Computer Science Club - How APIs work

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Introduction to APIs

- An API (Application Programming Interface) allows different software applications to communicate with each other.

- The **SCSU Student API** enables managing student records (Create, Read, Update, Delete - CRUD) through a RESTful interface.

API Development Lifecycle

1. Planning & Design

- **Stakeholders:** University admins, faculty, students.
- **Purpose:** Managing student records efficiently.
- **Endpoints:**
  - POST /students - Create a new student.
  - GET /students/{id} - Retrieve student details.
  - GET /students - Retrieve all students.
  - PUT /students/{id} - Update a student record.
  - DELETE /students/{id} - Remove a student record.

2. Development & Implementation

- **Tech Stack:** FastAPI (Python), SQLite (Database), Uvicorn (Server).
- **Authentication:** API Keys
- **Database Management:** SQLAlchemy ORM.
- **Error Handling:** Proper validation and exception handling for data integrity.

3. Testing

- **Functional Testing:** Using Postman for API calls.
- **Performance Testing:** Postman.
- **Security Testing:** OWASP API Security Guidelines.
- **Example Test Case:**
  - Send a POST /students request with invalid data.
  - Expected outcome: 400 Bad Request error.

4. Deployment

- **Hosting:** Deployed using AWS, Azure, or GCP.
- **CI/CD Pipeline:** Automated deployment using GitHub Actions.
- **API Gateway:** Securing and managing API traffic.

5. Monitoring & Maintenance

- **Performance Monitoring:** Using tools like Prometheus and Datadog.
- **Logging & Debugging:** Centralized logging system.
- **Version Control:** Managing API versions for backward compatibility.
- **Security Updates:** Regular patches for vulnerabilities.

Frontend Integration

- A simple HTML + JavaScript interface to interact with the API.
- Fetch API used for making requests.
- UI elements for adding, updating, and deleting students.

Postman Test Scripts

- Scripts to test each API endpoint automatically.
- Ensures response validity and data integrity.
- Verifies proper authentication and authorization.

Conclusion

- The **SCSU Student API** follows a structured API development lifecycle.
- Ensures efficiency, security, and scalability.
- Continuous improvement with monitoring and maintenance.