JÖNKÖPING UNIVERSITY

School of Engineering

REST API BASICS

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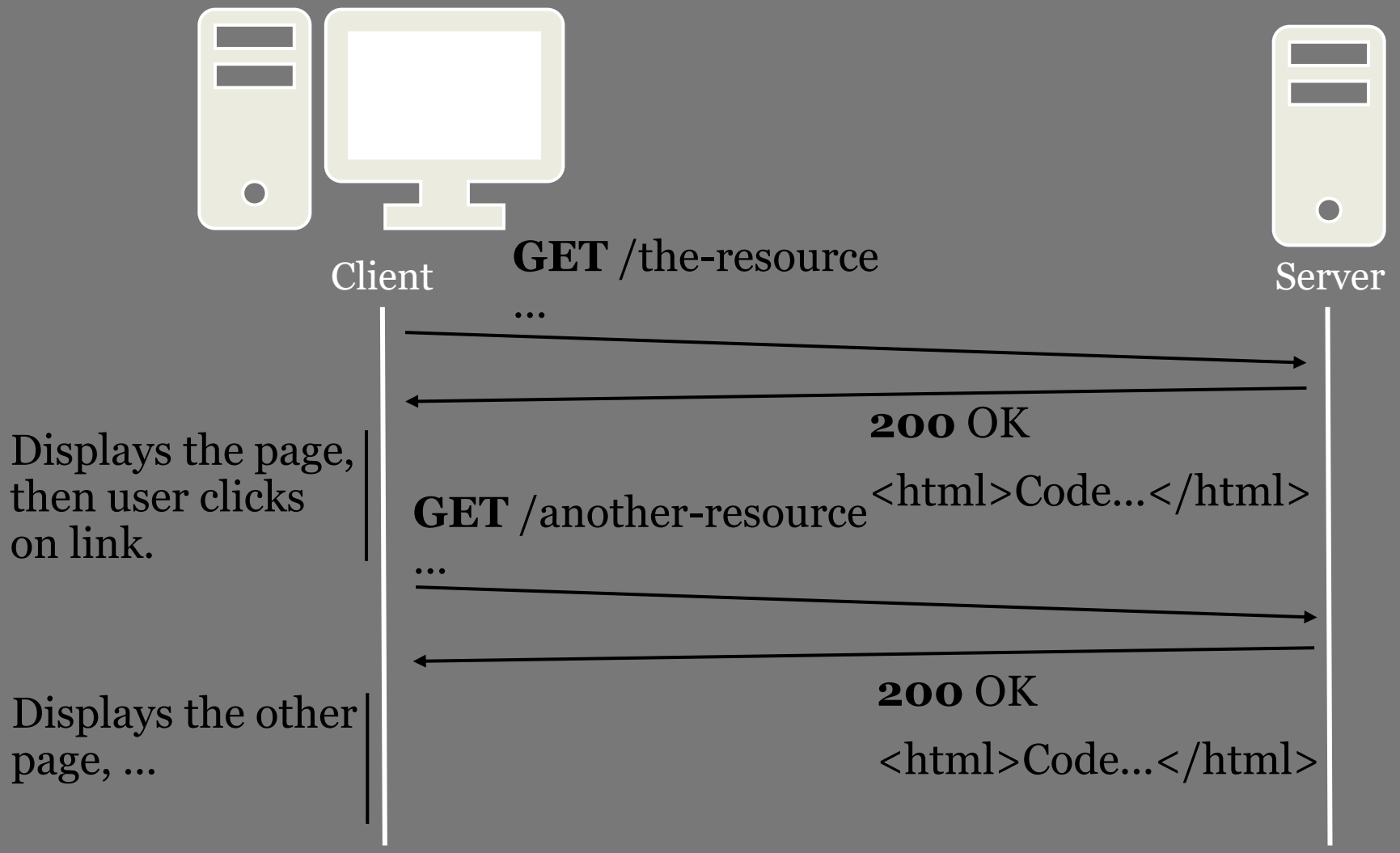
TRADITIONAL WEB APPLICATIONS

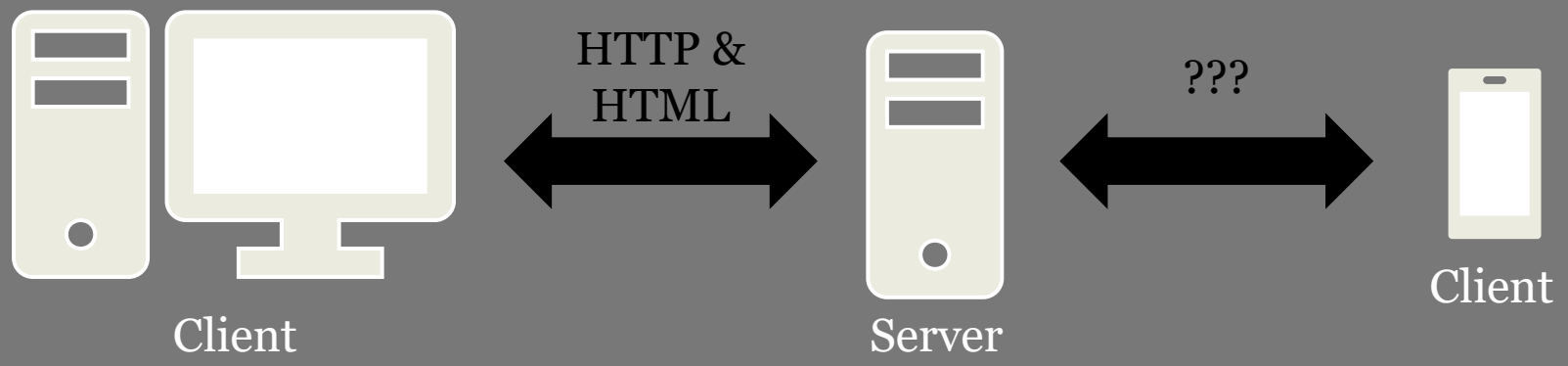


TRADITIONAL WEB APPLICATIONS

The interface is built on HTML & HTTP.

- Drawbacks:
  - The client must understand both HTTP and HTML.
  - The entire webpage is replaced with another one.
    - No way to animate transitions between webpages.
  - Same data is usually sent in multiple responses.
    - E.g. HTML code for the layout.

TRADITIONAL WEB APPLICATIONS



- HTTP & HTML can be used, but is not optimal.
  - The GUI on smartphones does not use HTML.
  - E.g. `GET /users/3`:

Name

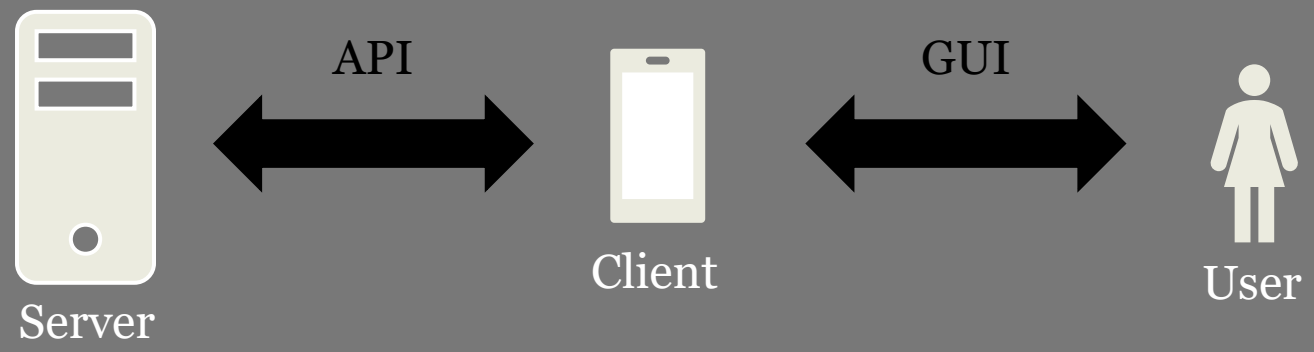
Age

City

```
<h1>Claire</h1>
<p>Claire is 24 years old and lives in Boston.</p>
```

Application Programming Interface

A GUI is an interface for Human ↔ Machine communication.



An API is an interface for Machine ↔ Machine communication.

- An API making use of HTTP is called a *Web API*.

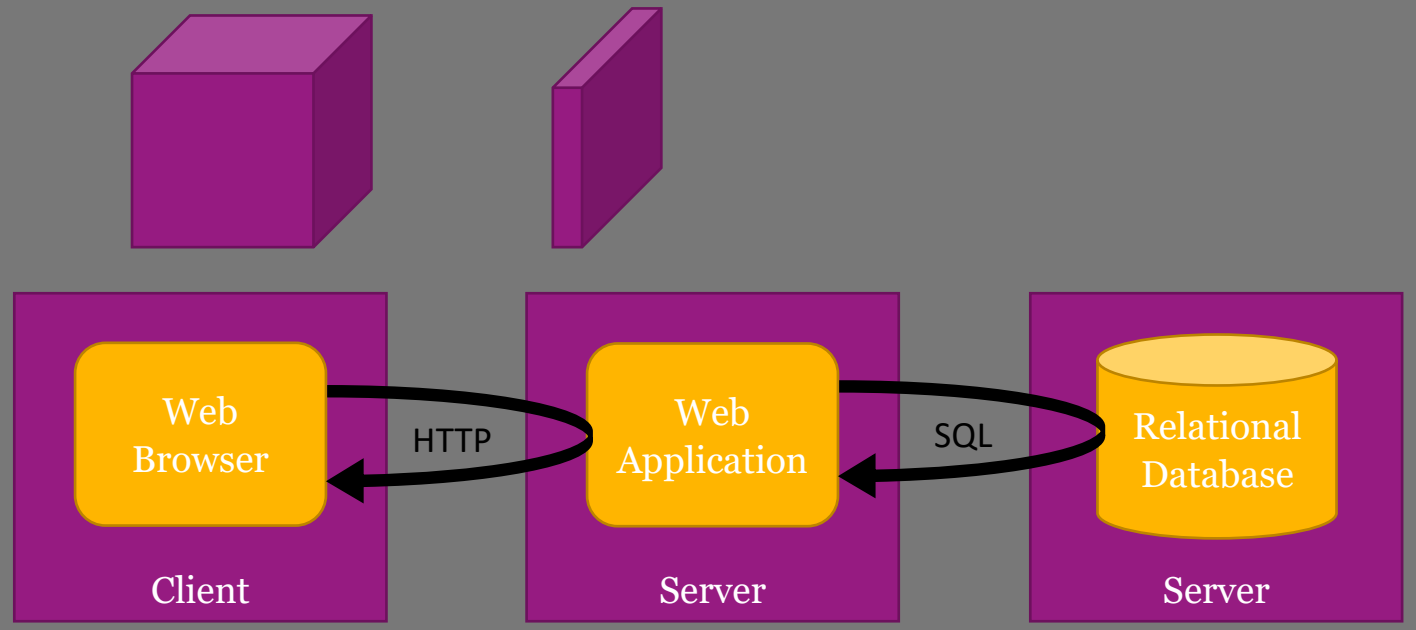
DIFFERENT TYPES OF WEB APIS

- *Remote Procedure Call*, RPC.
  - Clients can call functions on the server.
- *Remote Method Invocation*, RMI.
  - Clients can call methods on objects on the server.
- *Representational State Transfer*, REST.
  - Clients can apply CRUD operations on resources on the server.

WHAT IS REST?

An architectural style for *distributed hypermedia systems* described by Roy Thomas Fielding in his doctoral dissertation 2000.

- Consists of constraints:
  1. Client - Server
  2. Stateless
  3. Cache
  4. Uniform Interface
  5. Layered System
  6. Code-On-Demand



WHAT DOES REST MEAN?

The name "Representational State Transfer" is intended to evoke an image of how a well-designed Web application behaves: a network of web pages (a virtual state-machine), where the user progresses through the application by selecting links (state transitions), resulting in the next page (representing the next state of the application) being transferred to the user and rendered for their use.

From Roy's dissertation.

WHAT DOES REST MEAN?

Client

Server

GET /users/2

...

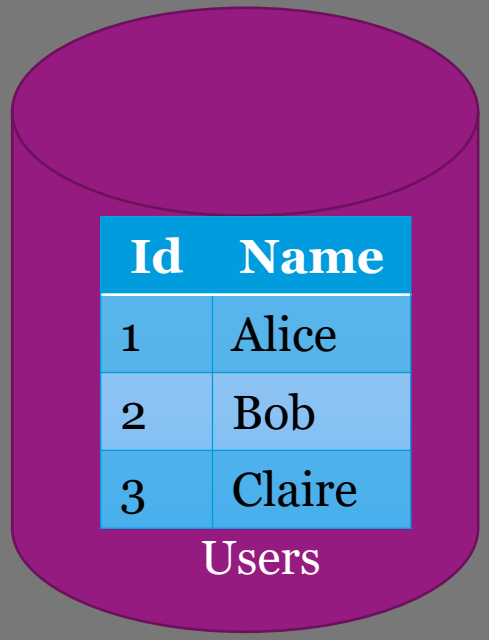
{"id": 2, "name": "Bob"}

Changes state.

{"id": 2,
"name": "Obi"}

PUT /users/2

{"id": 2, "name": "Obi"}



USING HTTP AS THE UNIFORM INTERFACE

- Use URIs to identify resources.
- Use HTTP methods to specify operation:
  - Create: POST (or PUT)
  - Retrieve: GET
  - Update: PUT (or PATCH)
  - Delete: DELETE
- Use HTTP headers `Content-Type` and `Accept` to specify data format for the resources.
- Use HTTP status code to indicate success/failure.

Bad	**Good**
`POST /login`	`POST /login-sessions`
`POST /create-book`	`POST /books`
`GET /get-top-10-books`	`GET /top-10-books`

USING HTTP AS THE UNIFORM INTERFACE

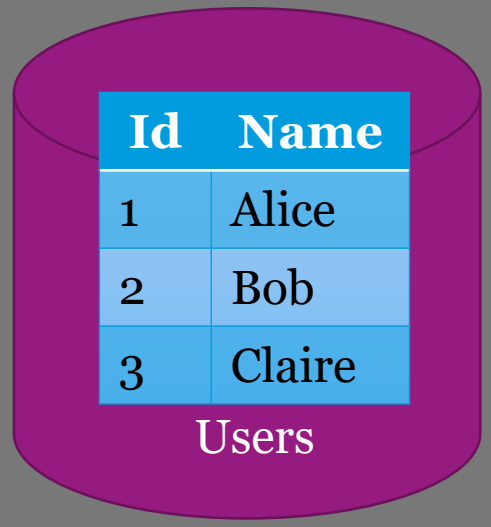
REST is an architectural style, not a specification.

- In practice, it can be used in many different ways.
  - But some are better than others.

Good recommendations:

- Web API Design - Crafting Interfaces that Developers Love
  - https://pages.apigee.com/rs/apigee/images/api-design-ebook-2012-03.pdf

REST EXAMPLE



A server with information about users.

- The GET method is used to retrieve resources.
  - `GET /users`
  - `GET /users/2`
  - `GET /users/pages/1` `GET /users?page=1`
  - `GET /users/gender/female` `GET /users?gender=female`
  - `GET /users/age/18` `GET /users?age=18`
  - `GET /users/???` `GET /users?gender=female&age=18`
  - `GET /users/2/name`
  - `GET /users/2/pets`

REST EXAMPLE

Id	Name
1	Alice
2	Bob
3	Claire

Users

A server with information about users.

- The GET method is used to retrieve resources.
  - Which data format? Specified by the `Accept` header!

```
GET /users HTTP/1.1
Host: the-website.com
Accept: application/json
```

`application/xml` was popular before JSON.

```
HTTP/1.1 200 OK
Content-Type: application/json
Content-Length: 66

[
  {"id": 1, "name": "Alice"},
  {"id": 2, "name": "Bob"}
]
```

REST EXAMPLE

Id	Name
1	Alice
2	Bob
3	Claire

Users

A server with information about users.

- The POST method is used to create resources.
  - Which data format? Specified by the `Accept` and `Content-Type` header!

```
POST /users HTTP/1.1
Host: the-website.com
Accept: application/json
Content-Type: application/xml
Content-Length: 49

<user>
  <name>Claire</name>
</user>
```

```
HTTP/1.1 201 Created
Location: /users/3
Content-Type: application/json
Content-Length: 28

{"id": 3, "name": "Claire"}
```

REST EXAMPLE

Id	Name
1	Alice
2	Bob
3	Claire

Users

A server with information about users.

- The PUT method is used to update an entire resource.

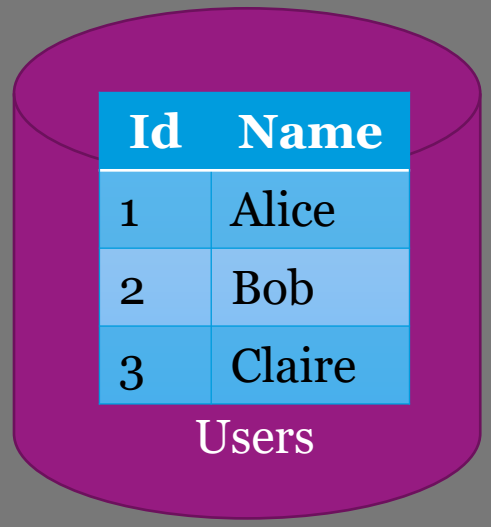
```
PUT /users/3 HTTP/1.1
Host: the-website.com
Content-Type: application/xml
Content-Length: 52

<user>
  <id>3</id>
  <name>Cecilia</name>
</user>
```

```
HTTP/1.1 204 No Content
```

PUT can also be used to create a resource if you know which URI it should have in advance.

REST EXAMPLE



A server with information about users.

- The DELETE method is used to delete a resource.

```
DELETE /users/2 HTTP/1.1
Host: the-website.com
```

```
HTTP/1.1 204 No Content
```

REST EXAMPLE

Id	Name
1	Alice
2	Bob
3	Claire

Users

A server with information about users.

- The PATCH method is used to update parts of a resource.

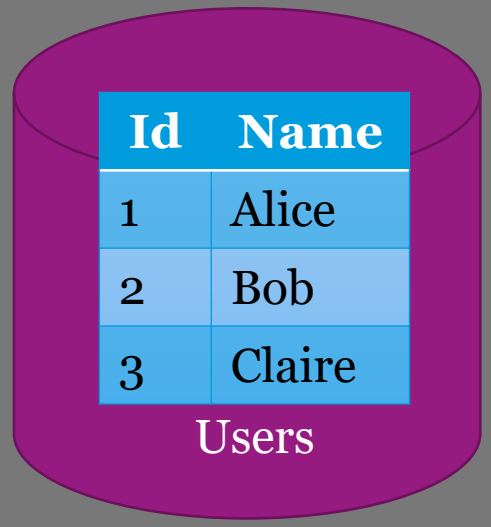
```
PATCH /users/1 HTTP/1.1
Host: the-website.com
Content-Type: application/xml
Content-Length: 37

<user>
  <name>Amanda</human>
</user>
```

```
HTTP/1.1 204 No Content
```

The PATCH method is only a proposed standard.

REST EXAMPLE



A server with information about users.

- What if something goes wrong?
  - Use the HTTP status codes to indicate success/failure.

```
GET /users/999 HTTP/1.1
Host: the-website.com
Accept: application/json
```

```
HTTP/1.1 404 Not Found
```

  - Read more about the different status codes at:
    - http://www.restapitutorial.com/httpstatuscodes.html
  - Optionally include error messages in the response body.

DESIGNING A REST API

How should you think?

- Make it as easy as possible to use by other programmers.

Facebook:

- Always return 200 OK.
- `GET /v2.7/{user-id}`
- `GET /v2.7/{post-id}`
- `GET /v2.7/{user-id}/friends`
- `GET /v2.7/{object-id}/likes`

DESIGNING A REST API

How should you think?

- Make it as easy as possible to use by other programmers.

Twitter:

- Only use GET and POST.
- `GET  /1.1/users/show.json?user_id=2244994945`
- `POST /1.1/favorites/destroy.json?id=243138128959913986`