Programming Handheld Systems

Adam Porter

NETWORKING

Today's Topics

Networking

Android networking Classes

Processing HTTP Responses

Networking

Early handheld devices gave us mobility

But with limited connectivity

Today's devices have greater mobility and connectivity

Many applications use data and services via the Internet

Networking

Android includes multiple networking support classes, e.g.,

java.net — (Socket, URL)

org.apache — (HttpRequest, HttpResponse)

android.net — (URI, AndroidHttpClient, AudioStream)

Example Application

Application sends a request to a netoworked server for earthquake data

Then Displays the requested data

Sending HTTP Requests

Socket

HttpURLConnection

AndroidHttpClient

NetworkingSockets

Load Data

HTTP/1.1 200 OKDate: Sat, 28 Sep 2013 02:23:57 GMTServer: Apache/2.2.17 (Linux/SUSE)Cache-Control: no-cacheAccess-Control-Allow-Origin: *Connection: closeTransfer-Encoding: chunkedContent-Type: application/json;charset=UTF-84bc{"earthquakes":[{"eqid":"c0001xgp","magnitude":8.8,"lng":142.369,"src":"us","datetime":"2011-03-11 04:46:23","depth":24.4,"lat":38.322},{"eqid":"c000905e","magnitude":8.6,"lng":93.0632,"src":"us","datetime":"2012-04-11 06:38:37","depth":22.9,"lat":2.311},{"eqid":"2007hear","magnitude":8.4,"l

Demonstration of
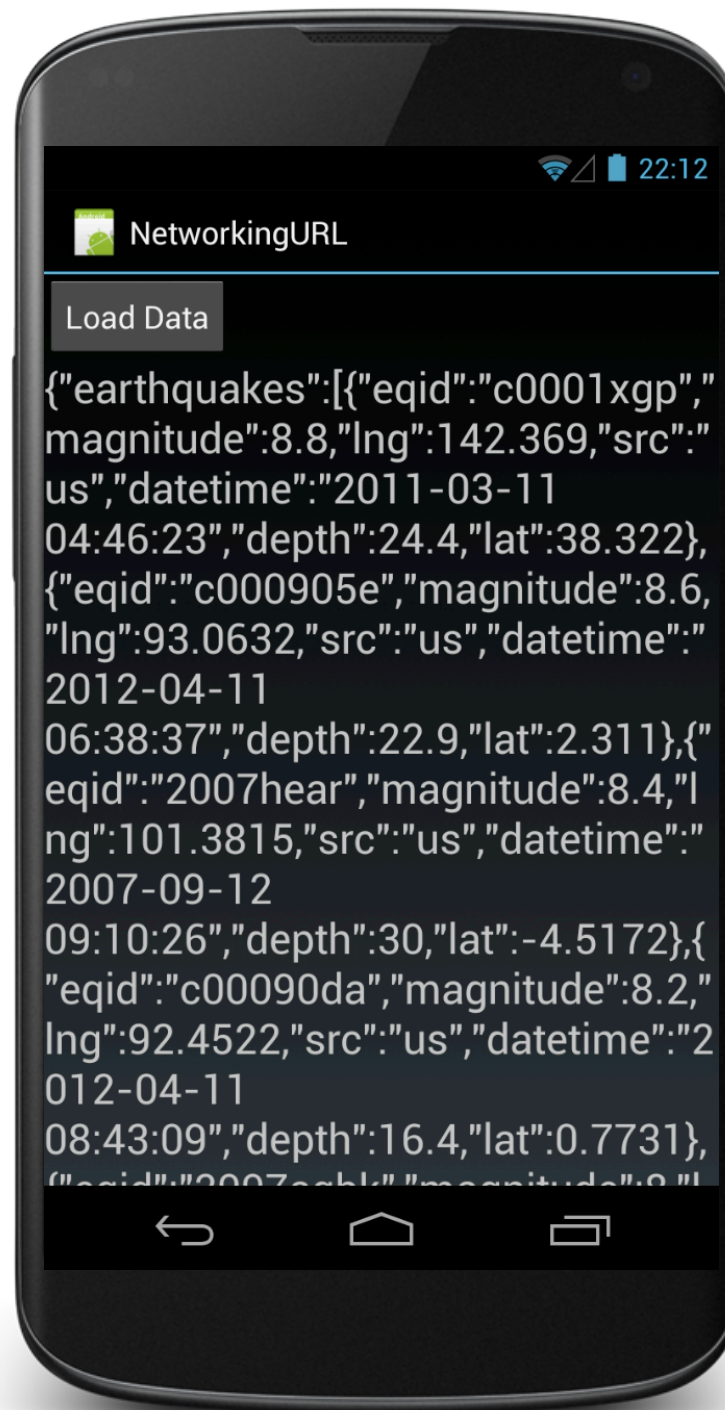NetworkingSockets project in the IDE

NetworkingSockets

Load Data

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HttpURLConnection

Higher-level than Sockets

Less Flexible API than HttpAndroidClient

NetworkingURL

Load Data

{"earthquakes":[{"eqid":"c0001xgp","magnitude":8.8,"lng":142.369,"src":"us","datetime":"2011-03-11 04:46:23","depth":24.4,"lat":38.322},{"eqid":"c000905e","magnitude":8.6,"lng":93.0632,"src":"us","datetime":"2012-04-11 06:38:37","depth":22.9,"lat":2.311},{"eqid":"2007hear","magnitude":8.4,"lng":101.3815,"src":"us","datetime":"2007-09-12 09:10:26","depth":30,"lat":-4.5172},{"eqid":"c00090da","magnitude":8.2,"lng":92.4522,"src":"us","datetime":"2012-04-11 08:43:09","depth":16.4,"lat":0.7731},{"eqid":"2007oghk","magnitude":8,"l

Demonstration of
NetworkingURL project in the IDE

AndroidHttpClient

An implementation of Apache's DefaultHttpClient

Breaks HTTP Transaction into separate Request and Response Objects

Demonstration of
NetworkingAndroidHttpClient
project in the IDE

Processing Http Responses

Several popular formats including

JSON

XML

Javascript Object Notation (JSON)

Intended to be a lightweight data interchange format

Data packaged in two types of structures:

Maps of key/value pairs

Ordered lists of values

See: http://www.json.org/

Earthquake Data (JSON Output)

http://api.geonames.org/earthquakesJSON?
north=44.1&south=-9.9&east=-22.4&west=55.
2&username=demo

Earthquake Data (JSON Output)

```
{"earthquakes”: [
 {"eqid":"c0001xgp","magnitude":8.8,"lng":142.369,
  "src":"us”, "datetime":"2011-03-11 04:46:23","depth":
  24.4,"lat":38.322}
 {"eqid":"2007hear","magnitude":8.4,"lng":101.3815,
  "src":"us”,"datetime":"2007-09-12 09:10:26","depth":
  30,"lat":-4.5172},

 …

 {"eqid":"2010xkbv","magnitude":7.5,"lng":91.9379,
  "src":"us”,"datetime":"2010-06-12 17:26:50","depth":
  35,"lat":7.7477}
 ]
}
```

Demonstration of
NetworkingAndroidHttpClientJSON
project in the IDE

eXtensible Markup Language (XML)

XML documents can contain markup & content

Markup encodes a description of the document's storage layout and logical structure

Content is everything else

See http://www.w3.org/TR/xml

Earthquake Data (XML)

http://api.geonames.org/earthquakes?
north=44.1&south=-9.9&east=-22.4&
west=55.2& username=demo

Earthquake Data (XML)

```xml
<geonames>
  <earthquake>
    <src>us</src>
    <eqid>c0001xgp</eqid>
    <datetime>2011-03-11 04:46:23</datetime>
    <lat>38.322</lat>
    <lng>142.369</lng>
    <magnitude>8.8</magnitude>
    <depth>24.4</depth>
  </earthquake>
...
</geonames>
```

Parsing XML

Several types of parsers available

DOM – Converts document into a tree of nodes

SAX – streaming with application callbacks

Pull – Application iterates over XML entries

Demonstration of
NetworkingAndroidHttpClientXML
project in the IDE

Next Time

Graphics & Animation

Extra – Networking Permissions

Applications need permission to open network sockets

```
<uses-permission android:name=
    "android.permission.INTERNET" />
```