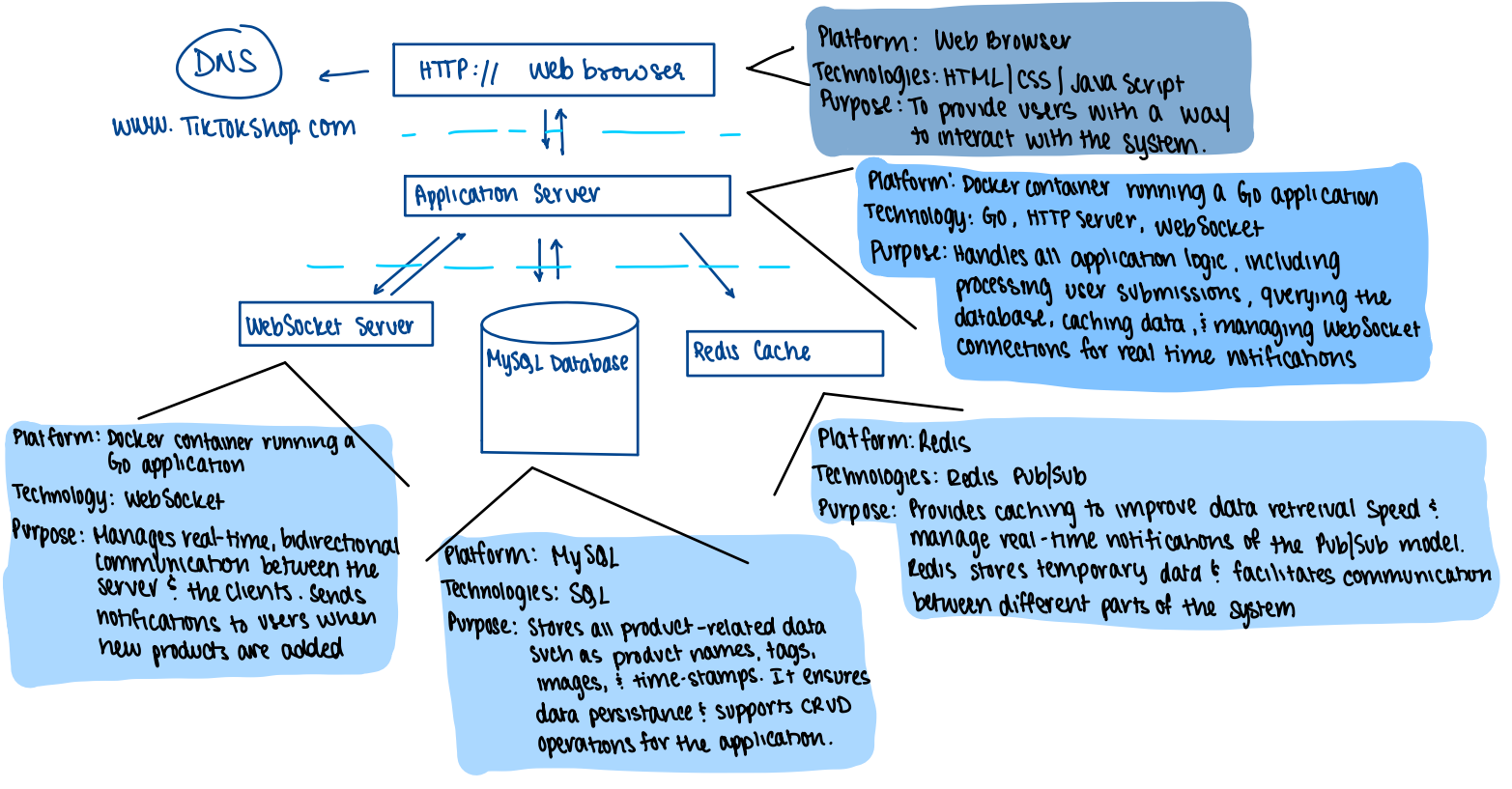
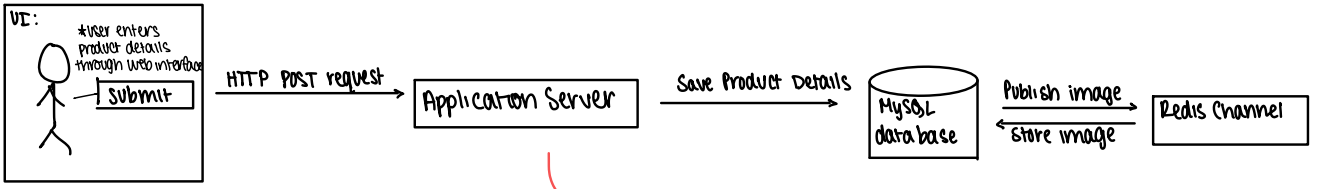
System Design : Components

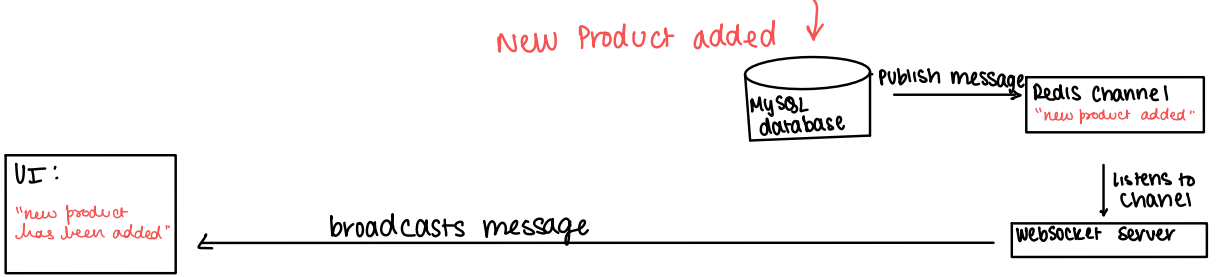


Data Flow

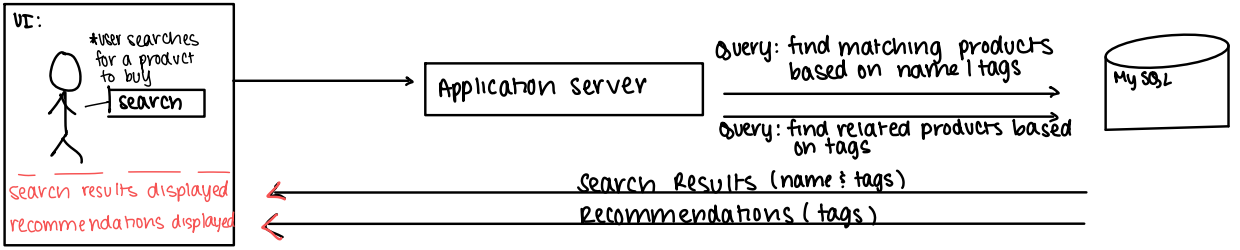
① User submits a product



② Real-time Notifications



③ Product search:



System Design Considerations and Next Steps

Performance:

- **Caching:** Redis is used to cache frequently accessed data, reducing the load on the MySQL database & improving response time
- **Asynchronous Processing:** WebSocket communication allows real-time updates without constantly polling the server.

Scalability:

- **Horizontal Scaling:** The application server, Redis, and WebSocket server can be scaled horizontally by running multiple instances in Docker containers
- **Load Balancing:** Load Balancers can be added in front of the application server & WebSocket server to distribute incoming traffic evenly across multiple instances

Deployment:

- **Containerization:** Use Docker for easy deployment & scaling of the application. Each component (application server, Redis, MySQL, WebSocket server) runs its own Docker container
- **CI/CD Pipeline:** Set up a continuous integration and continuous deployment (CI/CD) pipeline to automate testing & deployment of updates to the application

Security:

- **Data Validation:** Ensure all inputs from the UI are validated before being processed by the server
- **Authentication:** Implement authentication or authorization if needed for product submissions or other actions
- **WebSocket Security:** Use secure WebSocket connections for encrypted communication

Data Consistency:

- **MySQL** ensures strong consistency for all product-related data
- **Redis** provides eventual consistency for cached data & notifications

Reliability:

- **Redis:** In case of Redis failure, notifications might be temporarily delayed, but they aren't critical for the operation of the rest of the system
- **MySQL:** Backup strategies should be in place to prevent data loss in case of a database failure

NEXT STEPS:

- **User Authentication:** Add user authentication system to manage user accounts & secure product submissions
- **Advanced Search & Filtering:** Implement advanced search features like filtering by date, popularity, or specific tags