University of Sunderland

Faculty of Business and Technology: Programme -

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MODULE CODE: CET138

MODULE TITLE: Full Stack Development

MODULE LEADER: David Grey

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ASSIGNMENT:

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ANY OTHER COMMENTS FROM STUDENT:

What Is Full Stack Development?

Full stack development is a process at its whole building both front end (client-side) as well back end (server-side) web application. It means that a full stack developer can design user interfaces that are engaging and practical and accessible, while also creating secure, efficient, and scalable server-side systems to handle data processing with responses delivered. In today's tech industry, full stack developers are in high demand because they can manage the entire development lifecycle. From gathering a project's requirements and planning its architecture to putting the application live maintaining applications over time (dealing with bugs fixed at any phase). A full stack developer will typically be involved in all aspects of these tasks.

A typical full stack application will involve multiple layers: the front end for user interaction, the back end for business logic and management of information, and the database layer to store retrieve data. By mastering these layers, it is possible to build complete end-to- end solutions which work smoothly as a unit.

Front End (Client-Side)

Definition: The front end refers to everything that a user sees and interacts with directly in their web browser. It ensures that websites and applications display neatly on the user's computer. People who create front ends are responsible for the structure, visual design and interactive behaviour of a website or app.

Core Technologies: The structure of a web page is provided by HTML (HyperText Markup Language). CSS (Cascading Style Sheets) is used to control layout, colors and typography to produce a consistent look throughout the website or application. With JavaScript, it can also make elements that users drag and drop within the page come alive as well as animations become interactive and updates to content occur without a browser reload.

Front-end development also frequently uses frameworks and libraries such as Bootstrap for responsive layouts, Angular or Vue in building single-page applications with complex features.

Responsibilities: Ensuring accessibility for all users, including those with disabilities; laying out responsive designs that work well on mobile, tablet and desktop computers; optimizing performance by minimizing assets and loading resources lazily (not until they are needed but after the final version has been downloaded); and giving users an easy-to-use platform.

Security Considerations: While front-end code is visible to the user, sensitive operations and data validation must be performed on the server. Client-side validation is used to improve user experience but should never replace server-side security checks.

Back End (Server-Side)

Definition: The back end is the part of an application that is hidden from view of end users and run on a server. It houses business logic to process user requests, perform database operations, apply regulations and then send responses back to the front end.

Core Technologies & Patterns: Common back-end environments include Node.js w/ Express, Python with Django and Flask, PHP using Laravel or Java Spring Boot. There are even cases where it might expose APIs that use RESTful Resource API's for communication, also GraphQL which is much more flexible than the former option we mentioned earlier(Http Style). Additionally one could use WebSockets-esque techniques to keep updated real-time data in their app.

Responsibilities: Authenticating and authorizing users, implementing complex workflows, integrating with third-party APIs, managing sessions, and enforcing security policies.

Security Practices: Sanitizing and validating all input to prevent injection attacks, encrypting data in transit with HTTPS/TSL, applying the principle of least privilege for resource access, using secure storage for environment variables and credentials, as well as monitoring any suspicious activity through logging the activities to a database.

Database & Data Layer

Definition: The database layer stores the data it obtains, making sure that any information which has been received is reliably saved, retrived and updated in accordance with the Application program's demands. Access to the database is channeled uniquely through the back end, Keeping it remote from direct access by any user.

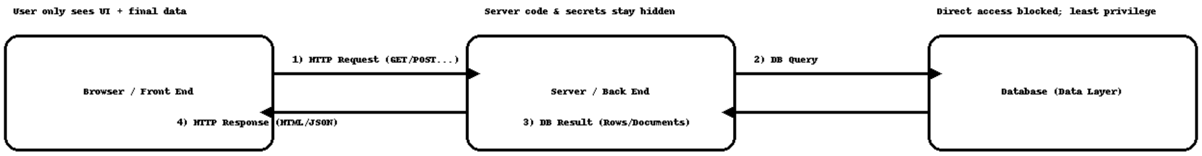
Options: Relational(SQL) databases(example MySQL, PostgreSQL) Just store data in structured tables and enforce schemas with relationships defined in advance. Some more complex queries as well as ACID-compliant transactions are possible for fitting applications. Non-relational(NoSQL) databases like MongoDB and DynamoDB Represent data in flexible ways: documents or key-value pairs for example. Their virtue is quick scaling and easy adaptation to changing demands.

Access & Performance: Back-end applications typically use ORMs (Object-Relational Mappers) like Sequelize, Prisma, or TypeORM for SQL databases, and ODMs (Object-Document Mappers) like Mongoose for MongoDB. Indexing frequently accessed fields, caching results, and optimizing query structure are key to high performance. Schema migrations are used to manage database changes safely.

Security: Enforce least-privilege permissions for database users, encrypt data both at rest and in transit, validate input to avoid malicious queries, and maintain regular, tested backups. Audit logs should be implemented to track changes and access to critical data.

Typical Request–Response Flow (Step-by-Step)

See the diagram below, then read the numbered explanation:


User only sees UI + final data
Server code & secrets stay hidden
Direct access blocked; least privilege
1) HTTP Request (GET/POST...)
2) DB Query
Browser / Front End
Server / Back End
Database (Data Layer)
4) HTTP Response (HTML/JSON)
3) DB Result (Rows/Documents)

1) HTTP Request (Browser → Server): The user triggers an action on the front end (e.g., submitting a form). The browser sends an HTTPS request to the server using GET, POST, PUT, or DELETE, including any necessary headers, cookies, and payloads.

2) Database Query (Server → Database): The server authenticates the user, validates the request data, applies business logic, and issues a parameterized query to the database through an ORM/ODM or direct driver.

3) Database Result (Database → Server): The database processes the query and returns the requested records or a confirmation. The server processes these results and removes sensitive information before preparing the response.

4) HTTP Response (Server → Browser): The server sends the final response (HTML, JSON, etc.) back to the browser. The front end then updates the interface accordingly. At no point is the server-side code or database directly exposed to the user.