount of traffic that must travel over the wireless connection, design your application to send only the necessary data, and send data only when it is required.

You can further reduce the bandwidth usage of your application by implementing push. In the push model, the server sends (pushes) data to the BlackBerry smartphone when it becomes available or at a designated time or interval. This requires less bandwidth than the traditional request/response model in which a device polls the server periodically until the requested information is available.

Disadvantages of developing Java applications

While there are many advantages to developing applications in Java, it may not be the right choice for you or for the application you are designing. Java does have some disadvantages that can make it a less viable development method than web development or widgets.
Skill requirements

Perhaps the greatest barrier to using Java to develop your mobile device applications is its complexity and skill requirements. It takes some time and experience to become familiar with Java, and it is not as easy or intuitive to use as the web and widget development methods.

Standards

When you create an application in Java, you must build it from the ground up. If you are experienced in developing with Java and you have a clear vision for your application, the lack of standards means you can create your application exactly the way you want it. This same lack of standards, however, can mean more work for you, because there is no existing framework for you to build on and you must make decisions about how to implement and present every feature of the application.

Additionally, when designing a Java application, you are free to create a completely unique UI. However, it is important to design your applications with users in mind; your application can be more effective and easier to use if it implements features and functions that are already familiar to users.

Local storage

The BlackBerry smartphone has a limited storage capacity for Java applications and their data. While local storage allows you to create offline applications and store persistent data, it also means you can be limited in application and data size. Design your Java applications with these capacity limitations in mind. For applications with wireless features, you will have to create a balance between storing features and data locally (thereby using up local storage space) and accessing features and data over the wireless connection (thereby using up bandwidth).

Application version control

Because Java applications reside on individual mobile devices, you may have to create different versions of your application to conform to different device capabilities. Furthermore, if you update the application or create a patch for it, you must distribute it or make it available to individual users.
1. Which of the following statements are true? Choose all that apply.
   A. Java applications are stored locally, so they can be run offline.
   B. Java applications are stored on a Java server, so they are slower than other application types.
   C. Java applications reside locally, so they are limited in size and data storage capacity.
   D. Java applications are stored on a web server to avoid local storage limitations.

2. Which BlackBerry smartphone features and components can Java applications make use of? Choose all that apply.
   A. GPS
   B. Camera
   C. Phone
   D. Security

3. Which is true of a standalone Java application?
   A. It resides on the BlackBerry smartphone and requires an Internet connection for some features and data.
   B. It does not require an Internet connection for function or storage.
   C. It resides on a web server and users access it using a BlackBerry smartphone.
   D. You cannot create standalone applications with Java.

4. Which of the following statements is true?
   A. Java applications for the BlackBerry smartphone are written in Java ME.
   B. Java applications are supported only on BlackBerry smartphones running BlackBerry Device Software version 4.2 or later.
   C. Java is more complex and provides fewer customization options than other development methods.
5. Which of the following are advantages of developing mobile applications with Java? Choose all that apply.

A. Flexibility
B. Background threads
C. Ease of use
D. Communication with peripheral devices

6. What is a location-based service?

A. An application that is available only if the user is in the correct wireless area.
B. A web-based application that users can access when they enter the same calling area as the content server hosting the application.
C. A service that detects the location of the BlackBerry smartphone and provides the most appropriate information for that location.
D. A service that can be accessed regardless of the strength of the wireless signal in the location of the server hosting the service.

7. Which of the following is true?

A. Background threads allow applications to listen for events and alerts while the user is running another application.
B. Java applications cannot use background threads.
C. Applications use background threads to incorporate the BlackBerry smartphone background colors in the application UI.
D. All applications for the BlackBerry smartphone can use background threads.

8. Which of the following statements are true? Choose all that apply.

A. Because Java is a condensed programming language, Java applications conform to BlackBerry smartphone storage limitations.
B. Large Java applications for mobile devices must reside and be accessed on a Java server.
C. All Java applications for the BlackBerry smartphone reside and run on the device itself.
D. Java provides a development framework and a set of easy-to-follow standards for application development.
Answers

1. A, C
2. A, B, C, D
3. B
4. A
5. A, B, D
6. C
7. A
8. C
Web development

Web applications can reside on a content server and users access them using browsers. Whether it is an online game, a streaming video service, or an online photo archive, web applications use the familiar browser *interface* to bring a variety of features to *BlackBerry smartphone users*.

**Note:**
BlackBerry Device Software version 5.0 and later supports SQLite through Google Gears, which allows local database access for web applications through JavaScript.

The BlackBerry® Browser (version 4.6 and later) can access and run applications written in a variety of markup languages, including HTML, xHTML, cHTML, and WML version 1.3. It also supports several image formats, including JPEG, GIF, PNG, and WBMP, and several presentation formats, including Frames, RSS, and ATOM.

You can create web applications for the BlackBerry smartphone using a variety of scripting languages, including *JavaScript* version 1.5 (including Ajax support), *ECMAScript™*, and *WML Script* 1.2.1. You can develop web applications for the BlackBerry smartphone using plug-ins for standard web authoring tools. These plug-ins include the BlackBerry® Web Development Plug-in for Eclipse® and BlackBerry® Plug-in for Microsoft® Visual Studio® version 1.2.

The *BlackBerry Smartphone Simulator* lets you test applications on various BlackBerry smartphone versions and operating systems, and the BlackBerry® MDS Simulator simulates network connectivity and (when applicable) the functionality provided by the *BlackBerry® Enterprise Server*. The BlackBerry MDS Simulator replicates the routing of email messages, push information, and other data to the BlackBerry Smartphone Simulator. The BlackBerry Smartphone Simulator is preconfigured to route information to the BlackBerry MDS Simulator automatically.

Advantages of developing web applications

When deciding on a method for developing a mobile device application, consider the following advantages of web development.

Skill requirements

The greatest advantage of web development is its ease of use. Web technologies are easy to learn and are familiar to many developers. And because your web application is built on the same foundations as numerous other web applications, users will find it easy and intuitive to use.
**Storage**

Since all web application information can be held on the content server, there is no need to deploy the application or associated files to the client. BlackBerry smartphone storage capacity is not an issue with web applications.

**Standards**

Web applications are built within existing frameworks, so it takes less work to make a web application available than it does to create a Java application from scratch. For example, web application data can leverage the same wireless connection, compression, encryption, and infrastructure as BlackBerry email messages, so you do not need to build in those networking functions.

And while adherence to web application standards means fewer choices for the look and behavior of your application, it also means faster deployment. Because web applications make use of existing, tested, working frameworks, you can focus your efforts on the application features rather than on the underlying functionality.

**Web signals**

Like Java applications, web applications can use push technology, sending data automatically to the BlackBerry smartphone at a designated time or interval, or as soon as it becomes available. Web applications can also make use of web signals, a service provided by BlackBerry that allows content providers to push icons to their subscribers’ BlackBerry smartphone desktops. When a user clicks the icon, it launches the browser and automatically directs it to the designated web address. Furthermore, content providers can push new icons that overwrite existing icons to reflect a change in status.

For example, a user can sign up for a web signal from an online sports update site. A custom icon appears on the user’s BlackBerry smartphone desktop, and when new sports scores are available, the content provider pushes a new icon to the BlackBerry smartphone to show the updated score. When the user clicks that icon, the browser launches and is immediately directed to a web page that gives further details.

**Application version control**

A web application resides on a server, where many mobile device users can access it. To update or create a new version of the application, you replace the older version with the newer version on the server. You do not need to distribute multiple application versions, updates, or patches to individual users.
Detection of device and capabilities

BlackBerry device models have different versions of the *BlackBerry Device Software*, different screen sizes, and different input methods. Web applications can detect the device type and capabilities, and use that information to present the appropriate features or display modes.

Disadvantages of developing web applications

Web application development provides the quickest and easiest way to create your application and make it available to users. There are, however, a few disadvantages to developing web applications.

Flexibility

The same set of standards and existing frameworks that make web application development quick and easy can also limit your options for look and functionality. Your web application has to use existing functionality and UI components, thus hindering your ability to create an application that is truly unique.

Background threads

Although web applications can use web signals to push informative icons to the BlackBerry smartphone desktop, these are not true background processes. BlackBerry smartphones can only run one application at a time, so your web application cannot work in the background while users attend to other tasks.

Offline use

To use your hosted web application, BlackBerry smartphones must connect to the hosting server. If there is no connection, users cannot access and use the application. One exception is the use of offline queueing, which temporarily stores web forms on the BlackBerry smartphone if the wireless connection is lost. The BlackBerry smartphone sends the form data automatically as soon as a connection is reestablished.

Because hosted web applications and their data are stored on servers instead of the users’ BlackBerry smartphones, it is the content provider’s responsibility to ensure there is adequate storage capacity.

Bandwidth

Because all interaction with a web application occurs over a wireless connection, you must design your web application with bandwidth in mind. Avoid features that require large file uploads or downloads, and minimize the bandwidth required for other tasks.
1. Which of the following statements are true? Choose all that apply.
   A. Web applications require more bandwidth than standalone Java applications.
   B. Web applications are typically easier to develop than Java applications.
   C. You can design a BlackBerry web application that detects the capabilities of the BlackBerry smartphone.
   D. The web application development method typically provides more flexibility than the Java application development method.

2. Which of the following plug-ins can you use to develop web applications for the BlackBerry smartphone? Choose all that apply.
   A. BlackBerry Web Development Plug-in for Eclipse
   B. BlackBerry JavaWeb Plug-in for Signals
   C. BlackBerry Plug-in for Microsoft Visual Studio version 1.2

3. True or false: web applications typically require more storage space on the mobile device than Java applications.
   A. True
   B. False

4. Which of the following are advantages of web application development? Choose all that apply.
   A. Enhanced offline use
   B. Detection of device capabilities
   C. Use of web signals
   D. Communication with device peripherals

5. Which of the following statements is true?
A. Web applications are typically associated with easier development but more difficult deployment than Java applications.

B. When you release a patch for a web application, it is better to push the patch to individual mobile devices than to allow users to download the patch themselves.

C. When you release a patch for a web application, it is better to allow users to download the patch themselves than to push the patch to individual mobile devices.

D. You do not have to distribute web application updates to individual mobile devices.

6. Which of the following statements is true?
   A. A BlackBerry web application is hosted on a server and accessed by multiple clients using a browser.
   B. The term web application typically refers to an application that the user can download from a web site and install on a mobile device.
   C. A web application is an application, typically a browser, that lets users access the Internet and view web content.

7. Which of the following can you use to create a web application? Choose all that apply.
   A. HTML
   B. Web ME
   C. Java ME
   D. WebMD

8. Which of the following is a function of the BlackBerry MDS Simulator?
   A. To test applications on various BlackBerry smartphone versions and operating systems.
   B. To compile web applications for distribution.
   C. To provide a basic application framework on which to develop web applications.
   D. To simulate network connectivity.
Answers

1. A, B, C
2. A, C
3. B
4. B, C
5. D
6. A
7. A
8. D
Widget development

Widgets are single-purpose applications that you create using web development tools. However, unlike web applications, widgets reside on the mobile device and behave like native Java applications.

Like Java applications, widgets can vary in their requirements for connectivity. Some widgets are standalone applications that do not require an Internet connection, such as an offline address book or another simple data storage application. Other widgets require an Internet connection to request and receive data or to receive automatic push data from a server. For example, a stock update widget application can inform the user whenever a particular stock value changes. Finally, some widgets have the sole purpose of providing the user with a portal to a specific web address or other web data. When the user runs this type of widget, it delivers only the specified Internet services and content to the mobile device.

Widgets for mobile devices consist of standard web components, including HTML, XHTML, style sheets, JavaScript, SVG, image files, and other resources. BlackBerry widgets are based on the W3C® widget specification. You can extend BlackBerry widgets using BlackBerry widget APIs, which are JavaScript extensions that let you automatically push application data to the BlackBerry widget running on a BlackBerry smartphone. These BlackBerry widget APIs expose BlackBerry smartphone capabilities that you can use to enhance the capabilities and usefulness of your BlackBerry widget.

After you create the HTML, style sheet, and JavaScript code for a web application, you can package them as a ZIP archive and convert them into a BlackBerry widget using the BlackBerry® Web Component Package.

In addition to standard web development resources, you need the following tools and resources to develop a BlackBerry widget:

- BlackBerry® Widget SDK
- BlackBerry® Widget Packager

Advantages of developing widgets

Widget development brings together some of the advantages of both web and Java application development. Widgets are based on the same intuitive, standard web technology as web applications, and provide you with some of the flexibility and customization of Java applications.

Ease of use

Widgets allow you to deploy features and services to mobile devices without learning the languages that the devices support. For example, you can create widgets for the BlackBerry smartphone without first learning Java. This means you can use highly familiar web technologies to build the same types of applications normally created only in Java.
Additionally, because widgets are single-purpose applications, they can be easier for users to use than web applications. After the user configures the widget (if configuration options are available), there are very few additional steps for the user to carry out to access the service or feature that the widget provides.

**Flexibility**

Widgets deliver features and web content that are specific to the user and personalized to meet the user’s requirements. When designing a widget, do so with the user in mind. Allow users to configure the display method. For example, let users choose whether information appears in full-screen mode or as a nonintrusive alert icon. You can also allow users to specify the timing of the delivery. For example, let users configure whether data is sent as soon as it is available or at a specified time or interval.

A good example of a customizable widget is the BlackBerry® Push Weather Clients widget, which allows BlackBerry users to get weather information every day. Users can choose to receive information from either AccuWeather or The Weather Network, and the software lets users choose how to receive weather updates: they can receive a text message or have a browser channel appear on their homepage.

BlackBerry widgets can also take advantage of the BlackBerry smartphone native features. For example, you can use location information to create widgets that offer location-based services, such as local maps, local offers, currency converters, and weather information. Additionally, users can combine a variety of widgets to meet their needs.

**Bandwidth**

Widgets send a small amount of data to users. This means that they typically require very little bandwidth compared to that of web applications and Java applications with wireless features.

**Reuse existing applications**

When you develop a widget, you can leverage features that you have already created for web applications and extend them to the BlackBerry smartphone. You can create a BlackBerry widget that pulls in existing resources from your content server. In the BlackBerry widget, you can specify your own custom header that is passed down on every web request so that you know the request for the content is coming from your widget. You can then have your existing server-based web content react to this header and add functionality to the markup specific to the BlackBerry smartphone.

For example, instead of writing a search in your client application that would return XML, and then provide the user with a results interface that is based on the XML, you can instead pass the search to the server, and have the server return the rendered HTML back to the widget user interface with specific JavaScript markup.
Disadvantages of developing widgets

Because widgets are based on the same technology as web applications, they have many of the same disadvantages, including reliance on an Internet connection and less flexibility than Java applications. The largest reason for choosing an alternate development method is that widgets are intended to bring a single feature or type of information to the mobile device; they are not suitable for larger, more complex, or more interactive tasks.
1. Which of the following statements is true?
   A. Widgets are not suitable for tasks that require Internet access.
   B. Widgets are not suitable for large or multipurpose applications.
   C. Widgets cannot be customized.
   D. Widgets are created using the same tools as Java applications.

2. Which of the following are required to develop a BlackBerry widget? Choose all that apply.
   A. BlackBerry Widget SDK
   B. BlackBerry Widget Java WE
   C. BlackBerry Widget Packager
   D. BlackBerry Widget Simulator

3. True or false: when developing a widget, you should convert the content from HTML to Java to optimize the *user experience*.
   A. True
   B. False

4. Which of the following features can you implement in a BlackBerry widget? Choose all that apply.
   A. Push technology
   B. Device detection
   C. Location-based services
   D. Integration with BlackBerry smartphone native features

5. Which of the following statements is true?
   A. One disadvantage of widgets is that they cannot be customized.
B. One advantage of widgets is that you can create them by leveraging features of existing web applications.

C. One disadvantage of widgets is that they cannot make use of the mobile device wireless connection.
Methods of application development for mobile devices

Answers

1. B
2. A, C
3. B
4. A, B, C, D
5. B
Java applications for the BlackBerry smartphone are written in Java ME. They reside on the BlackBerry smartphone and can be offline applications, applications with desktop synchronization, or applications with wireless features. The BlackBerry JDE includes Java ME and BlackBerry APIs, editing and debugging tools, a simulator, and sample applications to get you started.

Advantages BlackBerry Java development are flexibility, local application storage, support for location-based services, use of background threads, communication with peripheral devices, and incorporation of the BlackBerry smartphone native features. Additionally, many Java applications require no or reduced bandwidth. One disadvantage of BlackBerry Java development is that it requires a more advanced skill set. Another disadvantage is the fact that Java applications reside on the BlackBerry smartphone itself; Java applications must conform to the limited storage capacity of the BlackBerry smartphone and there is no centralized location for providing application updates (each device must be updated individually).

Web applications reside on a content server and users access them using browsers. You can write web applications using standard web authoring tools and languages, including HTML, xHTML, and Javascript version 1.5.

Advantages of developing web applications are ease of use and the fact that you can develop them using tested, familiar standards. Because web applications are hosted on a content server and accessed remotely, there is no local storage; application size is not limited by the storage capacity of the mobile device. Additionally, because web applications do not reside on individual mobile devices, there is no need to update or install individual instances of the application. To make a change to the web application, replace it on the server with a new version of the application. Web applications for the BlackBerry smartphone can detect individual device types and capabilities, delivering the appropriate content or format. Web applications can also make use of web signals, icons that are pushed to clients to provide a portal to web content or to provide information updates.

A drawback to developing web applications is its lack of flexibility for look and function. Web applications cannot make use of background threads and cannot be used offline. Because web applications require a connection to a web server, they can require more bandwidth than other application types.

Widgets are single-purpose applications that you create using web development tools. However, unlike web applications, widgets reside on the mobile device and behave like native Java applications.
One advantage of widget development is the ease of use; widgets are created with the same tools as web applications, and you can repackage existing web application features as widgets. Another advantage of widgets is their flexibility; you can customize your widget application, and you can design your application to allow users to customize its look and behavior. Because widgets are single-purpose applications, they typically require less bandwidth than other applications. The fact that widgets are single-purpose applications is also their greatest disadvantage; they are not suitable for large, complex tasks.
Review Questions

1. Which of the following is an example of a standalone application?
   
   A. An application is hosted on a content server, and only one client can connect to it at a time.
   
   B. An application resides on a mobile device and does not require an Internet connection.
   
   C. An application resides on a mobile device. If there is no Internet connection, the user can run the application, but may not be able to access all data.
   
   D. An application requires an Internet connection for some data, but does not interact with other applications or features on the mobile device.

2. Specify whether each characteristic below is a feature of a Java application, a web application, or both. The first item has been completed for you as an example.
   
   A. Offline use: *Java, widgets*
   
   B. Communication with peripheral devices:
   
   C. Use of location-based services:
   
   D. Local storage of the application:
   
   E. Single-source application version control:
   
   F. Use of web signals:
   
   G. Detection of device and capabilities:
   
   H. Use of background threads:
   
   I. Use of push technology:

3. What language do you use to develop Java applications for the BlackBerry smartphone?

4. Name three languages you can use to develop web applications for the BlackBerry smartphone.
5. Name two languages you can use to develop widget applications for the BlackBerry smartphone.

6. Read the following description of an application and, combining your own creativity with what you have learned in this chapter, briefly describe how the application might look and behave as a Java, web, or widget application. For each development method, include information about which language you can use, how users start the application, where the application is stored, and how users are notified of updates.

Description: the application provides users with access to cooking recipes. A new recipe is featured every day, and users can search through a database for previously featured recipes, based on dates or keywords.

Java:

Web:

Widget: