

SchoolNova

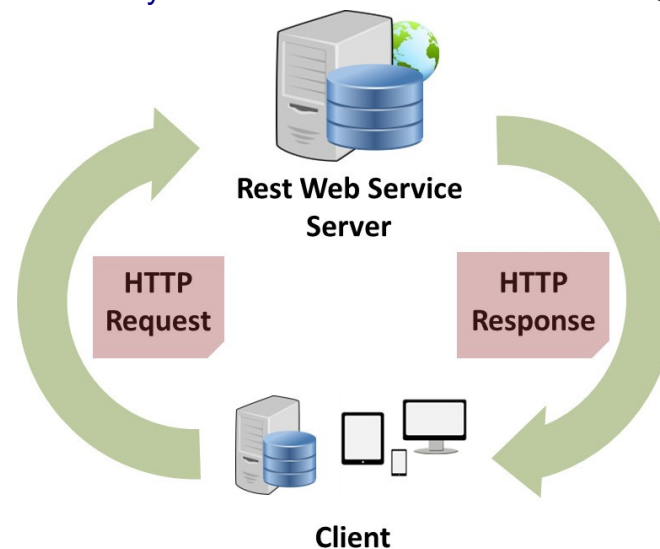


IT101

Web Services

Web Services

- Web Services are one of the dominant contemporary paradigms for programming distributed systems.
 - ◆ Enables business to business integration. (Suppose one organization uses JAVA and another uses .NET)
 - ◆ Enables service oriented architecture (SOA).
 - ◆ May exist internally to an organization or externally (in the cloud).
- Thousands of web services are publicly accessible: <http://www.programmableweb.com/apis/directory>
- Web Services began life when Microsoft introduced BizTalk in 1999. BizTalk was later renamed .NET.
- The idea: “to provide the technologies to allow software in different places, written in different languages and resident on different platforms to connect and interoperate.” From “Programming the World Wide” by Sebasta
- There are two major types of web services:
 - ◆ SOAP (Simple Object Access Protocol)
 - ◆ REST (Representational State Transfer – our today's focus)



REST

- REpresentational State Transfer
- First described in Roy Fielding's doctoral dissertation (2000). Fielding (along with Tim Berners-Lee) who designed HTTP and URI's.
- Two major advantages of REST web services:
 - ◆ Addressability
 - ◆ Scalability
- The web has **addressable resources**. Each resource has a URI.
`scheme://host:port/path?queryString#fragment`
- The web has a **uniform and constrained interface**. HTTP, for example, has a small number of methods (most popular are GET and POST). REST uses these methods to manipulate resources.
- The web is **representation oriented** – providing diverse formats.
- The web may be used to **communicate statelessly** – providing scalability
- Many web services can be cached.
- **REST is not protocol specific**. It is usually associated with HTTP but its principles are more general.
- HTTP is a **synchronous** request/response network protocol used for distributed, collaborative, document based systems.
- Various message formats may be used. Most popular are XML (eXtensible Markup Language) and JSON (JavaScript Object Notation)
- Binary data may be included in the message body.

JSON

- JSON (JavaScript Object Notation) is a lightweight, text-based, language-independent data exchange format that is easy for humans and machines to read and write.
- JSON can represent two structured types:
 - ◆ An object is an unordered collection of zero or more name/value pairs.
 - ◆ An array is an ordered sequence of zero or more values. The values can be strings, numbers, booleans, null, and these two structured types.

```
{
  "firstName": "John",
  "lastName": "Smith",
  "age": 25,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": 10021
  },
  "phoneNumbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "fax",
      "number": "646 555-4567"
    }
  ]
}
```

Listing 1. Example of JSON representation of an object

Example

```
public static void main(String[] args) {
    String output = null;
    HttpURLConnection conn = null;
    BufferedReader br = null;
    try {
        URL url = new URL("https://www.googleapis.com/books/v1/volumes?q=java");
        conn = (HttpURLConnection) url.openConnection();
        conn.setRequestMethod("GET");
        conn.setRequestProperty("Accept", "application/json");
        if (conn.getResponseCode() != 200) {
            throw new RuntimeException("Failed : HTTP error code : " + conn.getResponseCode());
        }
        br = new BufferedReader(new InputStreamReader((conn.getInputStream())));
        System.out.println("Output from the Google server ....");
        while ((output = br.readLine()) != null) {
            System.out.println(output);
        }
    } catch (IOException e) {
        e.printStackTrace();
    } finally {
        if (conn != null) {
            conn.disconnect();
        }
    }
}
```

Homework

- Change the sample program (Google Books Search) such that it prints out only Google Books API output lines that contain the word “title”.
- Sample output:

Output from the Google server

"title": "Effective Java",

"title": "The Religion of Java",

"title": "Java Programming",

- Consider using the String object's “matches” method.