Amdocs Internship: Creating Dashboards, Alerts, and Reports for C Spire

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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ABSTRACT

Amdocs created a new telecommunication architecture for 5G and had to move all of its existing customers from 4G to 5G. Many aspects of the old architecture were depreciated in the new architecture, and it was my task to replicate some of these aspects. I modified the old Kubernetes images of the UMS to recreate the dashboards and alarms for the 5G infrastructure. I also wrote new SQL scripts to generate reports of user data, similar to those generated in the 4G infrastructure . The dashboards and alarms were essential for C Spire to monitor their system and make repairs quickly when problems arise. The SQL scripts were used to scale the systems accordingly and make financial decisions. While the change from 4G to 5G is complete, it is not guaranteed to be permanent due to the ever changing landscape of technology.

1. INTRODUCTION

Amdocs is a multinational software and services company that provides solutions for customer experience management, revenue management, and digital transformation for telecommunications and media companies, as well as other industries. The company was founded in Israel in 1982 and is now headquartered in Chesterfield, Missouri, USA.

Amdocs provides a wide range of software and services to help its customers manage their business operations more efficiently and effectively. This includes solutions for customer care and billing, order management, network management, digital commerce, and more.

Some of Amdocs' customers include major telecommunications and media companies around the world, such as AT&T, Vodafone, T-Mobile, Comcast, and Verizon. The company has a global presence with operations in over 50 countries and employs over 26,000 people.

As part of my internship, I worked on a project for C Spire, a wireless solutions company located in the southeastern United States. The 5G solution offered by Amdocs comprised two distinct systems: Amdocs Openet Charging (AOC) and Amdocs Openet Policy (AOP). AOC was responsible for charging customers based on their data usage, whereas AOP was tasked with distributing data to customers and managing customer interactions with the system. Kubernetes was used to provide these services because of the benefits of containerized cloud computing such as scalability and availability.

Our focus was on upgrading the CSpire's existing infrastructure from 4G to 5G. In the 4G infrastructure, the AOC and AOP were called the Evolved Charging Suite (ECS) and Openet Policy Controller (OPC) respectively.

The observability dashboards, alarms, and report scripts were depreciated in the new 5G infrastructure, and it was my role to replicate these in the new 5G infrastructure.

2. RELATED WORKS

While it is difficult to find documentation on internal systems of other companies, many that provide services over the cloud utilize Kubernetes. T-Mobile is using Kubernetes to optimize its cloud infrastructure, reduce costs, and increase efficiency. The company is migrating its infrastructure to a container orchestration platform with Kubernetes in order to reduce its reliance on public cloud providers and save $30 million in cloud costs. By adopting Kubernetes, T-Mobile has streamlined application deployment, improved resource utilization, and better managed its application lifecycle. Kubernetes has also enabled T-Mobile to improve collaboration among teams and reduce operational overhead. (Sawaya, 2020).

Capital One has implemented Kubernetes to improve application resiliency and reliability, simplify application deployment, and increase infrastructure efficiency. The company is using Kubernetes to manage its containerized applications and provide a scalable and flexible infrastructure. With Kubernetes, Capital One has reduced deployment times, increased the stability of its applications, and enabled more efficient use of infrastructure resources. Additionally, Kubernetes has enabled Capital One to better manage its application lifecycle, improve collaboration among teams, and reduce operational overhead (Kubernetes, 2020).

The benefits that T-Mobile and Capital One gain from using Kubernetes are universal across all Kubernetes deployments, including Amdocs. One of the major challenges in upgrading infrastructure is dealing with the complexity of moving from the old system to the new one. However, with Kubernetes, the process of moving from the old 4G infrastructure to 5G infrastructure has become much simpler. This flexibility and resilience of Kubernetes make it an ideal platform for managing complex infrastructure upgrades like the one Amdocs was undertaking.

3. SYSTEM DESIGN

The entire system uses Kubernetes to receive, store, process, and send data. The structure of Kubernetes isolates these processes so that they can be executed and modified independently.

3.1 Kubernetes Architecture

Kubernetes is a container orchestration platform that has rapidly become an essential tool for building scalable and resilient cloud-native applications. It is a powerful technology that enables developers to easily manage and deploy containerized applications, and is designed to support the needs of modern, distributed systems.

At its core, Kubernetes is a distributed system that manages a cluster of machines, or nodes, and the containers that run on those nodes. These nodes contain pods, which act as containers for processes, sharing resources with other pods on the same node. Isolating processes in pods prevents any failure or modification from impacting the entire solution. This provides a flexible and modular architecture, allowing developers to deploy complex applications with ease. Pods are defined by images, which are a lightweight, stand-alone, executable package that contains all the files, libraries, and dependencies needed to define the pod.

3.2 Requirements

The dashboards, alerts, and reports are contained in two subsystems: the Unified Monitoring System (UMS), and the Service Based Architecture Profile Manager (SBAPM).

3.2.1 Unified Monitoring System

One of the components within AOC is the Unified Monitoring System (UMS) pod, which collects statistics from all other pods and leverages the Elastic Stack to generate visualizations and alarms. The old UMS in the ECS utilized Grafana, an open-source data visualization and monitoring platform that allows users to create and display real-time dashboards, alerts, and graphs for large-scale systems. It provides a unified interface to visualize data from multiple sources, including databases, cloud services, and applications, making it a popular tool for monitoring and troubleshooting distributed systems.

However, the UMS in AOC no longer supported Grafana and instead used the Elasticsearch, Logstash, and Kibana (ELK) Stack, a powerful platform for log management and analysis, providing users with the ability to search, analyze, and visualize large volumes of data from multiple sources in real-time. The image for the UMS had to be configured so that the ELK Stack displayed the same dashboards and generated the same alarms as Grafana did.

3.2.2 Service Based Architecture Profile Manager

A component within the AOP is the Service Based Architecture Profile Manager (SBAPM). The SBAPM contains vast datasets, with each customer having a unique account comprising their name, address, phone number, data plan type, and available data. In the OPC, reports made from these datasets are generated daily and monthly, providing C Spire with insights into how their customers utilize their services and whether adjustments are required to meet changing demands.

The SBAPM in AOP stored the data differently than the SBAPM in the OPC, so new SQL scripts had to be made, and the image for the SBAPM had to be configured to schedule and run these scripts.

4. RESULTS

The dashboards for observability and alerts for monitoring the C Spire system were non-existent after the move from 4G to 5G. The creation of these was essential to the upkeep of the system as it allows C Spire to easily view the health of the system and be promptly notified of any issues that arise. Currently, the dashboards and alerts are being used to ensure that the software that provides cellular connection to millions of users in the southeastern United States remains functional.

The daily and monthly reports provide useful statistics to C Spire about the capacity of their system. C Spire can monitor how much bandwidth they have available based on how customers use their network and scale accordingly. They can also use the data to optimize financial decisions such as how to price new data plans for customers.

5. CONCLUSION

This internship involved upgrading the existing infrastructure of C Spire's wireless solutions from 4G to 5G using Amdocs' Openet Charging (AOC) and Openet Policy (AOP) systems, which were deployed on Kubernetes. The project required the creation of observability dashboards and report scripts for the new 5G infrastructure, which were crucial for monitoring the system's health and ensuring that C Spire could quickly identify and resolve any issues that arose. The daily and monthly reports generated by SBAPM provided valuable insights into how customers used C Spire's services and helped optimize the system's capacity and pricing.

At this internship, I had the opportunity to be introduced to Kubernetes and the agile development methodology. Before starting the project, I had some basic knowledge about Kubernetes, but I was not familiar with

its practical applications. Through this project, I learned how Kubernetes can be used to manage complex applications and how it offers scalability, reliability, and flexibility to developers. I was impressed with the containerization concept and how it makes deploying and managing applications easier and more efficient.

I also had basic knowledge of the agile methodology used by software development companies through my coursework. Agile methodology is a flexible and iterative approach to software development, where development teams work collaboratively to deliver software in short cycles, and respond to changes in requirements and feedback quickly. This methodology promotes customer satisfaction, continuous improvement, and teamwork, and I found it to be a valuable approach for software development.

6. FUTURE WORK

Telecommunications is a rapidly evolving field that is always changing. The advancements in technology and the constant evolution of standards mean that telecommunications providers must always be ready to adapt to new changes. The move from 4G to 5G is not the end of the C Spire project for Amdocs. It is guaranteed that new and improved hardware and software will emerge, and the project will need to be revamped again.

In addition, as C Spire gains new customers, it may outgrow the existing system. C Spire will need to scale to meet the growing demand. Amdocs has the capacity to do this through Kubernetes, but it may require modifying the existing infrastructure or redesigning it all together.

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