core WEB programming

Using Applets as Front Ends to Server-Side Programs

Agenda

- Sending GET data and having the browser display the results
- Sending GET data and processing the results within the applet (HTTP tunneling)
- Using object serialization to exchange high-level data structures between applets and servlets
- Sending POST data and processing the results within the applet (HTTP tunneling)
- Bypassing the HTTP server altogether

Sending GET Request and Displaying Resultant Page

- Applet requests that browser display page – showDocument

```
try {
  URL programURL =
       new URL(baseURL + "?" + someData);
  getAppletContext().showDocument(programURL);
} catch(MalformedURLException mue) { ... };
```

- URL-encode the form data

```
String someData =
  name1 + "=" + URLEncoder.encode(val1) + "&" +
  name2 + "=" + URLEncoder.encode(val2) + "&" +
  ...
  nameN + "=" + URLEncoder.encode(valN);
```

GET Request Example: Applet

```
public class SearchApplet extends Applet
                          implements ActionListener {
  ...
  public void actionPerformed(ActionEvent event) {
    String query =
      URLEncoder.encode(queryField.getText());
    SearchSpec[] commonSpecs =
      SearchSpec.getCommonSpecs();
    for(int i=0; i<commonSpecs.length-1; i++) {
      try {
        SearchSpec spec = commonSpecs[i];
        URL searchURL =
          new URL(spec.makeURL(query, "10"));
        String frameName = "results" + i;
        getAppletContext().showDocument(searchURL,
                                        frameName);
      } catch(MalformedURLException mue) {}
    }
  }
}
```

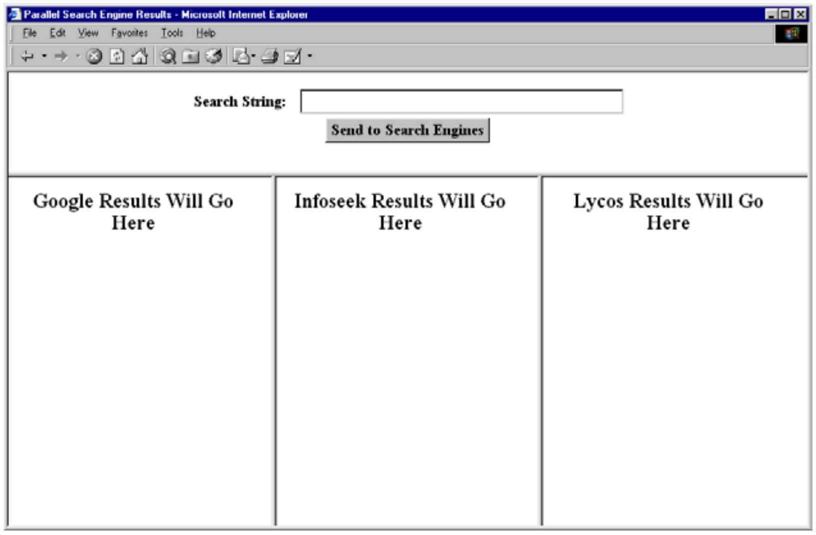
GET Request Example: Utility Class

```
public class SearchSpec {
  private String name, baseURL, numResultsSuffix;

  private static SearchSpec[] commonSpecs =
    { new SearchSpec("google",
                     "http://www.google.com/search?q=",
                     "&num="),
      ... };

  public String makeURL(String searchString,
                        String numResults) {
    return(baseURL + searchString +
           numResultsSuffix + numResults);
  }
  ...
}
```

Get Request Example: HTML File

```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Frameset//EN">
<HTML>
<HEAD>
  <TITLE>Parallel Search Engine Results</TITLE>
</HEAD>

<FRAMESET ROWS="120,*">
  <FRAME SRC="SearchAppletFrame.html" SCROLLING="NO">
  <FRAMESET COLS="*,*,*">
    <FRAME SRC="GoogleResultsFrame.html" NAME="results0">
    <FRAME SRC="InfoseekResultsFrame.html" NAME="results1">
    <FRAME SRC="LycosResultsFrame.html" NAME="results2">
  </FRAMESET>
</FRAMESET>
```

Get Request: Initial Result

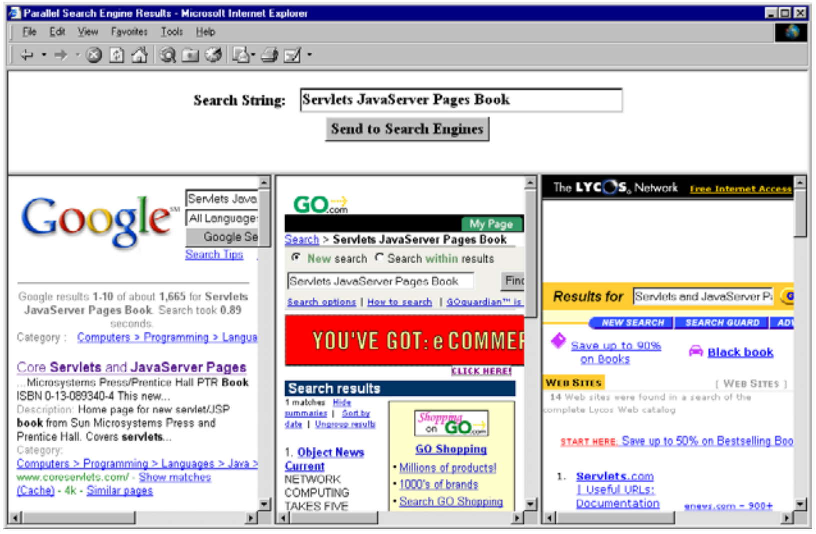

Parallel Search Engine Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help

Search String:

Send to Search Engines

Google Results Will Go Here	Infoseek Results Will Go Here	Lycos Results Will Go Here

GET Request: Submission Result


Parallel Search Engine Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help

Search String: Servlets JavaServer Pages Book

Send to Search Engines

Google
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Google results 1-10 of about 1,665 for Servlets JavaServer Pages Book. Search took 0.89 seconds.

Category : Computers > Programming > Langua

Core Servlets and JavaServer Pages
...Microsystems Press/Prentice Hall PTR Book ISBN 0-13-089340-4 This new...
Description: Home page for new servlet/JSP book from Sun Microsystems Press and Prentice Hall. Covers servlets...
Category:
Computers > Programming > Languages > Java >
www.coreservlets.com/ - Show matches
(Cache) - 4k - Similar pages

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NETWORK COMPUTING TAKES FIVE

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• Search GO Shopping

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Black book

WEB SITES [WEB SITES]

14 Web sites were found in a search of the complete Lycos Web catalog

START HERE: Save up to 50% on Bestselling Boo

1. Servlets.com | Useful URLs: Documentation
gnews.com - 900+

HTTP Tunneling

- **Idea**
  - Open a socket connection to port 80 on the server and communicate through HTTP
- **Advantages**
  - Communicate through firewalls
  - Server-side programs only needs to return the data, not a complete HTML document
- **Disadvantages**
  - Can only tunnel to server from which the applet was loaded
  - *Applet*, not *browser*, receives the response
    - Cannot easily display HTML

HTTP Tunneling and GET Requests

- **Create URL object referring to applet's host**
  `URL dataURL = new URL(…);`
- **Create a URLConnection object**
  `URLConnection connection = dataURL.openConnection();`
- **Instruct browser not to cache URL data**
  `connection.setUseCaches(false);`
- **Set any desired HTTP headers**
- **Create an input stream**
  - Call `connection.getInputStream`; wrap in higher-level stream
- **Read data sent from server**
  - E.g., call `readLine` on `BufferedReader`
- **Close the input stream**

HTTP Tunneling Template: Client Side

```
URL currentPage = getCodeBase();
String protocol = currentPage.getProtocol();
String host = currentPage.getHost();
int port = currentPage.getPort();
String urlSuffix = "/servlet/SomeServlet";
URL dataURL = new URL(protocol, host, port, urlSuffix);
URLConnection connection = dataURL.getConnection();
connection.setUseCaches(false);
connection.setRequestProperty("header", "value");

BufferedReader in = new BufferedReader(
  new InputStreamReader(connection.getInputStream()));
String line;
while ((line = in.readLine()) != null) {
  doSomethingWith(line);
}
in.close();
```

Using Object Serialization with HTTP Tunneling

- **Idea**
  - Server-side program (servlet) sends complete Java object
  - Client-side program (applet) reads it
- **Client-side program (applet) template:**

```
ObjectInputStream in =
  new ObjectInputStream(
   connection.getInputStream());

SomeClass object = (SomeClass)in.readObject();
doSomethingWith(object);
```

Using Object Serialization with HTTP Tunneling (Continued)

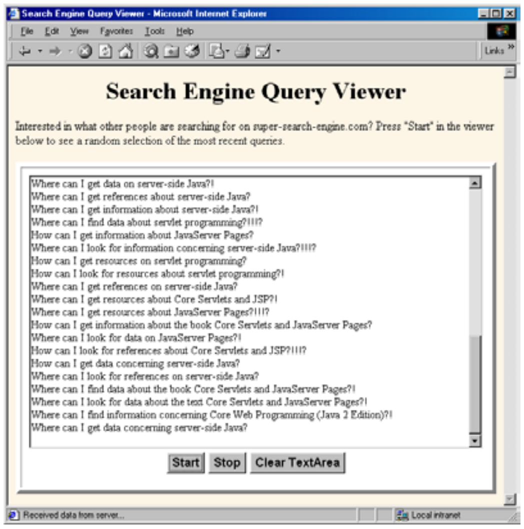
- **Server-side program (servlet) template:**

```
String contentType =
  "application/x-java-serialized-object";
response.setContentType(contentType);

ObjectOutputStream out =
  new ObjectOutputStream(
    response.getOutputStream());

SomeClass object = new SomeClass(...);
out.writeObject(value);
out.flush();
```

Example: Live Scrolling Data


Search Engine Query Viewer - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Links
Start
Stop
Clear TextArea
Received data from server...
Local intranet

Search Engine Query Viewer

Interested in what other people are searching for on super-search-engine.com? Press "Start" in the viewer below to see a random selection of the most recent queries.

```
Where can I get data on server-side Java?!
Where can I get references about server-side Java?
Where can I get information about server-side Java?!
Where can I find data about servlet programming?!!!?
How can I get information about JavaServer Pages?
Where can I look for information concerning server-side Java?!!!?
How can I get resources on servlet programming?
How can I look for resources about servlet programming?!
Where can I get references on server-side Java?
Where can I get resources about Core Servlets and JSP?!
Where can I get resources about JavaServer Pages?!!!?
How can I get information about the book Core Servlets and JavaServer Pages?
Where can I look for data on JavaServer Pages?!
How can I look for references about Core Servlets and JSP?!!!?
How can I get data concerning server-side Java?
Where can I look for references on server-side Java?
Where can I find data about the book Core Servlets and JavaServer Pages?!
Where can I look for data about the text Core Servlets and JavaServer Pages?!
Where can I find information concerning Core Web Programming (Java 2 Edition)?!
Where can I get data concerning server-side Java?
```

Sending POST Data to Server

- Applet sends POST request to server
- Processes the response directly

```
Url currentPage = getCodeBase();
String protocol = currentPage.getProtocol();
String host = currentPage.getHost();
int port = currentPage.getPort();
String urlSuffix = "/servlet/SomeServlet";
URL dataURL = new URL(protocol, host, port,
                      urlSuffix);

URLConnection connection =
  dataURL.openConnection();
connection.setUseCaches(false);
connection.setDoOutput(true);
```

Sending POST Data to Server (Continued)

- Character or Binary Data

```
ByteArrayOutputStream byteStream =
  new ByteArrayOutputStream(512);
PrintWriter out = new PrintWriter(byteStream, true);
out.print(data);
out.flush();

connection.setRequestProperty(
              "Content-Length",
              String.valueOf(byteStream.size()));
connection.setRequestProperty(
            "Content-Type",
            "application/x-www-form-urlencoded");
byteStream.writeTo(connection.getOutputStream());
```

Sending POST Data to Server

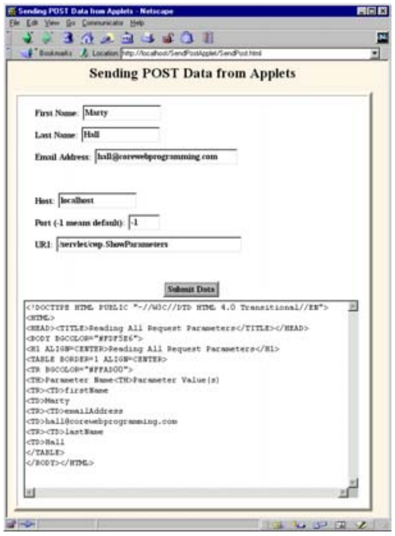
- **Serialized Data**

```
ByteArrayOutputStream byteStream =
  new ByteArrayOutputStream(512);
ObjectOutputStream out =
  new ObjectOutputStream(byteStream);
out.writeObject(data);
out.flush();

connection.setRequestProperty(
              "Content-Length",
              String.valueOf(byteStream.size()));
connection.setRequestProperty(
            "Content-Type",
            "application/x-java-serialized-object");
byteStream.writeTo(connection.getOutputStream());
```

Sending POST Data: Example

- **Sends data to a servlet that returns an HTML page showing form data it receives**
  – Displays result in an AWT TextArea


Sending POST Data from Applets - Netscape
File Edit View Go Communicator Help
Bookmarks Location: http://localhost/SendPostApplet/SendPost.html
Submit Data

Sending POST Data from Applets

First Name: Marty
Last Name: Hall
Email Address: hall@corewebprogramming.com

Host: localhost
Port (-1 means default): -1
URI: /servlet/cwp.ShowParameters

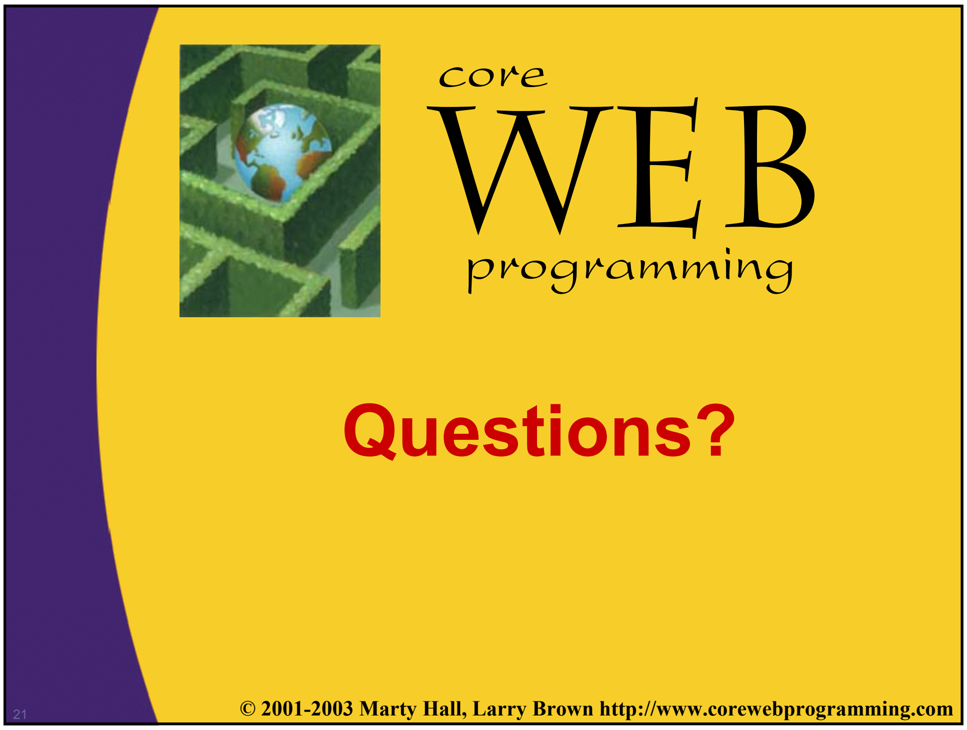
```
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.0 Transitional//EN">
<HTML>
<HEAD><TITLE>Reading All Request Parameters</TITLE></HEAD>
<BODY BGCOLOR="#FDF5E6">
<H1 ALIGN=CENTER>Reading All Request Parameters</H1>
<TABLE BORDER=1 ALIGN=CENTER>
<TR BGCOLOR="#FFAD00">
<TH>Parameter Name<TH>Parameter Value(s)
<TR><TD>firstName
<TD>Marty
<TR><TD>emailAddress
<TD>hall@corewebprogramming.com
<TR><TD>lastName
<TD>Hall
</TABLE>
</BODY></HTML>
```

Bypassing the HTTP Server

- **If you are using applets, you don't have to communicate via HTTP**
  - JDBC
  - RMI
  - SOAP (perhaps via JAX-RPC)
  - Raw sockets
- **Advantages**
  - Simpler
  - More efficient
- **Disadvantages**
  - Can only talk to server from which applet was loaded
  - Subject to firewall restrictions
  - You have to have a second server running

Summary

- **Send data via GET and showDocument**
  - Can access any URL
  - Only browser sees result
- **Send data via GET and URLConnection**
  - Can only access URLs on applet's home host
  - Applet sees results
  - Applet can send simple data
  - Server can send complex data (including Java objects)
- **Send data via POST and URLConnection**
  - Can only access URLs on applet's home host
  - Applet sees results
  - Applet can send complex data (including Java objects)
  - Server can send complex data (including Java objects)
- **Bypass Web Server**



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Questions?