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Implementation of Nutrition based REST APIs for Health Management Applications and Testing with Automation

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ABSTRACT

This work is to develop a back end of an application that provides a Nutrition API service which is a micro service and hosted on to cloud, and it exposed REST APIs which can be consume by the user (health management application).This particular application helps user to keep track of Nutrition In- take by providing in-depth nutritional and caloric information so that user can reinforce good behaviours and make changes to ones that are affecting health negatively.

Keywords : Microservices, Cloud Computing, Deployment, Automation Testing , Docker, Lucene query, RESTful API, Health Management, Postman automation, Jmeter, Performance Testing, Newman

I. INTRODUCTION

Most nutrition related apps around the world are developed for health management rather than for dietary guidance exclusively. Although basic principles of energy balance is being used, their nutritional functionality was relatively limited and not individualized[1]. More efforts we should made to develop nutrition related apps with evidence based nutritional knowledge ,comprehensive and personalized dietary guidance and with innovative technology. So this project aims to individualized and personalized the application.

II. METHODS AND MATERIAL

REST API

The RESTful API is an API that makes calling resources very convenient and intuitive, reducing the complexity of the service. In most cases, microservices use RESTful API to deliver messages. Considering that webpages or software may serve a large number of users sending requests at the same time [2].Many of RESTful Web services have downtime at specific intervals, such as the release of a new patch, so that all necessary information can be retrieved, stored on a local server, and then presented to users , it is all because of the problem that using relational databases and result in multiple REST requests to traverse the hierarchical structure and retrieve the needed information, leading to a long runtime before the application is loaded [3]. Restful API also known as (Representational State Transfer) is one of popular API type when we are going to provide Web services. It can be use over any protocol like HTTP, HTTPS,TCP/IP and so on. Hence, as a developer we don't need to use or install additional softwares or any libraries while creating REST APIs. Unlike Simple Object Access Protocol (SOAP), REST

is not constrained to XML as it can return XML, JSON, YAML or any other format as requested by the customers. In this project we have used JSON data for making request and response for the APIs.

USE OF MICROSERVICES

Microservices architecture has become enormously popular because traditional monolithic architectures no longer meet the needs of scalability and rapid development cycle [4].Now a days , use of microservices makes you able to build your application in large scale and helps to scale up independently. We had two microservices for Nutrition APIs for Health Management Applications. Food Service and Recipe Service. We made use of REST APIs to expose these microservices and to have communication among these services. These services are related to food and recipe data which generally required in any dietary application. One can make use of CRUD operations using respective REST API signature. Both service APIs takes request parameters in FHIR bundle resource JSON format and Response body is given in JSON FHIR bundle response format.

DATASTORE – ELASTICSEARCH

Time series similarity search is an important aspect of knowledge discovery in time series, and the index of data is the key to efficiency of similarity search in time series. In order to improve the efficiency of data query, a new similarity search method is proposed for hydrological time series using Lucene function mechanism[5]. As we know the growth of unstructured and partially-structured data in biological networks, social media, geographical information and other web-based applications present an open challenge to while handling and processing the data. The approach is to exhaustive BigData analysis that integrates structured and unstructured data processing have become increasingly critical in today's world. Use of powerful indexing techniques would allow users to significantly speed up query processing and get results in fraction of seconds. Currently, there are a number of indexing techniques like Hadoop++, HAIL, LIAH, Adaptive Indexing etc., but none of them provide an optimized technique for text based selection operations[6].The query efficiency is increased due to the highly effective categorization algorithm to segment data as an index with open source tool Lucene [7]. So, the datastore we have used to store the data is ElasticSearch. Elastic act as a search engine based on Lucene library. Its NoSQL, distributed and multitenant capability for full text search makes it more efficient to handle textual JSON data. As we have supported REST APIs with JSON data as request and response of API calls, Elastic search provides HTTP web interface and schema free JSON documents. Elastic-search also allow us to store, search and analyze large volume of data in real time within fraction amount of time. To store and retrieve data in elastic search one can query elastic search with simple REST call , GET, POST, PUT ,DELETE. In real time if we want to visualize data from ElasticSearch , we can make use of "Kibana". Kibana is known as opensource visualization dashboard for Elasticsearch.

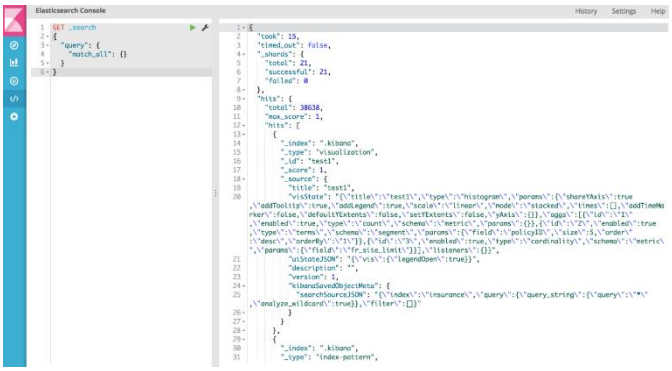

Figure 1: Kibana Dashboard

DEPLOYMENT OF MICROSERVICES

Public cloud storage services allow users to store their data remotely and access them at anytime via any devices; the service could even provide high performance and integral security if enterprises host their own service[8].The adoption of microservice-based architecture has become increasingly popular. Microservice containerization is a technique used by

developers to facilitate the deployment process of applications based on this architecture[9]. An application that based on microservices can have thousands of microservices internally which makes almost impossible for developers to deploy it manually. In addition to automation tools for the deployment of microservices, another tool began to gain popularity among developers: the use of Containers[9]. As we know, cloud offers data storage ,infrastructure and application over the internet so we have used cloud service for production infrastructure . We need not to install all the pre- requisites for the application to run in our local system. Cloud helps us a lot to overcome platform dependency issues also data security assurance. Alibaba cloud provides Elastic Compute Service (ECS) which is nothing but elastic Cloud-based products that are simpler to manage than physical servers. To deploy and run microservices, the process known as Containerization is more helpful to scale up , modify ,manage and run efficiently. A docker container launched by running docker image at first. Docker image is an executable package that contains pre-requisites to run an entire application. Generally, docker image includes application OS, source code, any libraries that required during runtime, environment varibales, configuration files, etc. You can build docker container locally and deploy them on cloud and run anytime, anywhere.

III. RESULTS AND DISCUSSION

VALIDATING RESULTS

As the complexity of software components in automation systems is increasing so it requires a systematic and compatible testing approaches. Test-First Development (TFD) – an established approach in business IT software development promises to support test automation in automation systems development[10]. So linking test case generation, execution, and execution reporting requires a sound framework to support testing processes more efficiently. To increase test efficiency, test coverage, and test effectiveness, organizations start to automate tests. Automated tests can be run repeatedly with comparably lower costs and faster speed, and currently is becoming the critical in more agile software development process[11]. Therefore , we have used below automation tools to validate APIs requests and responses.

A. POSTMAN

Postman is automation testing tool which helps developer to create, test and document APIs. We can add test scripts in different programming languages. In our project we have used JavaScript. With valid endpoint url of your API ,We can get response as follow.In our project ,we are supporting Response in Json format. We can have complete postman collection which includes all APIs re- quests and can be run as “Collection” at a time manually. You can find below API request and Response format from Postman Request also running complete test collection at one go using postman in below figures.

Figure 2: Postman API Request

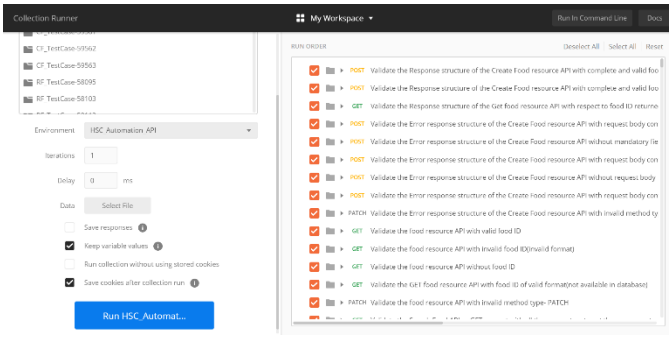

Figure 3: Postman Collection Runner

B. JMETER

With the development of Internet technology, web-based application systems have been widely used in

various fields of social life. With the increasing number of users, the performance of the system is related to whether it can provide services normally, and affects the users experience directly[12]. Jmeter is automation testing tool which mainly use for performance testing. We can send single request with multiple users at a time to test performance of the system.

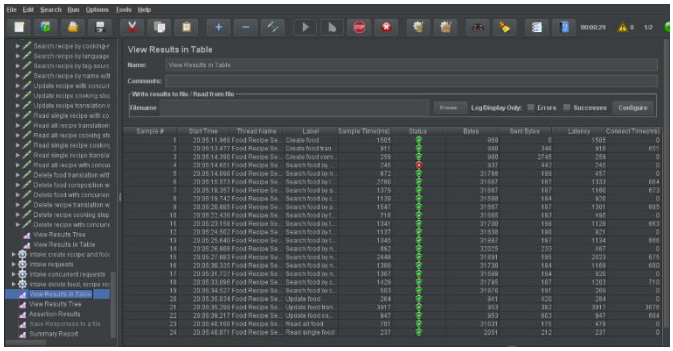

Figure 4: Performance test with Jmeter

C. NEWMAN

Newman provide a command line integration to run postman collection automatically.You should have node.js as pre-requisite to install newman.

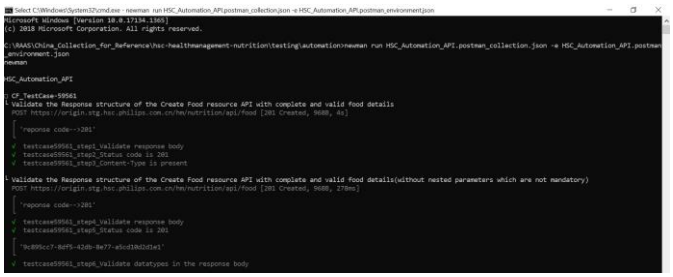

Figure 5: Running Postman collection with Newman

With newman we can run postman collection as a part of continuous integration and continuous deployment system. So that we can ensure that the existing functionality of an application is not breaking due to our latest change in source code after deployment. Command liine execution of postman collection and newman report looks like follow.

	executed	failed
iterations	1	0
requests	111	0
test-scripts	102	0
prerequest-scripts	13	0
assertions	168	0
total run duration: 1m 23.5s		
total data received: 30.98KB (approx)		
average response time: 491ms [min: 278ms, max: 1257ms, s.d.: 267ms]		

Figure 6: Newman Assertion Report

D. SWAGGER

Swagger is a open source tool that helps developers design, build, document, and consume RESTful web services. We can have real-time access to API requests with swagger. You need to have knowledge about JSON programming.

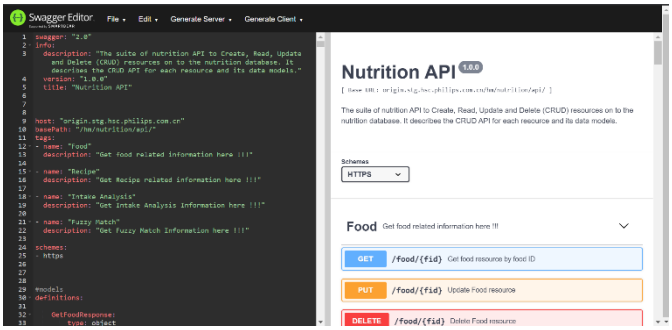

Figure 7: Swagger Editor

IV.CONCLUSION

More efforts we should be made to develop nutrition-related apps with evidence based nutritional knowledge, comprehensive and personalized dietary guidance, and innovative technology. Also we should ensure the quality of system or application by having strict testing and following standards. So this project aimed to individualized and personalized the application using latest technologies and test automation tools for product quality assurance.

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