



# **CLOUD COMPUTING APPLICATIONS**

Cloud Services

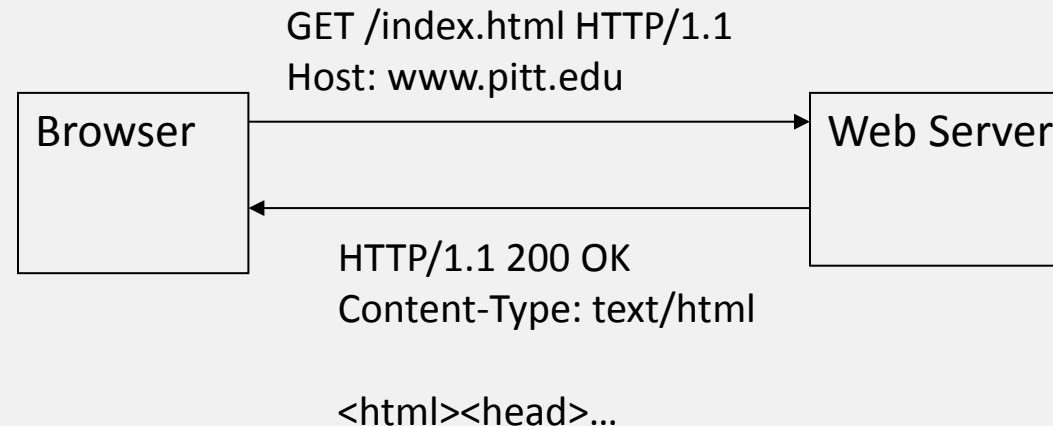
Prof. Roy Campbell

# 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



# 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

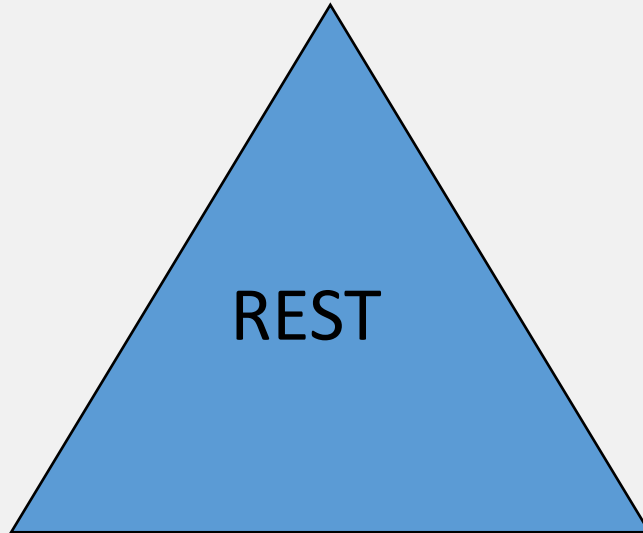
- REST is not a standard
  - JSR 311: JAX-RS: The Java™ API for RESTful Web Services
- But it uses several standards:
  - HTTP
  - URL
  - XML/HTML/GIF/JPEG/etc. (resource representations)
  - Text/xml, text/html, image/gif, image/jpeg, etc. (resource types, MIME types)

# 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

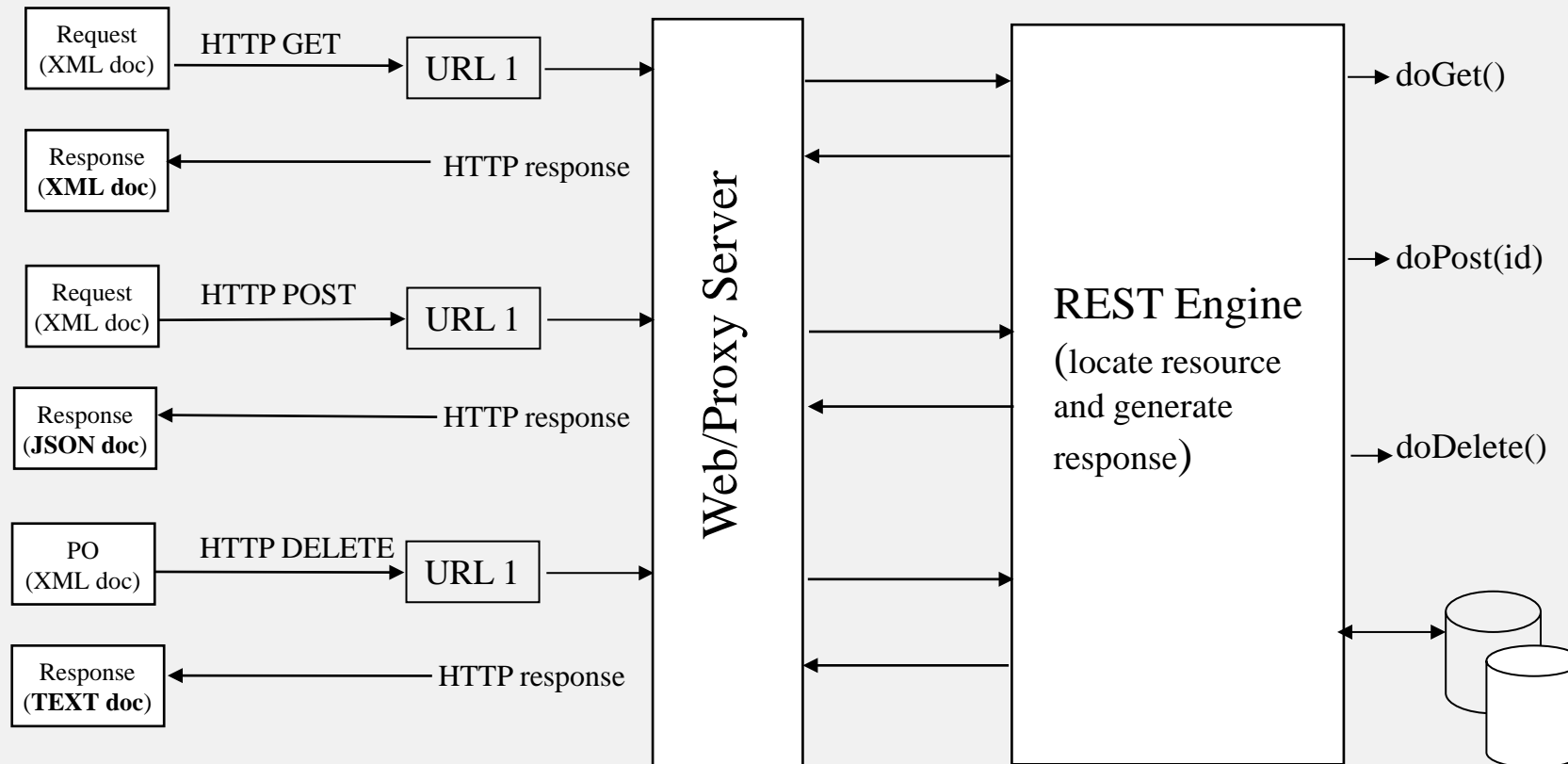
# Representations

- 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