



CMER

Centre for Mobile Education and Research

Mobile Applications with Java ME & BlackBerry



Overview

- **Java ME**
 - Networking
 - Databases
- **Java ME and the BlackBerry**
 - The BlackBerry wireless device
 - Converting existing Java ME apps for the BlackBerry
 - Deploying applications on the BlackBerry
 - Blackberry AppWorld



Java Networking

- **J2SE and J2EE networking APIs are not suitable for handheld devices**
 - **Require several megabytes of memory to run**
 - **Device manufacturers who work with circuit-switched networks require TCP support**
 - **Device manufacturers who work with packet-switched networks require UDP support**
 - **Other devices have specific mechanisms for communications**



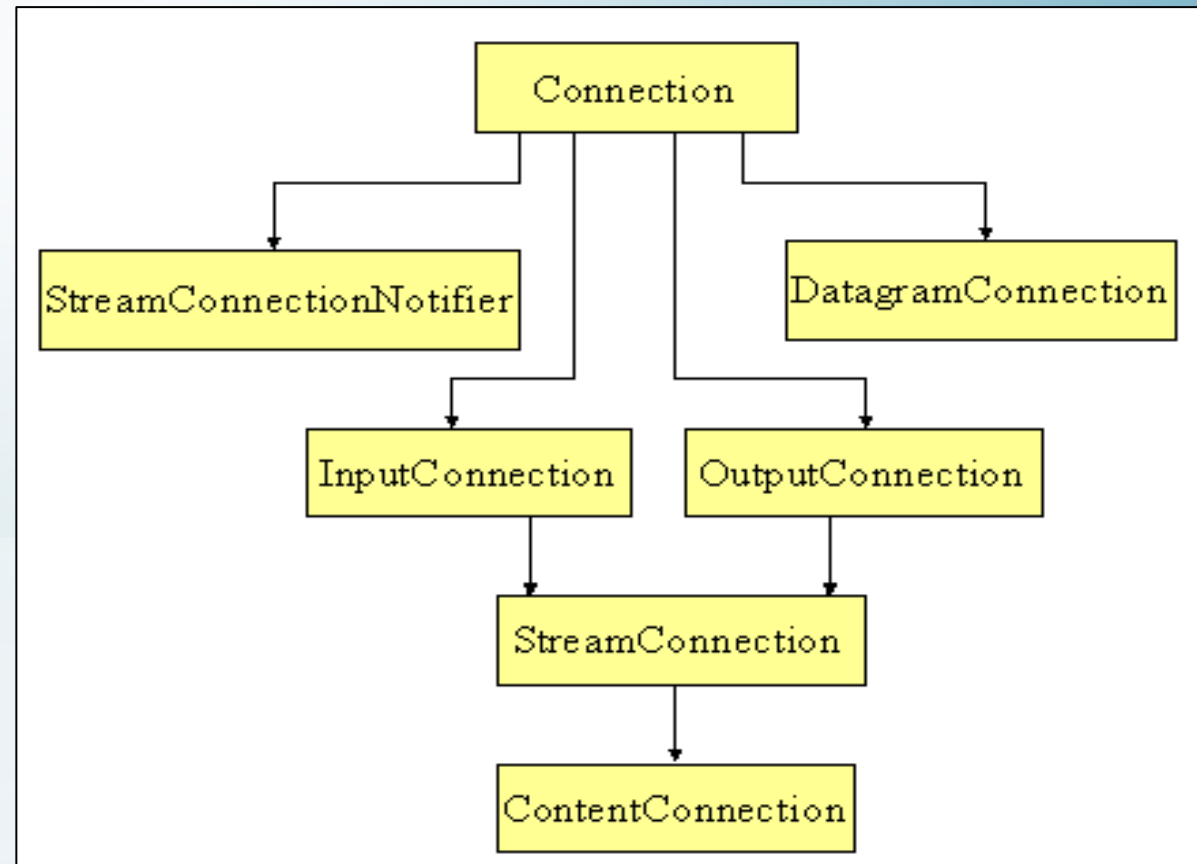
CLDC Generic Connections

- A set of related abstractions at the programming level
- No abstractions for different forms of communications
- All connections are created using the *Connector.open()*
- If successful, it returns an object that implements one of the generic connection interfaces



MIDP Generic Interfaces

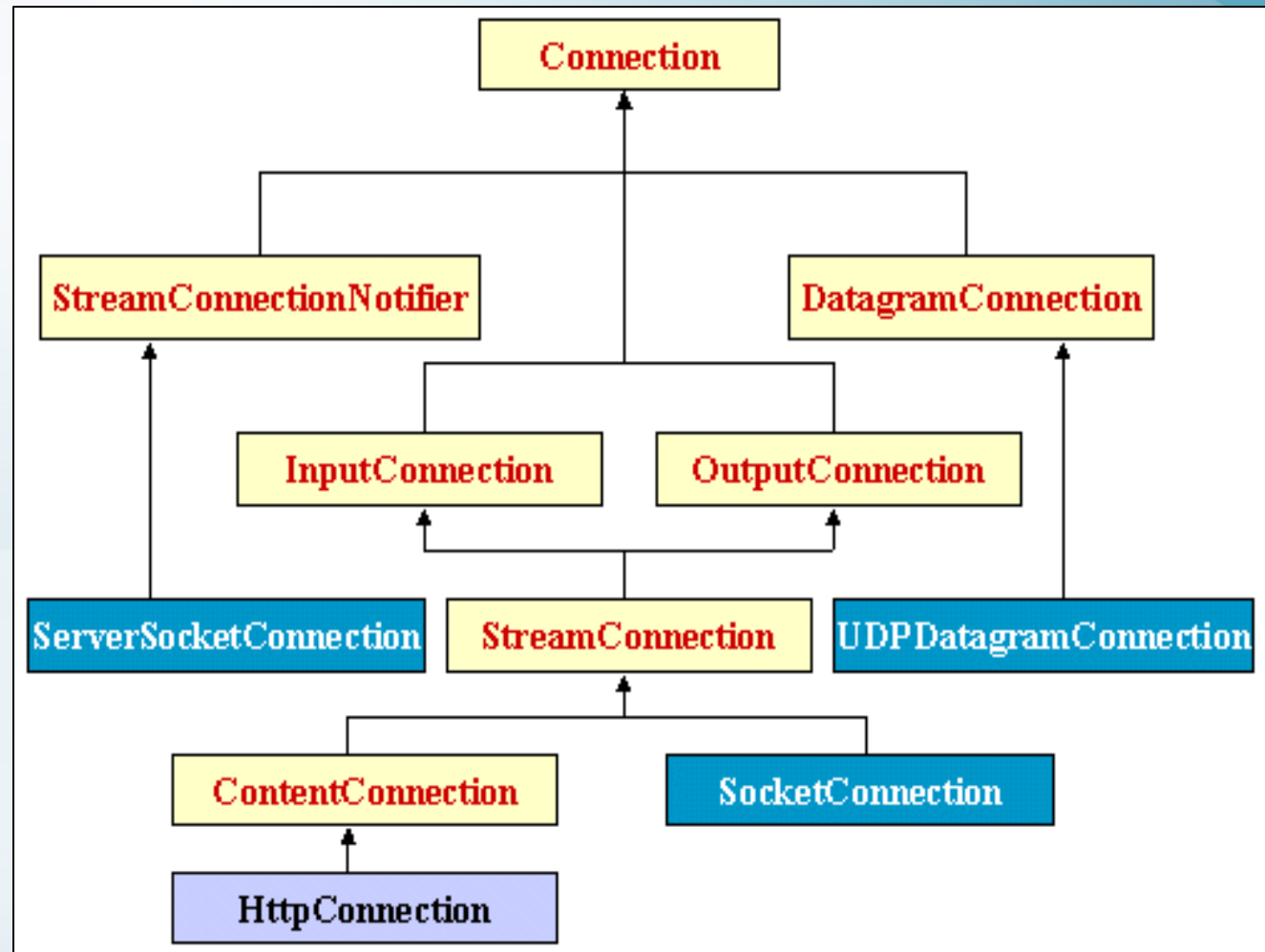
- MIDP 1.0





MIDP Generic Interfaces

- MIDP 2.0





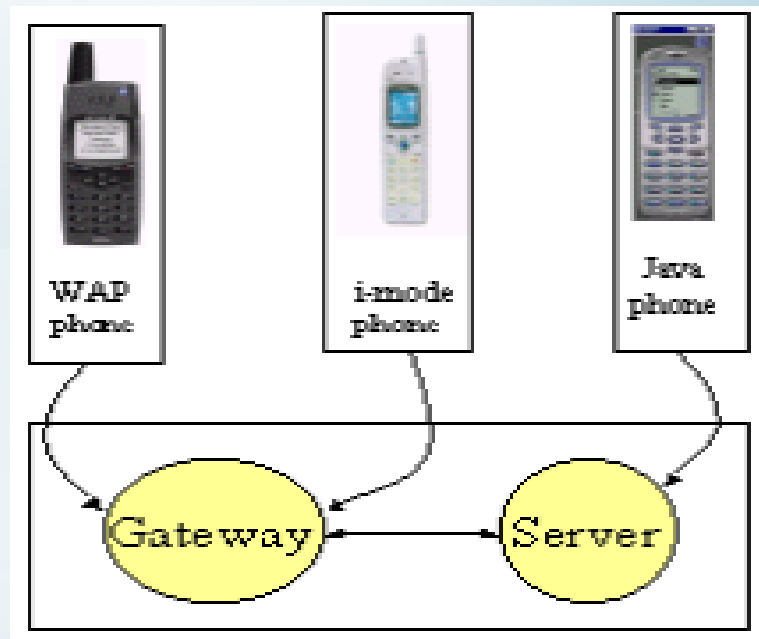
Connections: Examples

- **HTTP:**
`Connector.open("http://www.host.com");`
- **Socket:**
`Connector.open("socket://host.com:80");`
- **Datagram:**
`Connector.open("datagram://address:port");`
- **File:**
`Connector.open("file:/myfile.txt");`



MIDP Connectivity

- It provides support for HTTP (*HttpConnection*)
- Why? HTTP can be implemented using IP protocols or non-IP protocols





URLConnection

- Part of the `javax.microedition.io`
- Defines the necessary methods and constants for an HTTP connection

```
URLConnection c = (URLConnection)
    Connector.open("http://quotes.yahoo.com");
C.setRequestMethod(URLConnection.POST);
C.setRequestProperty("Content-Language", "en-CA");
```



Invoking Remote Applications

- A MIDlet may invoke remote applications:
 - Fetching a page
 - Invoking a CGI script (GET or POST method)
 - Invoking a Servlet



Advantages of CLDC Generic Connections

- Isolate the differences between the setup of one protocol and another
- Most of the application code remains the same regardless of the protocol you use
- Note: CLDC itself does not provide any protocol implementation



Databases

- **A persistent storage: a place to store the state of objects**
- **Facilities provided in J2SE and J2EE are not suitable for handheld devices**
- **MIDP provides a record-oriented database mechanism to persistently store data and retrieve it later**



MIDP'S RMS

- **Lightweight record-oriented database**
 - Device independent API
 - Unique recordID for each record within the store
 - A record is an array of bytes
 - Shared within MIDlet suite
 - Support for enumeration, sorting, and filtering
- `javax.microedition.rms`



MIDP - RMS Methods

- Record Store

openRecordStore, closeRecordStore, listRecordStore,
deleteRecordStore, getRecordSize, getNumRecords

- Record Data

addRecord, deleteRecord, getRecord, setRecord,
getRecordSize

- Record Selection

RecordEnumeration, RecordFilter, RecordComparator



RMS: Record Stores

- To open a record store:
 - `RecordStore db = RecordStore.openRecordStore("myDB", true);`
- To close a record store:
 - `db.closeRecordStore();`



Create/Add a New Record

- To create a new record:

```
ByteArrayOutputStream baos = new  
    ByteArrayOutputStream();
```

```
DataOutputStream dos = new DataOutputStream(baos);
```

```
dos.writeUTF(record);
```

```
Byte b[] = baos.toByteArray();
```

```
db.addRecord(b, 0, b.length);
```




THE BLACKBERRY WIRELESS DEVICE



The BlackBerry Smartphone

- The BlackBerry is a wireless handheld device developed by Research In Motion (RIM) in 1999.
- Supports push e-mail, mobile telephone, text messaging, internet faxing, web browsing and other wireless information services.
- Delivers information over the wireless data networks of mobile phone service companies.
- RIM currently offers BlackBerry e-mail service to non-BlackBerry devices, such as the Palm Treo, through the BlackBerry Connect software.



Developing for the BlackBerry

- Unlike MIDlets, BlackBerry applications do not have a lifecycle
- Applications are compiled into .COD files rather than .JAD and .JAR
- In addition to full support of standard CLDC and MIDP APIs, RIM provides BlackBerry-specific extensions that enable you to develop applications with the look and feel of native applications



Developing for the BlackBerry (Cont.)

- The BlackBerry APIs provide tighter integration for BlackBerry devices, and access to BlackBerry features for user interface, networking, and other capabilities
- CLDC, MIDP, and BlackBerry APIs may be used together in the same application – with the notable exception of user-interface APIs
- RIM's UI APIs provide greater functionality and more control over the layout of your screens and fields, but at a cost: Resulting MIDlets will be non-standard, so porting to other platforms will require more effort



Java ME to BlackBerry

- **Converting a J2ME MIDlet to a .COD involves the following steps:**
 - **Download and install the RIM Java Development Environment**
 - **Download and install Java SDK**
 - **Copy the jad & jar files in question to the /bin/ directory of your RIM JDE installation**



Java ME to BlackBerry (Cont.)

- From the command line (make sure you are in the bin directory of your RIM JDE installation) type:
`rapc import="$your_JDE_dir\lib\net_rim_api.jar"
codename=$your_app -midlet jad=$your_app.jad
$your_app.jar`

where \$your_JDE_dir is the directory of your RIM JDE installation, \$your_app is the name of the MIDlet you're trying to convert, \$your_app.jad is the name of the MIDlet descriptor and \$your_app.jar is the name of the MIDlet jar file



Java ME to BlackBerry (Cont.)

- The following files are generated:
 - `$your_app.debug`
 - `$your_app.cod`
- `$your_app.debug` may be discarded
- `$your_app.cod` is used to load the application onto the BlackBerry



Java ME to BlackBerry (Cont.)

- Some MIDlets can't be directly translated into RIM .cod files because attributes in the .jad contain ASCII characters that are not valid in a project name in the RIM tool used to build .cod files.
- BlackBerry devices do not install from .jar and .jad files, but from proprietary binary formats created from the .jar and .jad files.



Loading Applications on the BlackBerry

- To load the application onto the BlackBerry:
 - Connect BlackBerry to computer via USB and from the command line (make sure you are in bin directory of your RIM JDE installation) type:

```
javaloader -usb load $your_app.cod
```

- The J2ME application will appear in the home screen on the BlackBerry.



Removing Applications from the BlackBerry

- To remove an application from the BlackBerry:
 - Connect BlackBerry to computer via USB and from the command line (make sure you are in bin directory of your RIM JDE installation) type:

```
javaloader -usb erase $your_app.cod
```

- The J2ME application will no longer appear in the home screen on the BlackBerry.



Wiping the Blackberry Device

- Useful when transferring a device to another individual or cleaning the device after many application installations
- To wipe a Blackberry device of application data and third party applications enter the 'Options' menu, select 'Security Options' then 'General Settings', press the Blackberry button and select 'Wipe Handheld', confirm the dialog and type 'blackberry' to confirm



Blackberry AppWorld

- The BlackBerry AppWorld allows mobile application developers to distribute their applications to customers
- AppWorld helps provide BlackBerry developers a unified location to distribute their BlackBerry applications and helps promote development on the BlackBerry device
- RIM provides technical testing of applications and provides feedback on the suitability of the applications as well as information regarding the individuals who download your application



Java ME and BlackBerry Tools

- **Sun's Wireless Toolkit:**
 - <http://java.sun.com/products/sjwtoolkit>
- **NetBeans(Mobility Pack)**
 - <http://www.netbeans.org>
- **RIM's BlackBerryJDE:**
 - <http://www.rblackberry.com/developers>



Resources

- **Java ME (J2ME):**
 - <http://java.sun.com/javame/index.jsp>
- **CLDC and KVM:**
 - <http://java.sun.com/products/cldc>
- **MIDP:**
 - <http://java.sun.com/products/midp>
- **Sun Microsystems Developer Network:**
 - java.sun.com/wireless
- **WirelessDevNetDeveloper Portal:**
 - www.wirelessdevnet.com