## API (Application Programming Interface)

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### Key Features of an API:

1. **Interface**: Defines how one software component interacts with another.
2. **Abstraction**: Hides the internal workings of a system, exposing only necessary operations.
3. **Standardized Communication**: Ensures that different systems can work together using agreed-upon formats and protocols.

### Types of APIs:

**Web APIs**:

* 1. Facilitate communication between a client (browser, mobile app) and a server over the internet using HTTP/HTTPS.
  2. Common types:
     1. **REST (Representational State Transfer)**: Lightweight, scalable, and commonly used.
     2. **GraphQL**: Flexible querying for APIs.
     3. **SOAP (Simple Object Access Protocol)**: More rigid and formal, used for enterprise applications.

**Library APIs**:

* 1. APIs exposed by software libraries to perform specific functions, like math or string operations.

**Operating System APIs**:

* 1. Provide access to system-level features, such as file management or network communication (e.g., Windows API).

**Hardware APIs**:

* 1. Enable software to interact with hardware components like printers or sensors.

### How APIs Work:

**Request**:

* 1. A client sends a request to an API endpoint (URL) with specific parameters or data

**Processing**:

* 1. The API processes the request, often interacting with a database or other services.

**Response**:

* 1. The API sends back a response, usually in a format like **JSON** or **XML**.

### Example:

Imagine an e-commerce website with a "search products" feature.

* When a user searches for a product, their browser (client) sends a request to the server’s API.
* The API retrieves the relevant data from the database.
* The API sends the product data (e.g., name, price, image) back to the browser, which displays it to the user.