RESTful Services

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The Twitter REST API

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REST API version 1.1

The most recent version of the Twitter REST API.

API v1.1 Resources »

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REST API version 1

Version 1 of the REST API is now deprecated and will cease functioning in the coming months. Migrate to version 1.1 today.

Review the deprecated version 1 API »

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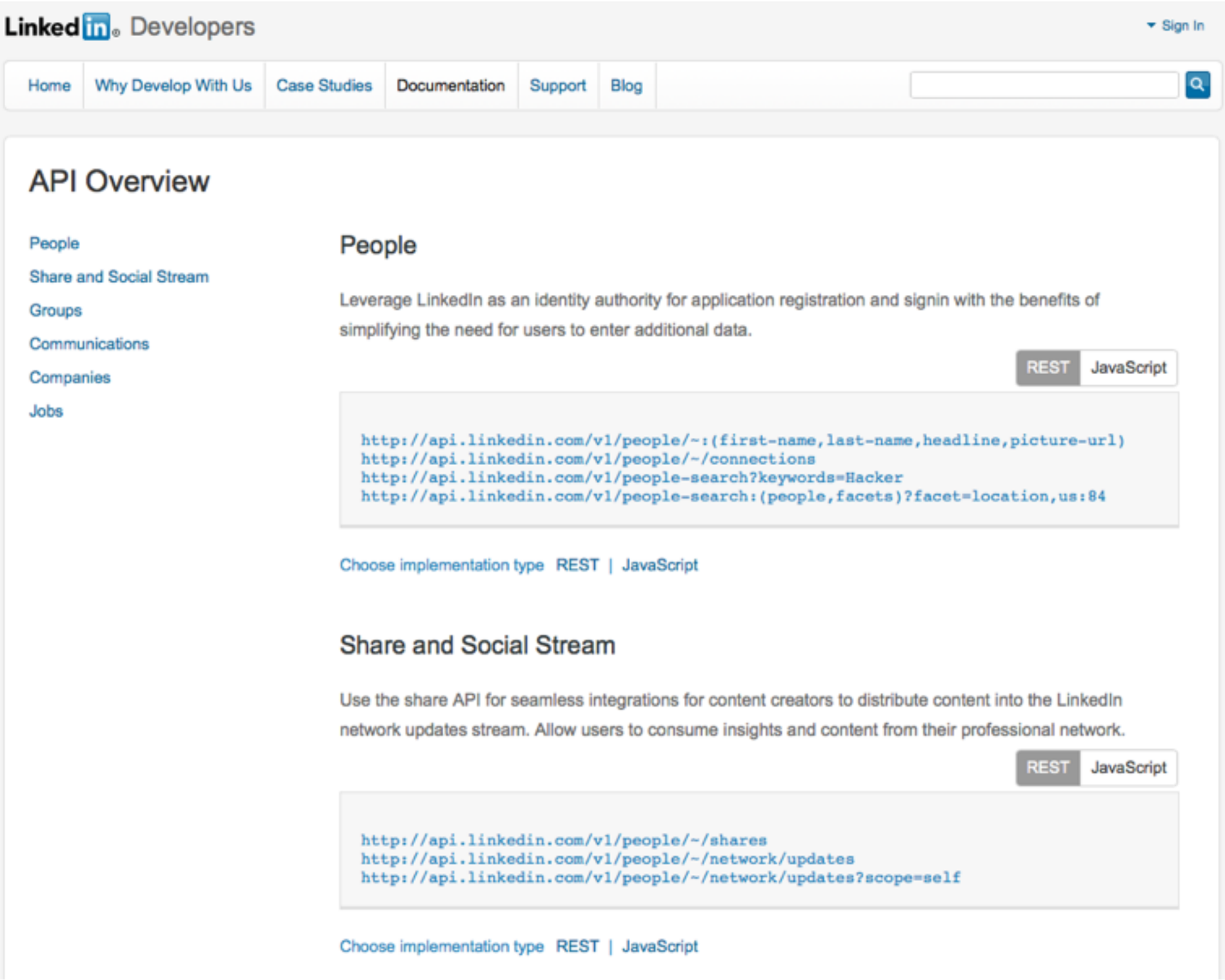

http://docs.aws.amazon.com/AmazonS3/latest/API/APIRest.html

aws documentation

Amazon Simple Storage Service
API Reference (API Version 2006-03-01)

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REST API

Topics

This section contains information specific to the Amazon S3 REST API.

The examples in this guide use the newer virtual hosted-style method for accessing buckets instead of the path-style. Although the path-style is still supported for legacy applications, we recommend using the virtual-hosted style where applicable. For more information, see Working with Amazon S3 Buckets

The following example is a virtual hosted-style request that deletes the `puppy.jpg` file from the `mybucket` bucket.

```
DELETE /puppy.jpg HTTP/1.1
User-Agent: dotnet
Host: mybucket.s3.amazonaws.com
Date: Tue, 15 Jan 2008 21:20:27 +0000
x-amz-date: Tue, 15 Jan 2008 21:20:27 +0000
Authorization: AWS AKIAIOSFODNN7EXAMPLE:k3nL7gH3+PadhTEVn5EXAMPLE
```

The following example is a path-style version of the same request.

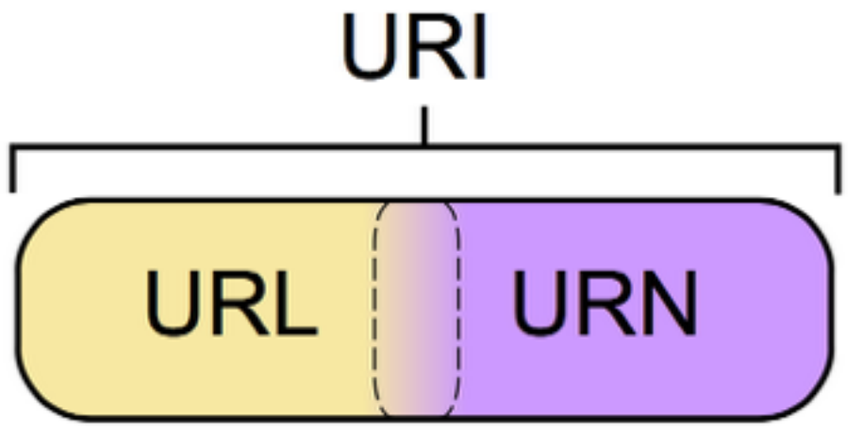
```
DELETE /mybucket/puppy.jpg HTTP/1.1
User-Agent: dotnet
Host: s3.amazonaws.com
Date: Tue, 15 Jan 2008 21:20:27 +0000
x-amz-date: Tue, 15 Jan 2008 21:20:27 +0000
Authorization: AWS AKIAIOSFODNN7EXAMPLE:k3nL7gH3+PadhTEVn5EXAMPLE
```

Web Architectural Components

1. Identification: URI
   - uniform resource identifier
2. Interaction: HTTP
   - hypertext transfer protocol
3. Standard Document Format: HTML, XML, JSON
   - hypertext markup language
   - extensible markup language
   - javascript object notation

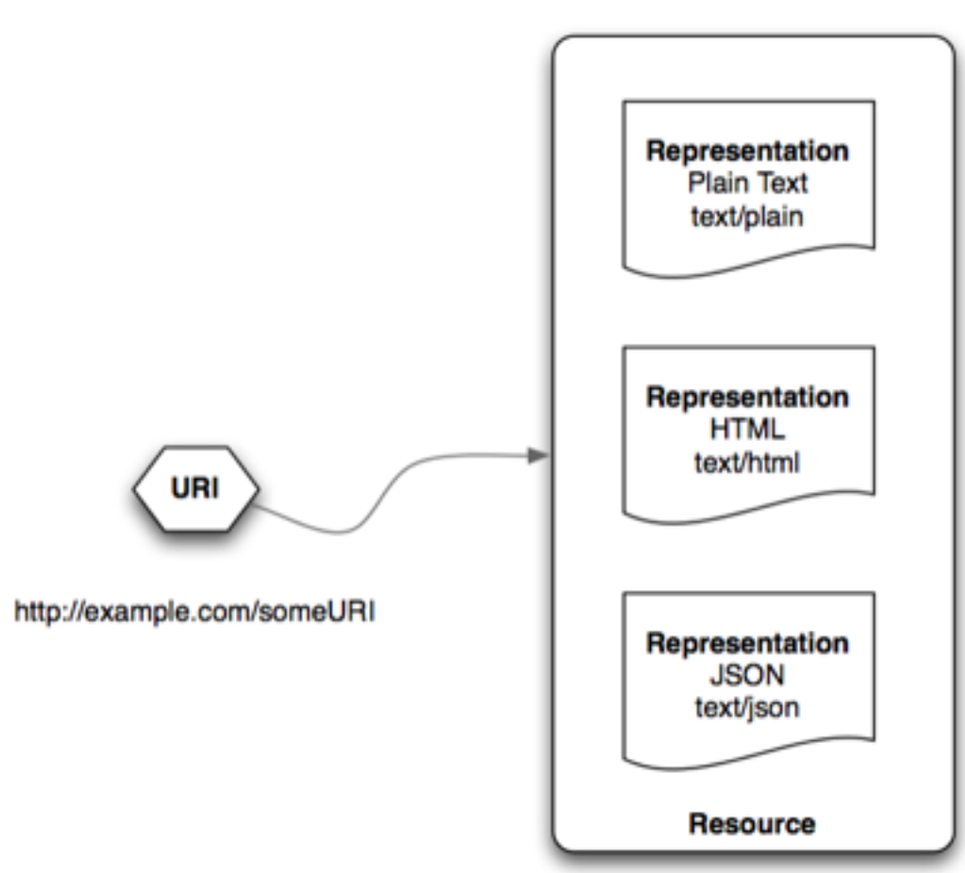
URIs

- URIs identify interesting things in the Web
  - documents on the Web
  - relevant aspects of a data set
- A URN (uniform resource name) defines an item's identity
  - A URN functions like a person's name
- A URL (uniform resource locator) provides a method for finding an item
  - A URL resembles that person's street address, while
- A URI can be a URL, a URN or both



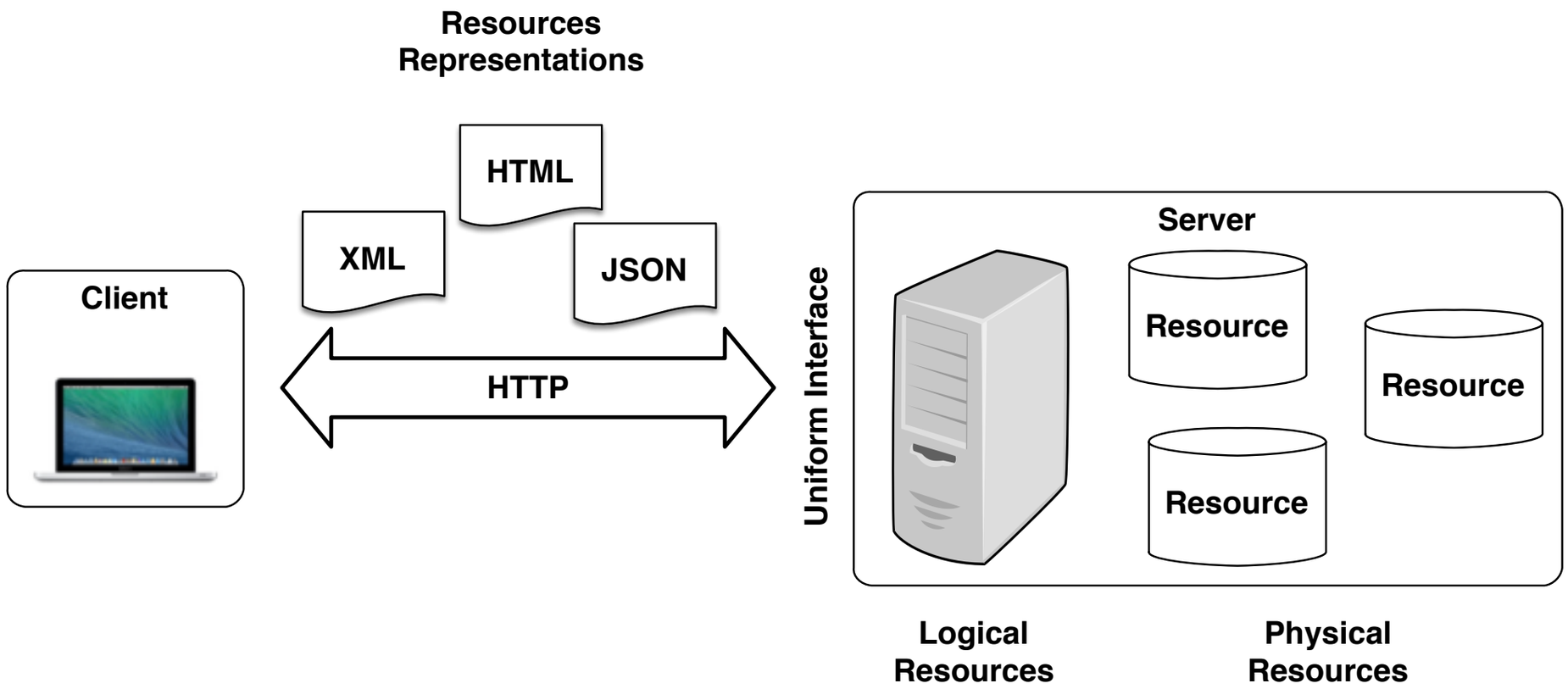
URI Examples

- HTTP URIs name and address resources in a Web system
  - A URI names and identifies one resource
  - A resource can have more than one name
    - http://example.com/software/latest-release
    - http://example.com/software/release-1.4
- A resource can have several representations:



Interacting with resources

- We interact with resource representations
  - not the resources themselves
  - representations can be in any format
    - defined by media type
- Each resource implements a standard uniform interface: HTTP
  - a small set of verbs applied to a large set of nouns
  - verbs are universal and not invented on a per-application basis



REST and ROA

- Representational State Transfer (REST)
  - Based on chapter 5 of Roy Fielding's PhD thesis (2000)
- An architectural style for building loosely coupled systems
  - The Web itself is an instance of that style
- Can be used to build Web services
- Resource Oriented Architecture (ROA)
  - A set of design principles to build RESTful Web services

Architectural Principles

- Addressability
- Uniform Interface
- Connectedness
- Statelessness

Addressability

- An addressable application
  - exposes the interesting aspects of its dataset as resources
  - exposes a URI for every piece of information it might serve
  - which is usually an infinite number of URIs
- A resource
  - is anything that is important enough to be referenced as a thing in itself
  - usually something
    - that you want to serve information about
    - that can be represented as a stream of bits
      - actors
      - movies
  - a resource must have at least one name (URI)
- Resource names
  - the URI is the name and address of a resource
  - resource's URI should be descriptive:

GOOD: http://example.com/movies

BAD: http://example.com/overview.php?list=all,type=movie

Uniform Interface

- The same set of operations applies to everything (every resource)
- A small set of verbs (methods) applied to a large set of nouns (resources)
- Verbs are universal and not invented on a per-application base
  - Natural language works in the same way (new verbs rarely enter language)
- HTTP defines a small set of verbs (methods) for acting on URI-identified resources

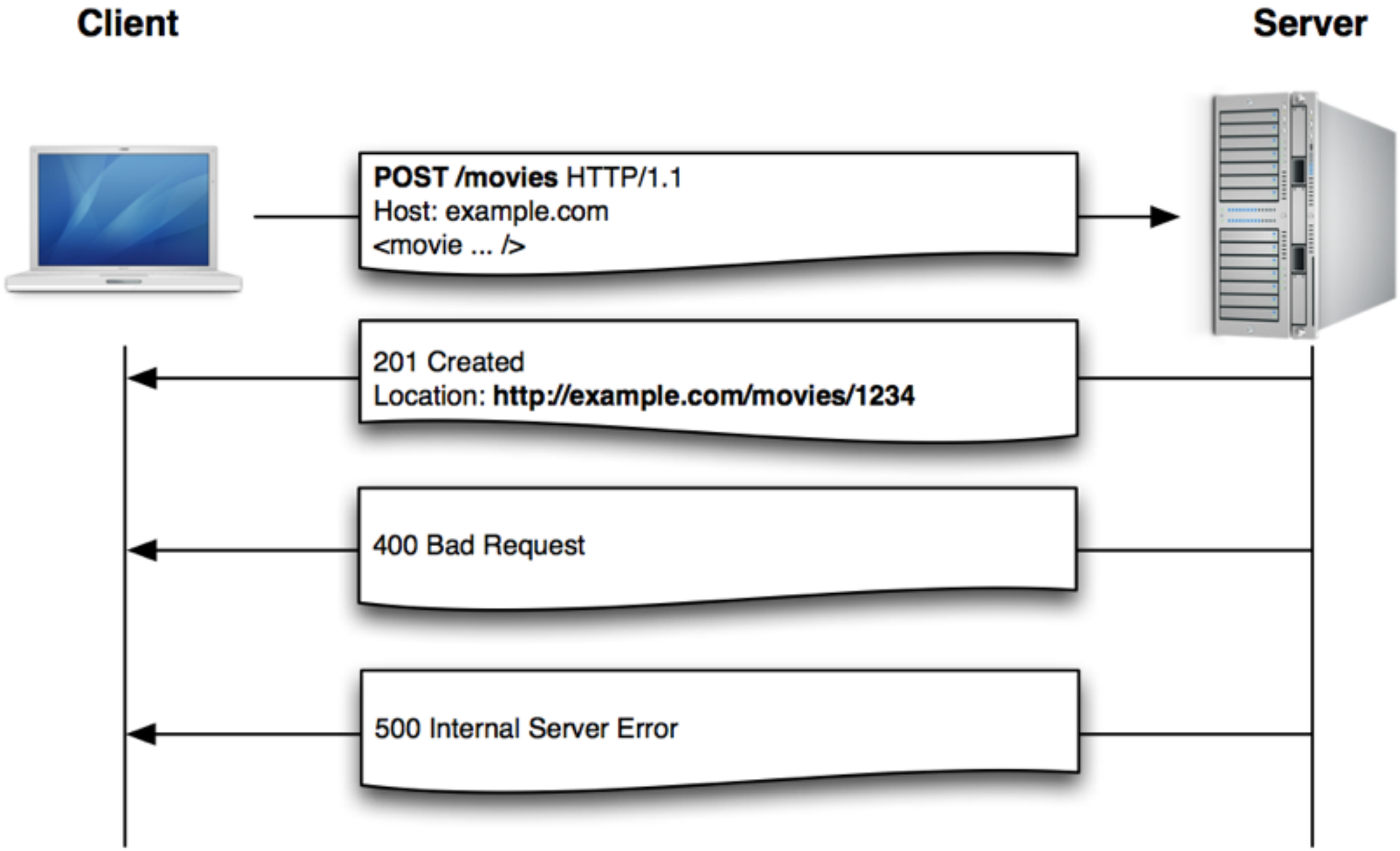
- RESTful Web Services use HTTP to its full extent
  - Methods: GET, POST, PUT, DELETE, (...)
  - Request headers: Authorization, Content-Type, Last-Modified
  - Response Codes: 200 OK, 304 Not Modified, 401 Unauthorized, 500 Internal Server Error
  - Body: an envelope for data to be transported from A to B

CRUD with HTTP

- With HTTP we have all methods we need to manipulate Web resources
- CRUD interface:
  - Create = POST (or PUT)
  - Read = GET
  - Update = PUT
  - Delete = DELETE
- Safe and idempotent behavior
  - Safe methods can be ignored or repeated without side-effects: GET and HEAD
  - Idempotent methods can be repeated without side-effects: PUT and DELETE
  - Unsafe and non-idempotent methods should be treated with care: POST

CREATE

- CREATE a new resource with HTTP POST

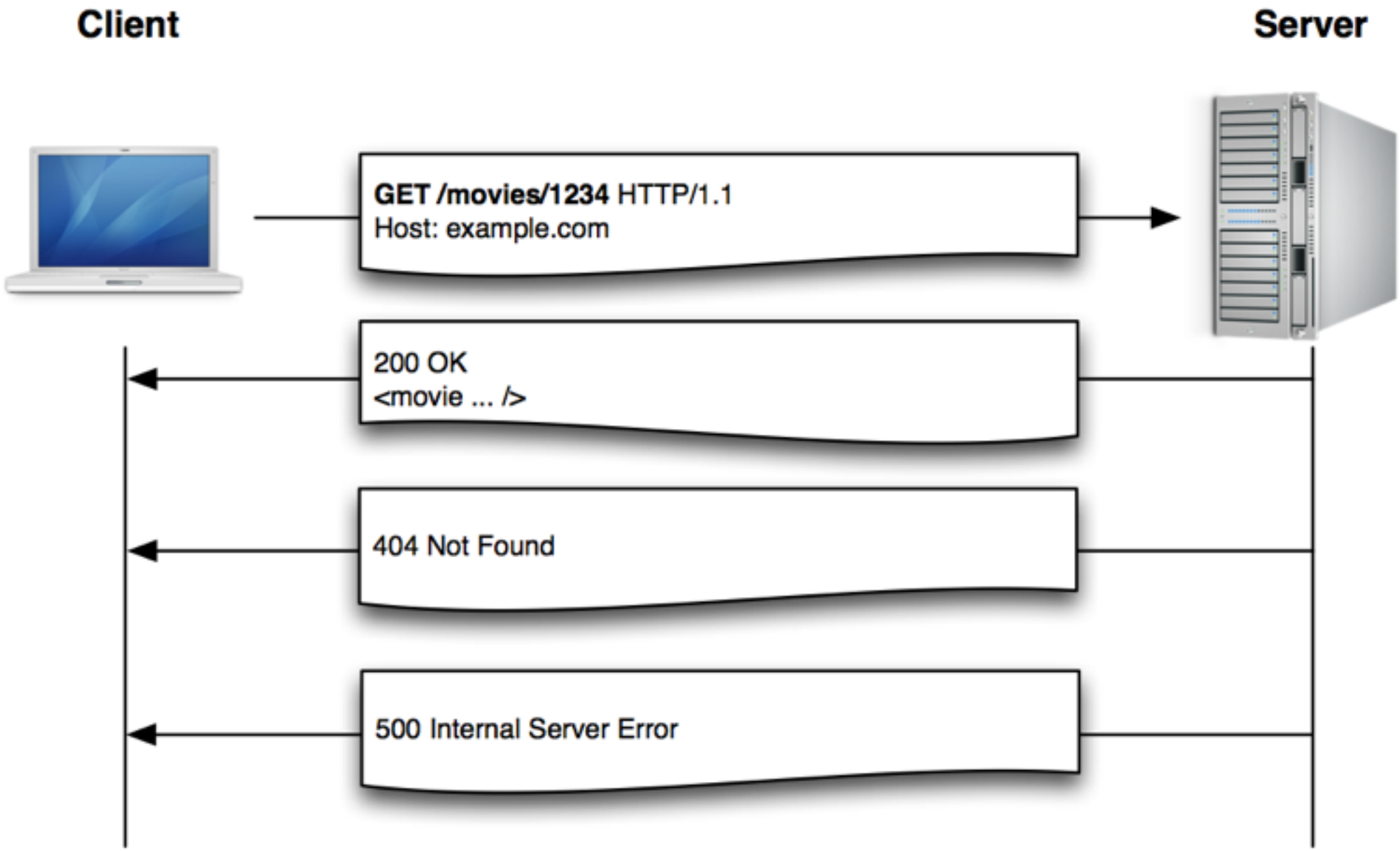


POST Semantics

- POST creates a new resource
- The server decides on the resource's URI
- POST is **not idempotent**
  - A sequence of two or more POST requests has side-effects
  - Human Web:
    - "Do you really want to post this form again?"
    - "Are you sure you want to purchase that item again?"
  - Programmatic Web:
    - if you post twice, you create two resources

READ

- READ an existing resource with HTTP GET

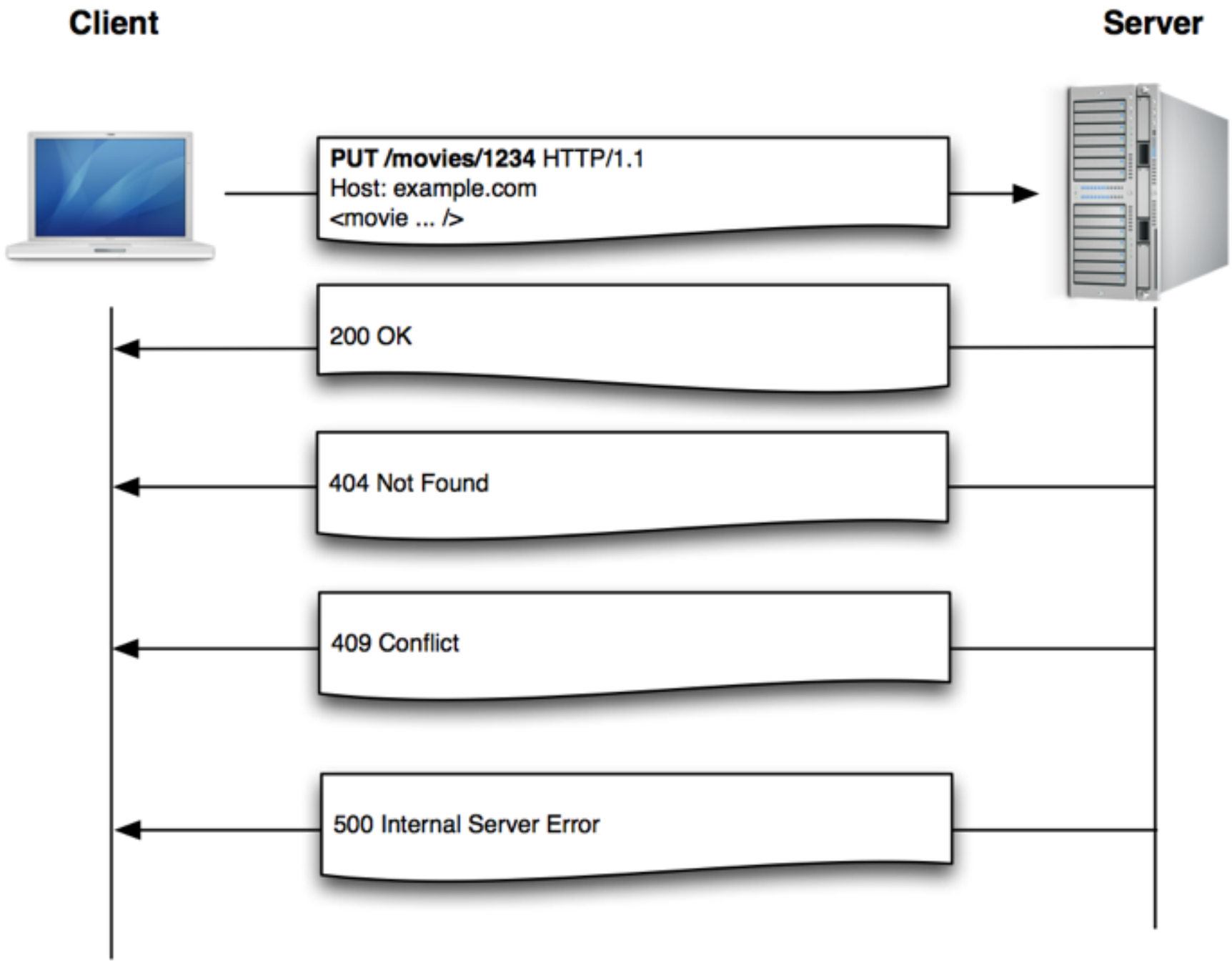


GET Semantics

- GET retrieves the representation (i.e., the current state) of a resource
- GET is **safe** (implies idempotent)
  - does not change state of resource
  - has no side-effects
- If GET goes wrong
  - GET it again!
  - no problem because it safe (and idempotent)

UPDATE

- UPDATE an existing resource with HTTP PUT

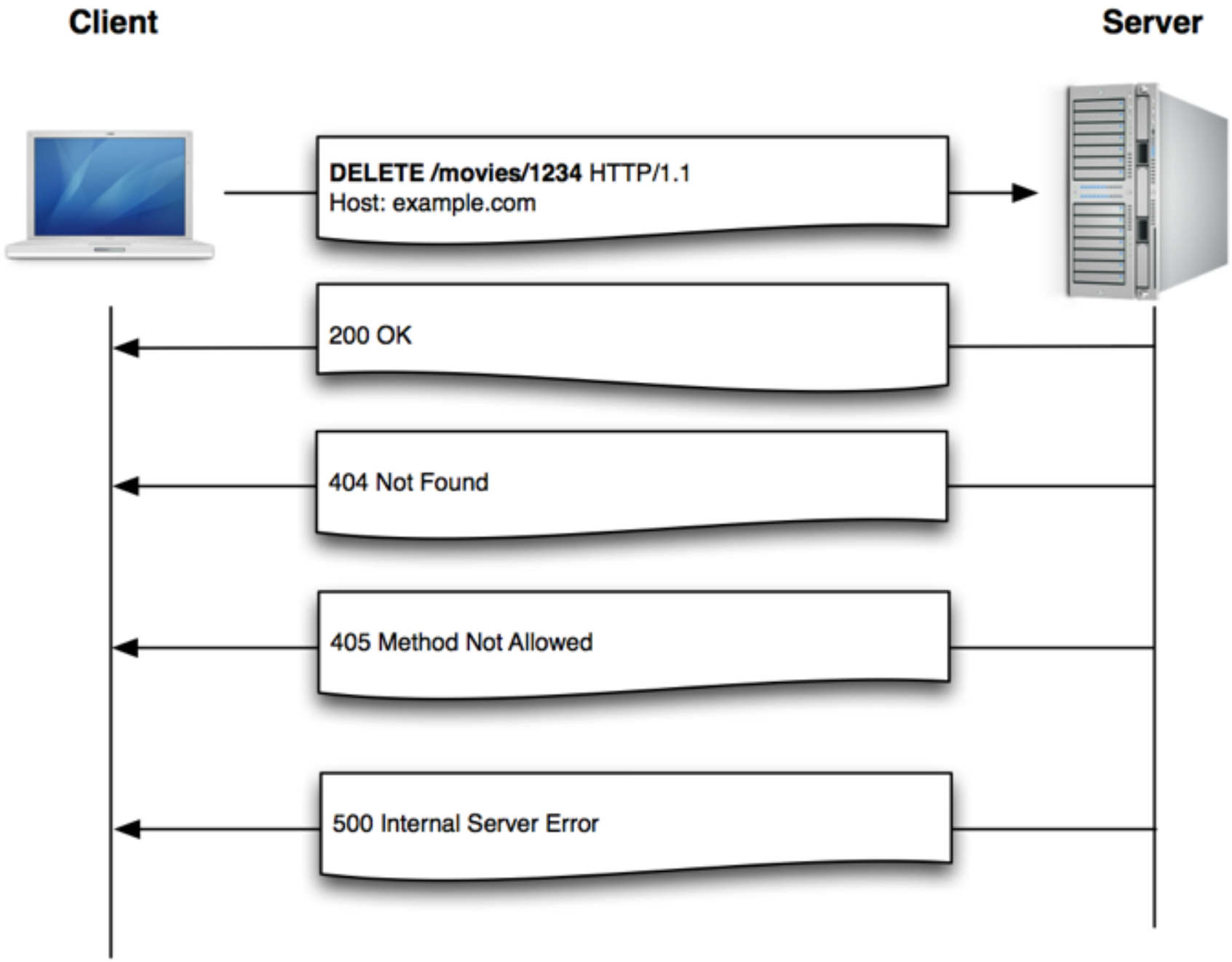


PUT Semantics

- PUT creates a new resource
- The client decides on the resource's URI
- PUT is **idempotent**
  - multiple PUT requests have no side effects
  - but it changes the resource state

DELETE

- DELETE an existing resource with HTTP DELETE



DELETE Semantics

- Stop the resource from being accessible
  - logical delete
  - not necessarily physical
- If DELETE goes wrong
  - try it again!
  - DELETE is idempotent

Representations in HTTP

- In HTTP, the format of a resource is identified through a MIME code
  - Multimedia Internet Mail Extension
  - format: type/subtype

Examples:

- Examples:
  - text/plain, text/html
  - application/xml
  - image/jpeg

Connectedness

- RESTful services representations are hypermedia documents
- These are documents that contain not just data, but links to other resources
- The server guides the client's path by serving “hypermedia”: links and forms inside hypertext representations
- The server sends the client guidelines about which states are near the current one.
- The quality of having links is called “connectedness”.
- Resources should link to each other in their representations.
- Hence, why the human web is easy to use because it is well connected

Statelessness

- Statelessness = every HTTP request executes in complete isolation
- The request contains all the information necessary for the server to fulfill that request
- The server never relies on information from a previous request
  - if information is important (e.g., user- authentication), the client must send it again
- This constraint does not say "stateless applications"!
  - for many RESTful applications, state is essential (e.g., shopping carts)
- It means to move state to clients or resources
- State in resources
  - the same for every client working with the service
  - when a client changes resource state other clients see this change as well
- State in clients (e.g., cookies)
  - specific to client and has to be maintained by each client – makes sense for maintaining session state (login / logout)

Tools and Frameworks

- Restlet - framework for mapping REST concepts to Java classes
  - http://www.restlet.org
- Django - framework for building RESTful Web applications in Python
  - http://django-rest-framework.org
- Ruby on Rails - a framework for building RESTful Web applications
  - http://www.rubyonrails.org/
- JAX-RS - a specification provides a Java API for RESTful Web Services over the HTTP protocol
  - https://jax-rs-spec.java.net
- Jersey - the open source reference implementation of JAX-RS
  - https://jersey.java.net
- RESTEasy - JBoss project that provides various frameworks for building RESTful Web Services and RESTful Java applications. Fully certified JAX-RS implementation.
  - http://www.jboss.org/resteasy/