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Chapter 4

Push technology for Java applications

Objectives

- Describe push technology
- Describe client/server push Java applications for a mobile device such as a BlackBerry® smartphone
- List and explain the advantages and disadvantages of push technology for mobile devices
- Write a basic client/server push Java application for a mobile device such as a BlackBerry smartphone

This chapter outlines push technology for Java applications used by BlackBerry smartphones. The chapter discusses the advantages and disadvantages of using push technology for mobile devices. The chapter explains basic client/server push Java applications and demonstrates basic examples of client/server push Java applications.
Introducing push technology

One of the cornerstones of the BlackBerry solution is the ability to proactively deliver, or push, data to BlackBerry smartphones. Push applications send data to specific BlackBerry smartphones. Users do not need to request or download the data because the push application delivers the information as soon as it becomes available. The BlackBerry smartphone listens for new information and notifies the user when it arrives by vibrating, changing an icon on the screen, or turning on a light. The BlackBerry smartphone does not poll the server to look for updates. It simply waits for the update to arrive and notifies the user when it does. You can create applications that push data to BlackBerry smartphone users, providing them with the information they need as soon as it is available.

Push applications for the BlackBerry Enterprise Server

You can use the BlackBerry MDS Connection Service component of the BlackBerry Enterprise Server to deliver data or web content directly to any BlackBerry smartphone that is activated on an organization's BlackBerry Enterprise Server. Users do not need to request or download data; the push application, in conjunction with the BlackBerry MDS Connection Service, delivers it as soon as it is available.

Two applications are required to push data to a BlackBerry smartphone: a server-side push application that submits the push request, and a client-side listener application that listens for incoming push messages.

The server-side push application is designed to send HTTP POST requests to the BlackBerry MDS Connection Service on the web server listen port. The HTTP POST requests contain delivery parameters and the data to be pushed. The BlackBerry MDS Connection Service then delivers the data to a specified port number on the BlackBerry smartphones within a specified time frame. You must create the server-side application. The push requests that this application generates must conform to either the WAP PAP version 2.0 specification or to the RIM® push format.

A client-side listener application listens for data to be delivered to its specific port number. You can create a custom BlackBerry MDS Java Application that is designed to listen for and handle pushed data, or you can push web content to the BlackBerry Browser. The BlackBerry Browser has an integrated listener thread, which allows you to push web content to the BlackBerry smartphone without the need to create a custom client-side application.

The BlackBerry MDS Connection Service manages the flow of pushed data from various push applications, and sends the data to the BlackBerry smartphone using the same encrypted channel that is used for data communication between the BlackBerry smartphone and the BlackBerry Enterprise Server. The BlackBerry MDS Connection Service can push data to individual users or to user groups.
1. What is a push application?

2. True or false. Push applications work with the BlackBerry MDS Connection Service.

3. How many applications are required to push data to a BlackBerry smartphone using BlackBerry Enterprise Server? Name them.

4. What are two ways can you view information pushed to a BlackBerry smartphone?
Answers

1. Push applications send data to specific BlackBerry smartphones as soon as it becomes available. The BlackBerry smartphone listens for new information and notifies the user when it arrives.

2. True

3. Two applications are required to push data to a BlackBerry smartphone using the BlackBerry Enterprise Server.
   - Server-side push application that submits the push request
   - Client-side listener application that listens for incoming push messages

4. You can view information pushed to a BlackBerry smartphone through the following:
   - A custom BlackBerry MDS Java Application
   - The BlackBerry Browser
Client/server push application

Client/server push applications consist of a custom client BlackBerry smartphone application and a server-side application that pushes content to the client BlackBerry smartphone. This approach provides more control than browser push applications. It also provides more flexibility regarding the type of data that you can send and how the BlackBerry smartphone processes and displays the data.

Client/server push applications have many advantages: you can store data on the BlackBerry smartphone, you can make network connections based on the information that comes in, and you can integrate the data with BlackBerry applications such as a calendar. The BlackBerry smartphone listens for new information and notifies the user when it arrives by vibrating or with a ring tone.

Server-side push applications

Server-side push applications make requests to the BlackBerry MDS Connection Service to push data to specified BlackBerry smartphone users. These requests include push delivery parameters that uniquely identify the push request, inform the BlackBerry MDS Connection Service which BlackBerry smartphones to send the data to, and provide additional delivery information, such as the priority and the reliability level of the push request.

You can create a server-side push application using any development language. However, the application must generate and send HTTP POST requests to the BlackBerry MDS Connection Service and use either the PAP push format or RIM push format to specify the delivery parameters.

You can push data to individual users based on either their email addresses or their BlackBerry smartphone PINs, or to groups of users created and maintained on the BlackBerry Enterprise Server.

Supported push formats

The push format you use for push requests not only affects the format in which the delivery parameters are specified, but also affects how the data is packaged within the HTTP POST request. The BlackBerry MDS Connection Service supports two push formats: PAP push format and RIM push format.

PAP push format

The PAP push format sends an HTTP POST request to the BlackBerry MDS Connection Service. The request contains a MIME multipart message that includes two components: an XML-based PAP control entity that defines the delivery parameters, and the data to be pushed.

The PAP push format is an open standard developed by the Open Mobile Alliance. The BlackBerry MDS Connection Service supports the WAP PAP version 2.0 standard.
RIM push format

The RIM push format sends an HTTP POST request to the BlackBerry MDS Connection Service. However, in this case, the pushed content is sent as a byte stream. The destination port is specified within the URL of the pushed content, and the destination users and other delivery parameters are specified in HTTP headers included with the request.

The RIM push format is a proprietary push format supported exclusively by the BlackBerry MDS Connection Service and BlackBerry smartphone.

Making a push request

Whether you are using the PAP push format or the RIM push format, a push request is made up of the data to be pushed, and a set of delivery parameters, which define how, when, and to whom the data is pushed. The principle difference between the two formats is the way in which the delivery parameters are specified.

Both the PAP push and RIM push formats support the following features:

- Reliable push requests: You can request that the BlackBerry MDS Connection Service send a result notification to indicate the success or failure of the push request for each recipient address.
- Deliver-Before time stamp: You can provide a time stamp before which the BlackBerry MDS Connection Service can deliver the pushed data. If the BlackBerry MDS Connection Service is unable to deliver the data by the specified time, the push request fails.
- Deliver-After time stamp: You can provide a time stamp before which the push cannot be delivered. If a push is not successfully delivered after the specified time, the push fails.

In addition, the PAP push service implementation supports the following features:

- Push cancellation: Allows push applications to cancel a push submission that has already been sent.
- Push status query: Allows push applications to check the status of a push submission.

If you are pushing data to the BlackBerry Browser, you must also specify additional browser push HTTP headers in addition to the delivery parameters.

Client-side listener applications

Client-side listener applications on the BlackBerry smartphone listen for incoming data. You can create a custom listener application using Java. You can create a custom BlackBerry MDS Java Application that contains a listening thread that listens for incoming data on a specified port.

To create a Java-based push application architecture, you must create both the custom client-side application that receives the pushed data and the server-side application that makes the push request.
This approach requires that you have some knowledge of Java® ME, as well as an understanding of BlackBerry application design and development. However, creating a custom BlackBerry MDS Java Application can provide you with control over both the type of data that you can deliver and the manner in which this data is processed and displayed on the BlackBerry smartphone.

**Push applications**

Using push applications, you can create a wider range of applications that enhance the BlackBerry experience for BlackBerry smartphone users.

You can use push applications for time- and location-sensitive alerts.
- news and weather
- banking and stocks
- medical services
- sports scores
- backup notifications

**Advantages and disadvantages of push technology for mobile devices**

You gain many advantages and few disadvantages by using push technology for BlackBerry smartphones.

**Advantages of push technology**

Push technology offers a number of concrete benefits for BlackBerry smartphone users and application developers alike.

**Immediacy**

Pushing data to a BlackBerry smartphone is the most efficient way to get information to BlackBerry smartphone users. Data is delivered to applications on the BlackBerry smartphone as soon as it becomes available.

**Efficiency**

Applications do not need to repeatedly poll servers for new data. Although these polling requests and responses are small individually, the cost of these can add up quickly with frequent polling intervals across multiple applications.
Reduced latency

Applications that use push can reduce the impact on network latency. Data is delivered to BlackBerry smartphones in the background without user involvement. The most recent data is synchronized and available on the BlackBerry smartphone the moment the user opens the application.

Longer battery life

Push applications can extend battery life. Instead of actively checking for new data, the application listens in the background for data to arrive. Wireless communication uses battery power. BlackBerry smartphone users reduce the amount of battery power they use by minimizing the BlackBerry smartphone wireless communication. When data arrives, the application can process it as needed.

Shorter learning curve

BlackBerry smartphone users already know all that is needed to access push content. For developers, much of the complexity of a push data delivery service is hidden because the BlackBerry® Infrastructure handles the process of managing and delivering push requests.

Disadvantages of push technology

Push technology has few disadvantages for BlackBerry smartphone users and application developers.

Limited format

You must limit the data sent to a BlackBerry smartphone to what the BlackBerry Browser can handle or what a custom application can decode.

No delivery status for individuals within a group address

When pushing to a group address, you cannot determine the status of delivery to a particular recipient or cancel delivery to one or more recipients. If the application requires this functionality, specify multiple recipient addresses in the push submission.
1. What does a client/server push application consist of?
   A. Custom client BlackBerry smartphone application
   B. Server-side application that pushes content to the client BlackBerry smartphone
   C. Client application that polls the server for new data
   D. Server-side application that pulls content from the BlackBerry smartphone

2. What push formats are supported by the BlackBerry MDS Connection Service?
   A. MDS push format
   B. RIM push format
   C. CLDC push format
   D. PAP push format

3. True or False. You can create a custom client-side listener application using Java.

4. True or False. You do not have to create both the custom client-side and the server-side applications to create a Java-based push application architecture.

5. How is the push content sent for RIM push formats?

6. What are the advantages of push technology? Select all that apply.
   A. Immediacy
   B. Unlimited format
   C. Reduced latency
   D. Shorter battery life
   E. Steep learning curve
Answers

1. A, B
2. B, D
3. True
4. False
5. As a byte stream
6. A, C, D
Client/server push Java applications

You can use any programming language that can establish an HTTP connection to create a push application. The following tasks use standard Java to demonstrate a server-side push application.

PAP push format

Your server-side application can use the PAP push format to send the following three types of requests to the BlackBerry MDS Connection Service:

- **Push request**—This request allows you to push data to the specified recipients. A PAP push request is a MIME multipart message, which contains a PAP control entity that defines the delivery parameters, and the data to be pushed.
- **Status-query request**—This request allows you to query the status of a push request for one or more specified recipients. A PAP status-query request includes only an XML-based PAP control entity, which identifies the associated push request, and lists the recipient addresses for which the push request status should be queried.
- **Cancellation request**—This request allows you to cancel a push request for one or more specified recipients. A PAP cancellation request includes only an XML-based PAP control entity, which identifies the associated push request, and lists the recipient addresses for which the push request should be cancelled.

In each case, you send the request as an HTTP POST request to the BlackBerry MDS Connection Service. If the BlackBerry MDS Connection Service is configured to support secure connections, you can use the HTTPS protocol. The HTTP POST request must use the following format:

```
POST http://<MDS_CS>:<MDS_CS_port>/pap
<message>
```

where

- `<MDS_CS>` is the URL address of the BlackBerry MDS Connection Service web server. If you are unsure of the URL address of the BlackBerry MDS Connection Service, contact your BlackBerry Enterprise Server Administrator.
- `<MDS_CS_port>` is the port number on which the BlackBerry MDS Connection Service web server listens. By default, the BlackBerry MDS Connection Service listens on port number is 8080. If you are unsure of the port number, contact your BlackBerry Enterprise Server administrator.
- `<message>` is either a multipart message with the PAP control entity and the data (in the case of push requests), or a PAP control entity on its own (in the case of status-query and cancellation requests)
Create a PAP push request

You can use a PAP push request to push content to one or multiple BlackBerry smartphone users using PAP.

1. Send an HTTP POST request using the following format:

   http://mdsServer:web server listen port/pap - The URL to send the PAP push to.

   The request is a MIME multipart message, which consists of the following items:
   • XML document specifying the control entity
   • push content

   The following example shows a PAP push request:

   Content-Type: multipart/related; type="application/xml";
   boundary=asdlfkjiurwghasf
   X-Wap-Application-Id: /
   --asdlfkjiurwghasf
   Content-Type: application/xml
   <?xml version="1.0"?><!
   DOCTYPE pap PUBLIC "-//WAPFORUM//DTD PAP 2.0//EN" "http://www.wapforum.org/DTD/pap_2.0.dtd">
   <pap>

   The following are the optional push ID and notification URL parameters:

   <push-message push-id="a_push_id" ppg-notify-requested-to="http://foo.rim.net/ReceiveNotify">
   <address address-value="WAP-PUSH=aisha.wahl%40blackberry.com%3A7874/TYPE=USER@rim.net"/>
   <quality-of-service delivery-method="unconfirmed"/>
   </push-message>
   </pap>

   The following is the pushed content:

   --asdlfkjiurwghasf
   Content-Type: text/html
   <html><body>Hello, PAP world!</body></html>
   --asdlfkjiurwghasf--

2. To push content to multiple recipients using PAP, add multiple address tags to the post request. For example
3. To push content to a group using PAP, in the recipient addresses part of the push submission, prefix the group name with the $ character. In the following example, the $ character is URL encoded.

The following example shows an address element used to push to a group named IT using PAP:

```xml
<address address-value="WAPPUSH=%24IT/TYPE=USER@rim.net"/>
```

**Code sample: Submitting a PAP push request**

The following code sample shows an example of the push request that is sent to the BlackBerry MDS Connection Service. This request is a multipart message that includes a PAP push message control entity and the pushed data.

The PAP push message control entity requests the BlackBerry MDS Connection Service to push accompanying data to two individual BlackBerry smartphone users (user1@rim.com and user2@rim.com). The `<quality-of-service>` element defines this request as application-reliable.

Special characters specified in the email address portion of the address-value attribute are URL encoded, as specified in the WAP PAP version 2.0 specification.

The content portion of the multipart message includes a number of browser push headers, which specify a browser channel and the icons that represent the browser channel on the Home screen.

```xml
Content-Type: multipart/related; type="application/xml";
boundary=asdlfkjiurwghasf

--asdlfkjiurwghasf

Content-Type: application/xml
<?xml version="1.0"?>
<!DOCTYPE pap PUBLIC "-//WAPFORUM//DTD PAP 2.0//EN"
 "http://www.openmobilealliance.org/tech/DTD/pap_2.0.dtd"
[<?wap-pap-ver supported-versions="2.0"?>]>
<pap>
<push-message push-id="123@foo.rim.com"

deliver-before-timestamp="2009-12-31T13:30:00Z"
```
RIM push format

Your server-side application can use the RIM push format to send both the data and the delivery parameters to the BlackBerry MDS Connection Service in a single byte stream.

You send the request as an HTTP POST request to the BlackBerry MDS Connection Service. If the BlackBerry MDS Connection Service is configured to support secure connections, you can use the HTTPS protocol. The HTTP POST request must use the following format:

```
POST http://<MDS_CS>:<MDS_CS_port>/push?
```
Create a RIM push request

You can push data to BlackBerry smartphone users in several ways.

To push content to one or multiple BlackBerry smartphone users using a RIM push request, send an HTTP POST request using the following URL format:

```
http://mdsServer:web_server_listen_port/push?DESTINATION=destination&PORT=port&REQUESTURI=uri headers content
```

where

- destination is the destination PIN, email address or BES group
- port is the destination port number
- uri is the URI sent to the BlackBerry smartphone
- headers are HTTP headers
- content is a byte stream
To push content to multiple recipients using a RIM push, include multiple **DESTINATION** parameters in the query string.

```
http://mds_server:8080/push?DESTINATION=
user1@rim.com&DESTINATION=user2@rim.com&PORT=7874&REQUESTURI=/
```

To push content to a group using RIM push, in the recipient addresses portion of the push submission, prefix the group name with the $ character. In the following example, the $ character is URL encoded.

The following example shows a URL used to push to a group named IT using RIM push:

```
```

1. Specify a unique message ID to cancel or check the status of a message. Use the **X-RIM-Push-ID** header. Typically, specify a URL in combination with a value, such as 123@blackberry.com. If this header is omitted, the BlackBerry® Mobile Data System generates a unique message ID.

   **Note:**
   Do not end push identifiers in @ppg.rim.com.

2. You can optionally specify a URL to which the BES sends a result notification. Use the **X-RIM-Push-NotifyURL** header.

   The result notification contains the **X-RIM-Push-ID** header, which specifies the message ID, and the **X-RIM-Push-Status** header, which specifies an HTTP response code. The notification also contains an **X-RIM-Push-Destination** header that specifies the recipient address to which the result pertains.

3. You can optionally specify the delivery reliability mode of the content. Use the **X-RIM-Push-Reliability-Mode** header with one of the following modes:
   - application-level (**APPLICATION**)  
   - application-preferred (**APPLICATION-PREFERRED**)  
   - transport-level (**TRANSPORT**)
1. What programming language can you use to create a push application?
   A. Perl is the preferred language for creating a push application
   B. Java is required to efficiently create a RIM push application
   C. Any programming language that can establish an HTTP connection
   D. MySQL provides the development backbone for push applications

2. Your server-side application can use the PAP push format to send what three types of requests to the BlackBerry MDS Connection Service?

3. What is the default port number the BlackBerry MDS Connection Service listens on?

4. Your server-side application can use the RIM push format to send what parameters to the BlackBerry MDS Connection Service in a single byte stream?
Answers

1. C

2. Three types of requests
   - Push request
   - Status-query request
   - Cancellation request

3. 8080

4. Data and delivery parameters
Push technology is the ability to proactively deliver, or *push*, data to BlackBerry smartphones. Push applications send data to specific BlackBerry smartphones as soon as it becomes available. The BlackBerry smartphone listens for new information and notifies the user when it arrives.

Client/server push applications consist of a custom client BlackBerry Java application for the BlackBerry smartphone and a server-side application that pushes content to the client BlackBerry Java application.

The BlackBerry MDS Connection Service supports two push formats: PAP push format and RIM push format. The PAP push format is an open standard developed by the Open Mobile Alliance. The BlackBerry MDS Connection Service supports the WAP PAP version 2.0 standard. The RIM push format is a proprietary push format supported exclusively by the BlackBerry MDS Connection Service and BlackBerry smartphone.

To create a Java-based push application architecture, you must create both the custom client-side application that receives the pushed data and the server-side application that makes the push request.

You can use the RIM push API for time- and location-sensitive alerts.

- news and weather
- banking and stocks
- medical services
- sports scores
- backup notifications
You gain advantages by using push technology for BlackBerry smartphones.

- immediacy
- efficiency
- reduced latency
- longer battery life
- shorter learning curve

There are few disadvantages of push technology for mobile devices.

- limited format
- no delivery status for individuals within a group address

Whether you are using the PAP push format or the RIM push format, a push request is made up of the data to be pushed, and a set of delivery parameters, which define how, when, and to whom the data is pushed. The principle difference between the two formats is the way in which the delivery parameters are specified.

Your server-side application can use the PAP push format to send three types of requests to the BlackBerry MDS Connection Service: push request; status-query request; cancellation request.

Your server-side application can use the RIM push format to send both the data and the delivery parameters to the BlackBerry MDS Connection Service in a single byte stream.
1. When do Java push applications deliver data to Blackberry smartphones?
   A. Whenever users request data from the server
   B. As soon as it is available
   C. As scheduled by the user, with a default interval of ninety seconds
   D. When applications poll the server for data

2. How does a client-side Java application make use of the data offered by the associated push service?
   A. Listens in the background for incoming data from the server
   B. Submits a push request when new data is available
   C. Polls in the background for new data from the server
   D. Receives requests to push data from the content provider, and then delivers the data to the BlackBerry smartphone

3. Which of the following is not an advantage of push technology?
   A. Deliver data to Java applications on the BlackBerry smartphone as it becomes available
   B. Reduce the impact of network latency
   C. Repeatedly poll servers for new data
   D. Create applications that can exploit the unique capabilities that only the BlackBerry Infrastructure provides

4. What programming language can you use to create a push application?
   A. Any programming language that can establish an HTTP connection
   B. Perl is the preferred language for creating a push application
   C. Java is required to efficiently create a RIM push application
   D. MySQL provides the development backbone for push applications
5. How do push applications prolong battery life on a Blackberry smartphone?

6. What one of the following is a characteristic of push request reliability?
   A. Fire and Forget
   B. Encryption
   C. HTTPS
   D. Notifications

7. Which of the following you use to specify time restrictions on a push requests? Choose two.
   A. Delivery Date
   B. Deliver-Before
   C. Deliver-After
   D. Delivery Range