API Slides Companion

Anatomia API REST

curl -s

https://api.github.com/repos/didattica-forever/Chirpy (address API)

https://api.github.com/repos/didattica-forever/Chirpy (address API)
<filtro_username>/<filtro_reponame> (filtri)

/repos/<filtro_username>/<filtro_reponame> API

/repos/{username}/{reponame} API

result

JSON

SOAP

```
curl -X POST https://www.example.com/weatherService \
  -H "Content-Type: text/xml" \
  -d '<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
  <soap:Body>
    <GetCityWeather xmlns="http://weather.example.com/">
      <CityName>Rome</CityName>
    </GetCityWeather>
  </soap:Body>
</soap:Envelope>'
```

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
 <soap:Body>
  <GetCityWeatherResponse>
   <GetCityWeatherResult>
    <Temperature>18</Temperature>
    <Condition>Sunny</Condition>
   </GetCityWeatherResult>
  </GetCityWeatherResponse>
 </soap:Body>
</soap:Envelope>
```

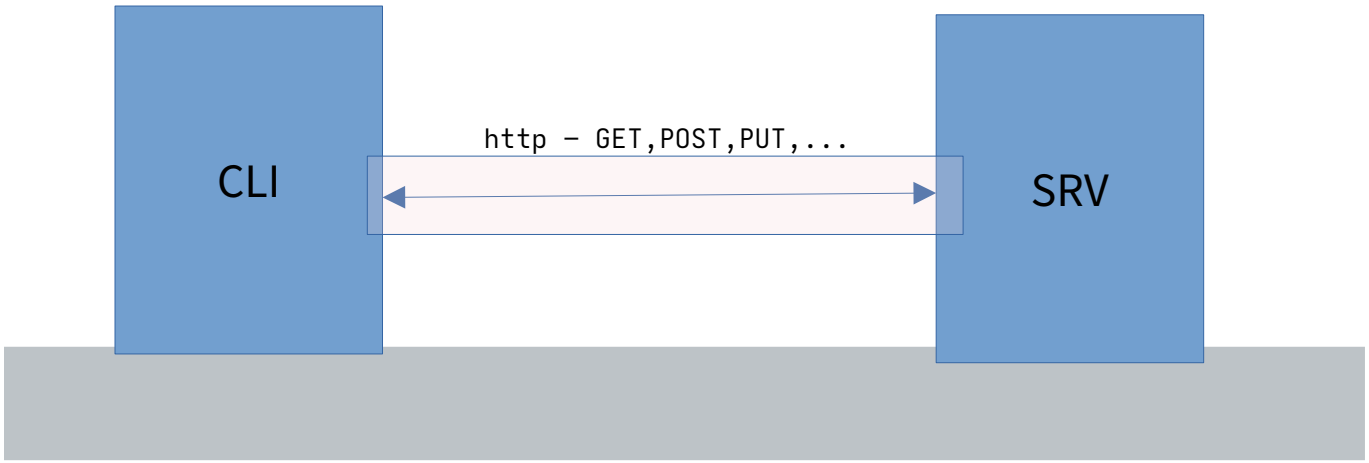
REST

REST trasferimento stato (Es: da server a client)

1) POST /customers — crea nuovo cliente (payload necessario)

2) GET /customers/{id} — profilo cliente

3) elenco di tutti i clienti? ==> GET /customers



CRUD & HTTP

CRUD	SQL	HTTP	DAO/REPO
Create	insert	POST	create
Read	select	GET	find findAll findBy+sort
Update	update	PUT (100%) PATCH	update merge
Delete	delete	DELETE	delete remove

Idempotenza

PUT /devices/12 { "mode": "AUTO" } - IDEM

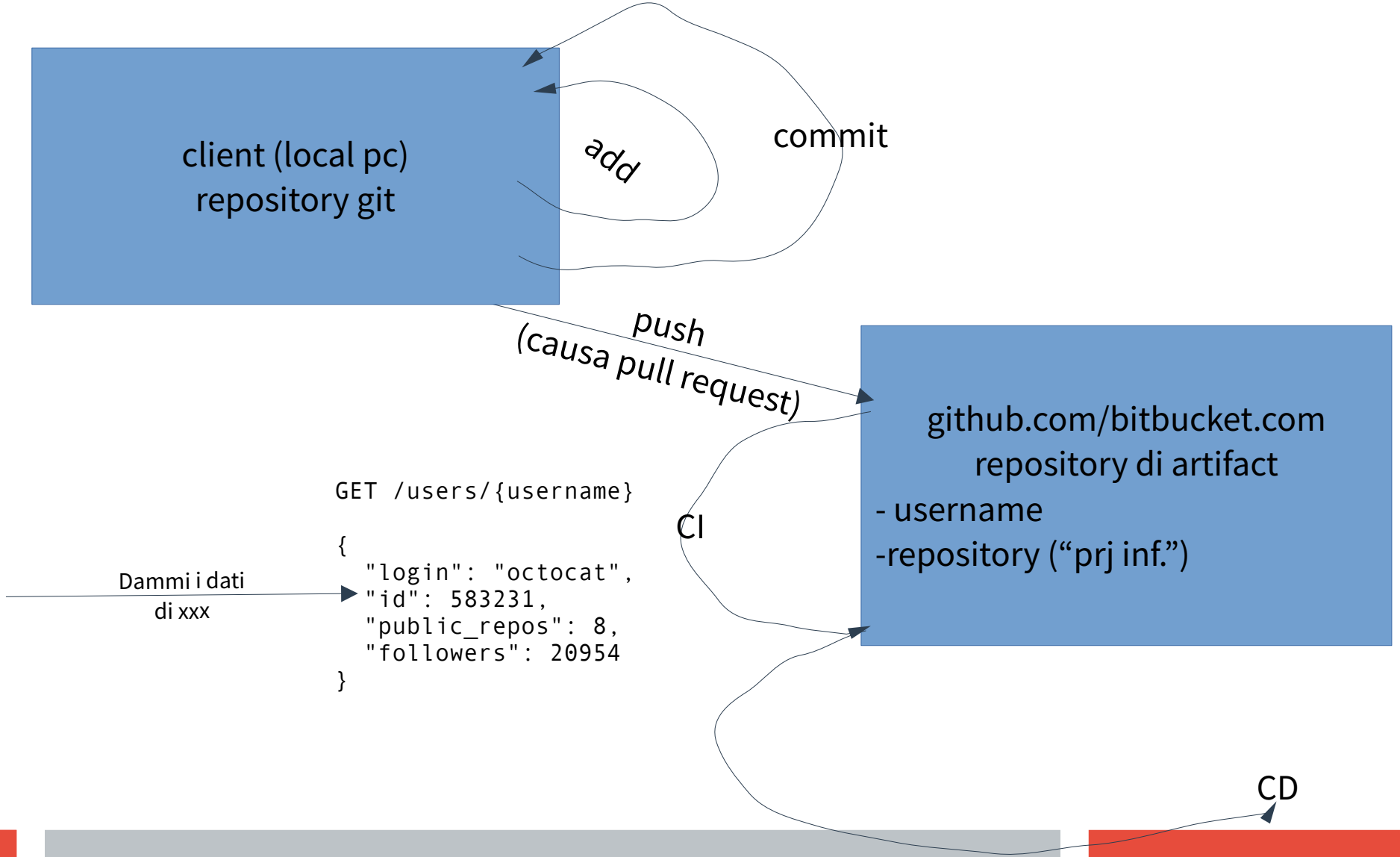
POST /logs { "event": "login" } - NO

DELETE /sessions/99 - IDEM

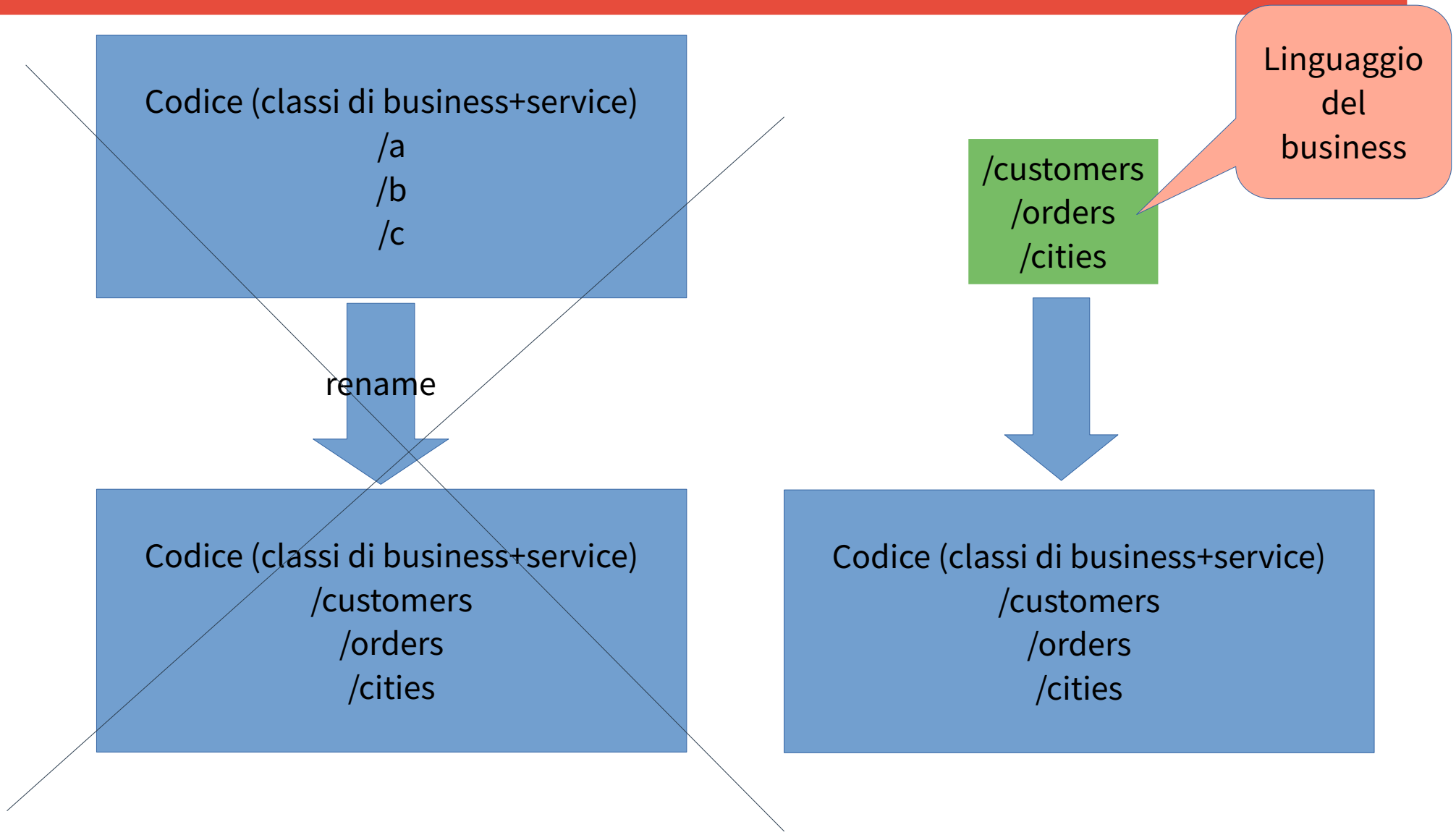
UPDATE accounts SET score = score + 1 – NO

UPDATE accounts SET saldo = credit + debit - NO

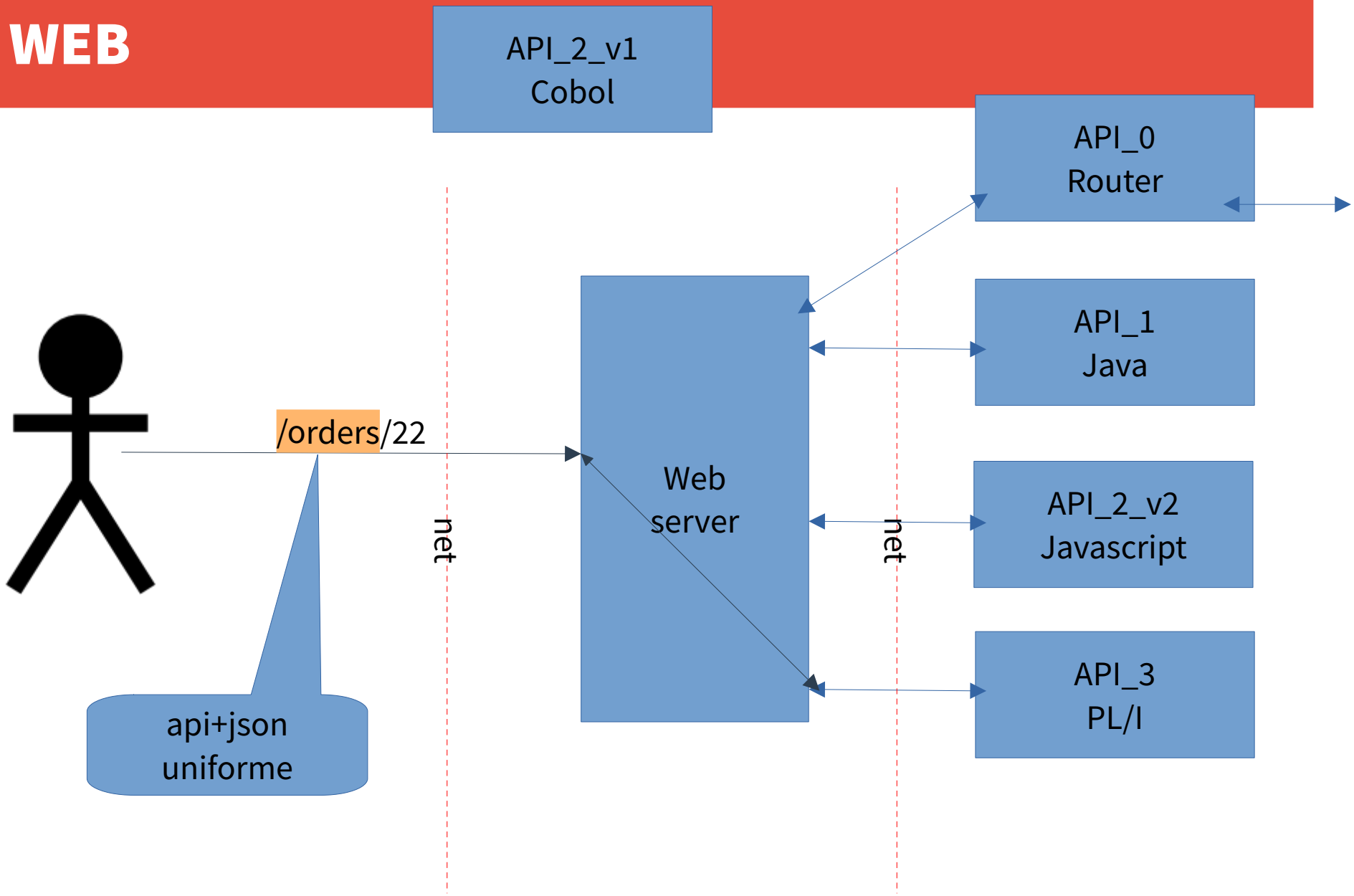
Git & Github


client (local pc)
repository git
add
commit
push
(causa pull request)
github.com/bitbucket.com
repository di artifact
- username
-repository (“prj inf.”)
CI
CD
Dammi i dati
di xxx
GET /users/{username}
{
"login": "octocat",
"id": 583231,
"public_repos": 8,
"followers": 20954
}

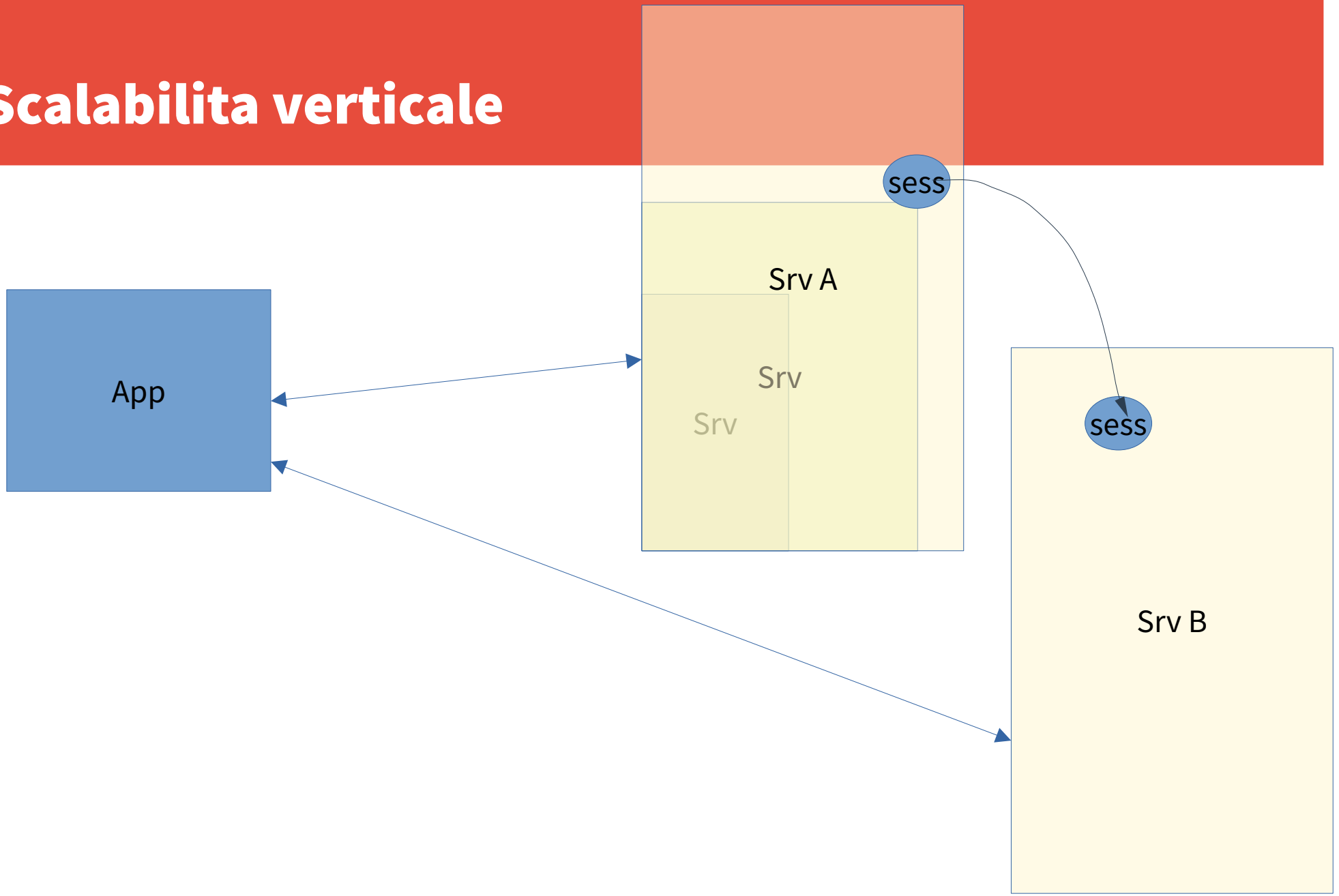
realizzazione API REST



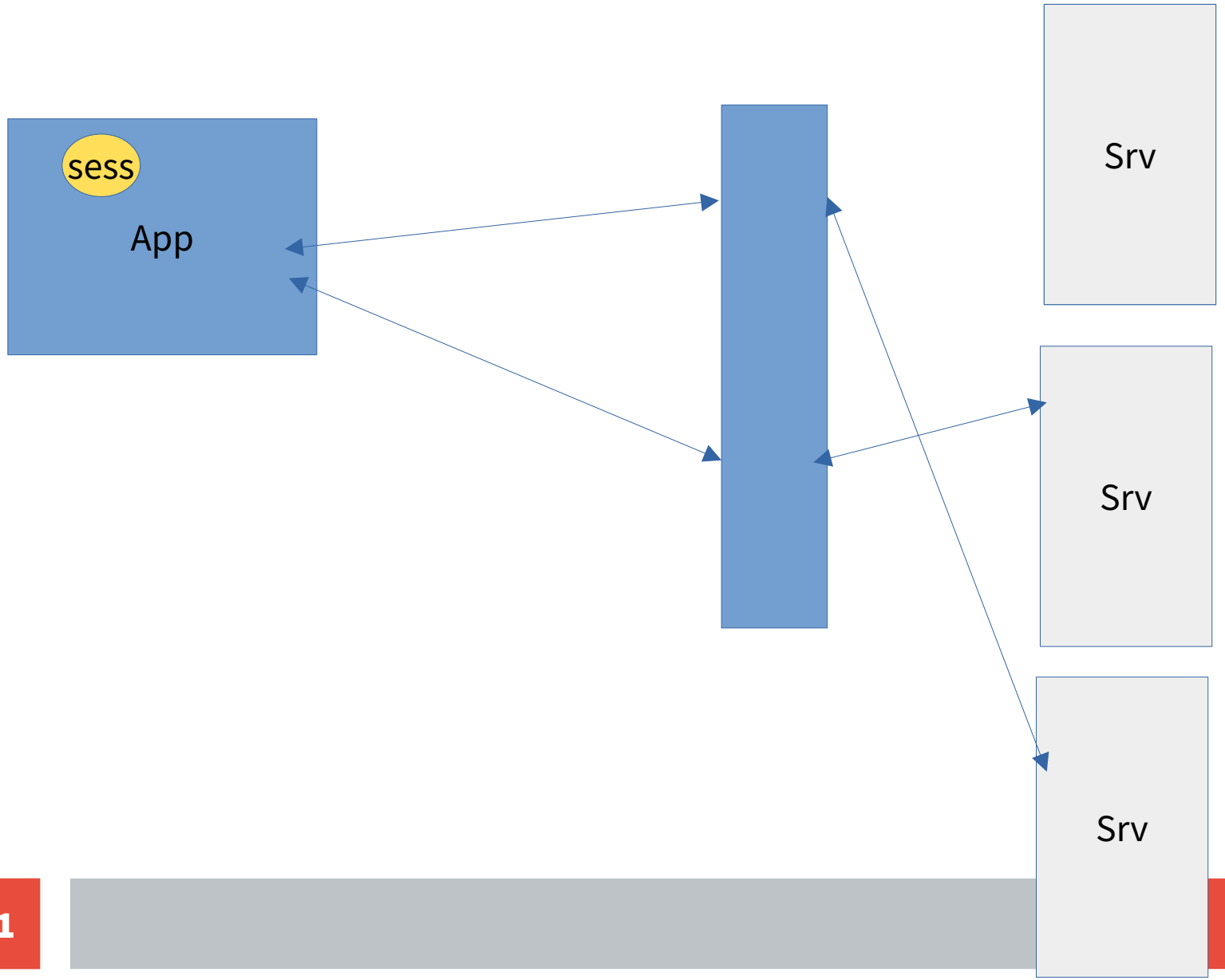
API WEB


API_2_v1
Cobol
API_0
Router
API_1
Java
API_2_v2
Javascript
API_3
PL/I
Web
server
/orders/22
api+json
uniforme
net
net

Scalabilita verticale



Scalabilita orizzontale



Cache

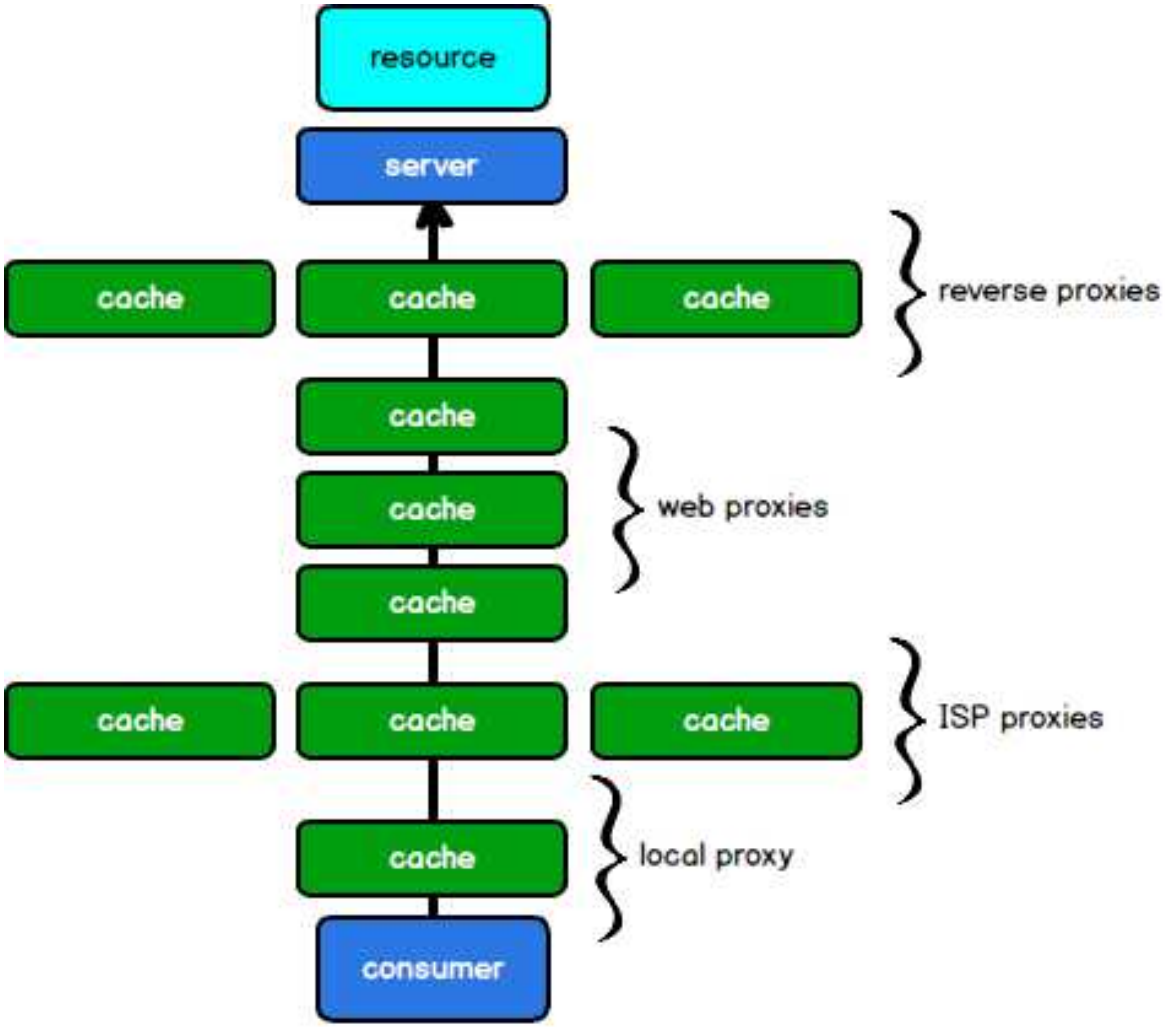
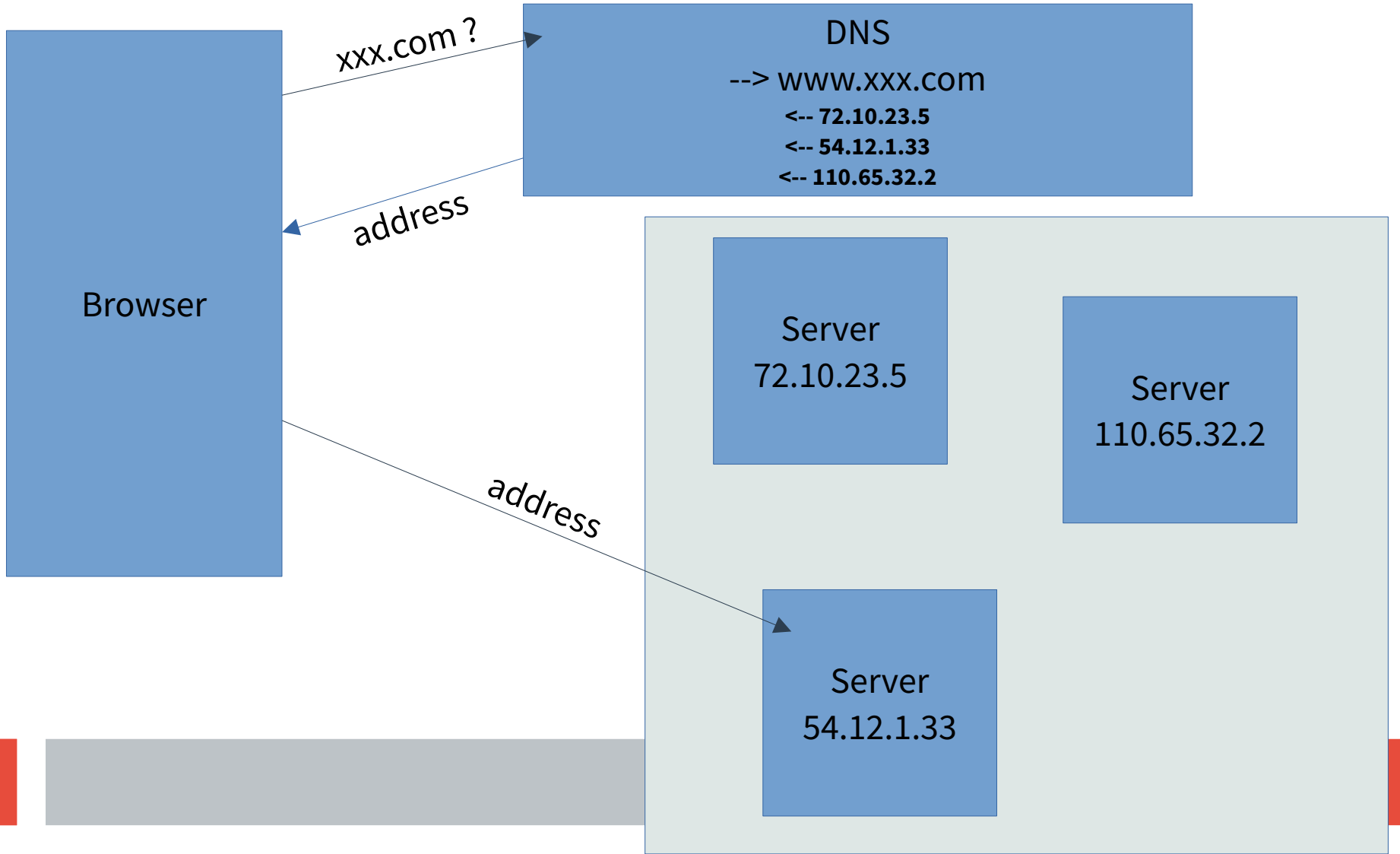
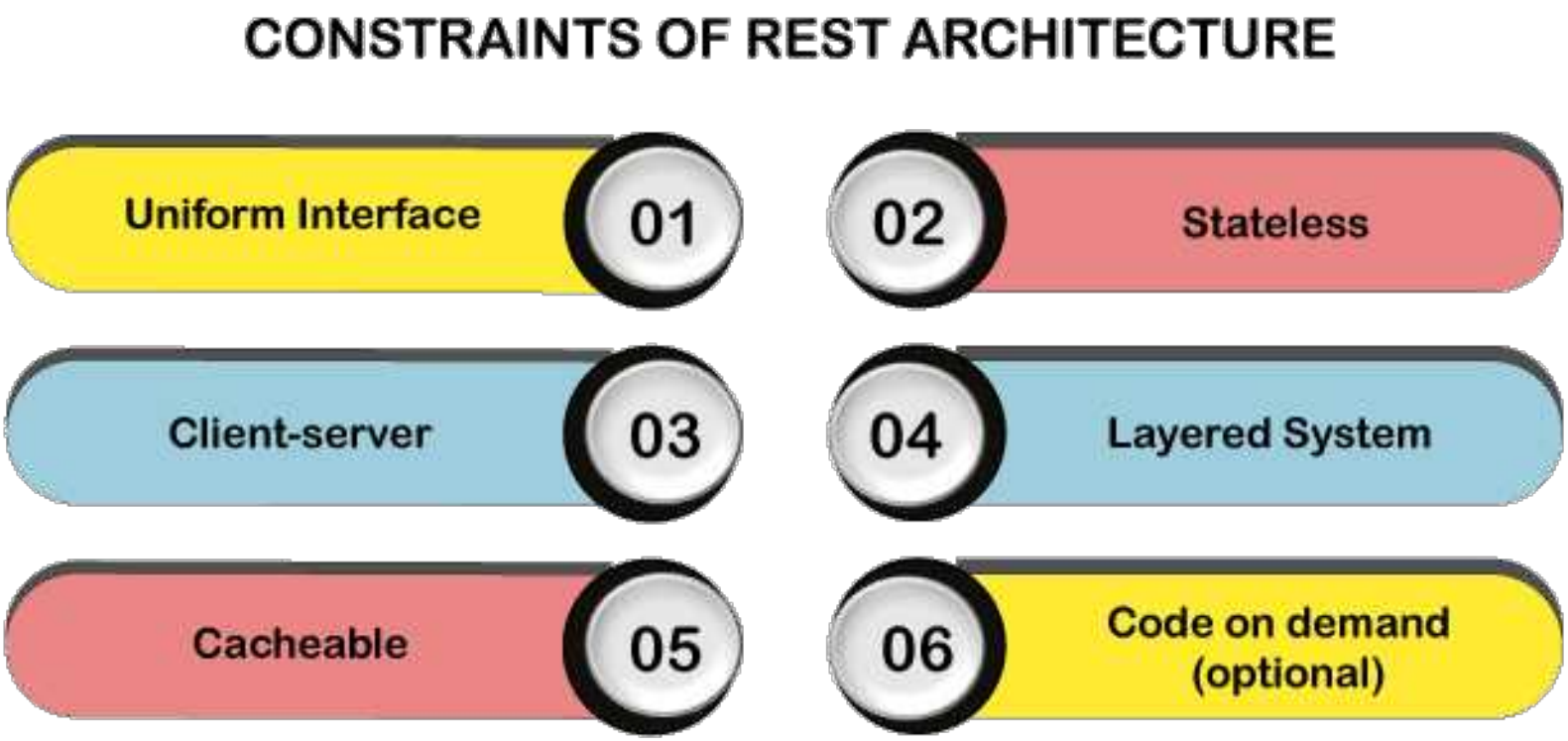


Figure 1. Web caches. REST In Practice, 2010.

DNS


Browser
xxx.com ?
address
DNS
--> www.xxx.com
<-- 72.10.23.5
<-- 54.12.1.33
<-- 110.65.32.2
address
Server
72.10.23.5
Server
110.65.32.2
Server
54.12.1.33

Constraint Stile Architetturale REST



BitBucket

Lista Commit di un repository

```
GET /rest/api/1.0/projects/{projectKey}/repos/{repoSlug}/commits
```

Lista commenti Pull Request filtrando quelli con action=="COMMENTED"

```
GET /rest/api/latest/projects/{project}/repos/{repo}/pull-requests/{prId}/
activities
```

Elencare permessi repository (cloud)

```
GET /repositories/{workspace}/{repo_slug}/permissions-config/users
```

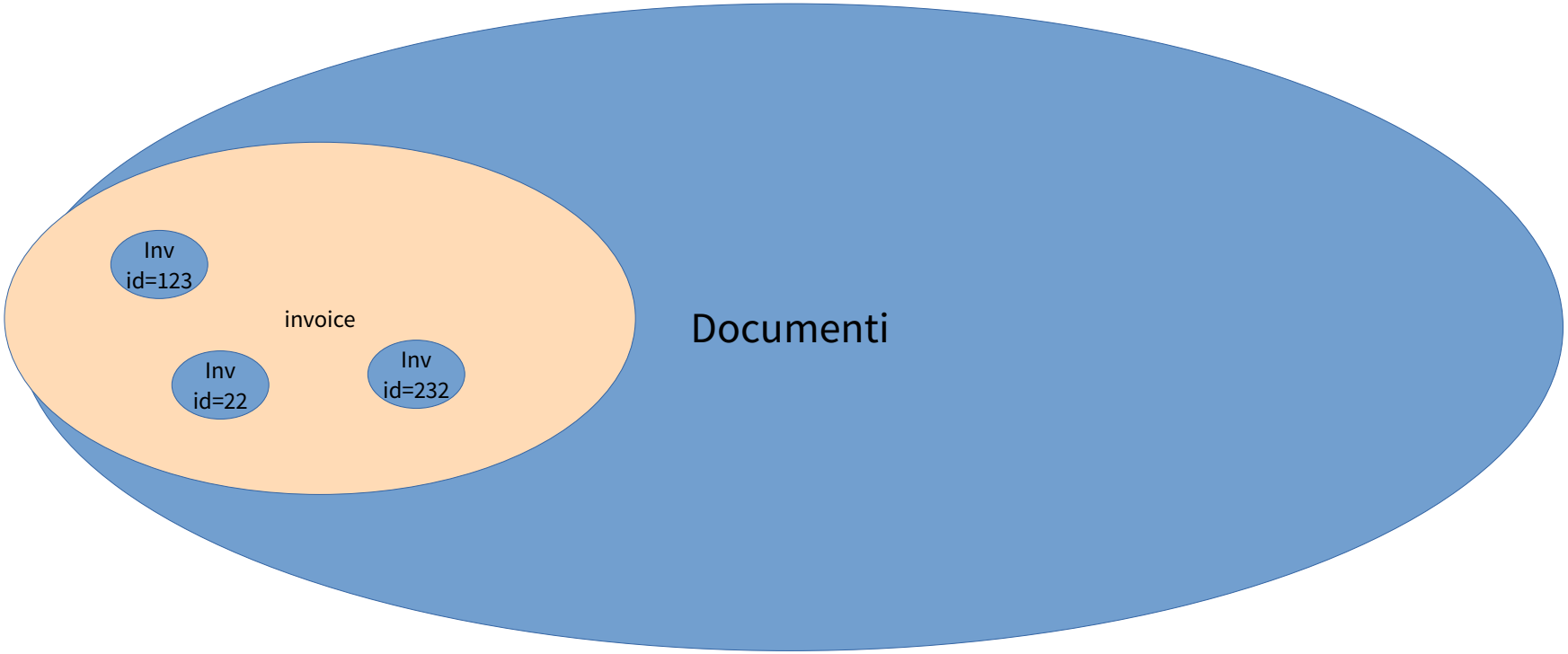
BitBucket

Lista Commit di un repository (ritorna un JSON)

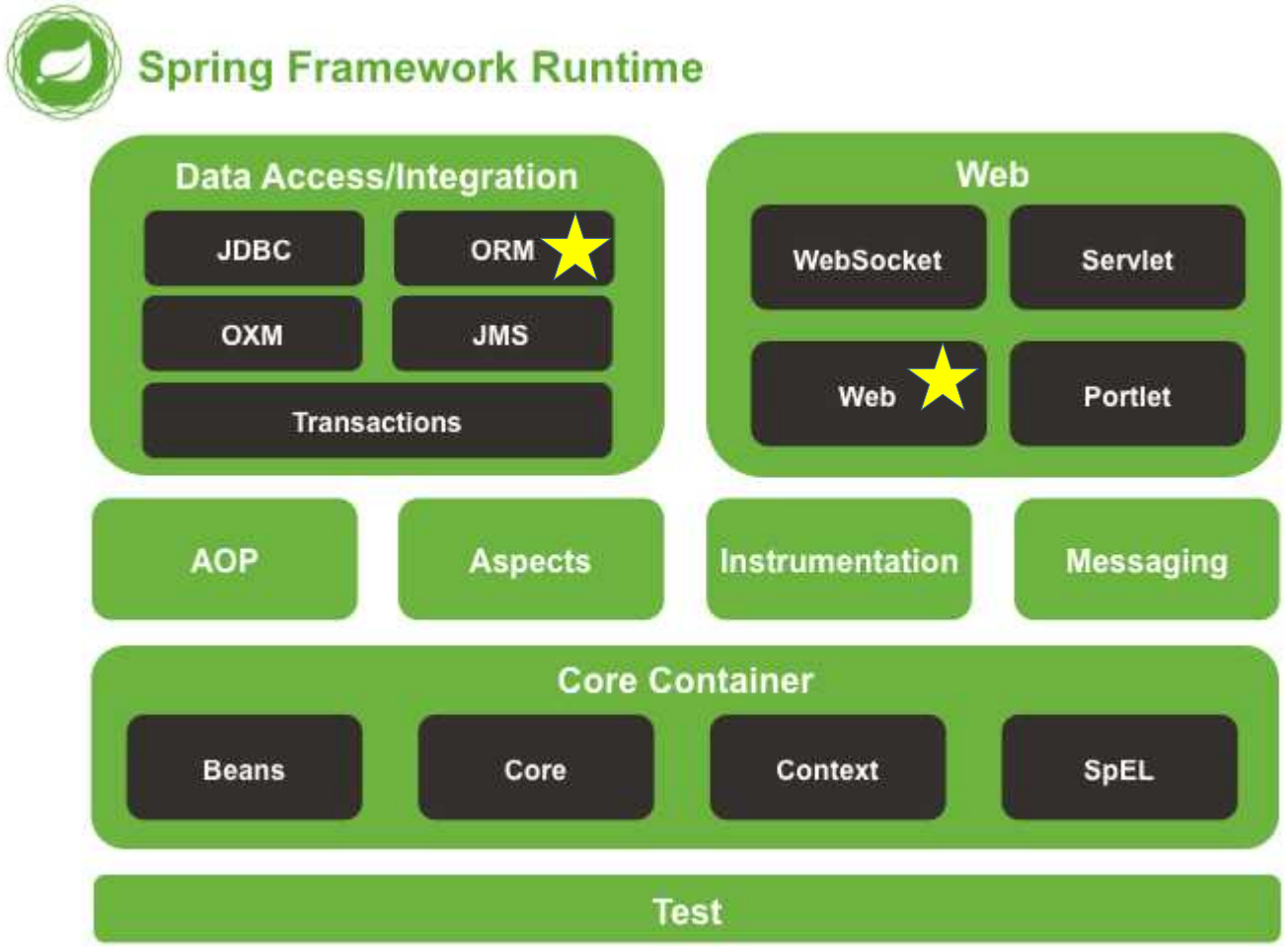
```
curl -u USER:PASS \
  "https://your-bitbucket-server/rest/api/1.0/projects/PROJ/repos/my-repo/commits?until=master"
```


```
{
  "size": 2,
  "limit": 25,
  "isLastPage": true,
  "values": [
    {
      "id": "01f9c86...",
      "displayId": "01f9c86",
      "author": { "name": "Alice", "emailAddress": "alice@example.com" },
      "message": "Fix bug XYZ",
      "parents": [ { "id": "abcdef123" } ]
    },
    { /* altro commit */ }
  ],
  "start": 0,
  "nextPageStart": 2
}
```

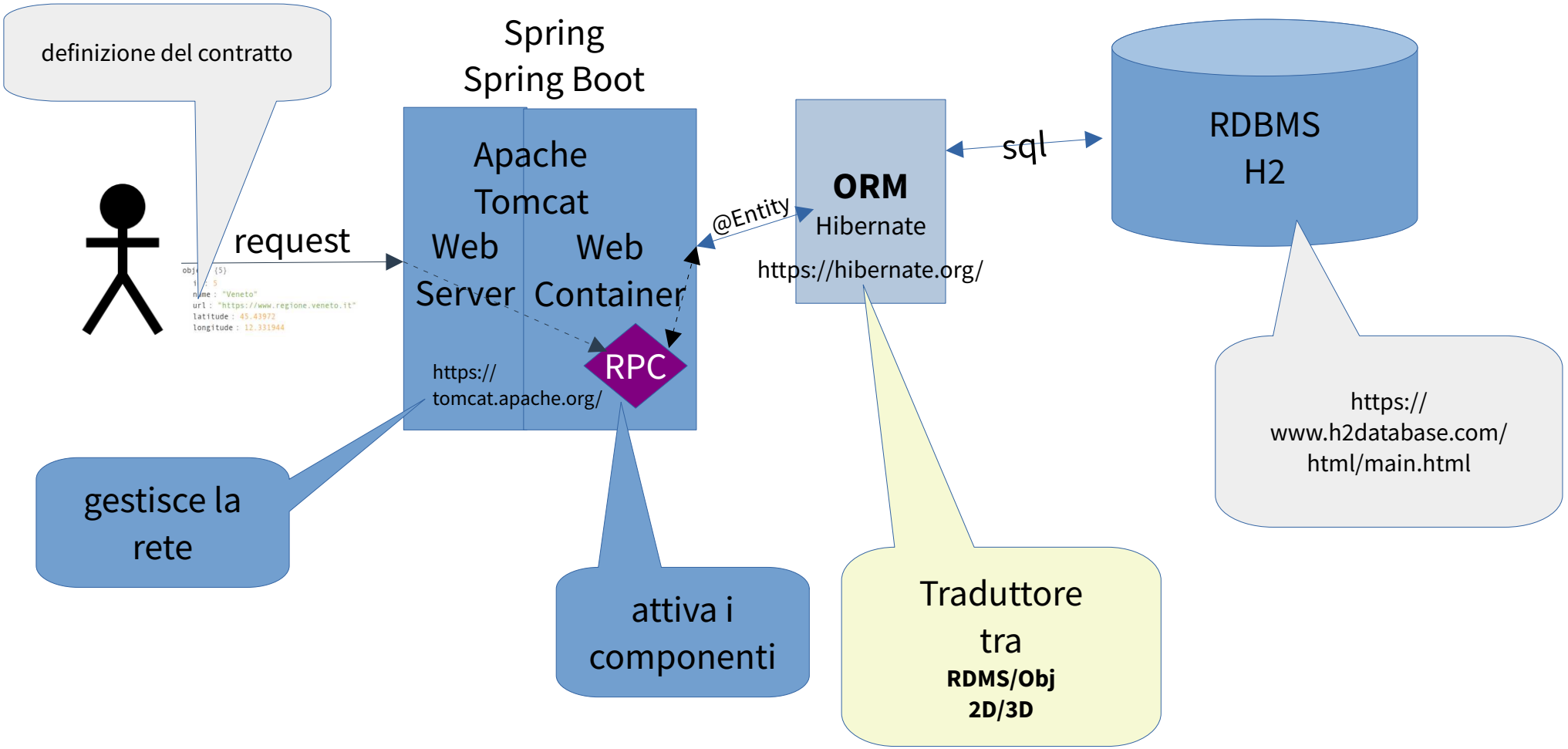
Classes o tipi & valori



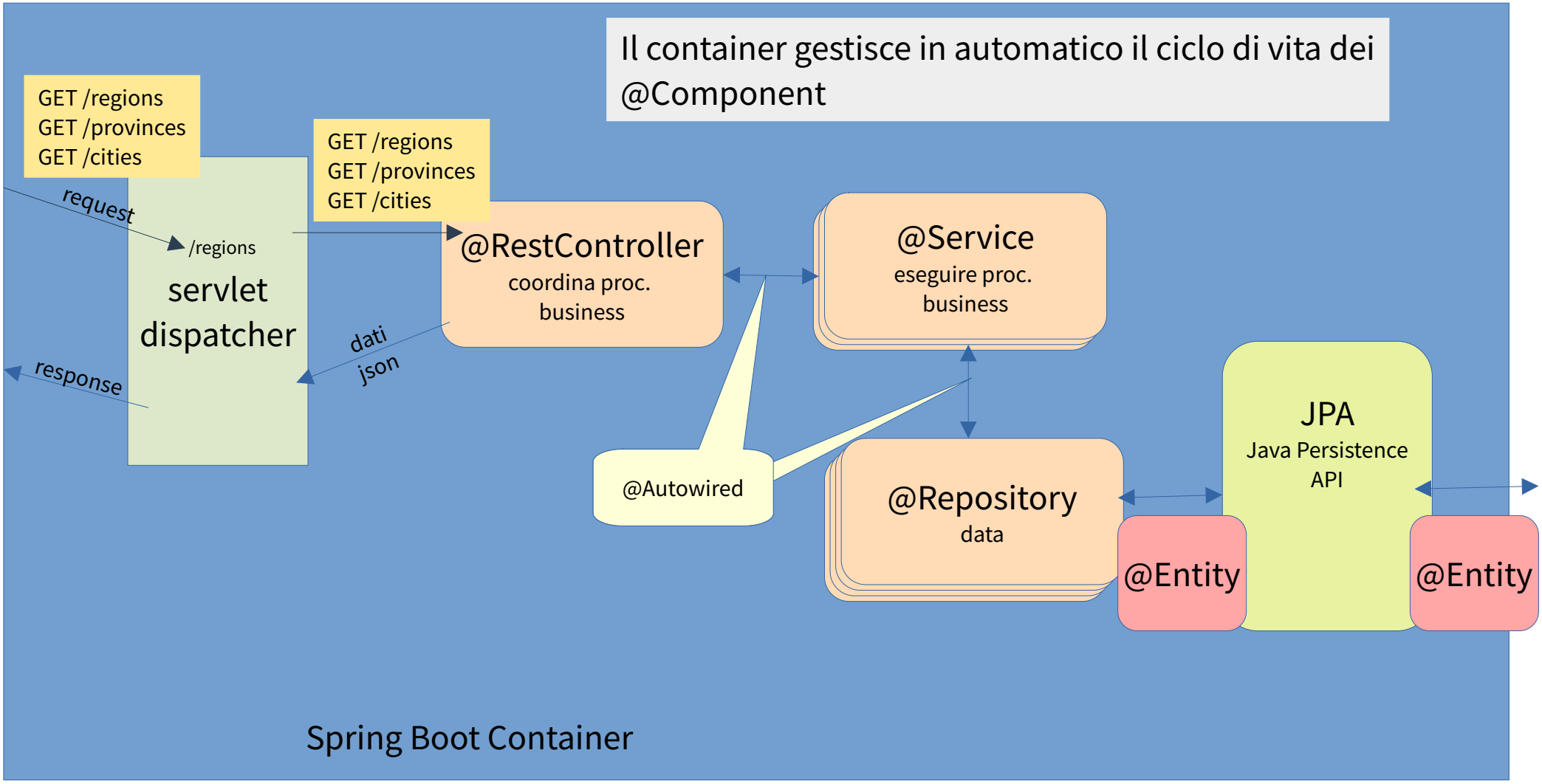
Server REST Backend Java+Spring(boot)



Spring Boot Application



Application in SpringBoot



RDBMS VS Objects

```
@Column(name = "codice_citta_metropolitana") // visione lato rdbms
```

```
private String codiceCittaMetropolitana; // visione lato OOP
```

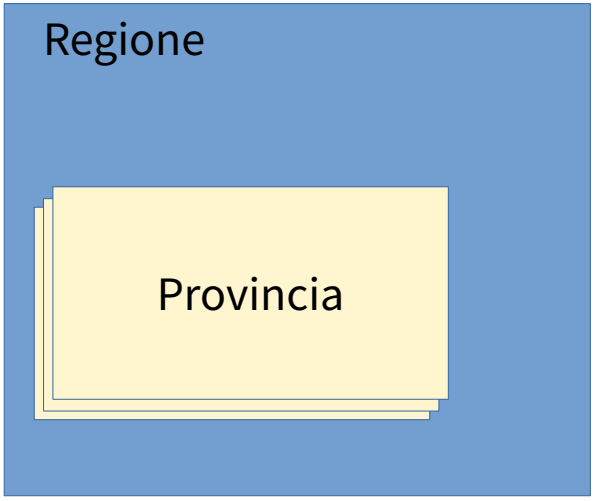
SELECT * FROM province;

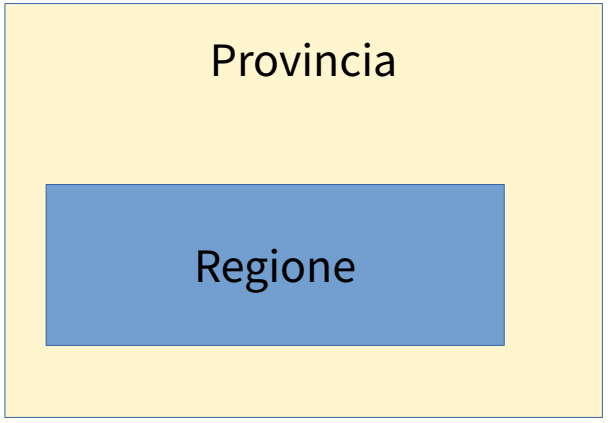
ID	ID_REGIONE	CODICE_CITTA_METROPOLITANA	NOME	SIGLA_AUTOMOBILISTICA	LATITUDINE	LONGITUDINE
1	1	201	Torino	TO	45.063299	7.669289
2	1	*null*	Vercelli	VC	45.320220	8.418508
3	1	*null*	Novara	NO	45.548513	8.515079
4	1	*null*	Cuneo	CN	44.597031	7.611422
5	1	*null*	Asti	AT	44.900765	8.206432
6	1	*null*	Alessandria	AL	44.817559	8.704663

SELECT * FROM REGIONI;

ID	NOME	URL	LATITUDINE	LONGITUDINE
1	Piemonte	https://www.regione.piemonte.it	45.066666	7.7
2	Valle d'Aosta/Vallée d'Aoste	https://www.regione.vda.it	45.73722	7.320556
3	Lombardia	https://www.regione.lombardia.it	45.46416	9.190336
4	Trentino-Alto Adige/Südtirol	https://www.regione.taa.it	46.066666	11.116667
5	Veneto	https://www.regione.veneto.it	45.43972	12.331944
6	Friuli Venezia Giulia	https://www.regione.fvg.it	45.636112	13.804167

2D





3D

Al boot dell'applicazioni

https://start.spring.io/

HTTP Methods

GET => `@GetMapping`

POST => `@PostMapping`

PUT => `@PutMapping`

DELETE => `@DeleteMapping`

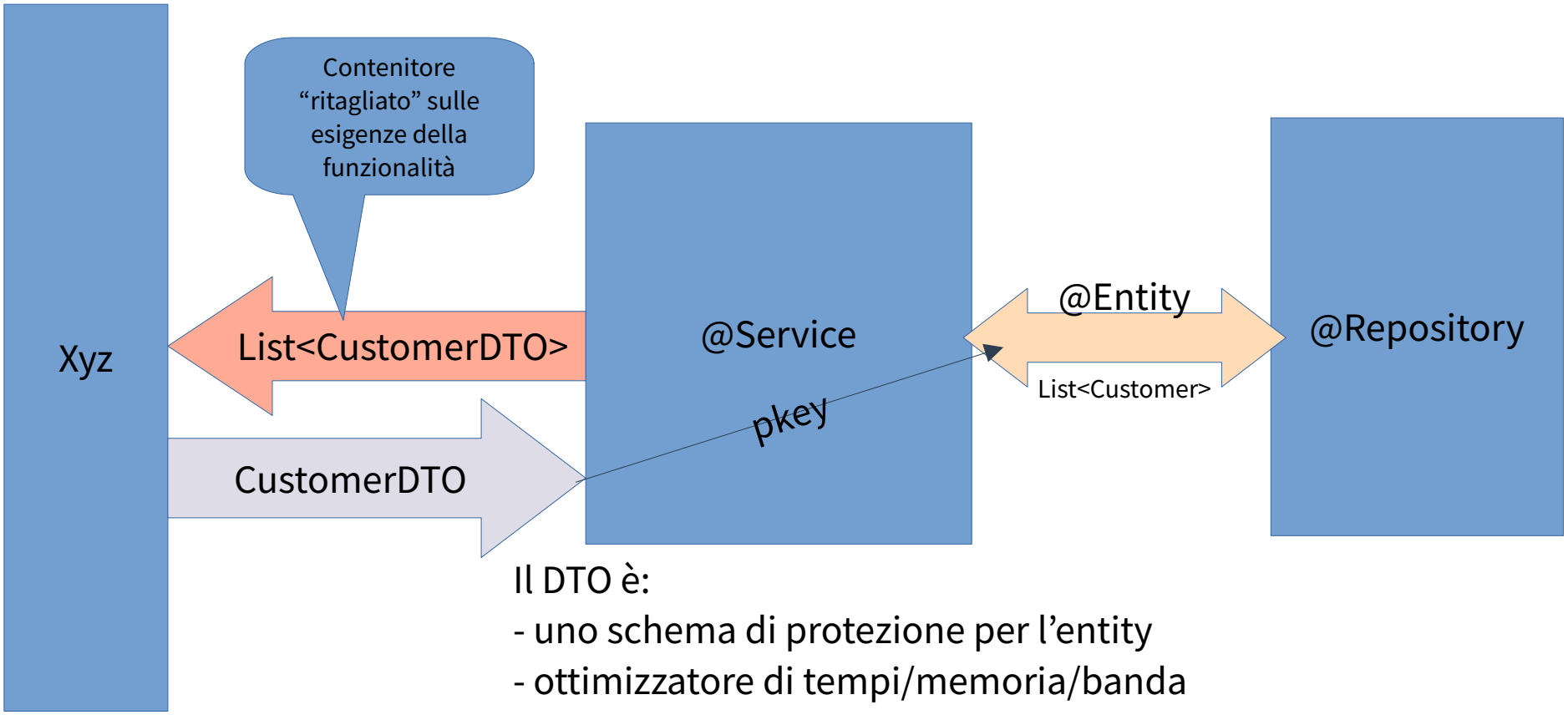
PATCH => `@PatchMapping`

1) match tra urlpath e RequestMapping
onMatch=>attiva
onNoMatch=>404

2) match tra Http Method e @XyzMapping
onMatch=>attiva
onNoMatch=>404

3) match tra Http Method Url e URL di @XyzMapping
onMatch=>attiva
onNoMatch=>404

DTO pattern (Data Transfer Object)



Il DTO è:
- uno schema di protezione per l'entity
- ottimizzatore di tempi/memoria/banda
- foundation per il JSON di scambio

Il DTO è associato ad un mapper che converte da e verso l'entity

News in V2

- new ApiError

- repo method findByNomeContainingIgnoreCase(String nome) di RegionRepository, ProvinceRepository, CityRepository (query added)

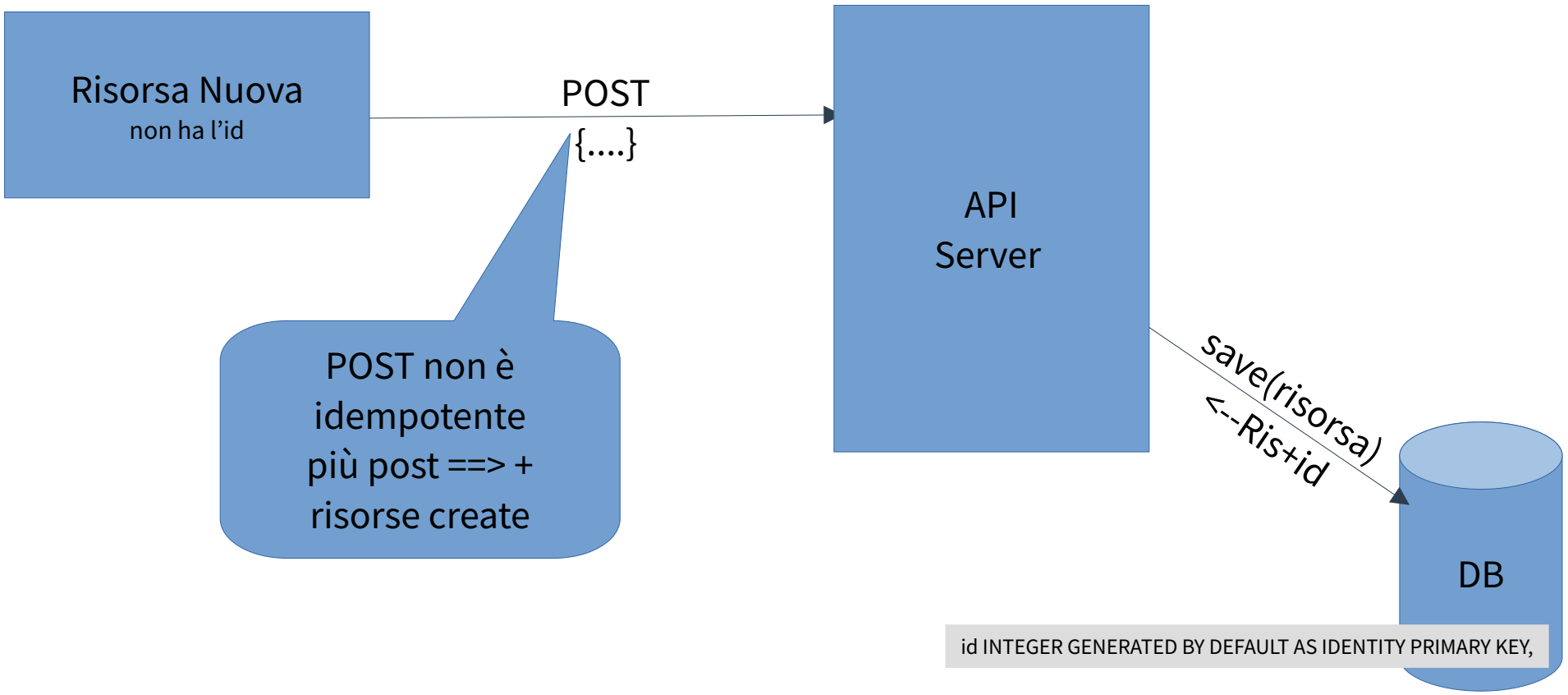
- RegionController, ProvinceController, CityController per aggiunta metodo di filtraggio e “query string”

```
@GetMapping
public List<CityDTO> getAllCities(
        @RequestParam(name = "regionId", required = false) Integer regionId,
        @RequestParam(name = "provinceId", required = false) Integer provinceId,
        @RequestParam(name = "name", required = false) String name) {
    return cityService.getCities(regionId, provinceId, name);
}
```

API: cosa serve? Lista della spesa.

- progettare la semantica (significato delle API), tenendo presente il linguaggio “funzionale” (DDD ubiquitus language), non il linguaggio del DB.
- Progettare il contratto: definire la struttura del JSON+DTO (o dell’XML) da usare nello “scambio dei dati”, ovvero l’interfaccia fornita dai servizi. [il DTO viene serializzato in JSON e deserializzato da JSON]
- Progettare il contratto relativo al messaging: definire la struttura del JSON (o dell’XML) da usare nella segnalazione degli errori (Possibilmente risolto dagli standard aziendali).

POST e Creazione risorse



Navigazione con limit

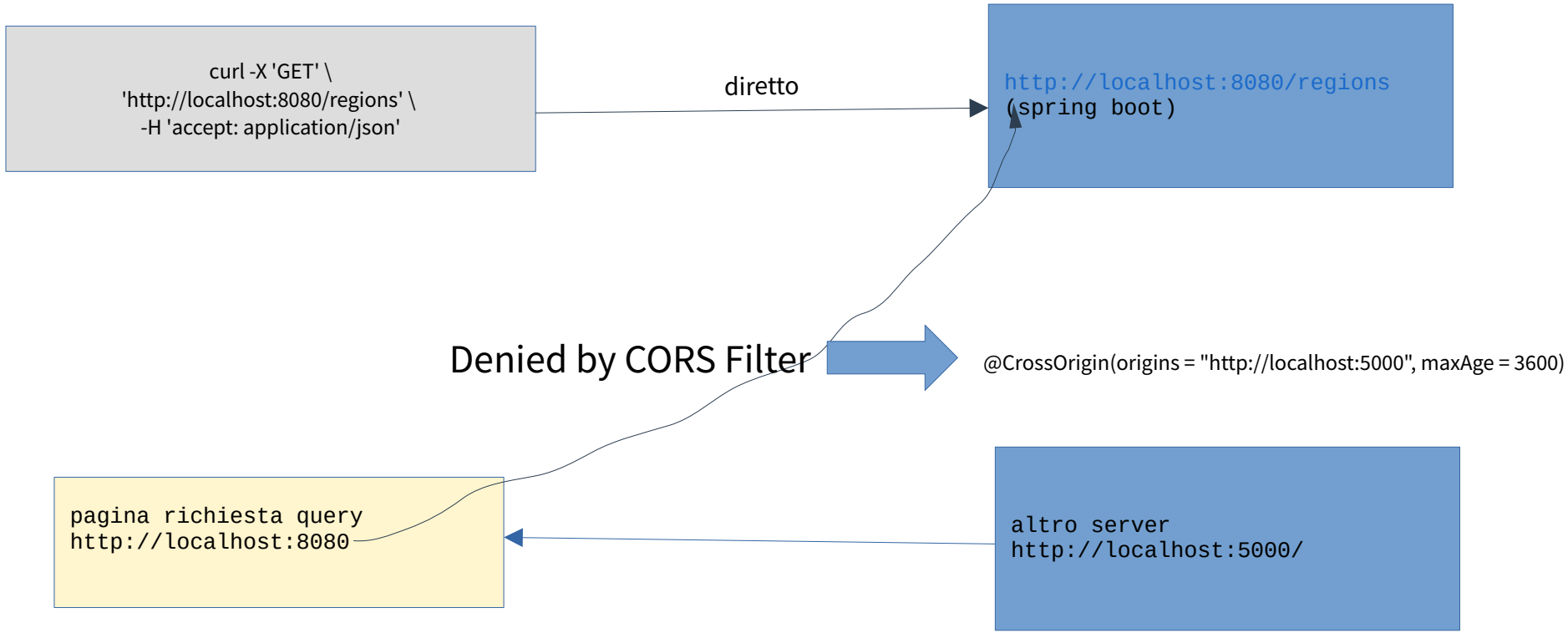
a) prima volta ==> /products?cursor=abc123&limit=50

b) altre volte /products?cursor=abc123&limit=50&productId=xyz
dove productId è l'ultimo id dei prodotti ricevuti:
Il server calcola

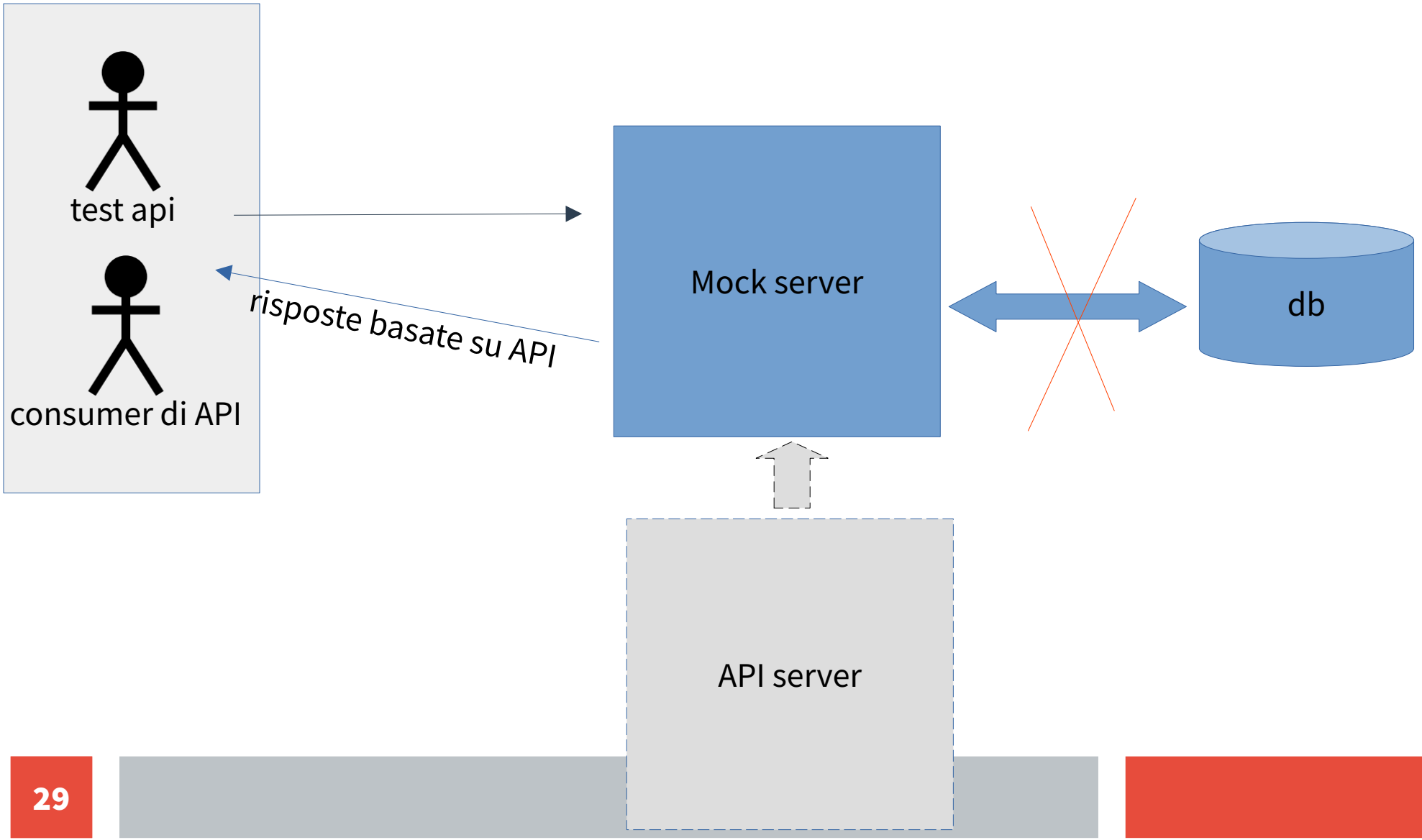
in avanti
select * from products where productId>xyz limit 50

all'indietro
select * from products where productId<=xyz limit 50

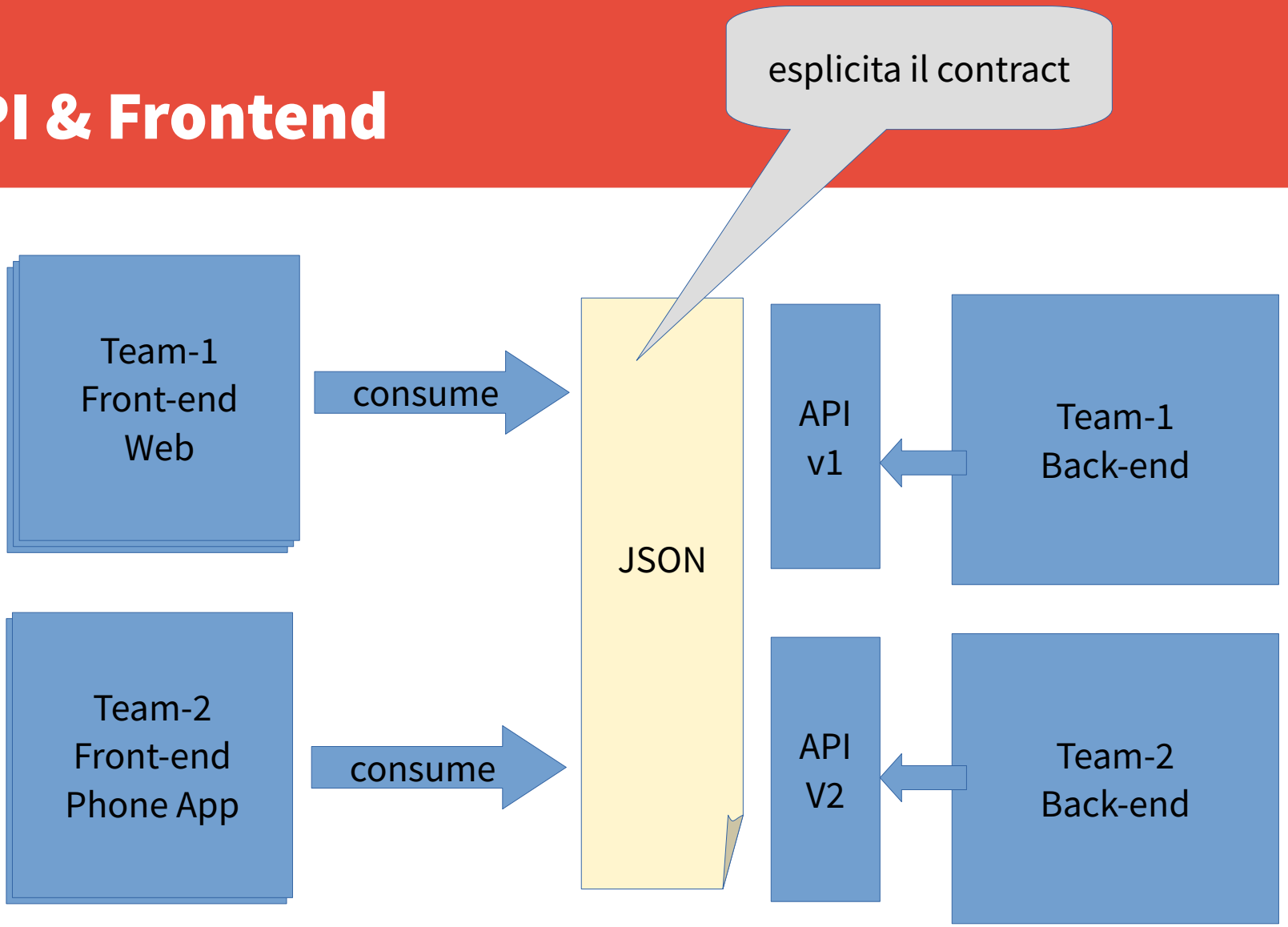
CORS


curl -X 'GET' \
'http://localhost:8080/regions' \
-H 'accept: application/json'
diretto
http://localhost:8080/regions
(spring boot)
Denied by CORS Filter
@CrossOrigin(origins = "http://localhost:5000", maxAge = 3600)
pagina richiesta query
http://localhost:8080
altro server
http://localhost:5000/

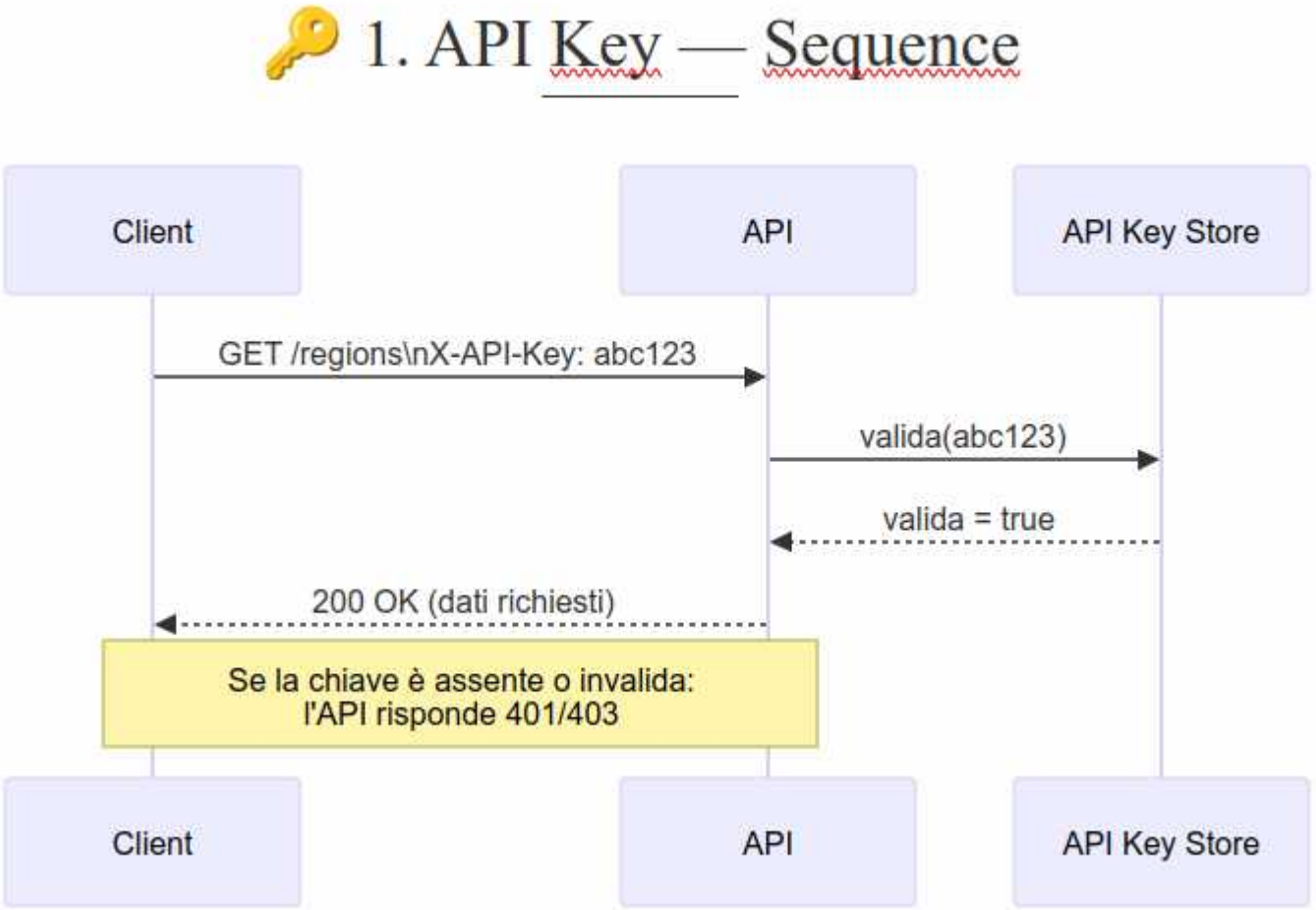
Mock Server


test api
consumer di API
risposte basate su API
Mock server
db
API server

API & Frontend



AUTENTICAZIONE api-key



API-KEY HTTP headers spec

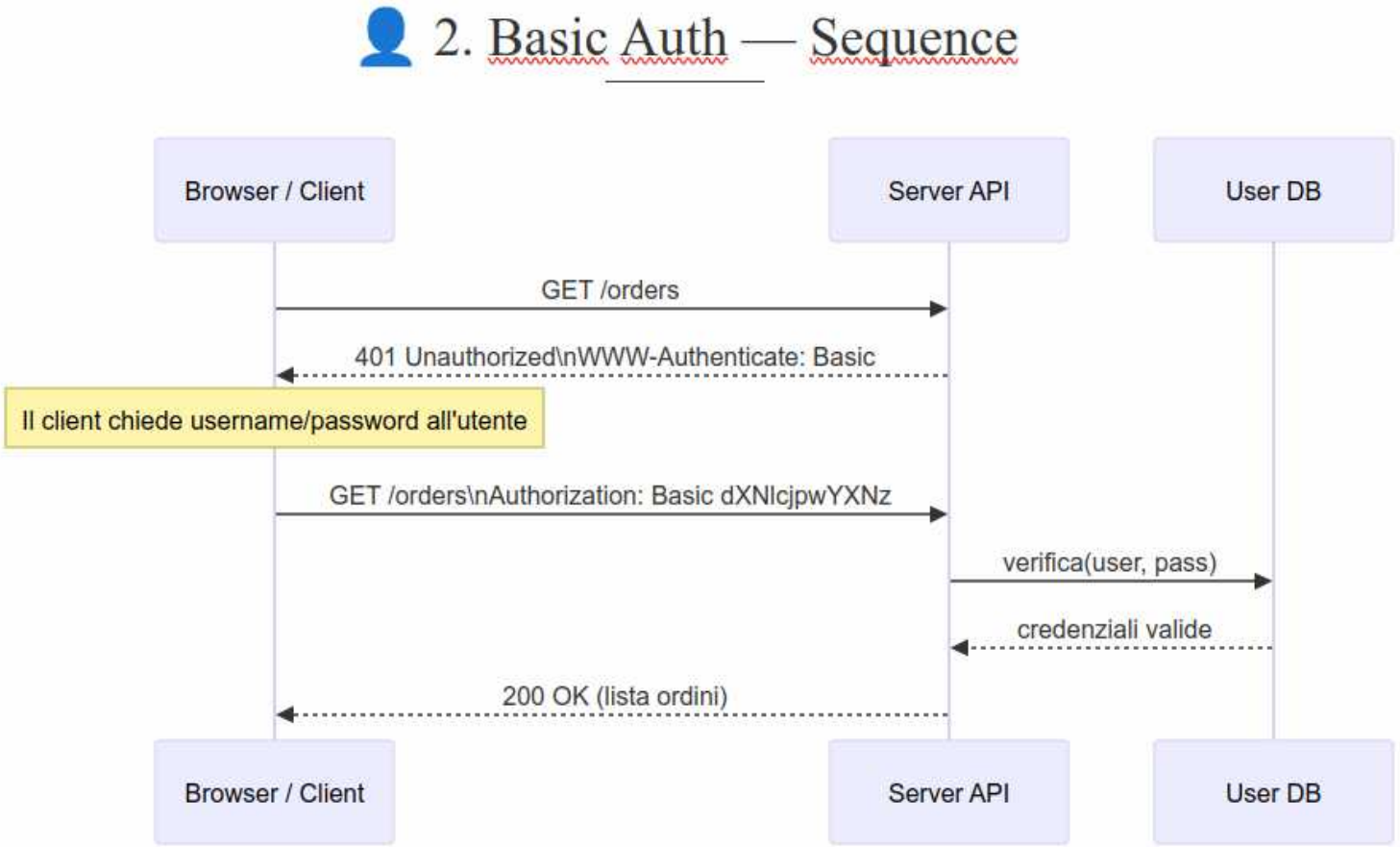
```
curl -v -H "X-API-KEY: demo-key-123" "http://localhost:8080/provinces"

* Host localhost:8080 was resolved.
* IPv6: ::1
* IPv4: 127.0.0.1
*   Trying [::1]:8080...
* Connected to localhost (::1) port 8080
* using HTTP/1.x
> GET /provinces HTTP/1.1
> Host: localhost:8080
> User-Agent: curl/8.15.0
> Accept: */*
> X-API-KEY: demo-key-123
>
* Request completely sent off
< HTTP/1.1 200
< X-Content-Type-Options: nosniff
< X-XSS-Protection: 0
< Cache-Control: no-cache, no-store, max-age=0, must-revalidate
< Pragma: no-cache
< Expires: 0
< X-Frame-Options: DENY
< Content-Type: application/json
< Transfer-Encoding: chunked
< Date: Tue, 09 Dec 2025 14:42:00 GMT
<
[{"id":1,"name":"Torino","regionId":1,
```

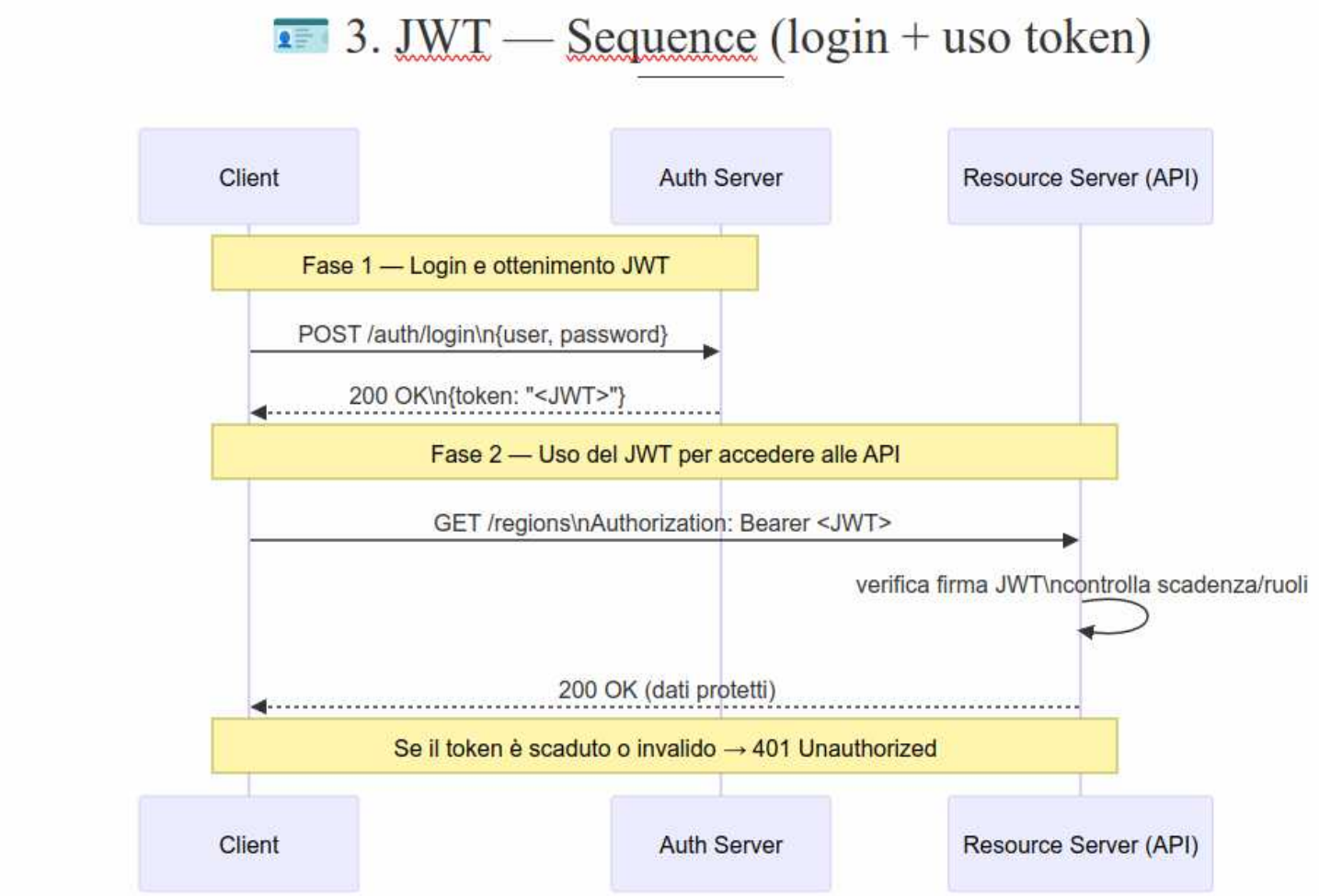
API KEY inviata dalla request

Body
json delle province

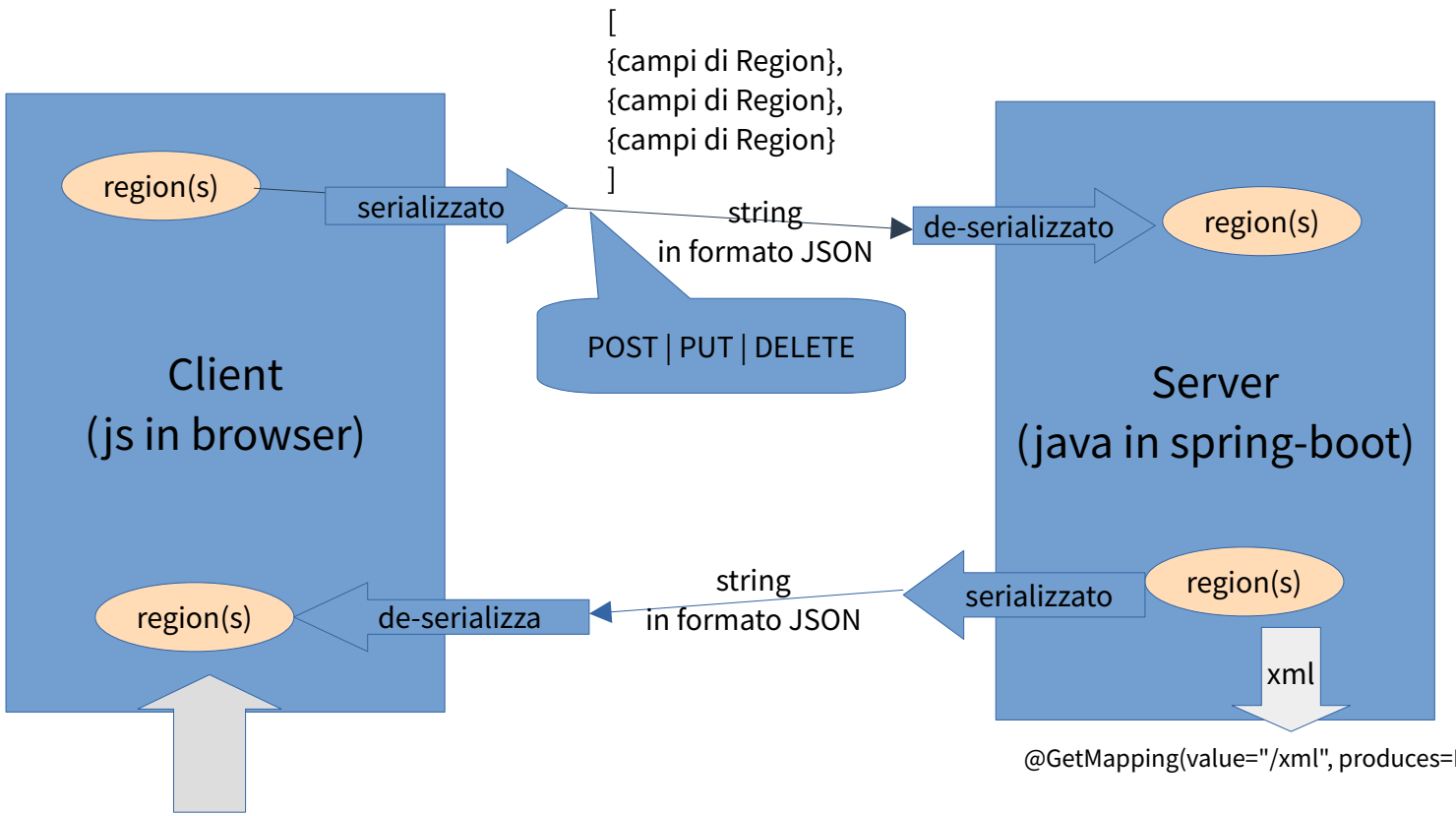
Autenticazione basic



Jwt (Json Web Token) autentication



Serializzazione/Deserializzazione



@GetMapping(value="/xml", produces=MediaType.APPLICATION_XML_VALUE)

```
// de-serializza in un oggetto lo stream json
let obj = JSON.parse('{"id":1,"name":"Piemonte","url":"https://www.regione.piemonte.it"}');
print("nome="+obj.name);
```

Cosa serve per provare

- ambiente java

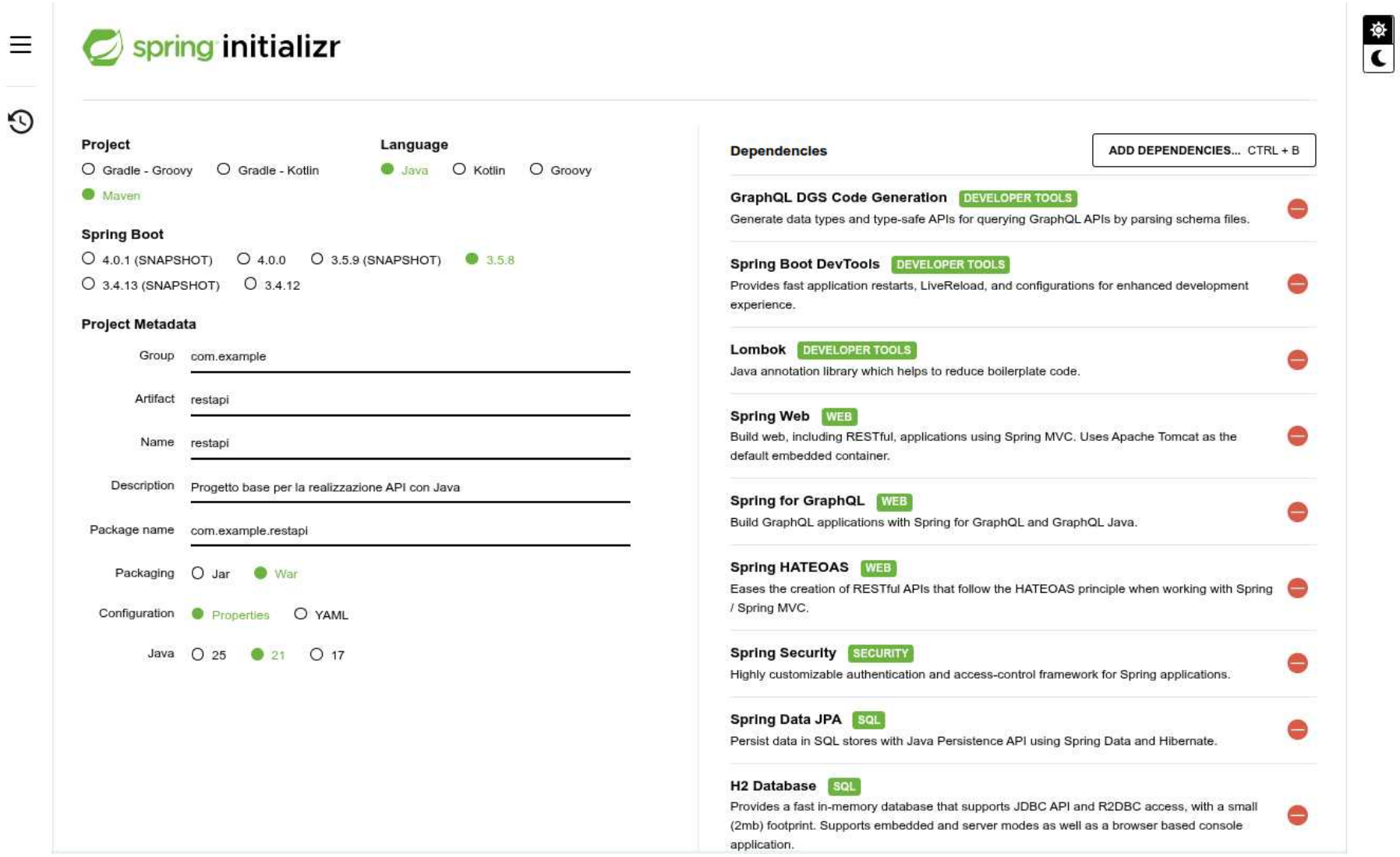
- java jdk (java.oracle.com)
- IDE es: eclipse da www.eclipse.org
- curl (da https://curl.se/windows/)
- browser

- base per lo sviluppo

- scheletro di progetto pronto start.spring.io (es: restapi.zip) da importare nell'IDE
- modificare application.properties
- struttura database schema.sql (struttura) data.sql (dati) da posizionare in <progetto>/src/main/resources

```
# Carica schema.sql e data.sql automaticamente
spring.sql.init.mode=always
spring.sql.init.schema-locations=classpath:schema.sql
spring.sql.init.data-locations=classpath:data.sql,.....
```

start.spring.io



Roadmap

1 – struttura db

2 – mappare le @Entity

3 – @Entity --> cosa mostrare --> dto

4 – @Repository (accesso ai dati)

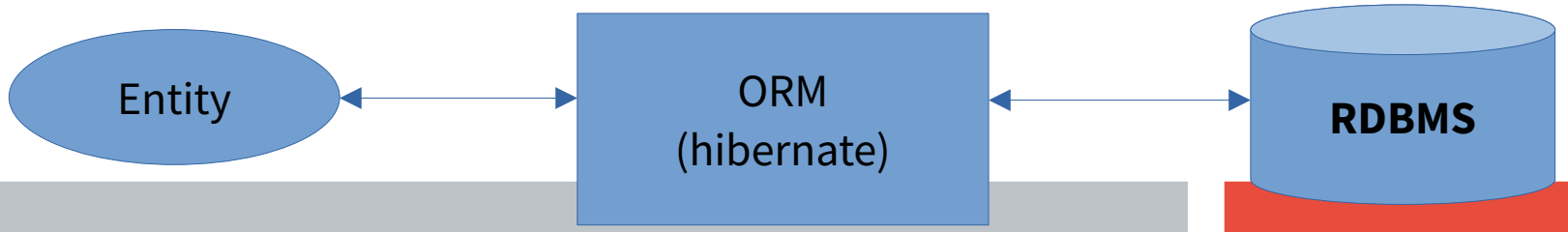
5 – @Service (logica di business)

6(0) – disegno delle API significato di business+path+parametri

7 - @Controller

8 – test

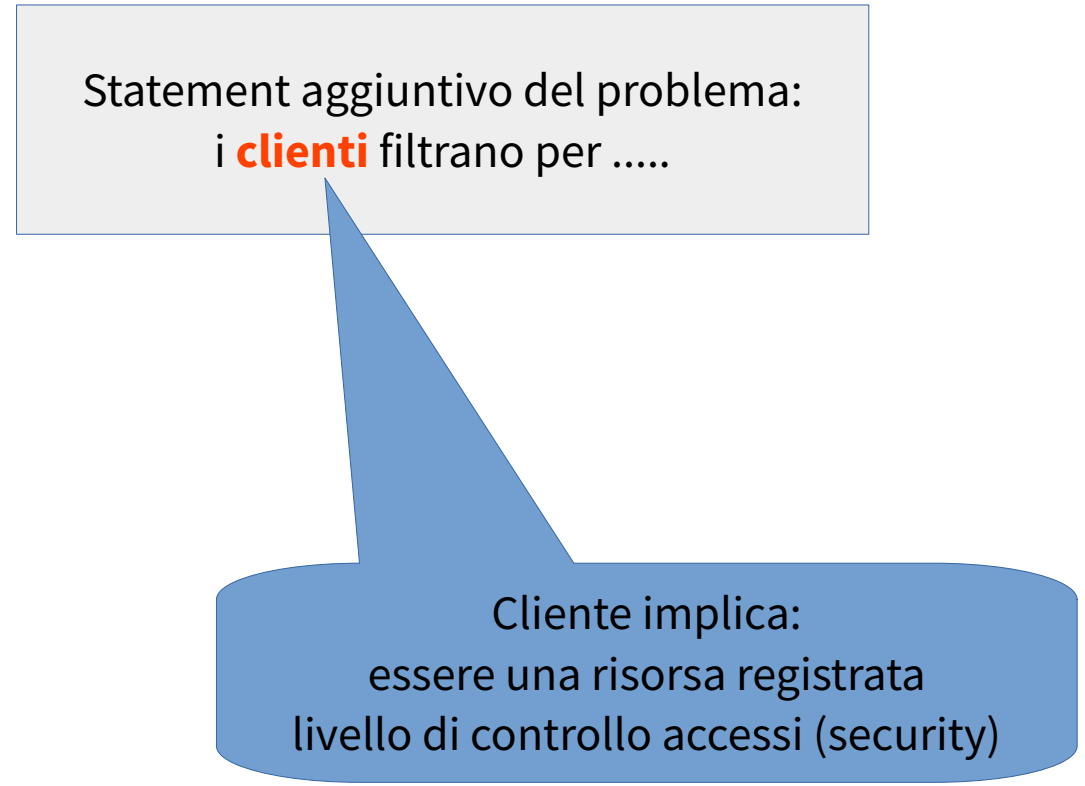
@Entity è il legame stretto tra la ns applicazione e l'ORM (Object Relational Mapper). Non usiamo più un RDBMS, ma un prodotto che da un lato fornisce oggetti e dall'altro si unisce al RDMBS.



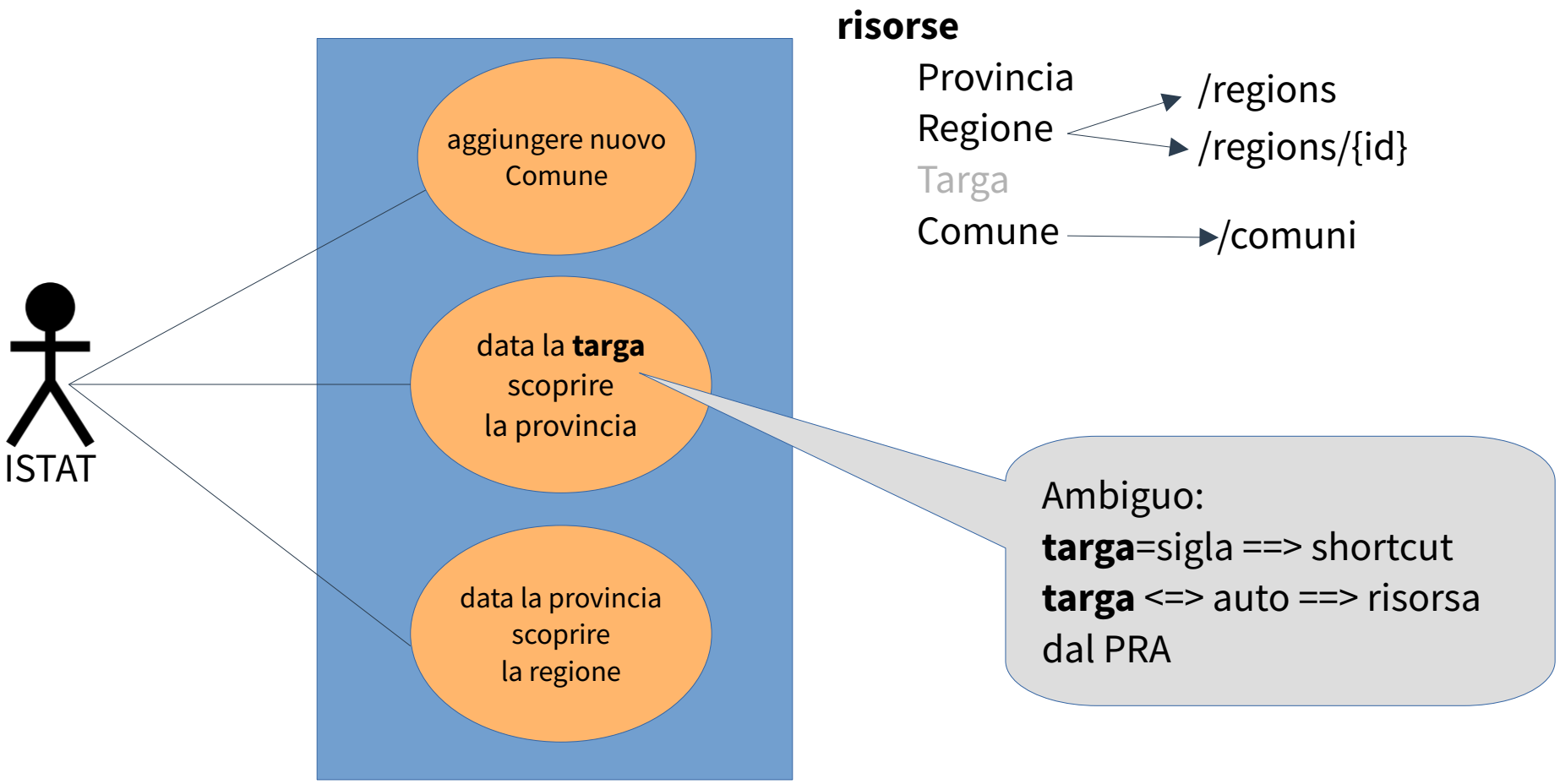
Roadmap

Progettare una piccola API design-first, usando quello che abbiamo visto:

- **risorse**
- **URI**
- **metodi HTTP**
- **parametri**
- **pagination**
- **esempi**
- **OpenAPI (livello base)**



Risorse esempio (italia=>regioni,province,comuni)

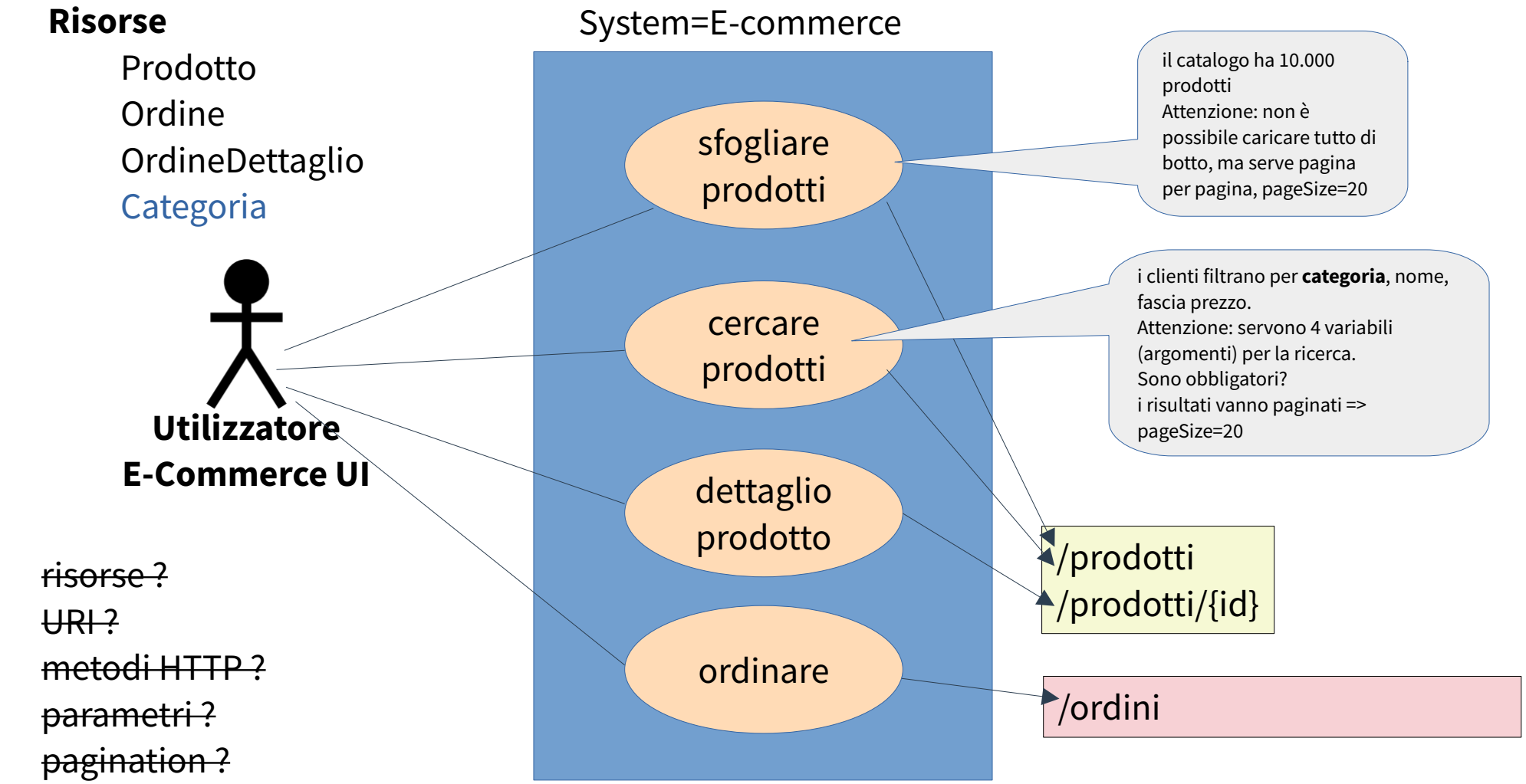


E-commerce API
UML Use Case Diagram

Domande guida:
A cosa serve questa realizzazione?
Quali parametri servono davvero al consumer?
Ci sono casi d'uso reali?

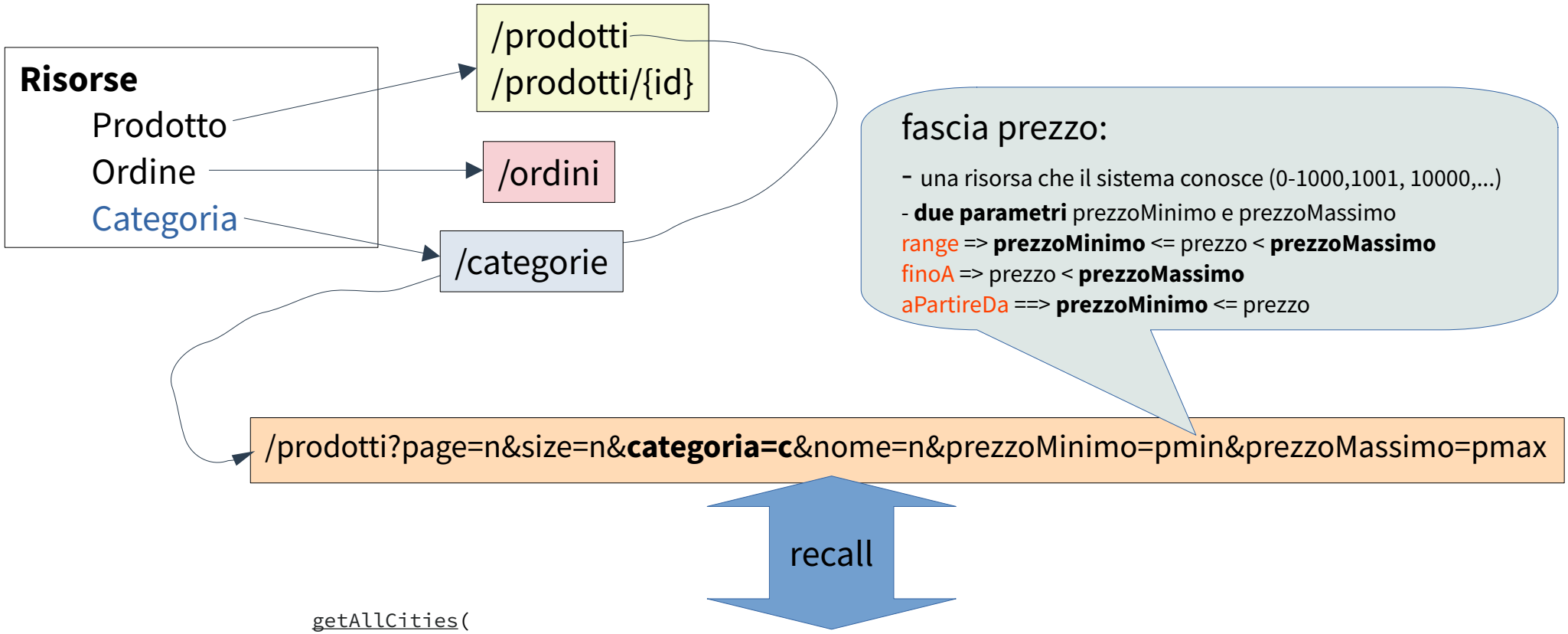
Risorse

- Prodotto
- Ordine
- OrdineDettaglio
- Categoria



~~risorse ?~~
~~URI ?~~
~~metodi HTTP ?~~
~~parametri ?~~
~~pagination ?~~

Risorse




```
getAllCities(
            @RequestParam(name = "regionId", required = false) Integer regionId,
            @RequestParam(name = "provinceId", required = false) Integer provinceId,
            @RequestParam(name = "name", required = false) String name,
            @RequestParam(name = "page", required = false) Integer pageParam,
            @RequestParam(name = "size", required = false) Integer sizeParam)
```

URI

GET /prodotti?page=n&size=n&categoria=c&nome=n&prezzoMinimo=pmin&prezzoMassimo=pmax
GET /prodotti/{id}

GET /ordini?page=n&size=n&clienteId=cid
GET /ordini/{id}
POST /ordini
DELETE /ordini/{id}
PUT /ordini/{id}
PATCH /ordini/{id}

GET /categorie
GET /categorie{id}

TODO-LIST
per le GET che ritornano liste
occorre definire il criterio di sort

Manca il sorting, per i prodotti potrebbe essere
sort=price,asc
Mancano default per paging
size = 20
max size = 100

GET lettura
POST crea nuova risorsa
PUT modifica tutta la risorsa
PATCH modifica parzialmente la risorsa
DELETE elimina risorsa

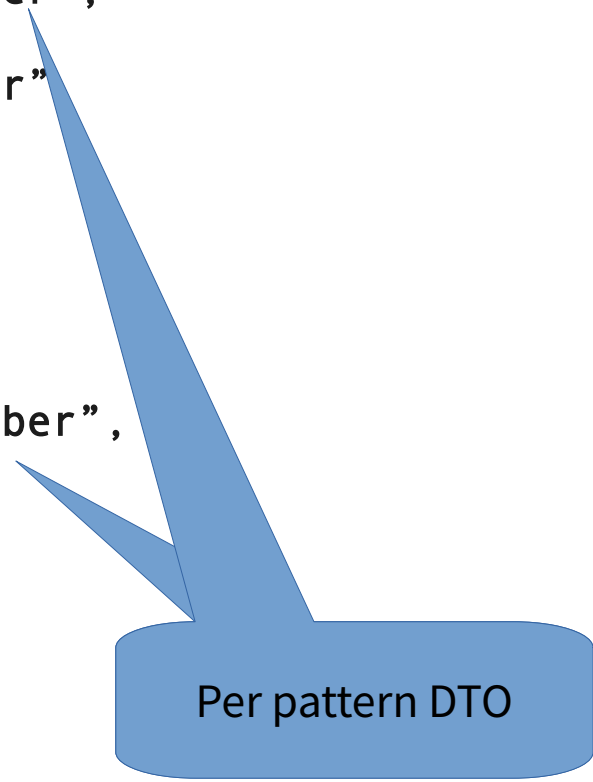
JSON delle risorse Prodotto e Categoria

```
Prodotto
{
“idProdotto” : “number”,
“nome” : “string”,
“categoria” : “number”,
“prezzo” : “number”,
“stock” : “number”
}

Categoria
{
“idCategoria” : “number”,
“nome” : “string”
}
```

```
ProdottoResponse
{
“idProdotto” : “number”,
“nome” : “string”,
“categoria” : “number”
“prezzo” : “number”,
“stock” : “number”
}

CategoriaResponse
{
“idCategoria” : “number”,
“nome” : “string”
}
```



CONTRATTO

JSON delle risorse Ordine (segue swagger editor)

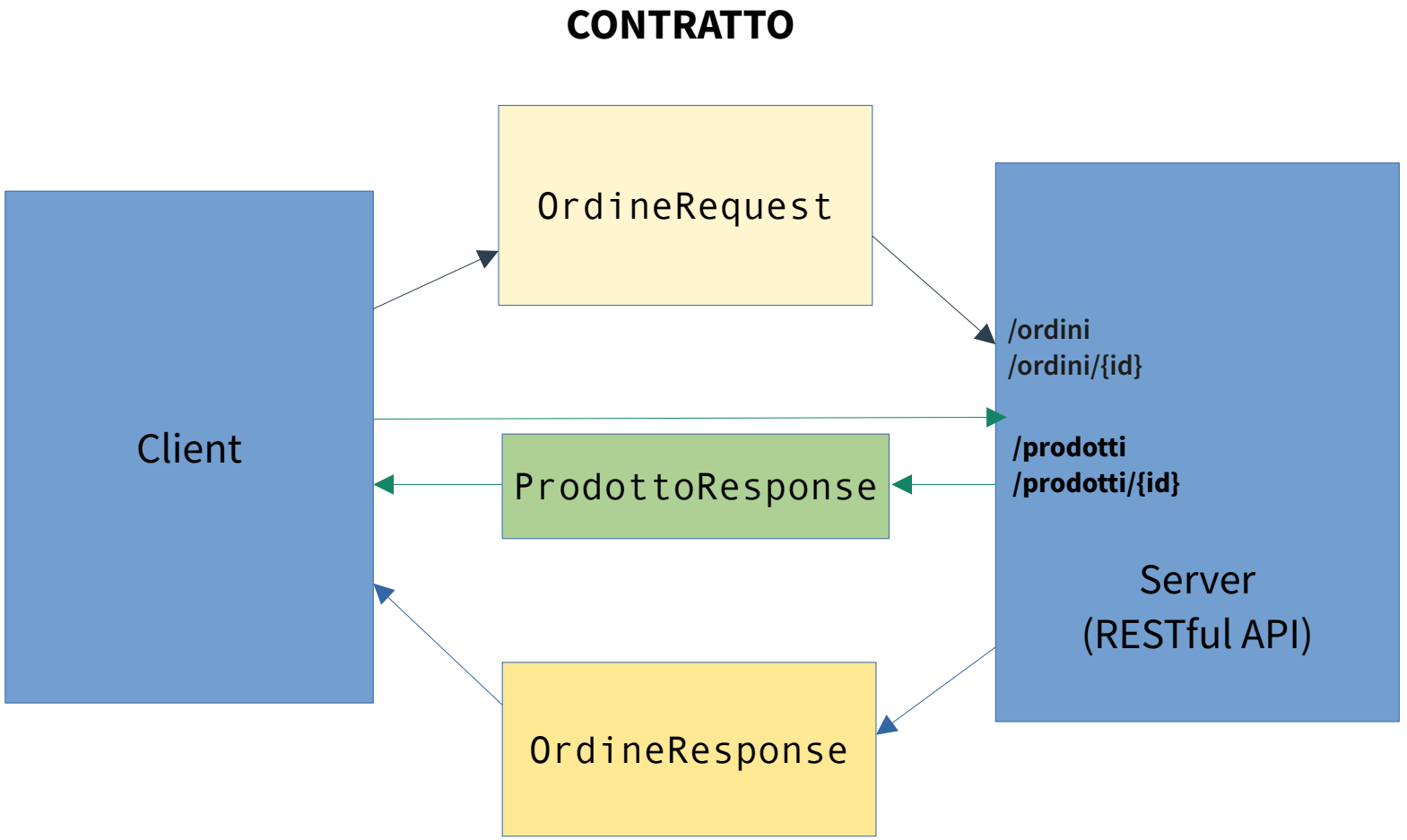
```
Ordine
{
“idOrdine” : “number”,
“data” : “string”,
“valore” : “number”,
“customer” : “?”,
“linee” : [
   “idProdotto” : “number”,
   “quantita” : “number”,
   “prezzo_unitario” : “number”,
   ]
   }
```

```
OrdineRequest
{
“data” : “string”,
“valore” : “number”,
“customer” : “?”,
“linee” : [
   “idProdotto” : “number”,
   “quantita” : “number”,
   “prezzo_unitario” : “number”,
   ]
   }
```

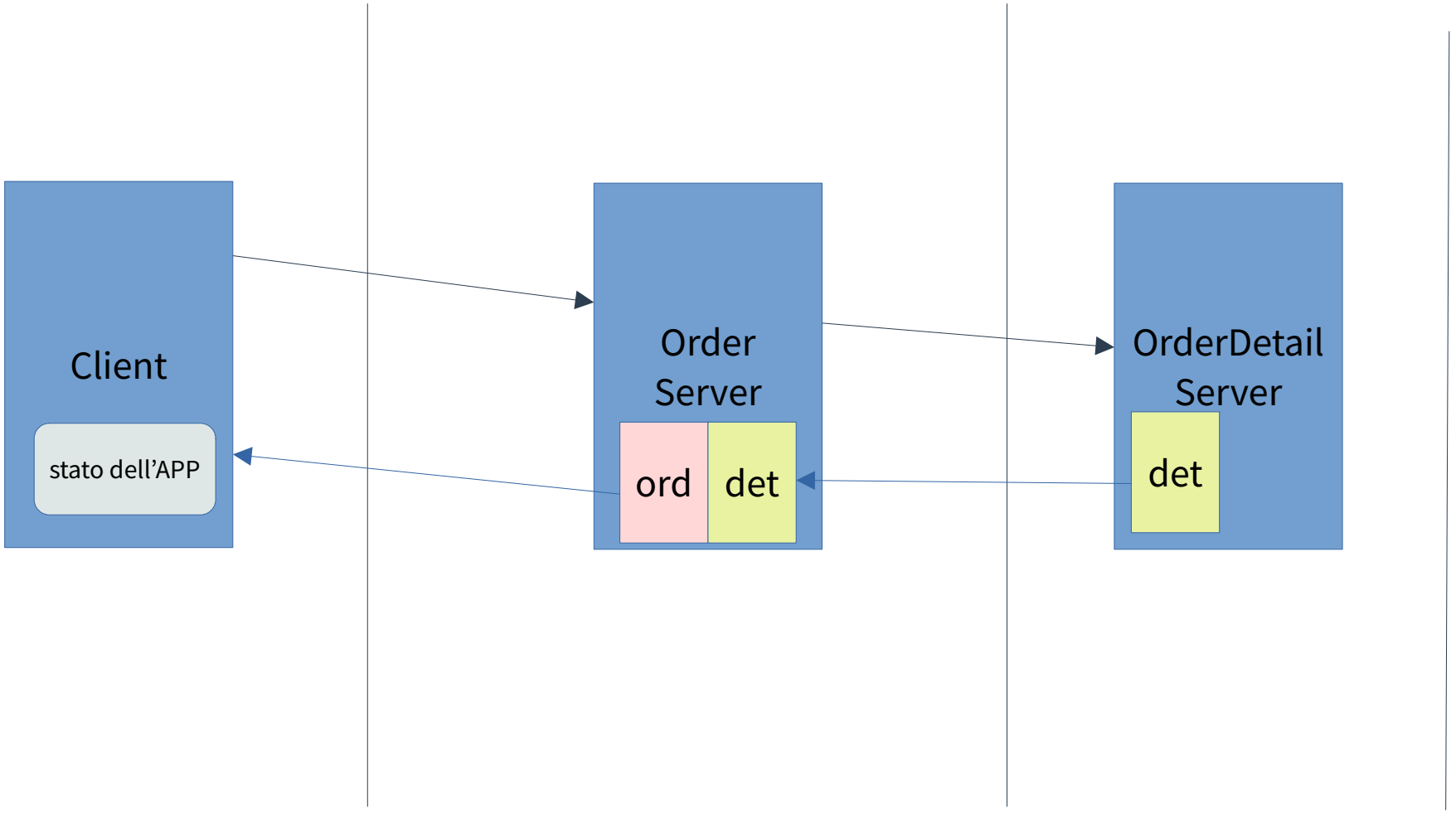
```
OrdineResponse
{
“idOrdine” : “number”,
“data” : “string”,
“valore” : “number”,
“customer” : “?”,
“linee” : [
   “idProdotto” : “number”,
   “quantita” : “number”,
   “prezzo_unitario” : “number”,
   ]
   }
```

CONTRATTO

uso del contratto



layered system



POST e idempotenza

POST non è idempotente by default

se mi serve una POST idempotente devo poter distinguere la risorsa da creare in qualche modo e controllare che non sia sta già creata. Implicare una GET con criteri

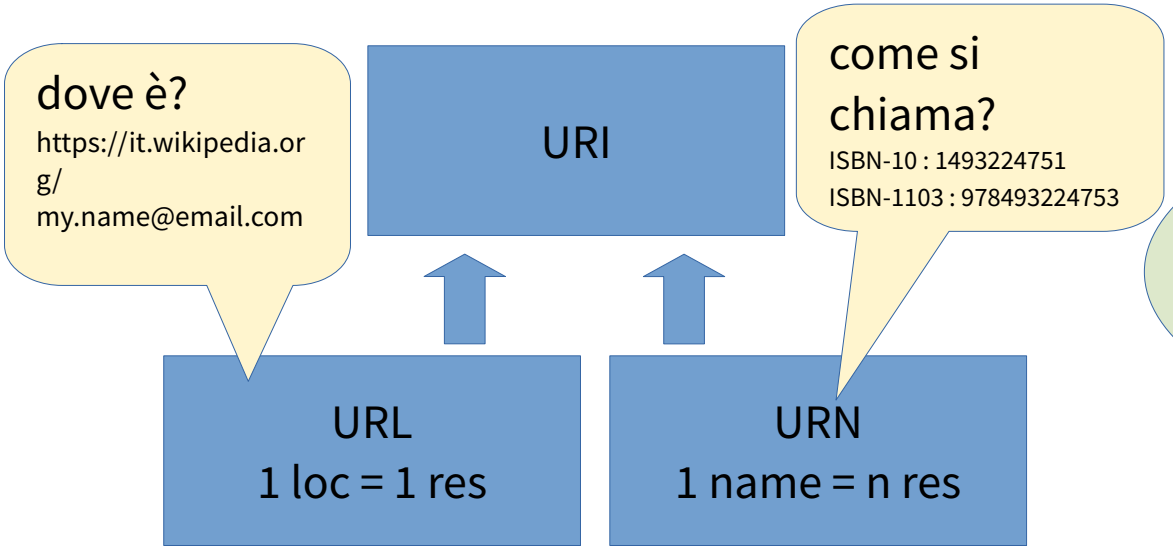
esempio di POST e idempotenza logica

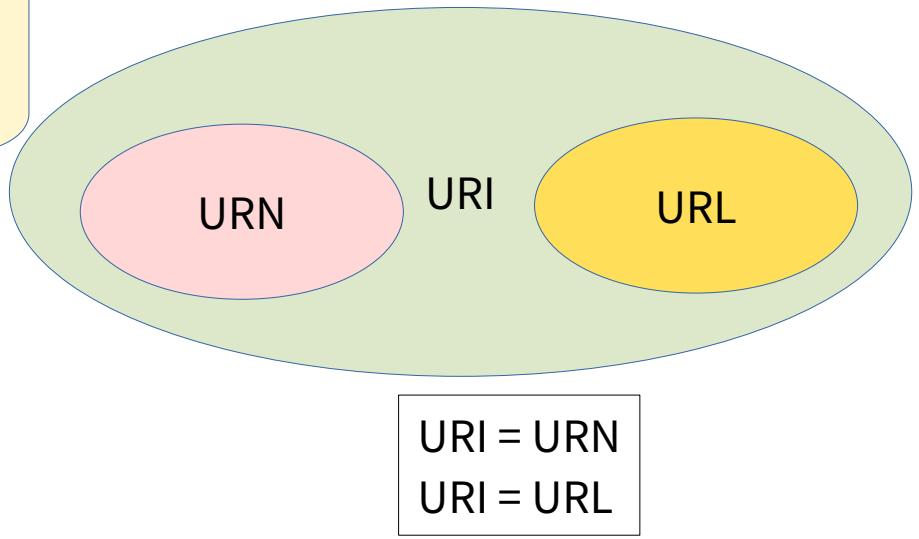
URI <==> URL e URN

URI = Uniform Resource Identifier

URL = Uniform Resource Locator

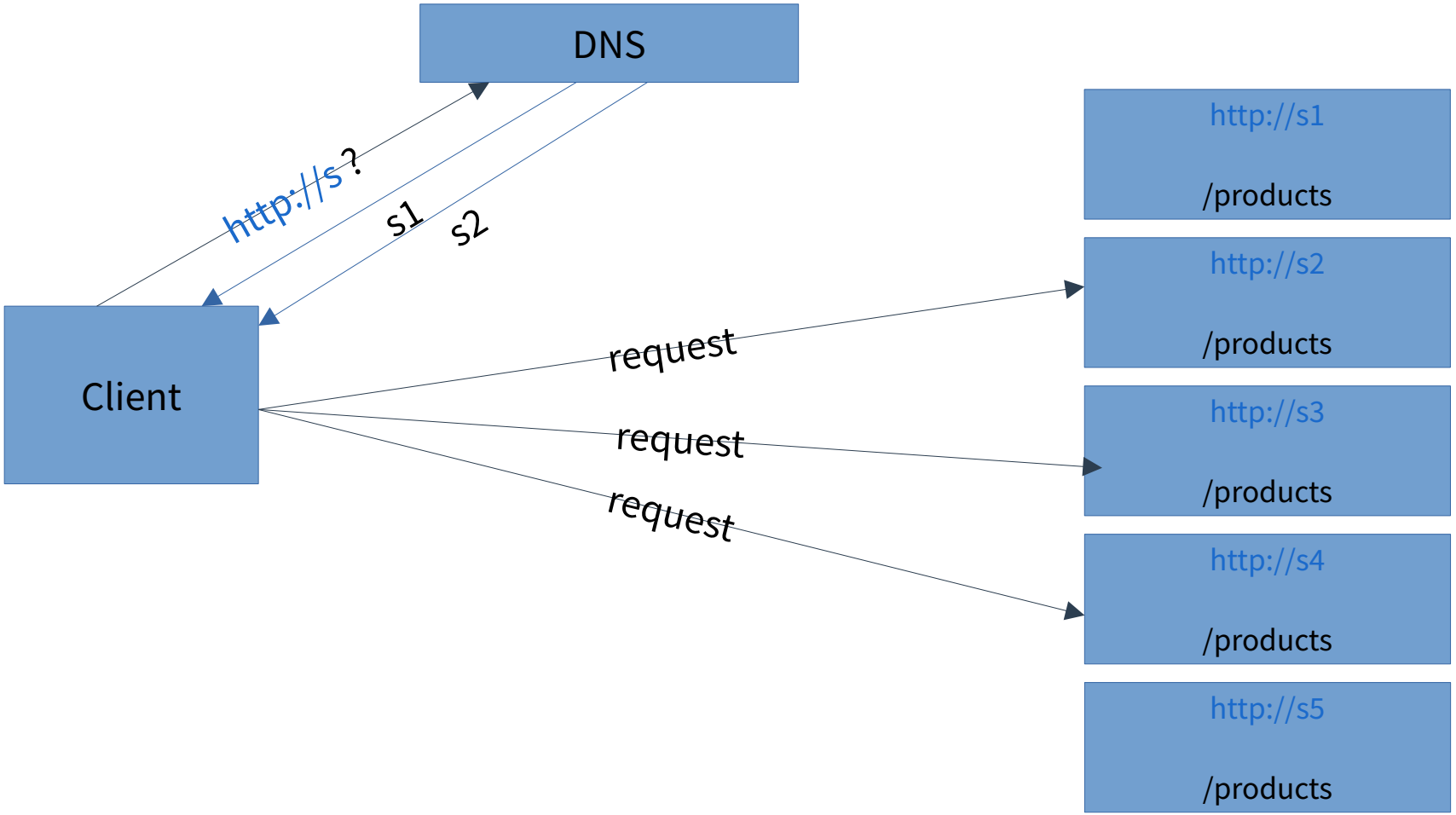
URN = Uniform Resouce Name



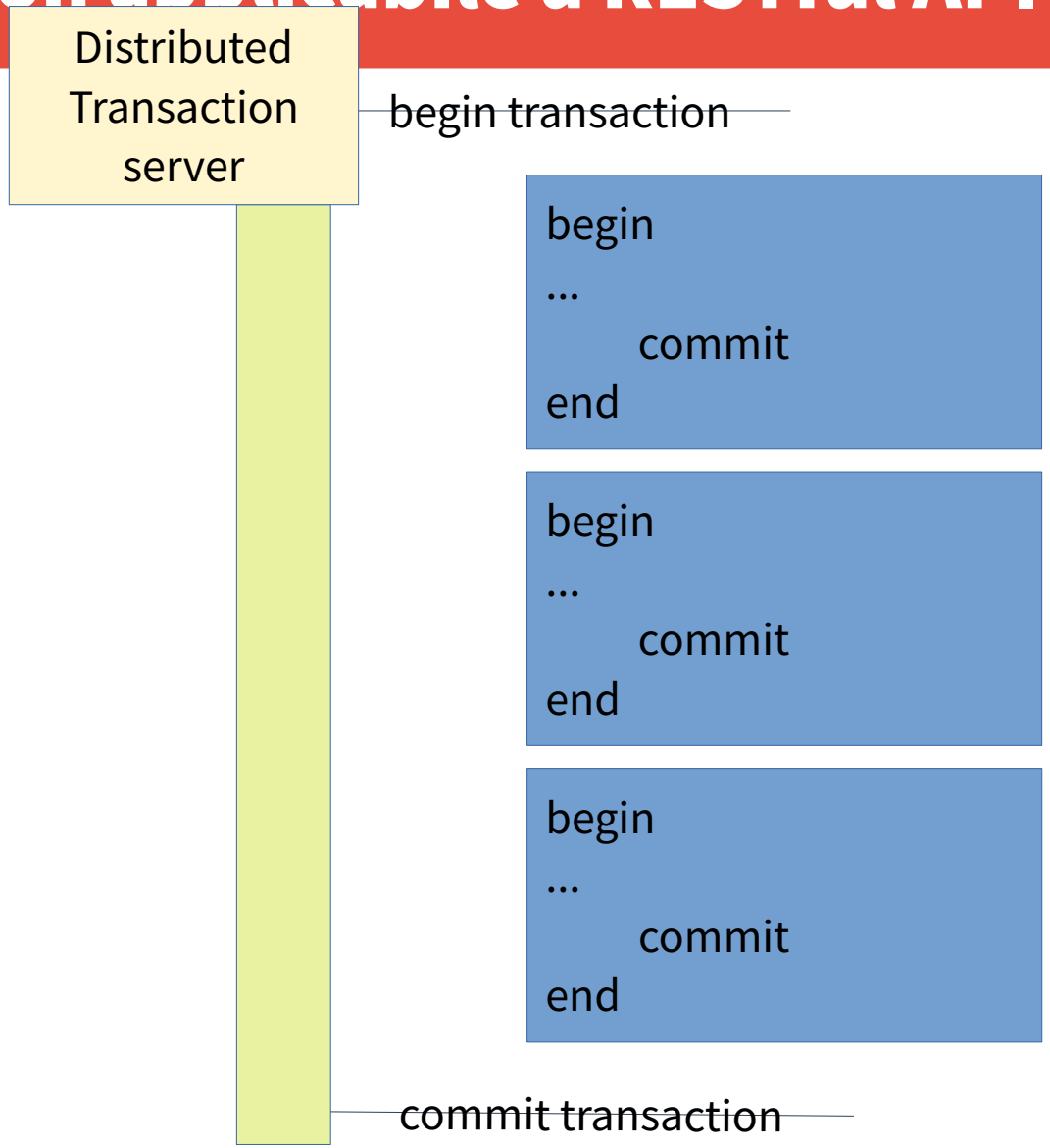


URI = URN
URI = URL

API-URL-Server



2PC non applicabile a RESTful API



Saga Pattern

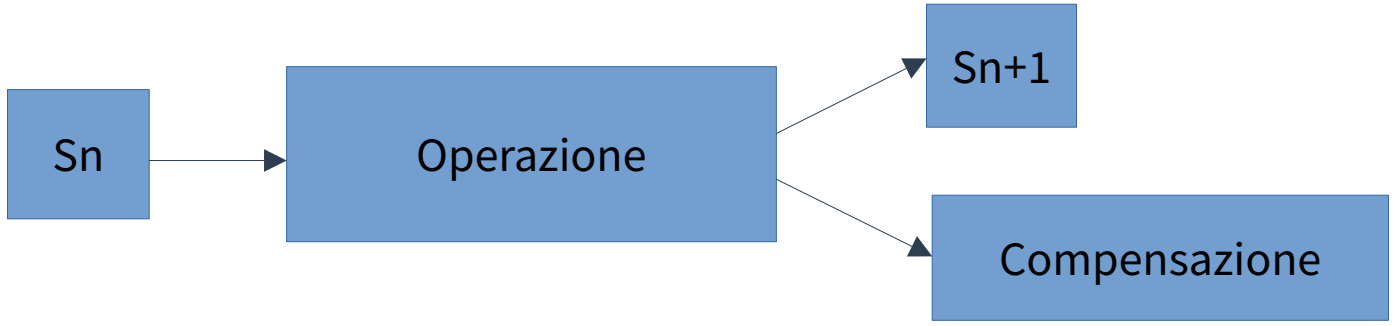
1) spezzare il percorso in tappe ben definite (local transaction?)

2) definire stato di arrivo, eseguo operazione

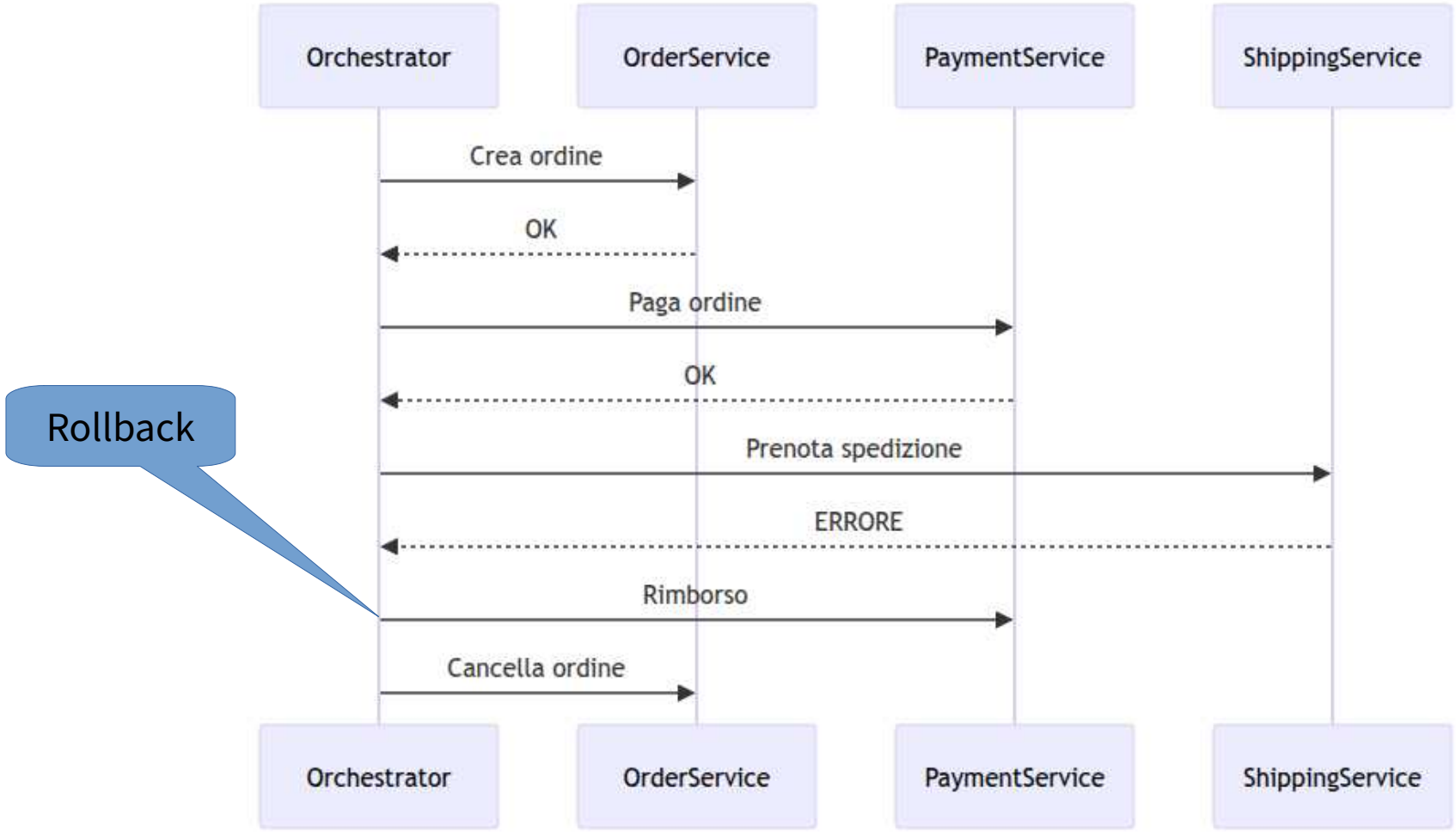
3.1) se tutto ok la macchina a stati evolve stato_attuale -> stato_passo_completato

3.2) se qualcosa va storto devo eseguire una compensazione (equivale alla rollback)

4) passo allo step successivo e ritorno a 2



Compensazioni



Il rollback non è magico: è una sequenza di **azioni di business** pensate in anticipo.

Pausa Caffè

rientro 16:00