

## CS 230 A RESTful API

### Introduction

In today's technology environment, you will encounter the term REST, usually in the context of building a "RESTful API." REST is an acronym for **RE**presentational **S**tate **T**ransfer. Coined by Dr. Roy Fielding, an early pioneer in HTML and Uniform Resource Identifiers, the term describes a software architectural style for building distributed hypermedia systems.

### Distributed Hypermedia System

When using the HTTP protocol, a browser can retrieve web pages, images, sound files, movie files, or any type of file (generally referred to as resources) from a web server by sending the address, or URL, to that server. This approach to interacting with remote servers to retrieve resources by sending HTTP requests is exactly what a "distributed hypermedia system" is. In other words, it is a network of resources accessible via HTTP with hyperlinks that contain the addresses of other linked resources.

### Representational State

JSON is a text syntax that facilitates structured data interchange between all programming languages. JSON is a syntax of braces, brackets, colons, and commas that is useful in many contexts, profiles, and applications. JSON was inspired by the object literals of JavaScript.

JSON can be easily read and written by people and easily parsed by programming languages. This example of a customer purchase order from the IBM Knowledge Center illustrates the simplicity and ease of understanding of the JSON format:

```
{ "name" : "John Smith",  
  "sku" : "20223",  
  "price" : 23.95,  
  "shipTo" : { "name" : "Jane Smith",  
               "address" : "123 Maple Street",  
               "city" : "Pretendville",  
               "state" : "NY",  
               "zip" : "12345" },  
  "billTo" : { "name" : "John Smith",  
               "address" : "123 Maple Street",  
               "city" : "Pretendville",  
               "state" : "NY",  
               "zip" : "12345" }
```

The basic JSON format is to wrap the data structure in curly braces and have one or more pairs of names and values, such as "name" : "John Smith", with a comma separating each pair. The values returned in the JSON are said to represent the current state of the resource, such as the purchase order above.

For our purposes, a RESTful API is a commonly agreed-upon pattern of client-server communication (HTTP) along with a standard way of representing the message data being passed back and forth (JSON).

Dr. Fielding's dissertation proposed a set of constraints for building an API that closely aligns with the concepts underlying the HTTP protocol and its interaction with remote servers.

1. **Client-Server:** The separate and distinct role of a client interacting with a server enforces the well-established design principle of separation of concerns: a consumer (client) of remote resources that are maintained by a producer (server).
2. **Stateless:** Each request transmitted from a client and each response processed and returned by a server is separate and self-contained. The server does not maintain the “state” of a client between requests. This implies that each request must contain all the information necessary for the server to retrieve the resource.
3. **Cache:** Clients and intermediate servers or devices are expected to be able to cache the response of a server for faster delivery to multiple clients. In order for caching to work, a server must indicate whether a response can be cached or must be completely re-retrieved from the originating server each time the client needs the results.
4. **Uniform Interface:** To ensure that APIs behave in predictable ways, they must allow for unique identification of resources and a common vocabulary for manipulating those resources. They must also provide all the necessary information the server needs in a request, along with a way for the server to inform the client of all the ways the resource can be manipulated.
5. **Layered System:** Any layers between the client and the server, such as caching, security, load-balancing, and so on, must be transparent to both the client and the server.
6. **Code-On-Demand:** The server may optionally return code, most often script such as JavaScript, that the client can then use to extend its behavior and interaction with the resource.

All of the above can essentially be satisfied by exposing your API to support the HTTP protocol – including the common HTTP verbs GET, PUT, POST, and DELETE.

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