Advanced Java Application Development for the BlackBerry Smartphone

BlackBerry Academic Program
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Chapter 7
Understanding client/server push

Objectives

- Explain client/server push and describe the benefits of push
- Explain how to write a basic client-side push application
- Explain how to write a basic server-side push application
- Describe and use the various features of push reliability

This chapter describes how to push content to a BlackBerry® smartphone and how to listen for pushed content on a BlackBerry smartphone. This chapter describes how to write both a server-side application that sends content to a BlackBerry smartphone simulator or BlackBerry smartphone, and a client-side application that listens for pushed content on the BlackBerry Smartphone Simulator or BlackBerry smartphone.
Client/server push

Client/server push applications send data from a server-side application to a custom client application on the BlackBerry smartphone. Compared to browser push applications, client/server push provides more control over the type of content that can be sent, and over how the BlackBerry smartphone processes and displays the content. The push application, in conjunction with the BlackBerry MDS Connection Service, delivers content without user intervention.

Two applications are involved in client/server push. A server-side push application, which submits the push request, and a client-side listener application, which listens for incoming push messages.

- You create the server-side push application, which sends 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 smartphone within a specified time. Push requests generated by this application must conform to either the WAP PAP version 2.0 specification or to the RIM push format.
- You can use the client-side listener application that is integrated into the BlackBerry® Browser, or you can create a custom BlackBerry Java Application that listens for and handles pushed data.

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.
Writing a basic client-side push application

A client-side push application requires a listening thread. The application sends and receives data on a separate thread so as not to block the main event thread.

To create a basic client-side push application, complete the following steps:

1. Open a connection that listens for incoming push connections.
2. Read the pushed data.
3. Close the connection.
Opening an input stream

To open an input stream, complete the following steps:

1. Open a connection using http, and specify a high port number to avoid conflicts with other applications (valid port numbers are 1 to 65,535).

   `Connector.open(http://:6234);`

   **Note:** Some port numbers are reserved. You cannot use the following port numbers:
   - 80
   - 443
   - 7874
   - 8080

2. To specify the connection type that the application uses for incoming and outgoing connections, add a colon at the end of the connection string followed by the `deviceside=boolean` parameter as follows:
   - If the application listens for content from BlackBerry MDS Services, configure the `deviceside` parameter to `false`.
   - If the application listens for content from WAP push requests, do not use the `deviceside` parameter.

3. Cast the object that `Connector.open` returns as a `StreamConnectionNotifier`.

   ```java
   StreamConnectionNotifier _notify =
   (StreamConnectionNotifier)Connector.open("http://:6234");
   ```

4. Open a server-side stream connection once and keep the server-side stream connection open.

   ```java
   StreamConnection stream = _notify.acceptAndOpen();
   InputStream input = stream.openInputStream();
   ```

5. Read the incoming data.

6. If you use application-level push reliability, use the `MDSPushInputStream.accept()` method to accept and acknowledge the incoming data.

7. If an `IOException` occurs, reopen the connection.

Closing the stream connection notifier

To close the stream connection notifier, invoke `close()` on the stream connection notifier.

```java
_notify.close();
```
1. Which of the following port numbers can you use for push applications? Choose two.

   A. 80
   B. 8080
   C. 14000
   D. 7874
   E. 64000
Answers

1. C and E
Overview of the 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: Use this request 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 push.
- Status-query request: Use this request 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 addresses to query.
- Cancellation request: Use this request to cancel a push request for one or more specified recipients. A PAP cancellation request includes an XML-based PAP control entity, which identifies the associated push request, and lists the addresses for which to cancel the push request.

In each case, you send the request as an HTTP POST request to the BlackBerry MDS Connection Service. If you configure the BlackBerry MDS Connection Service 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>
```

- `<MDS_CS>` is the web address of the BlackBerry MDS Connection Service web server. If you are unsure of the web 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. The default 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).

Constructing a PAP control entity

A PAP control entity is an XML document, which contains the control information that is required by the PAP. When you include a PAP control entity in a multipart message, as in a push request, it must be the first entity in the message.
The BlackBerry MDS Connection Service supports three request types, corresponding to three PAP control entities.

<table>
<thead>
<tr>
<th>Request type</th>
<th>Corresponding PAP control entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>push</td>
<td>push message control entity</td>
</tr>
<tr>
<td>cancellation</td>
<td>cancellation message control entity</td>
</tr>
<tr>
<td>statusquery</td>
<td>status-query message control entity</td>
</tr>
</tbody>
</table>

All PAP control entities have the following three common document elements:

- the XML declaration
- the DOCTYPE declaration
- a root <pap> element

Because the BlackBerry MDS Connection Service supports WAP PAP version 2.0 only, the DOCTYPE declaration included in all PAP control entities submitted to the BlackBerry MDS Connection Service must specify supported version information.

**Code sample: Formatting a PAP control entity to send to the BlackBerry MDS Connection Service**

```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>
  <!-- message-specific elements go here -->
</pap>
```

For more information about PAP control entities, visit www.openmobilealliance.org, to see the PAP specification.
**Elements of a PAP push message**

<table>
<thead>
<tr>
<th>Element</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;pap&gt;</td>
<td></td>
<td>Defines a PAP control entity.</td>
</tr>
<tr>
<td>&lt;push-message&gt;</td>
<td>push-id</td>
<td>Specifies a request to push data to a BlackBerry smartphone.</td>
</tr>
<tr>
<td></td>
<td>ppg-notify-requested-to</td>
<td>You must include one or more &lt;address&gt; elements in the &lt;push-message&gt; element to specify the recipient addresses.</td>
</tr>
<tr>
<td></td>
<td>deliver-before-timestamp</td>
<td>You can optionally include a &lt;quality-of-service&gt; element in the &lt;push-message&gt; element to specify the reliability level of the push request.</td>
</tr>
<tr>
<td></td>
<td>deliver-after-timestamp</td>
<td>You must include the push-id attribute, which specifies a string that uniquely identifies the web address with a value, such as <a href="mailto:123@rim.com">123@rim.com</a>.</td>
</tr>
</tbody>
</table>

You can optionally include the following attributes:

- **ppg-notify-requested-to**: Specifies a web address to which the BlackBerry MDS Connection Service can post result notification messages. If you include the value for the <quality-of-service> element, specify a value for this attribute.

- **deliver-before-timestamp** and **deliver-after-timestamp**: Specify the date and time, in 24-hour UTC format, before or after which the push request must be delivered.
### Element: `<address>`

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| `address-value` | Specifies a single recipient of the push request.  
You must include the `address-value` attribute to specify the recipient address. The `address-value` attribute uses the following format:  

```
WAP_PUSH=<recipient>%3A<port>/TYPE=USER@rim.com
```

Where `<recipient>` is the email address, BlackBerry smartphone PIN, or BlackBerry user group name, and `<port>` is the port number on which the client-side listener application listens.  

Note: All nonalphanumeric characters in the BlackBerry smartphone email portion of the `address-value` attribute, other than "+", ".", "", or ", " must be web address encoded as hexadecimal values in the PAP control entity.  

You can include multiple `<address>` elements in a `<push-message>` element, one for each recipient address you want to specify.

### Element: `<quality-of-service>`

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| `deliverymethod`| Specifies the level of reliability for the push request. The value you specify defines the criteria for a successful outcome of the push request.  
The BlackBerry MDS Connection Service supports the `deliverymethod` attribute, which can have one of the following values:  

- **confirmed**: This value is equivalent to application-level reliability.  
- **unconfirmed, preferconfirmed, or notspecified**:  

These values are equivalent to transport-level reliability. The BlackBerry Infrastructure treats these values identically.  

This attribute does not imply any notification from the BlackBerry MDS Connection Service specifying the outcome of the push request.  

To receive a result notification, you must configure the `ppg-notify-requested-to` attribute of the `<push-message>` element.
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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 web address 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=asdlfkjierwghasf
--asdlfkjierwghasf
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"
    ppg-notify-requested-to="http://rim.com/ReceiveNotify">
    <address address-value="WAPPUSH=user1%40rim.com%3A7874/TYPE=USER@rim.com"/>
    <address address-value="WAPPUSH=user2%40rim.com%3A7874/TYPE=USER@rim.com"/>
    <quality-of-service delivery-method="confirmed"/>
  </push-message>
</pap>

--asdlfkjierwghasf
Content-Encoding: binary
Content-Type: text/html
X-Wap-Application-Id: /
Elements of a PAP cancellation message

<table>
<thead>
<tr>
<th>Element</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;pap&gt;</td>
<td></td>
<td>Defines a PAP control entity.</td>
</tr>
<tr>
<td>&lt;cancel-message&gt;</td>
<td>push-id</td>
<td>Specifies a request to cancel a previously submitted push request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can optionally include one or more &lt;address&gt; elements in the &lt;cancel-message&gt; element to indicate for which recipients the original push request is cancelled. If you do not include an &lt;address&gt; element, then the cancellation request applies to all recipients specified in the original push request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You must include the push-id attribute, which specifies the push ID of the push request to cancel.</td>
</tr>
</tbody>
</table>
### Understanding client/server push

<table>
<thead>
<tr>
<th>Element</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;address&gt;</td>
<td>address-value</td>
<td>Specifies a single recipient of the push request. Any recipients specified must match recipients specified in the original push request.</td>
</tr>
</tbody>
</table>

This element is optional.

If you include the &lt;address&gt; element, you must include the address-value attribute to specify the recipient address. The address-value attribute uses the following format:

```plaintext
WAPPUSH=&lt;recipient&gt;%3A&lt;port&gt;/TYPE=USER@rim.com
```

Where &lt;recipient&gt; is the email address, BlackBerry smartphone PIN, or BlackBerry user group name, and &lt;port&gt; is the port number on which the client-side listener application listens.

All nonalphanumeric characters in the BlackBerry smartphone email portion of the address-value attribute, other than "+", ",", ",", or "," must be web address encoded as hexadecimal values in the PAP control entity.

You can include multiple &lt;address&gt; elements in a &lt;cancel-message&gt; element, one for each recipient address.
Code sample: Submitting a PAP cancellation request

The following code sample shows an example of a cancellation request. The PAP cancellation message control entity requests the BlackBerry MDS Connection Service cancel the push request (push-id="123@rim.com").

Because the `<cancel-message>` element does not contain any `<address>` elements, the cancellation request applies to all recipient addresses specified in the original push request.

```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>
  <cancel-message push-id="123@rim.com">  
  </cancel-message>
</pap>
```

Elements of a PAP status-query message

<table>
<thead>
<tr>
<th>Element</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;pap&gt;</code></td>
<td></td>
<td>Defines a PAP control entity.</td>
</tr>
<tr>
<td><code>&lt;status-query-message&gt;</code></td>
<td>push-id</td>
<td>Specifies a request to check the status of a previously submitted push request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can optionally include one or more <code>&lt;address&gt;</code> elements in the <code>&lt;statusquery-message&gt;</code> element to indicate for which recipients the original push request status is queried. If you do not include an <code>&lt;address&gt;</code> element, then the status-query request applies to all recipients specified in the original push request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>You must include the push-id attribute, which specifies the push ID of the push request to query.</td>
</tr>
</tbody>
</table>
Understanding client/server push

<table>
<thead>
<tr>
<th>Element</th>
<th>Attribute</th>
<th>Description</th>
</tr>
</thead>
</table>
| <address>   | address-value | Specifies a single recipient address of the push request. Any recipients specified must match recipients specified in the original push request. This element is optional. If you include the <address> element, you must include the address-value attribute to specify the recipient address. The address-value attribute uses the following format:  

```
WAPPUSH=<recipient>%3A<port>/TYPE=USER@rim.com
```

Where <recipient> is the email address, BlackBerry smartphone PIN, or BlackBerry user group name, and <port> is the port number on which the client-side listener application listens.

All nonalphanumeric characters in the BlackBerry smartphone email portion of the address-value attribute, other than "+", ",", ",", or "_" must be in the form of a web address encoded as hexadecimal values in the PAP control entity.

You can include multiple <address> elements in a <statusquery-message> element, one for each recipient address you want to specify.

Querying the status of push requests can result in increased network traffic, which can negatively impact the performance of the BlackBerry MDS Connection Service. Requesting a result notification is more efficient than querying the status of the request.
Chapter 7

Code sample: Submitting a PAP status-query request

The following code sample shows an example of the status-query request that is sent to the BlackBerry MDS Connection Service. The PAP status-query message control entity requests the BlackBerry MDS Connection Service to return the status of the push request (push-id="123@.rim.com") for one BlackBerry user group (Marketing). Only one status is returned for the entire group. If all members have received the data except for one, the message state returns as pending.

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

```
--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>
 <statusquery-message push-id="123@.rim.com">
  <address address-value="WAPPUSH=%24Marketing/
   TYPE=USER@rim.com"/>
 </statusquery-message>
</pap>
--asdlfkjiurwghasf--
```

Code sample: Receiving a PAP push format result notification

If you use the PAP push format, the BlackBerry MDS Connection Service sends the result notification as a PAP result notification control entity.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE pap PUBLIC "-//WAPFORUM//DTD PAP 2.0//EN"
 "http://www.wapforum.org/DTD/pap_2.0.dtd"
[<?
 wap-pap-ver supported-versions="2.0"?>]>
<pap product-name="Research In Motion Ltd. Mobile Data Service">
 <resultnotification-message code="1000"
```
Understanding client/server push

message-state="delivered"
event-time="2007-05-02T16:34:41Z"
received-time="2007-05-02T16:34:38Z"
sender-name="YOUR_MDS_CS_SERVER"
sender-address="http://YOUR_BES_NAME:8080/pap"
push-id="9f0e39jbf084@pi.com">
  <address address-value="WAPPUSH=YOUR_EMAIL_ADDRESS%40YOUR_DOMAIN%2ecom%3A7874/
TYPE=USER@rim.net"/>
  <quality-of-service delivery-method="confirmed"/>
</resultnotification-message>
</pap>
Overview of the 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 you configure the BlackBerry MDS Connection Service 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?
DESTINATION=<destination>&PORT=<client_port>&REQUESTURI=<uri>
=headers
<data>
```

- **MDS_CS** is the web address of the BlackBerry MDS Connection Service web server. If you are unsure of the web 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.
- **destination** is the recipient email address, BlackBerry smartphone PIN, or BlackBerry user group name, to whom the BlackBerry MDS Connection Service pushes the data. To specify multiple recipient addresses, include a separate DESTINATION parameter for each intended recipient email address or BlackBerry smartphone PIN.
- **client_port** is the port number on which your client-side listening application listens. If you are pushing to the BlackBerry Browser, the port number is 7847. Custom BlackBerry Java Applications must each listen on a unique port number.
- **uri** is the web address sent to the BlackBerry smartphone.
- **headers** are the HTTP headers that specify the delivery parameters such as reliability level or delivery time stamp. If you are pushing data to the BlackBerry Browser, you must also include the browser-specific HTTP headers.
- **data** is a byte stream containing the data or content that the BlackBerry MDS Connection Service must deliver to the recipient BlackBerry smartphones.
## HTTP headers for the RIM push format

<table>
<thead>
<tr>
<th>Header</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-Rim-Push-Id</td>
<td>Specifies a string that identifies the push request. To ensure that the string is unique, specify a web address with a value, such as <a href="mailto:123@rim.com">123@rim.com</a>.</td>
</tr>
<tr>
<td>X-Rim-Push-Description</td>
<td>Specifies a description for the push request. This header is optional.</td>
</tr>
</tbody>
</table>
| X-Rim-Push-Reliability         | Specifies the level of reliability of your push request. This header is optional. If you specify a value for this header, you must also specify a value for X-Rim-Push-NotifyURL. You can specify one of the following values:  
  * transport: The BlackBerry smartphone sends a response to the BlackBerry MDS Connection Service when the pushed data has arrived at the BlackBerry smartphone.  
  * application: The BlackBerry smartphone sends a response to the BlackBerry MDS Connection Service when the pushed data has arrived at the client application listening port number.  
  * application-preferred: On BlackBerry smartphones running BlackBerry Device Software version 3.8 or later, the BlackBerry smartphone sends a response to the BlackBerry MDS Connection Service when the pushed data has arrived at the client application's listening port number. On BlackBerry smartphones running BlackBerry Device Software version 3.7 or earlier, the BlackBerry smartphone sends a response when the pushed data arrives at the smartphone. |
| X-Rim-Push-NotifyURL           | Specifies a web address to which the BlackBerry MDS Connection Service can post result notification messages. If you specify a value for X-Rim-Push-Reliability, you must also specify a value for this header. |
| X-RIM-Push-Deliver-Before      | Specifies the date and time, in HTTP format, before which the push request must be delivered. This header is optional. For recipients that have not received the pushed data by this time, the push request is considered unsuccessful. |
Receiving a RIM push format result notification

If you use the RIM push format, the response information is returned in the headers of the HTTP POST request.

<table>
<thead>
<tr>
<th>Header</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RIM-Push-Deliver-After</td>
<td>Specifies the date and time, in HTTP format, after which the push request is delivered. This header is optional.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Header</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-RIM-Push-ID</td>
<td>This header provides the ID that you specified in the original push request. If it is not specified, then the BlackBerry MDS Connection Service generates a random push request ID.</td>
</tr>
<tr>
<td>X-RIM-Push-Status</td>
<td>This header indicates the success or failure of the push request. A response status of 200 indicates a successfully delivered push request.</td>
</tr>
<tr>
<td>X-RIM-Push-Destination</td>
<td>This header contains the email address, BlackBerry smartphone PIN, or BlackBerry smartphone user group name to which the push request was sent.</td>
</tr>
<tr>
<td></td>
<td>- Your organization must have BlackBerry Enterprise Server 4.1 or later for the BlackBerry MDS Connection Service to include this header in the response.</td>
</tr>
</tbody>
</table>

Response codes for the RIM push format

<table>
<thead>
<tr>
<th>Response code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>The push request was accepted by the BlackBerry MDS Connection Service.</td>
</tr>
<tr>
<td>400</td>
<td>A general error occurred. This response is often caused by an invalid push format.</td>
</tr>
</tbody>
</table>

- In BlackBerry Enterprise Server 3.7 and earlier, this error code is returned if the BlackBerry smartphone is not associated with the BlackBerry Enterprise Server, or when push access control has been enabled on the BlackBerry Enterprise Server and the server making the push request does not have permission to push data.
<table>
<thead>
<tr>
<th>Response code</th>
<th>Description</th>
</tr>
</thead>
</table>
| 403           | The BlackBerry smartphone is not associated with the BlackBerry Enterprise Server, or push access control has been enabled on the BlackBerry Enterprise Server and the server making the push request does not have permission to push data.  
This error code was introduced in BlackBerry Enterprise Server 4.0. In previous versions of the BlackBerry Enterprise Server, the BlackBerry MDS Connection Service responds to this error with response code 400. |
| 404           | The push request was not received by the BlackBerry MDS Connection Service. Verify that you have supplied the correct web address and port number for the BlackBerry MDS Connection Service in your push request. |
| 503           | The BlackBerry MDS Connection Service is busy or is unable to manage the push request due to temporary overloading or server maintenance.  
By default, the BlackBerry MDS Connection Service is configured to manage 1000 simultaneous push requests, including push requests that have previously been accepted and are pending delivery. |
Writing a basic server-side push application

You can use any programming language that can establish an HTTP connection to create a server-side push application. This chapter uses Java® to demonstrate a server-side push application.

To write a basic server-side push application, complete the following steps:

1. For PAP push, specify the push parameters. (For RIM push, the parameters are specified as part of the Push web address.)
2. Connect to the BlackBerry MDS Connection Service.
3. Define the properties for the HTTP POST request.
4. Write data to the server connection.
5. Read the server response.
6. Close the server connection.

Specifying a port number

To specify a port number, include the X-Rim-Push-Dest-Port header with the port number.

Note: Some port numbers are reserved. You cannot use the following port numbers:
- 80
- 443
- 7874
- 8080

Connecting to the BlackBerry MDS Connection Service

To connect to the BlackBerry MDS Connection Service, establish a connection using the fully qualified computer name or IP address.

Constructing the push web address

To construct the push web address, use one of the following formats:
Understanding client/server push

- To create a RIM push request:
  `/push?DESTINATION=destination&PORT=port&REQUESTURI=uri`
  `<headers>`
  `<content>`
- To create a PAP push request:
  `/pap`

Connecting to the BlackBerry Enterprise Server

To connect to the BlackBerry Enterprise Server, complete the following steps:

1. **Invoke** `openConnection()` with the push web address.

2. **Cast the object that the** `openConnection()` **returns as an HttpURLConnection.** An HttpURLConnection represents a connection to a remote object.
   ```java
   HttpURLConnection conn = (HttpURLConnection) url.openConnection();
   ```

Defining the properties for the HTTP POST request

To define the properties for the HTTP POST request, complete the following steps:

1. **Create a POST request.**
   ```java
   conn.setRequestMethod("POST");
   ```

2. **To receive confirmation, configure the parameter in** `setDoInput(Boolean)` **to True to indicate that the application will read data from the web address connection.**
   ```java
   conn.setDoInput(true);
   ```
Writing data to the server connection

To write data to the server connection, complete the following steps:

1. To access an output stream, invoke `getOutputStream()`.
   ```java
   OutputStream out = conn.getOutputStream();
   ```

2. Write data to the output stream.
   ```java
   out.write(data);
   ```

3. Close the output stream.
   ```java
   out.close();
   ```

Reading the server response

To read the server response, complete the following steps:

1. To access an input stream, invoke `getInputStream()`.
   ```java
   InputStream ins = conn.getInputStream();
   ```

2. Determine the size of the content. If the size of the content is not zero, open a data input stream, and then retrieve the content.
   ```java
   int contentLength = conn.getContentLength();
   if (contentLength > 0) {
       byte[] someArray = new byte [contentLength];
       DataInputStream dins = new DataInputStream(ins);
       dins.readFully(someArray);
       System.out.println(new String(someArray));
   }
   ```

3. Close the input stream.
   ```java
   ins.close();
   ```

Closing the server connection

To indicate that the application will make no further requests to the server, invoke `disconnect()`.
```java
conn.disconnect();
```
1. Your server-side application can use the PAP push format to send the following three types of requests to the BlackBerry MDS Connection Service:
   A. Push request
   B. Pull request
   C. Load request
   D. Status-query request
   E. Cancellation request
   F. Close request

2. All PAP control entities have what three common document elements?

3. You send the request as an ______________________ to the BlackBerry MDS Connection Service. If you configure the BlackBerry MDS Connection Service to support secure connections, you can use the HTTPS protocol. Fill in the blank.
Answers

1. A, D, and E

2. All PAP control entities have the following three common document elements:
   - the XML declaration
   - the DOCTYPE declaration
   - a root <pap> element

3. HTTP POST request
Creating 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 delivery parameters that 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
- Deliver-Before time stamp
- Deliver-After time stamp

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

- Push cancellation
- Push status query

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

Pushing data to multiple BlackBerry smartphone users

In BlackBerry Enterprise Server 4.1 or later, use the BlackBerry MDS Connection Service to submit a single push request for multiple BlackBerry smartphone users. You can specify multiple recipients using one of the following methods:

- by specifying multiple email addresses or BlackBerry smartphone PINs in the push request
- by specifying a BlackBerry user group (which specifies multiple recipients using a single address) in the push request

Some BlackBerry Enterprise Server architectures feature multiple distributed BlackBerry MDS Connection Service push servers.

If a push request is received by a central push server that supports multiple recipients, and the push request is redirected to a BlackBerry MDS Connection Service that does not support multiple recipients, then the central push server creates a new push request for each address (or in the case of a group, each member address) specified in the original push request.

Pushing data to multiple recipient addresses

Pushing data to multiple recipient addresses rather than to a BlackBerry user group permits you to cancel, query, or receive result notifications for individual recipients.

However, using multiple addresses can result in large push requests. For example, the Apache Tomcat server limits the total size of the web address and headers in an HTTP request to about 3KB. A RIM push
request that adds a large number of recipient addresses to the query string can exceed this limit, causing Tomcat to close the connection. To avoid this issue, push to fewer recipient addresses at a time.

Push requests can be redirected from a centralized push server to other BlackBerry MDS Connection Services for delivery using the RIM push format. As a result, even if the original push request uses the PAP push format, the web address size limitation can cause a redirection error if enough destination addresses require redirection. To avoid this issue, either push to fewer recipient addresses at a time, or submit the push request directly to the BlackBerry MDS Connection Service to which the recipient addresses are mapped.

**To push data to multiple recipient addresses**

- **Using the PAP push format:** Include an `<address>` element for each intended recipient. The `address-value` attribute specifies the email address or BlackBerry smartphone PIN for the recipient, along with the port number.

  For example, the following XML indicates sends data to two BlackBerry smartphone users specified by their email addresses (user1@rim.com and user2@rim.com):

  ```xml
  <address address-value="WAPPUSH=user1%40rim%2ecom%5B%3A7874/
  TYPE=USER@rim.net" />
  <address address-value="WAPPUSH=user2%40rim%2ecom%5D%3A7874/
  TYPE=USER@rim.net" />
  ``

  All nonalphanumeric characters in the smartphone email portion of the `address-value` attribute, other than "+", ",", ",", or "," must be web address encoded as hexadecimal values in the PAP control entity.

- **Using the RIM push format:** Include a separate DESTINATION parameter for each intended recipient email address or BlackBerry smartphone PIN in the query string.

  For example, the following web address sends the push request to two BlackBerry smartphone users specified by their email addresses (user1@rim.com and user2@rim.com):

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

**Pushing data to a BlackBerry user group**

BlackBerry user groups represent multiple recipients using a single address. Groups are administered on the server, so you can add or remove BlackBerry smartphone users without altering the address of the group as a whole. This reduces the complexity of adding many individual addresses to a push request, and minimizes the size of the push request.

When you send a push request to a group, the BlackBerry MDS Connection Service considers the group to be a single entity, which can inhibit the flexibility of a push application. For example, the following limitations apply:
• If you submit a reliable push request for a group, you do not receive a result notification for each
member of the group. Instead, the BlackBerry MDS Connection Service returns a single result
notification for the group as a whole.
• If you send a push request to a group using the PAP push format, you cannot cancel or query the
status of the push request for a particular group member; you must cancel or query the status
for the entire group.

The BlackBerry® MDS Simulator does not support pushing data to groups, so you cannot test pushing
data to groups in a simulated environment.

To push data to a group
• Using the PAP push format: Include a single <address> element for the group. The address-
value attribute specifies the group name.

To identify the value as a BlackBerry user group, you must prefix the group name with a web
address encoded $ character (%24). The following example sends the push request to a single
group called Marketing:

<address address-value="WAPPUSH=%24Marketing/TYPE=USER@rim.com"/>

All nonalphanumeric characters in the smartphone email portion of the address-value
attribute, other than "+", ",", ",", or "/" must be web address encoded as hexadecimal values in the
PAP control entity.
• Using the RIM push format: Add a DESTINATION parameter for the group to the request.

To identify the value as a BlackBerry user group, you must prefix the group name with a $
character. For example, the following web address sends the push request to a single group
called Marketing:

PORT=7874&REQUESTURI=/

Using push request reliability

In your push request, you can specify that you want the BlackBerry smartphone to return a result noti-
formation when the pushed data is successfully delivered. The BlackBerry MDS Connection Service
receives notifications from each destination BlackBerry smartphone that successfully receives the
pushed data and forwards those notifications to the push originator. Similarly, the BlackBerry MDS
Connection Service sends a notification to the push originator if a push request is not successfully
delivered to one or more destination BlackBerry smartphones within the allotted time.

If you do not specify a reliability level for your push method, the BlackBerry MDS Connection Service
does not provide the push originator with any notification regarding the outcome of the push request.
With every push request that specifies a reliability option, you must also specify a notification web address to which the BlackBerry MDS Connection Service sends result notifications. A push request that requests some level of reliability but does not provide a notification web address is rejected by the BlackBerry MDS Connection Service.

If you create a custom BlackBerry Java Application to receive and process pushed data and intend to use application-reliable push requests, you must register the client-side application listen port number with the BlackBerry MDS Connection Service. Provide the unique port numbers to your BlackBerry Enterprise Server Administrator. If you are pushing data to the BlackBerry Browser, the port is preregistered.

If you have created a BlackBerry Java Application as a push listener and you intend to use application level reliability push requests, design your application to make a request through the BlackBerry MDS Connection Service the first time the application runs.

Application-reliable push requests are supported only on BlackBerry smartphones running BlackBerry Device Software 3.8 or later. Therefore, before you can submit an application-reliable push request, the BlackBerry MDS Connection Service must acquire the BlackBerry Device Software version information. The BlackBerry MDS Connection Service acquires the BlackBerry smartphone information from the device profile, which is identified in the `UAProf` header when a BlackBerry smartphone user requests content using the BlackBerry Browser.

If the BlackBerry smartphone user must register to use your push application, or if the user downloads your BlackBerry Java Application using the BlackBerry Browser, then the BlackBerry MDS Connection Service automatically registers the smartphone information for each recipient.

Your application can return the following error:

The specified delivery method is not possible

This error appears when your application attempts to send an Application-Level Reliable Push to a BlackBerry smartphone when either of the following conditions is true:

- the user has never used the BlackBerry Browser
- an IT Policy disables the use of the BlackBerry Browser.

You can prevent this by making a request using the BlackBerry MDS and providing the necessary values for the User Agent and User Agent Profile headers. This causes BlackBerry MDS to register the BlackBerry Device Software version and thereby verify whether Application-Level acknowledgements are supported.

- Configure the User Agent header as follows:
  `BlackBerry<BlackBerry-model>/<software-version>`

  Where `<BlackBerry-model>` is the model number of the device making the request, and `<software-version>` is the device software version.

Following is an example header for the BlackBerry 8700 Wireless Handheld™ running Device Software 4.1:
`BlackBerry8700/4.1.0`
• Configure the User Agent Profile header as follows:
  http://www.blackberry.net/go/mobile/profiles/uaprof/<BlackBerry-model>/</software-version>.rdf

  Where <BlackBerry-model> is the model number of the device making the request and
  <software-version> is the device software version.

  Following is an example for the BlackBerry 8700 wireless handheld running Device Software 4.1:
  http://www.blackberry.net/go/mobile/profiles/uaprof/8700/4.1.0.rdf

Use one of the following methods to determine the device model and software version:

• On the BlackBerry smartphone, click Options > About

• Use method net.rim.device.api.system.DeviceInfo.getDeviceName(), and DeviceInfo.getSoftwareVersion().
1. Which of the following uses XML for push notifications? *Choose one.*
   
   A. RIM push
   
   B. PAP push
Answers

1. B
Client/server push applications send data from a server-side application to a custom client application on the BlackBerry smartphone. Compared to browser push applications, client/server push provides more control over the type of content that can be sent, and over how the BlackBerry smartphone processes and displays the content. The push application, in conjunction with the BlackBerry MDS Connection Service, delivers content without user intervention.

Two applications are involved in client/server push. A server-side push application, which submits the push request, and a client-side listener application, which listens for incoming push messages.

- You create the server-side push application, which sends 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 smartphone within a specified time. Push requests generated by this application must conform to either the WAP PAP version 2.0 specification or to the RIM push format.
- You can use the client-side listener application that is integrated into the BlackBerry® Browser, or you can create a custom BlackBerry Java Application that listens for and handles pushed data.

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.

You can use any programming language that can establish an HTTP connection to create a server-side push application.

A push request can require a server-side application to be notified when pushed data arrives on a destination BlackBerry smartphone. You specify a web address in the X-RIM-Push-NotifyURL header, and the BlackBerry Mobile Data Service sends a notification to the specified web address when the push is delivered, or if a failure occurs.
Review Questions

1. What are the distinguishing characteristics of client/server push applications?

2. List the network gateways you can use, and how push works with each one.

3. You can use ________ programming language that can establish an HTTP connection to create a server-side push application. Fill in the blank.

4. A client-side push application requires a ____________ thread. Fill in the blank.

5. Push reliability provides an ________________ mechanism for push requests. Fill in the blank.

6. Push requests for multiple recipients can specify multiple email addresses, multiple PINs, or a user group. If you specify multiple recipients by using email addresses or PINs, a ____________ push notification is sent from the BlackBerry MDS Connection Service for each push recipient. Fill in the blank.