API testing is a type of software testing that involves verifying **Application Programming Interfaces (APIs)** directly. Since APIs lack a GUI (Graphical User Interface), testing happens at the message layer, focusing on business logic, data responses, security, and performance.

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1. What is an API?

Think of an API as a waiter in a restaurant. You (the client) give an order to the waiter, the waiter takes it to the kitchen (the server), and then brings the food back to you. API testing ensures the waiter is bringing the correct order, doing it quickly, and not leaking information about other tables.

2. Core Components of an API Request

To test an API, you must understand the four primary parts of a request:

- **Endpoint (URL):** The specific address where the API resides (e.g., https://api.example.com/v1/users).
- **Method (Verb):** What action are you taking?
  - **GET:** Retrieve data.
  - **POST:** Create new data.
  - **PUT/PATCH:** Update existing data.
  - **DELETE:** Remove data.
- **Headers:** Metadata for the request (e.g., Content-Type: application/json or Authorization: Bearer [token]).
- **Body (Payload):** The data being sent to the server (usually in JSON or XML format).

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3. What to Validate (The "Big Three")

When you run an API test, you are primarily looking for three things:

A. Status Codes

The server returns a three-digit code indicating the result.
Code Range	Meaning	Example
2xx	Success	200 OK, 201 Created
3xx	Redirection	301 Moved Permanently
4xx	Client Error	400 Bad Request, 404 Not Found
5xx	Server Error	500 Internal Server Error

B. Response Body

You must verify that the data returned is accurate. This includes:

- **Schema Validation:** Does the JSON have the correct keys and data types (string, integer, boolean)?
- **Data Integrity:** If you requested User ID 5, did the API actually return User ID 5?

C. Performance & Security

- **Response Time:** Does the API respond within an acceptable threshold (e.g., < 200ms)?
- **Auth:** Can a user access data without a valid token? (It should fail).

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4. Types of API Testing

Testing goes beyond just checking if a link works. Common types include:

- **Unit Testing:** Testing a single endpoint in isolation.
- **Integration Testing:** Testing how multiple APIs work together (e.g., an Order API calling a Payment API).
- **Load Testing:** Checking how many requests the API can handle before it crashes.
- **Fuzz Testing:** Sending "garbage" or unexpected data to see if the API handles errors gracefully.

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5. Popular Tools

While you can test APIs via code (Python, Java), most testers use specialized tools:

- **Postman:** The industry standard for manual and automated API testing.
- **Insomnia:** A lightweight, streamlined alternative to Postman.
- **Rest-Assured:** A popular Java library for automating REST services.
- **Swagger (OpenAPI):** Used for documenting and interacting with APIs.