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CMSC436: Programming Handheld Systems
Networking
Today’s Topics

Networking
Android networking classes
Processing HTTP responses
Networking

Early handheld devices gave us mobility, but had limited connectivity

Today’s devices have greater mobility and connectivity

Today, many applications use data and services via the Internet
Networking

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

java.net – (Socket, URL, URLConnection)
Example Application

Sends a request to a networked server for earthquake data
Receives the earthquake data
Displays the requested data
Sending HTTP Requests

HttpURLConnection
OkHttpClient
Ktor HttpClient
Networking Permissions

Applications need permission to open network sockets

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

Http client for Android and Java applications

See: https://ktor.io/docs/getting-started-ktor-client.html#create-client
Usage Pattern for Http Get

1. Get an HttpClient instance
2. Prepare your request
3. Issue get() call (or related method)
4. Read the response
5. Process response
Processing Http Responses

Will focus on two popular formats:

- JSON
- XML
Javascript Object Notation (JSON)

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 Request (JSON)

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

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

Click SEND to issue a network request.
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
XML Response

<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
Click SEND to issue a network request.
Next Time

Graphics and Animation
Example Applications

NetworkingURL
NetworkingJSON
NetworkingXML