Code Examples Using Java™ ME Technology and New Web 2.0 Services (Beyond Google Maps)

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Goal

What you will learn

Learn how to use Web 2.0 services with Java™ Platform, Micro Edition technology-enabled cell phones by seeing code examples and stepping through the lines of code

Updates

https://j2me-cdc.dev.java.net/servlets/ProjectDocumentList

Look in: conferences->javaone->2006

Agenda

Introduction to Web 2.0
Overview of Java ME Technology
Bridging Web 2.0 and Java ME Technology
Code Example One: Amazon Searches
Code Example Two: Flickr
Code Example Three: Your Own Service
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Introduction to Web 2.0

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Introduction to Web 2.0

Moving to semantic-based Internet services

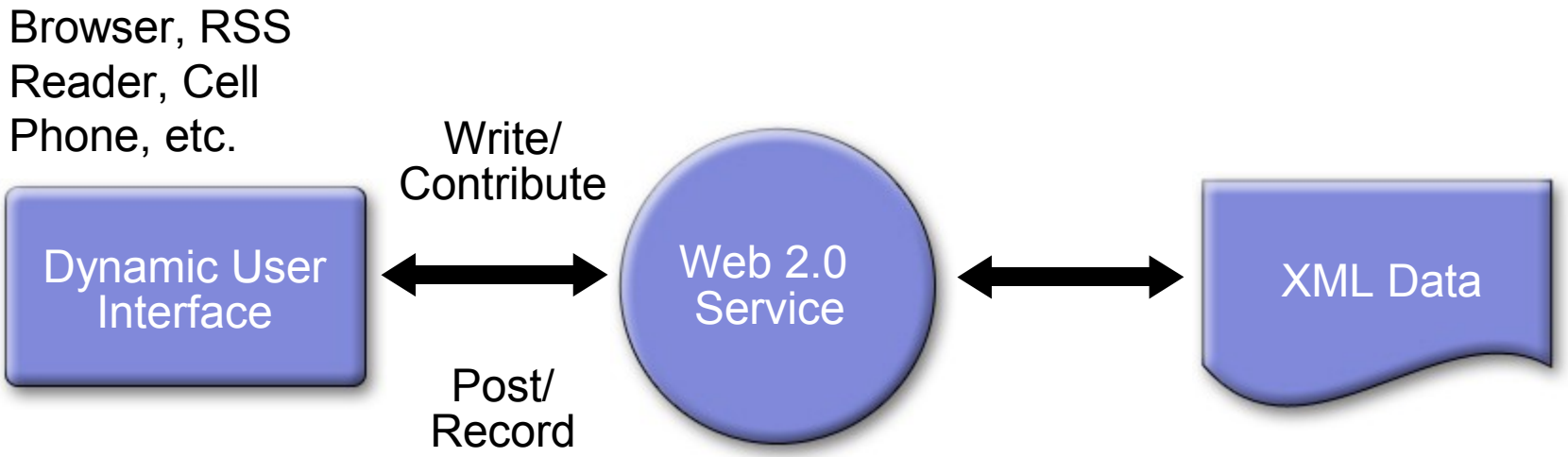
- **The Web as a Platform**: Programming to the Internet, not to a computer system
- **Collective Services**: Using various Web services together; Mash-ups
- **Shareable Data**: Sharing XML data among many services
- **Dynamic Updates**: Software is updated whenever it is used

Introduction to Web 2.0 (Cont.)

Moving to semantic-based Internet services

- **Lightweight Programming:** Example: **AJAX**—**A**synchronous **J**avaScript™ technology **A**nd **X**ML
  - XHTML/CSS—Standards based markup
  - DOM—Document Object Model dynamic display
  - XMLHttpRequest—Asynchronous data retrieval
  - JavaScript technology—For Web page programming
- **Cross-Device Compatibility:** Not targeted for one platform
- **Better User Experience:** Combine data from many sites; Example: Map of houses for sale

Web 2.0


Browser, RSS Reader, Cell Phone, etc.
Write/ Contribute
Dynamic User Interface
Web 2.0 Service
XML Data
Post/ Record

Introduction to Web 2.0

Moving to semantic-based Internet services

- **The Web as a Platform:** Programming to the Internet, not to a computer system
- **Collective Services:** Using various Web services together—Mash-ups
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Introduction to Web 2.0 (Cont.)

REST Protocol

- **REST**—Representational State Transfer (Roy Fielding)
- Software architecture defined:
  - Components
  - Connectors
  - Data
- Constrained in their relationships in order to achieve a desired set of architectural properties

Introduction to Web 2.0 (Cont.)

REST Protocol

- To create a REST service, you need to answer the following questions, and you should answer them in this order:
  - What are the URIs?
  - What is the format?
  - What methods are supported at each URI?
  - What status codes could be returned?
- Example:

  http://xml.amazon.com/onca/xml2?t=webservices-20&dev-=D1UCR04XBIF4A6&page=1&+”f=xml&mode=books&type=lite+”&KeywordSearch='hinkmond’

Introduction to Web 2.0 (Cont.)

AJAX example: HTML page (UI dynamic update)

```
<form name="autofillform" action="autocomplete" method="get">
 <table border="0" cellpadding="5" cellspacing="0">
    <tr>
     <td><b>Employee Name:</b></td>
     <td>
      <input type="text" id="complete-field" size="20"
                autocomplete="off"
                onkeyup="doCompletion();">
     </td>
     <td align="left">
      <input id="submit_btn" type="Submit" value="Lookup Employee">
     </td>
    </tr>
    <tr><td id="auto-row" colspan="2"> <td/></tr>
  </table>
</form>
<div style="position: absolute; top:170px;left:140px" id="menu-
popup">
 <table id="completeTable" border="1" bordercolor="black"
cellpadding="0" cellspacing="0" />
</div>
```

Introduction to Web 2.0 (Cont.)

AJAX example: JavaScript technology

```
function getXHR(url) {
    if (window.XMLHttpRequest) {
        return new XMLHttpRequest();
    } else if (window.ActiveXObject) {
        return new ActiveXObject("Microsoft.XMLHTTP");
    }
}

function doCompletion() {
    var url = "autocomplete?action=complete&id=" +
encodeURI(target.value);
    var req - getXHR(url);
    req.onreadystatechange = processRequest;
    req.open("GET", url, true);
    req.send(null);
}
```

Introduction to Web 2.0 (Cont.)

AJAX example: Servlet

```
public  void doGet(HttpServletRequest request, HttpServletResponse  response)
            throws IOException, ServletException {
    String targetId = request.getParameter("id");
    Iterator it = employees.keySet().iterator();
    while (it.hasNext()) {
        EmployeeBean e = (EmployeeBean)employees.get((String)it.next());
        if ((e.getFirstName().toLowerCase().startsWith(targetId) ||
            e.getLastName().toLowerCase().startsWith(targetId)) && !targetId.equals(""))  {
            sb.append("<employee>");
            sb.append("<id>" + e.getId() + "</id>");
            sb.append("<firstName>" + e.getFirstName() + "</firstName>");
            sb.append("<lastName>" + e.getLastName() + "</lastName>");
            sb.append("</employee>");
            namesAdded = true;
        } }
    if (namesAdded) {
        response.setContentType("text/xml");
        response.setHeader("Cache-Control", "no-cache");
        response.getWriter().write("<employees>" + sb.toString() + "</employees>");
    } response.setStatus(HttpServletResponse.SC_NO_CONTENT);
}
```

Introduction to Web 2.0 (Cont.)

AJAX example: JavaScript client callback

```
function postProcess(responseXML) {
    clearTable();
    var employees = responseXML.getElementsByTagName("employees")[0];
    if (employees.childNodes.length > 0) {
        completeTable.setAttribute("bordercolor", "black");
        completeTable.setAttribute("border", "1");
    } else {
        clearTable();
    }
    for (loop = 0; loop < employees.childNodes.length; loop++) {
        var employee = employees.childNodes[loop];
        var firstName = employee.getElementsByTagName("firstName")[0];
        var lastName = employee.getElementsByTagName("lastName")[0];
        var employeeId = employee.getElementsByTagName("id")[0];
     appendEmployee(firstName.childNodes[0].nodeValue,
lastName.childNodes[0].nodeValue, employeeId.childNodes[0].nodeValue);
    }
}
```

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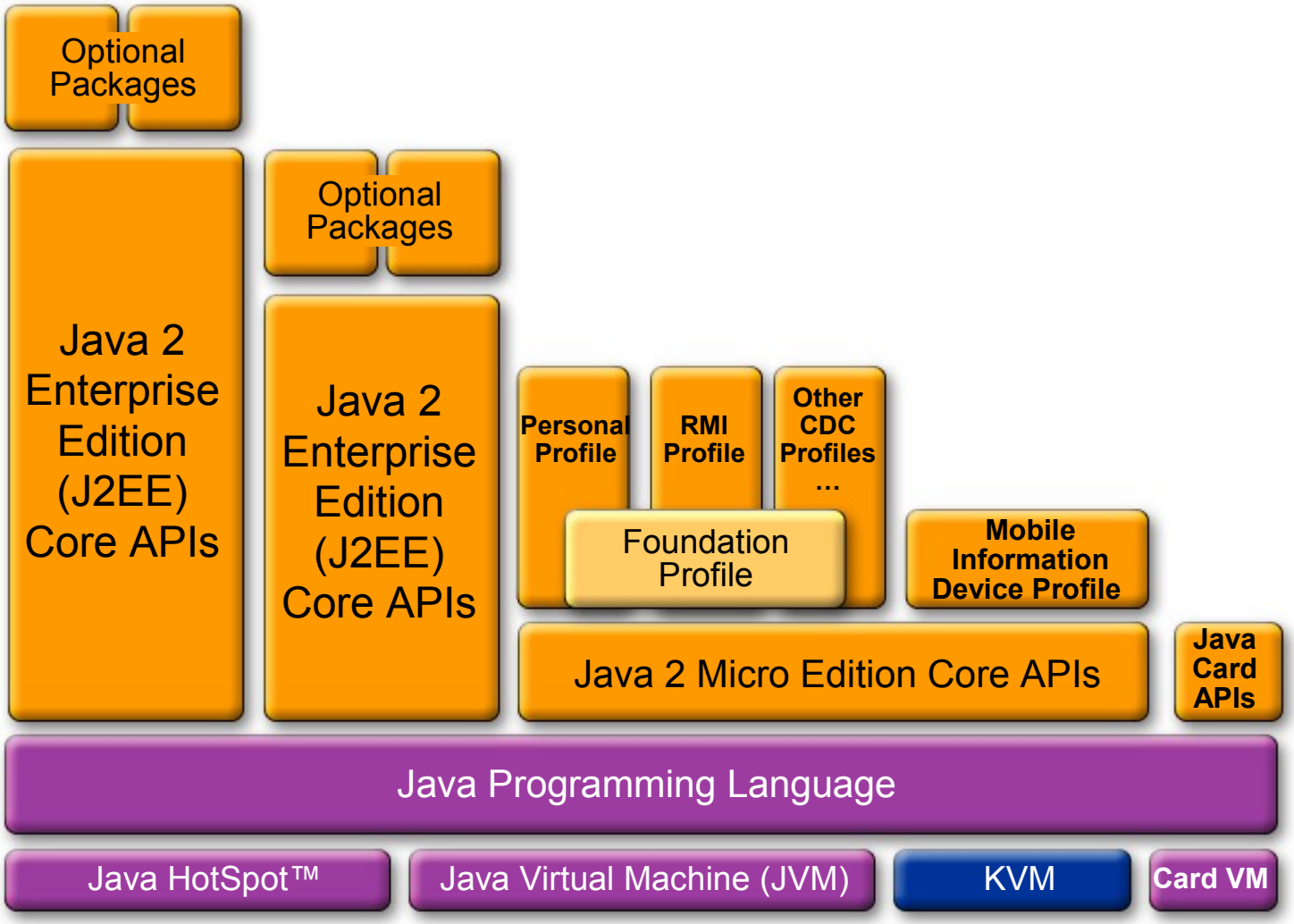
Java Platform, Micro Edition (Java ME)



Overview of Java ME Technology

Mapping the layers

- **Configurations:** CLDC and CDC—Virtual Machines and base libraries
- **Profiles:** MIDP and Foundation Profile—Adding more specific APIs
- **Optional Packages:** Platform extensions.
- **Java Community Process℠:** Specifications developed by expert groups with representation from different companies and individuals

Overview of Java ME Technology

JSR 290

- Integrate Java ME and Web Technologies
  - Web Formats (XHTML, SVG* Tiny, ESMP*, CSS* Basic)
  - Java ME/Browser interactions
  - Java ME Web Engines integration
  - Browser integration of Java ME components
- Integrate the work of professionals with different skills:
  - Various programming skills (Java technology or ESMP)
  - Various graphic art skills

Overview of Java ME Technology

JSR 290: What is CDF?

- Compound Document Format
- W3C Working Group
  - Nokia, Vodafone, Sun, France Telecom, Sony Ericsson, RIM, IBM, Adobe, Opera, Iikivo, Fuchsia Design, Infraware, Streamezzo, Mozilla, Justsystem, Helsinki University of Technology, Volantis, Expway, Infraware
- Defining rules for combining XML UI markups
  - XHTML Basic, SVG, CSS Basic, ESMP
- Goal is to facilitate rich multimedia content defined using multiple markup languages (+ ECMAScript)

Overview of Java ME Technology

JSR 290: What is the value proposition of CDF?

- Adds layout capabilities to combined markup
- Adaptability to screen size and form factor
- Mixed content
  - Interaction rules for combined markup
  - Animation and interactivity as a UI around other content
- Unified and consistent DOM API model, animation model and event model—Simple
- Leverages body of experience, content, and tools

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Bridging Web 2.0 and Java ME Technology

Java platform for small devices

- **XHTML/CSS**—XML data can also be used by Java ME (JSR 172—Web Services)
- **DOM**—Future Java Specification Requests will address DOM better (JSR 290—CDF); For now, use MIDP MIDlets as the User Interface
- **XMLHttpRequest**—Using Generic Connection Framework HttpConnection with XML parsing
- **JavaScript technology**—Only found in Opera Mini Browser. Instead use Java ME CLDC/MIDP which is more robust and allows object-oriented design
- JSR 279: Service Connection API for Java ME **(SOA)**
- JSR 280: **XML** for Java ME

XML Parsing Http Request Code Sample

```
SAXParserFactory saxpf =
  SAXParserFactory.newInstance();
SAXParser saxp = saxpf.newSAXParser();

// HTTP Request of XML data
try {...
StreamConnection httpconn = (StreamConnection)
  Connector.open("http://localhost/test.xml");
...} catch...

InputStream is = httpconn.openInputStream();
InputSource inputsrc = new InputSource(is);

saxp.parse(is, new MyHandler(this));
```

XML Parsing Http Request Code Sample (Cont.)

```
class MyHandler extends DefaultHandler {
  private Stack tags = new Stack();

  public void startDocument() throws SAXException {}

  public void startElement(String uri, String
   localname, String qName, Attributes attr)
   throws SAXException {
    if(qName.equals("blah")) {
      // Do stuff here
    }
    tags.push(qName);
  }
```

XML Parsing Http Request Code Sample (Cont.)

```
public void characters(...) {
   // Process characters here...
}

public void endElement(...) {
}

public void endDocument() throws SAXException {
   // Action after everything parsed
}
```

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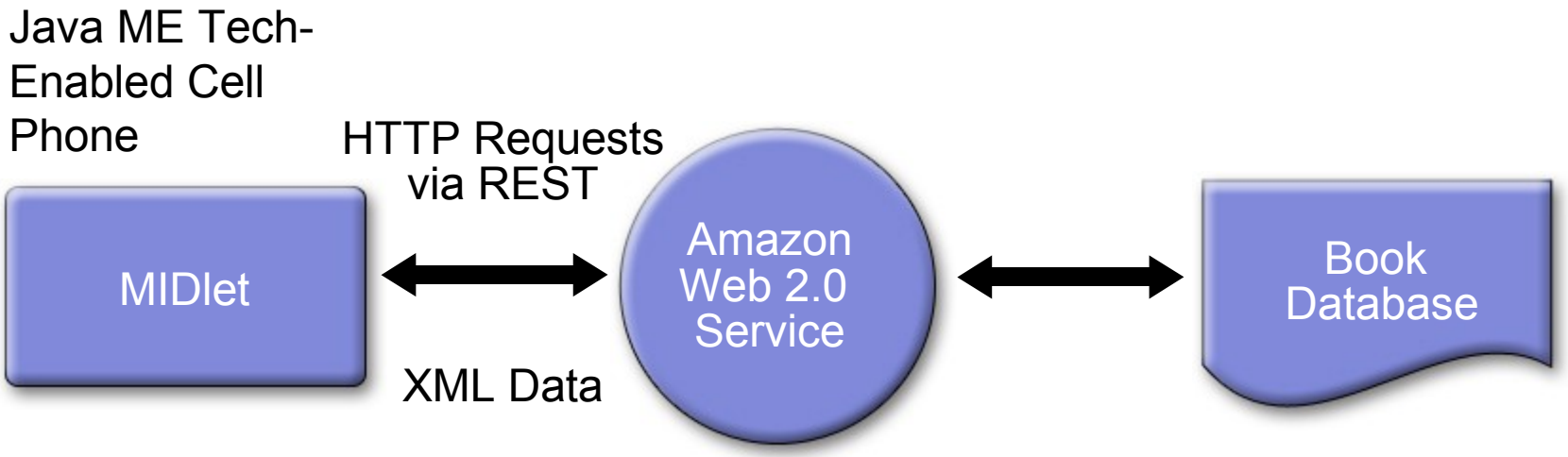
Amazon Searching



Amazon Searching

Code sample using Amazon as a web service

- **REST**—Representational State Transfer
- **Contacting the Amazon server**—Via URL, which results in a HTTP Request

  http://xml.amazon.com/onca/xml2...
- **Forming the URL**—Embed the command parameters
- **XML Data is returned**—Parse the data using Java ME technology

Amazon Http Request Code Sample

```
...
 SAXParser saxp = saxpfactory.newSAXParser();

 String url = "http://xml.amazon.com/onca/xml2"
+"?t=webservices-20&dev-t=D1UCR04XBIF4A6&page=1&"
+"f=xml&mode=books&type=lite"
+"&KeywordSearch='hinkmond'";

 // HTTP Request of XML data
 ...
 StreamConnection httpconn = (StreamConnection)
   Connector.open(url);
 ...

 saxp.parse(is, new MyHandler(this));
```

Amazon Http Request Code Sample (Cont.)

```
// Dynamically update User Interface in a MIDlet
try {
  // Assume: Parsed return data in returnStr
  textbox = new javax.microedition.lcdui.TextBox
    ("Book data = "+returnStr, 40, 0);

  textbox.addCommand(exitCommand);
  textbox.addCommand(anotherSrchCommand);
  textbox.setCommandListener(this);
  // This updates the screen without refreshing
  display.setCurrent(textbox);

} catch (Exception e) {
    e.printStackTrace();
}
```

Amazon Http Request Xlet Code Sample

```
...
 SAXParser saxp = saxpfactory.newSAXParser();

 String urlStr = "http://xml.amazon.com/onca/xml2"
+"?t=webservices-20&dev-t=D1UCR04XBIF4A6&page=1&"
+"f=xml&mode=books&type=lite"
+"&KeywordSearch='hinkmond'";

 // Open Xlet connection
 url = new URL(urlStr);
 InputStream inputStream = url.openStream();
 InputStreamReader inputStreamReader = new
                InputStreamReader(inputStream);
 BufferedReader bufferedReader = new
                BufferedReader(inputStreamReader);
 saxp.parse(is, new MyHandler(this));
```

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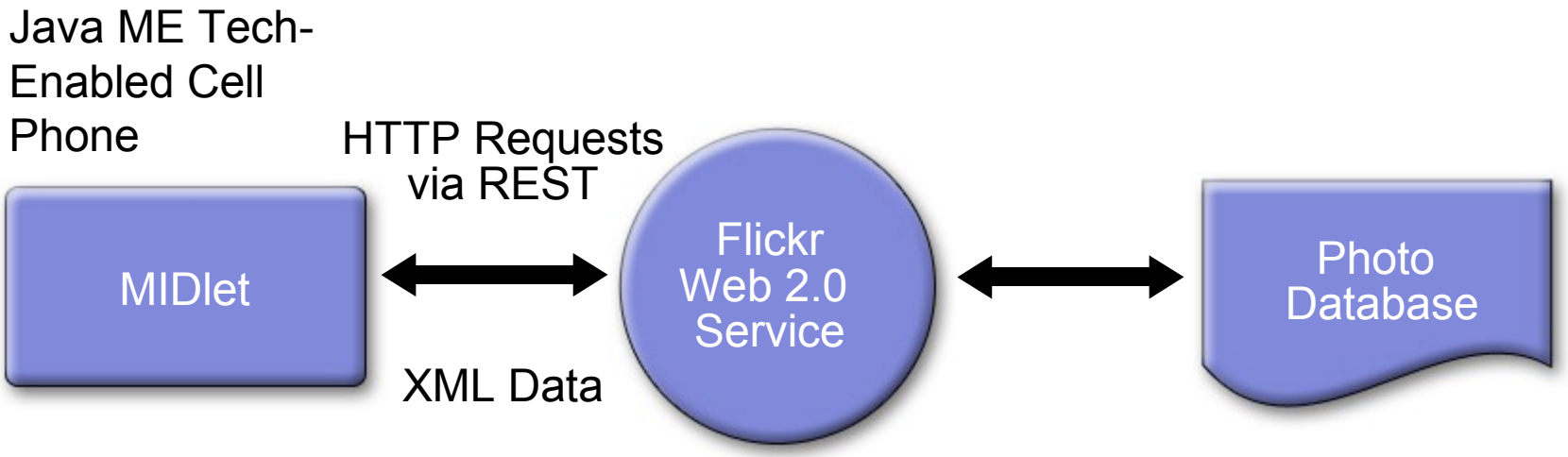
Flickr Service



Flickr Service

Code sample using Flickr as a Web Service

- **REST**—Representational State Transfer
- **Contacting the Flickr server**—Via URL, which results in a HTTP Request

  http://www.flickr.com/services/rest/?api_key=...
- **API Key Registration**—Must be a registered developer at their Web site
- **Forming the URL**—Embed the command parameters
- **XML Data is returned**—Parse the data using Java ME technology

Flickr Http Request Code Sample

```
...
 SAXParser saxp = saxpfactory.newSAXParser();

 String url ="http://www.flickr.com/services/rest/?"
+"api_key=7f14d2ba4b1c973fabc9d539c0a09f3a"
+"&method=flickr.test.echo&name=%22test%22";

 // HTTP Request of XML data
 ...
 StreamConnection httpconn = (StreamConnection)
    Connector.open(url);
 ...

 saxp.parse(is, new MyHandler(this));
```

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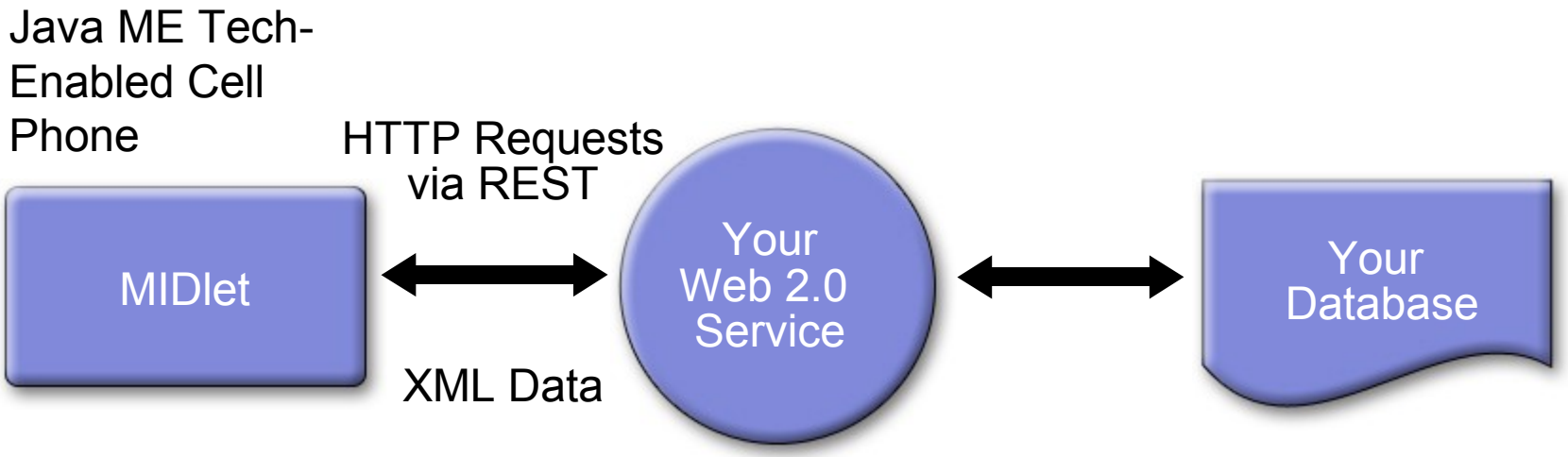
Your Web 2.0 Service



Your Web 2.0 Service

Code sample using your own web service

- **Your Web Server**—May use REST along with Java EE (servlets), PHP, CGI-BIN script, etc.
- **Contacting your server**—Via URL, which results in a HTTP Request

  http://www.yourserver.com/services/rest/?api_key=...
- **API Key Registration**—May decide to have developers register themselves
- **Forming the URL**—Decide on parameters to use.
- **XML Data is returned**—Parse the data using Java ME technology

Your Web Service Http Request Code Sample

```
...
 SAXParser saxp = saxpfactory.newSAXParser();

 String url =”http://yourserver.com/services/rest?”
+”api_key=00000000000000000000000000000000”
+”&method=your.test.function&param1=%22test%22”;

 // HTTP Request of XML data
 ...
 StreamConnection httpconn = (StreamConnection)
    Connector.open(url);
 ...

 saxp.parse(is, new MyHandler(this));
```

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Code Examples Using Java ME Technology and Web 2.0

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Summary

- Web 2.0 is a new highly dynamic and popular model of programming
- Bridging Web 2.0 and Java ME Technology is simple
- Examined code examples: Amazon, Flickr, Your Own Web Services
- Web 2.0 services can easily be used with Java ME technology-enabled cell phones

For More Information

URLs

AJAX

http://en.wikipedia.org/wiki/AJAX

REST

http://www.xfront.com/REST-Web-Services.html

Amazon

http://www.amazon.com/webservices

Flickr

http://www.flickr.com/services/

Google

http://www.google.com/apis/maps/documentation/

Other Web 2.0 services

http://www.programmableweb.com/howto

Q&A

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