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HOSPITAL INFORMATION SYSTEM BASED ON MICRO-SERVICE ARCHITECTURE

INTRODUCTION

Hospital Information Systems (HIS) play a critical role in healthcare facilities by managing patient data and streamlining administrative and clinical operations. In recent years, microservice architecture has emerged as a popular approach to designing HIS systems. This article will discuss the advantages of microservice architecture for HIS systems and its implementation.

I. TECHNOLOGIES APPLIED IN HIS SYSTEM

HIS systems often consist of multiple subsystems and services, such as mobile application for patients, web system for doctors and administrators, and data management system. The Front-end design of mobile application is developed using Vue.js and scss; html5, css, jquery, js for web system's Front-end design; And SpringBoot, Mybatis-plus, Spring-mvc, Spring-cloud for Back-end design.

Microservice architecture allows these subsystems to function independently, which improves system performance and reduces development time. To achieve this, developers use various technologies such as RESTful APIs, message brokers, and containerization tools like Docker and Kubernetes.[1]

II. SYSTEM IMPLEMENTATION

To implement microservice architecture for HIS systems, developers must consider various factors, such as system security, data management, and scalability. The use of containerization technologies, such as Docker and Kubernetes, can simplify the deployment and management of microservices. Developers should also follow best practices for microservice development, such as using a service registry for service discovery, implementing circuit breakers for fault tolerance, and using an API gateway to manage access to the services.[1]

III. BUSINESS PROCESSES

The mobile app used by patients is mainly used for appointment registration and consultation, as well as some information inquiry, the appointment process is shown in Figure 1; the web application used by doctors is mainly used for the management of patients' appointment information, the reply to patients' questions and the management of hospital information, this process contains doctor information management, call or pass the appointment for patient, online diagnose,

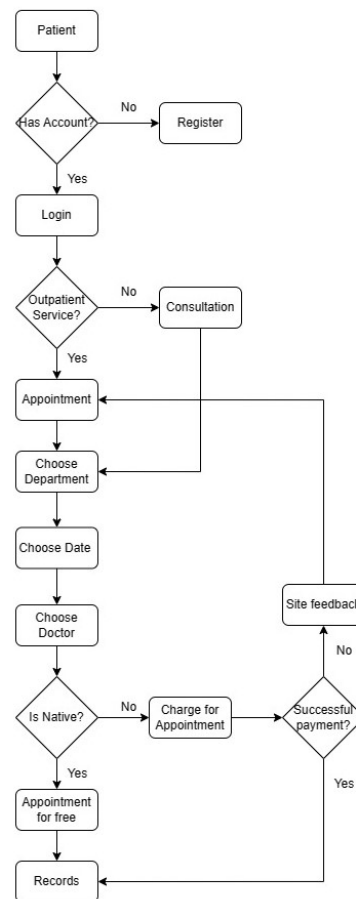hospitalization management, patient information management and so on.

Fig. 1   Business process for patient

IV. ADVANTAGES OF MICROSERVICE ARCHITECTURE

One of the key advantages of microservice architecture is its ability to scale and adapt to changing business requirements. As each subsystem operates independently, developers can make changes without affecting the entire system. Additionally, microservice architecture simplifies the development process by dividing the system into smaller, more manageable components. This leads to a more efficient development process and faster time-to-market.[2]

In the design of microservices, the overall function of "Internet+Medical" service is analyzed comprehensively, modeled according to the domain, and the original system development is transformed into functional module development. A single application with complex functions is decomposed into a set of tiny services, and the different tiny

services coordinate with each other to complete a complex function together.[3]

V. PROJECT STRUCTURE FOR THE SYSTEM

To effectively implement microservice architecture for HIS systems, developers must carefully plan the project structure. Each subsystem should be designed to operate independently and communicate with other subsystems through well-defined APIs. Developers should also consider the use of common libraries and tools across subsystems to promote consistency and reduce development time.

Here is an overview of the project structure for the system:

Eureka Service: As a registry for all services, Eureka allows them to register their own information to it and pull the list of services from EurekaServer according to the service name, and make remote calls through load balancing.

Gateway Service: Provide a unique entry point for all microservices, and the gateway provides internal and external isolation to ensure the security of backend services; services can be developed independently and mapped through the gateway layer.

Patient Service: This service manages patient records and personal information, deals with some operations for getting information from database.

Register Service: This service mainly deals with the mobile application users' appointments to doctors and some complex queries for the database like multi-Criteria query for available appointment in specific date and time.

Doctor Service: This service is responsible for doctors' information management, work arrange management and department information management.

Administration Service: This service allows administrators to manage hospital information, such as departmental information and staffing.

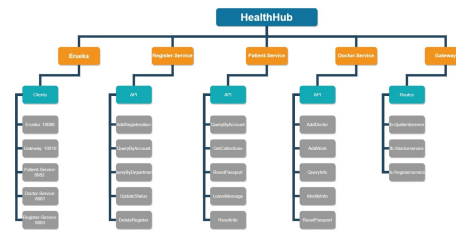The structure for these services in this system are shown as below.(Figure.2)

Fig. 2   Micro-Service structure for HIS system

VI. CHALLENGES AND LIMITATIONS

While microservice architecture offers many benefits, it also presents certain challenges and limitations. For example, we must carefully manage the interactions between subsystems to avoid introducing bugs or performance issues. Additionally, microservice architecture may not be suitable for all HIS systems, such as those with limited resources or legacy systems.

SUMMARY

Based on its flexibility, scalability, and manageability, the microservices architecture is an effective method for designing hospital information systems. By breaking down large HIS systems into smaller independent components, each microservice operates independently without affecting others, resulting in low coupling. we can more effectively build, deploy, and maintain these critical systems. However, to effectively implement the microservices architecture, we need to carefully plan the project structure based on the environment and size of different hospitals and their specific circumstances.

References

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