CLOUD COMPUTING APPLICATIONS

HTTP SOAP REST

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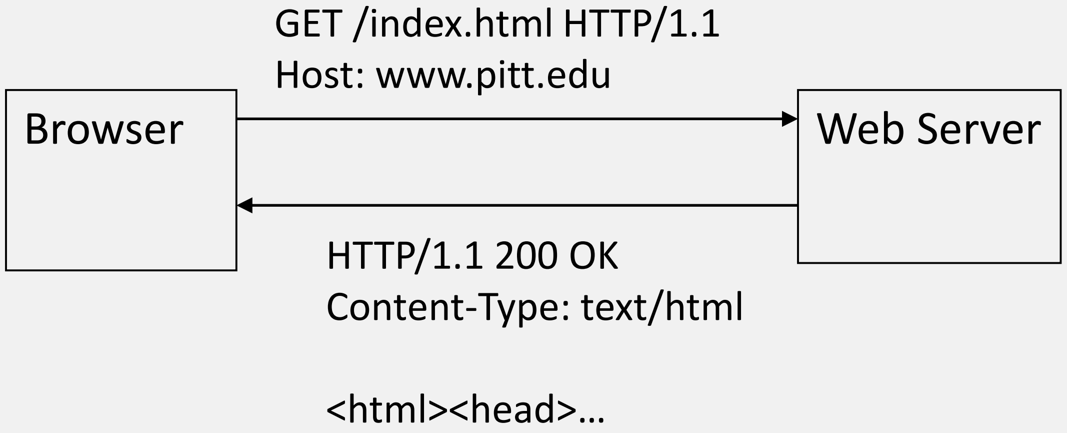
Hypertext Transfer Protocol (HTTP)

- A communications protocol

- Allows retrieving inter-linked text documents (hypertext)
  - World Wide Web

- HTTP verbs
  - HEAD
  - **GET**
  - **POST**
  - PUT
  - DELETE
  - TRACE
  - OPTIONS
  - CONNECT



```
GET /index.html HTTP/1.1
Host: www.pitt.edu
```

```
HTTP/1.1 200 OK
Content-Type: text/html

<html><head>…
```

SOAP –
Simple Object Access Protocol

- Transmitted by HTTP or SMTP (or many others)
- Coded in XML (can be decoded on any machine)
- Return value: any XML document
- Underlies Web Services Description Language (WSDL)

Representational State Transfer (REST)

- A style of software architecture for distributed hypermedia systems such as the World Wide Web

- Introduced in the doctoral dissertation of Roy Fielding
  - One of the principal authors of the HTTP specification

- A collection of network architecture principles that outline how resources are defined and addressed

REST and HTTP

- The motivation for REST was to capture those characteristics of the Web that made the Web successful
  - URI-addressable resources
  - HTTP
  - Make a request – receive response – display response

- Exploits the use of the HTTP beyond HTTP POST and HTTP GET
  - HTTP PUT, HTTP DELETE

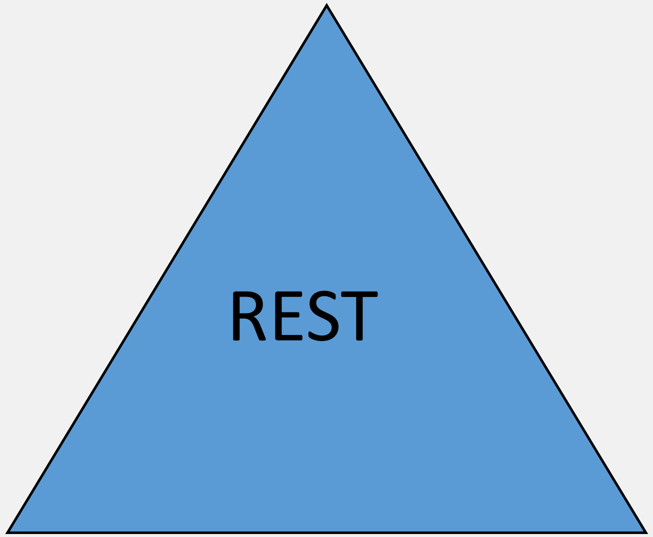
REST – Not a Standard

- REST is not a standard
  - JSR 311: JAX-RS: The Java^{TM} API for RESTful Web Services

- But it uses several standards:
  - HTTP
  - URL
  - XML/HTML/GIF/JPEG/etc. (resource representations)
  - Text/xml, text/html, image/gif, image/jpeg, etc. (resource types, MIME types)

Main Concepts

Nouns (resources)
unconstrained
i.e., http://example.com/employees/12345



Verbs
constrained
i.e., GET

Representations
constrained
i.e., XML

Resources

- The key abstraction of information in REST is a resource
- A resource is a conceptual mapping to a set of entities
    - Any information that can be named can be a resource: a document or image, a temporal service (e.g., "today's weather in Los Angeles"), a collection of other resources, a non-virtual object (e.g., a person), and so on
- Represented with a global identifier (URI in HTTP)
    - http://www.boeing.com/aircraft/747

Naming Resources

- REST uses URI to identify resources

  - http://localhost/books/
  - http://localhost/books/ISBN-0011
  - http://localhost/books/ISBN-0011/authors

  - http://localhost/classes
  - http://localhost/classes/cs2650
  - http://localhost/classes/cs2650/students

- As you traverse the path from more generic to more specific, you are navigating the data

Verbs

- Represent the actions to be performed on resources

- HTTP GET
- HTTP POST
- HTTP PUT
- HTTP DELETE

HTTP GET

- How clients ask for the information they seek

- Issuing a GET request transfers the data from the server to the client in some representation

- GET http://localhost/books
  - Retrieve all books

- GET http://localhost/books/ISBN-0011021
  - Retrieve book identified with ISBN-0011021

- GET http://localhost/books/ISBN-0011021/authors
  - Retrieve authors for book identified with ISBN-0011021

HTTP POST, HTTP PUT

- HTTP POST creates a resource
- HTTP PUT updates a resource

- POST http://localhost/books/
  - Content: {title, authors[], …}
  - Creates a new book with given properties

- PUT http://localhost/books/isbn-111
  - Content: {isbn, title, authors[], …}
  - Updates book identified by isbn-111 with submitted properties

HTTP DELETE

- Removes the resource identified by the URI

- DELETE http://localhost/books/ISBN-0011
    - Delete book identified by ISBN-0011

Representations

- How data is represented or returned to the client for presentation
- Two main formats:
    - JavaScript Object Notation (JSON)
    - XML
- It is common to have multiple representations of the same data

Representations

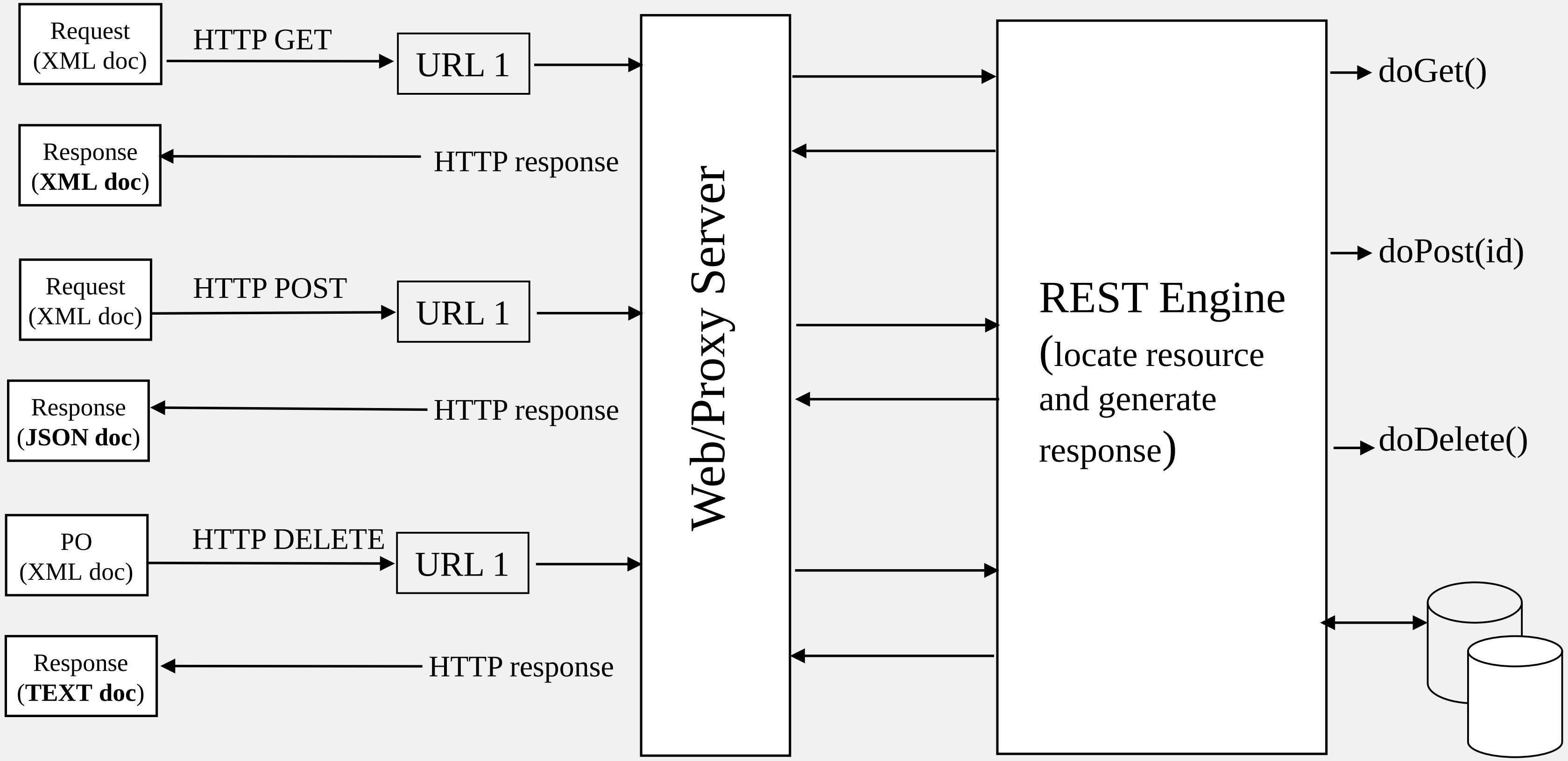
- XML

```
<COURSE>
    <ID>CS2650</ID>
    <NAME>Distributed Multimedia Software</NAME>
</COURSE>
```

- JSON

```
{
  "course":{
    "id":"CS2650",
    "name":"Distributed Multimedia Software"
  }
}
```

Architecture Style



Real Life Examples

- Google Maps

- Google AJAX Search API

- Yahoo Search API

- Amazon WebServices