RESTful API, MVC, OOP, ORM

Language Technology and Web Applications

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Topics

1. RESTful API
2. MVC
3. OOP
4. ORM

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What is an API?

- Application Programming Interface
- Way the two computers or applications talk to each other

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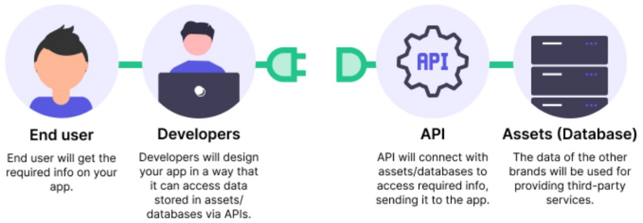

API
End user
End user will get the required info on your app.
Developers
Developers will design your app in a way that it can access data stored in assets/ databases via APIs.
API
API will connect with assets/databases to access required info, sending it to the app.
Assets (Database)
The data of the other brands will be used for providing third-party services.

API Examples

- Bot API – building a bot for Telegram
- Telegram API – own client

- Posting Tweets and images
- Read Tweets

- Instagram Graph API – publishing, comments, …
- Instagram Messaging – for messages

What is a RESTful API?

- **Re**presentational **S**tate **T**ransfer
- Set of rules (architectural style)
- API that follows these rules -> RESTful API

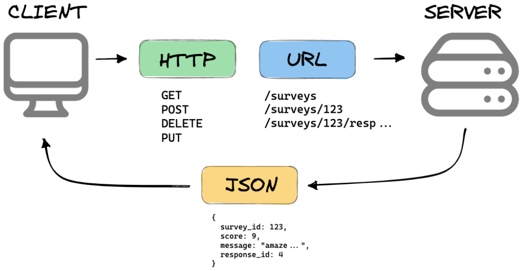
Key Principles

- Client-server
- Rest APIs are stateless
- Uniform Interface – one resource, one URI
- Cacheable

REST and HTTP

- **H**yper**T**ext **T**ransfer **P**rotocol
- HTTP methods
  POST, GET, PUT, DELETE

CREATE
READ
UPDATE
DELETE
C
R
U
D



```
GET
POST
DELETE
PUT
```

```
/surveys
/surveys/123
/surveys/123/resp ...
```

```
{
  survey_id: 123,
  score: 9,
  message: "amaze ... ",
  response_id: 4
}
```

URIs organization

- **U**niform **R**esource **I**dentifiers

```
GET https://www.example.com/api/v1/users

GET https://www.example.com/api/v1/books
```

URIs organization

- Resources should be named by plural nouns

```
GET https://www.example.com/api/v1/books

GET https://www.example.com/api/v1/getAllBooks
POST https://www.example.com/api/v1/addBook
```

URIs organization

- Query parameters for filtering

```
GET https://example.com/api/v1/books?author=tolkien
```

URIs organization

- Endpoint for individual resources

```
GET https://www.example.com/api/v1/books/12
```

URIs organization

- Endpoint for resources

```
GET https://www.example.com/api/v1/users/20/books
```

URIs organization

- Update a book

```
PUT https://www.example.com/api/v1/books/12
```

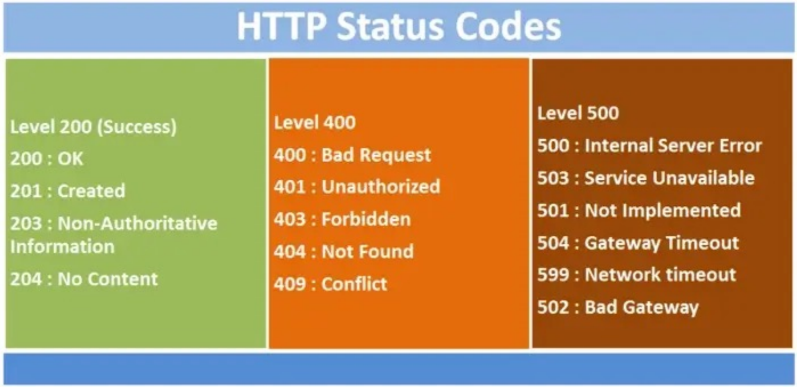
URIs organization

- Delete a book

```
DELETE https://www.example.com/api/v1/books/12
```

REST and HTTP

- Use HTTP codes to provide feedback



HTTP Status Codes

Level 200 (Success)	Level 400	Level 500
200 : OK	400 : Bad Request	500 : Internal Server Error
201 : Created	401 : Unauthorized	503 : Service Unavailable
203 : Non-Authoritative Information	403 : Forbidden	501 : Not Implemented
204 : No Content	404 : Not Found	504 : Gateway Timeout
	409 : Conflict	599 : Network timeout
		502 : Bad Gateway

Documentation

- When building an API good documentation is critical for developers
- Request and response examples

Security and REST APIs

- Authentication and Authorization (e.g., OAuth 2.0)
- Bearer token
- Secure transport (HTTPS/SSL)
- Audits

Versioning in RESTful APIs

- URI versioning (e.g., /v1/users)
- Header versioning

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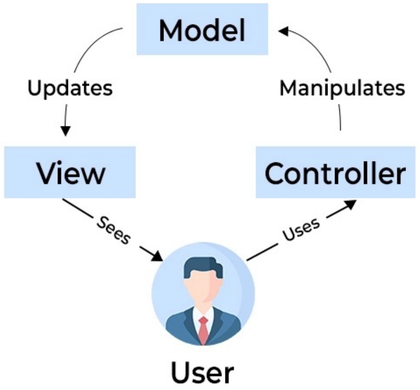
What is an MVC?

- Model: The data layer of the application
- View: The presentation layer (UI)
- Controller: The logic layer that handles user interaction, works with the model, and ultimately selects a view to render

- Separates application logic from the user interface

What is an MVC?

- **Model**
  The kitchen where the food is prepared
  (data and business logic)
- **View**
  The dining area where guests eat
- **Controller**
  The waitstaff takes orders and bring food



Benefits of MVC

- Simplifies management of complex applications
- Improves organized coding and development processes
- Facilitates scalability and maintenance

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What is an OOP?

- Object-Oriented Programming
- A way of computer programming using the idea of “objects” to represent data and methods

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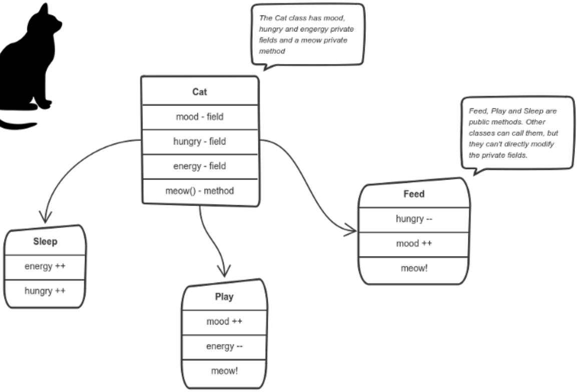
The Cat class has mood, hungry and engergy private fields and a meow private method
Cat
mood - field
hungry - field
energy - field
meow() - method
Feed, Play and Sleep are public methods. Other classes can call them, but they can't directly modify the private fields.
Sleep
energy ++
hungry ++
Play
mood ++
energy --
meow!
Feed
hungry --
mood ++
meow!

Classes vs Objects

- Class is blueprints for objects defining the common attributes and behavior

```
class Cat():
  def __init__(self, name, hungry,
                energy, mood):
    self.name = name
    self.hungry = hungry
    self.energy = energy
    self.mood = mood

  def meow(self):
    print("Meow!!")

  def feed(self):
    self.hungry -= 1
    self.mood += 1
    self.meow()

  def play(self):
    self.energy -= 1
    self.mood += 1
    self.meow()
```

Classes vs Objects

- An object is an instance of a class

```
// Create an object
cat1 = Cat('Fluffy', 7, 7, 7)
cat1.play()

cat1.energy  // 6
```

```
class Cat():
  def __init__(self, name, hungry,
               energy, mood):
    self.name = name
    self.hungry = hungry
    self.energy = energy
    self.mood = mood

  def meow(self):
    print("Meow!!")

  def feed(self):
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```

OOP Benefits

- **Modularity**
  Just like LEGO bricks, OOP lets us build modules that fit together. It makes complex systems easier to manage

- **Maintainability**
  Because objects are self-contained, we can swap out parts of our system with less risk of breaking other parts

- **Reusability**
  Just like using a template to create multiple documents, OOP lets us reuse code for multiple purposes

Inheritance

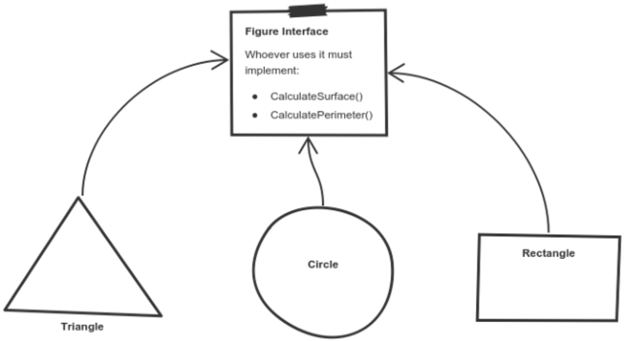

Figure Interface

Whoever uses it must implement:

- CalculateSurface()
- CalculatePerimeter()

Triangle, **Circle** and **Rectangle** inherit the Figure interface or abstract class.

They implement their own versions of **CalculateSurface()** and **CalculatePerimeter()**.

They can be used in a mixed collection of Figures.

Inheritance

```python
class Figure():
  def __init__(self, color):
    self.color = color

  def area(self):
    pass

  def perimeter(self):
    pass
```

Inheritance

```python
class Figure():
  def __init__(self, color):
    self.color = color

  def area(self):
    pass

  def perimeter(self):
    pass


class Square(Figure):
  def __init__(self, color, side):
    super().__init__(color)
    self.side = side

  def area(self):
    return self.side ** 2

  def perimeter(self):
    return 4 * self.side
```

Inheritance

```python
class Figure():
  def __init__(self, color):
    self.color = color

  def area(self):
    pass

  def perimeter(self):
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class Square(Figure):
  def __init__(self, color, side):
    super().__init__(color)
    self.side = side

  def area(self):
    return self.side ** 2

  def perimeter(self):
    return 4 * self.side
```

```python
class Rectangle(Figure):
  def __init__(self, color, sideA, sideB):
    super().__init__(color)
    self.sideA = sideA
    self.sideB = sideB

  def area(self):
    return self.sideA * self.sideB

  def perimeter(self):
    return 2 * self.sideA + 2 * self.sideB
```

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What is an ORM?

- Object-relational mapping
- A technique that lets you query and manipulate data from a database using an object-oriented paradigm
- Solving: Mismatch between the object-oriented world of applications and the relational world of databases

Why ORM?

- Write Python code instead of SQL
- Object-oriented code is often easier to read and maintain
- Allows developers to switch between different databases with minimal changes in code

SQLAlchemy

- SQL toolkit and ORM for Python
- Integrates with Python models

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- Integrates with Python models

```
@app.route("/get-entries", methods=["GET"])
def get_entries():
  """ Return the data from the database """
  select_query = "SELECT text FROM sentences"
  cursor.execute(select_query)
  messages = cursor.fetchall()
  return jsonify(messages)
```

SQLAlchemy

- SQL toolkit and ORM for Python
- Integrates with Python models

```
@app.route("/get-entries", methods=["GET"])
def get_entries():
  """ Return the data from the database """
  messages = [sentence.text for sentence in Sentence.query.all()]
  return jsonify(messages)
```

SQLAlchemy

```
class Sentence(db.Model):
    __tablename__ = "sentences"

    id = db.Column(db.Integer, primary_key=True)
    text = db.Column(db.String(1000), unique=True, nullable=False)
```