RL4Eng

Development of Remote and Virtual Laboratories for Teaching and Training Engineering Students in the South Mediterranean and Sub-Saharan Higher Education Institutions

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Web Security

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INTRODUCTION

Web security involves protecting websites, servers, and data from unauthorized access and breaches.

Key Concepts Covered in this presentation:

1. Web Architecture
2. Web Servers: Apache and Nginx
3. HTTP Protocol
4. Cookies
5. HTTP Requests and Responses

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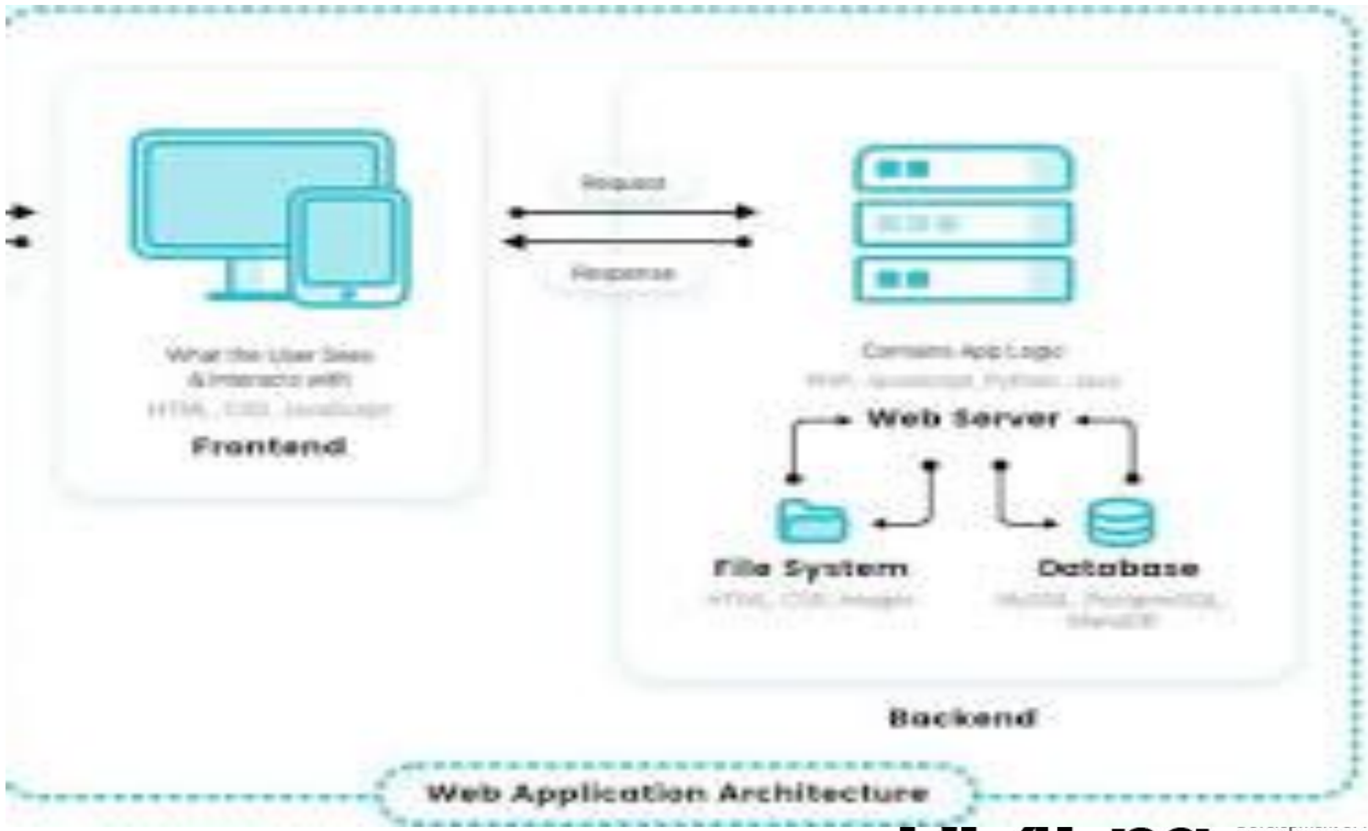
Web Architecture



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Web Architecture

- Client: User's device (computer, smartphone, tablet)
- Browser: Software to interpret and display web pages (Chrome, Firefox, Safari)
- Server: Computer that stores and serves web content
- Web Server: Software on the server that handles requests and sends responses (Apache, Nginx)

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WEB SEVERS

- A web server is software or hardware that serves web content.
- Apache:
  - Open-source, widely used
  - Highly configurable
  - Supports various modules for security, performance, and more
- Nginx:
  - High-performance, efficient
  - Often used as a reverse proxy or load balancer
  - Strong security features

HTTP Protocols

- HTTP (HyperText Transfer Protocol): Foundation of web communication.
    - Common HTTP Methods:
    - GET: Retrieve data.
    - POST: Submit data.
    - PUT: Update data.
    - DELETE: Remove data.
- HTTPS: Secure version of HTTP using SSL/TLS encryption.
- Importance:
    - Prevents data interception.
    - Ensures data integrity and authenticity

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COOKIES

- Cookies are small text files stored on the client-side by websites.
- Types:
    - Session Cookies: Temporary, deleted after the session ends.
    - Persistent Cookies: Stored until a specified expiration date.
- Usage:
    - Session management (e.g., logins).
    - Personalization (e.g., themes).
    - Tracking user behavior.
- Security:
    - Use HTTP-Only and Secure flags.
    - Regularly validate cookie content.

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HTTP Requests and Responses

- HTTP Request Structure:
  1. Request Line: Method, URL, and HTTP version.
  2. Headers: Metadata (e.g., User-Agent, Content-Type).
  3. Body: Data sent to the server (e.g., form submissions).
- HTTP Response Structure:
  1. Status Line: HTTP version and status code (e.g., 200, 404).
  2. Headers: Metadata (e.g., Content-Type).
  3. Body: Content returned to the client.
- Common Status Codes:
  1. 200 OK: Request succeeded.
  2. 404 Not Found: Resource not found.
  3. 500 Internal Server Error: Server-side issue

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Security Implications

- Common Vulnerabilities:
  - Unsecured cookies.
  - Improper server configurations.
  - Open redirects.
- - Best Practices:
  - Use HTTPS to encrypt communications.
  - Sanitize and validate all inputs.
  - Configure secure HTTP headers (e.g., Content-Security-Policy).

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Tools for Securing Web Basics

- Web Application Firewalls (WAFs): Protect against common threats.
- SSL/TLS Certificates: Secure web communications.
- Vulnerability Scanners: Detect potential flaws in web applications.
- Logging and Monitoring Tools: Track and respond to anomalies.

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Q &A

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