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Digital Torque Transformation

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Abstract

The Equipment Installment Plan (EIP) was a game changer in telecom industry and is an integral part of T-Mobile?s Un-carrier strategy. The EIP system is a home-grown system based on Java/J2EE and a combination of client-server and SOA architecture principles. The application runs on Bea Web Logic servers with Oracle DB with multiple batch jobs. As the system grew in size, operational challenges surfaced which includes multiple physical server security updates and maintenance cost. (DTT)? was the answer to address these challenges. The method employed PaaS Pivotal Container Services (PKS). Enterprise PKS uses the latest stable OSS distribution of Kubernetesâ??"with no proprietary extensions. PKS is widely expansible to other applications in T-Mobile ecosystem as PKS can be deployed On-premises as a PaaS.

Index terms—

1 Introduction

In 2009, T-Mobile designed, implemented, and launched Device Financing Product. It is known as "Equipment Installment Plan" (EIP) in the telecommunication industry. EIP is the, predecessor of similar products such as Lease, JUMP (Just Upgrade My Phone) and 'Un-Carrier.' Most telecommunication companies now have to use derived EIPs to stay competitive.

The EIP is a T-Mobile home-grown Computer Science Application finance system which currently serves over 45 Million 'Active' Loans and Leases. The EIP built on information technology Java, J2EE, Oracle client-server architecture. The EIP Legacy system feeds large amount of data to over 150+ echo systems in the T-Mobile landscape, which serves Customers, Accounting, Billing, Auditing, Ordering, and the Reporting verticals.

The current challenges involved legacy application [Forbes 2018], EIP system evolved into a very tightly coupled architectural system with numerous interactions and validations. Many functions, though not required for the system itself, are forced to fit-in. As business and market need to be evolved, the system ended up having orchestrations and dependencies on credit decisions, billing, business rule engine, millions of lines of code, over 250 database tables with more than a quarter billion transactional and historical records.

The monolithic nature of the system is the driver that triggered the need to docker containerize the EIP finance information system using PKS (Pivotal container Service) on-premise cloud [define cloud, cloud computing models]. There are functional and technical disadvantages to the legacy system. Some of them in clude low scalabilities, as the system is not designed to support elastic infrastructural capacity, low fault tolerance and high turnaround time on speed to market.

Increased business volume caused system response time increased, and performance declined. Infrastructure costs continued to rise because of the need to apply security patches over multiple servers. System Telemetry **??**1) and Logging mechanisms were a challenge.

A client impact-free solution is warranted without any code changes, application configuration changes and database changes.

Lessons Learned: The finer level details during the engagement of a monolithic system should be given proper care, before its introduction into the landscape, given the fast-changing business and technical needs.

2 Telemetry is an automated communications process by which measurements and other data are collected at remote or inaccessible points and transmitted to receiving systems (Splunk or in-house logging systems) for monitoring. a) The DTT Method

PKS PaaS was elected to overcome existing challenges in the operational front of EIP system.

DTT method is a method to upgrading an application from its existing platform, adhering to clouds' 'Beyond Twelve Factor' **??**2) principles and make it run on cloud, while preserving existing functionality.

Strangler pattern concepts were adopted, and custom java scripts are designed to route the traffic between legacy Web Logic infrastructure and the new cloud PKS infrastructure without interrupting production traffic and clients.

Docker concepts adopted and extended for DTT to build the cloud native application docker container that includes application code, WebLogic application server docker image, and dependent libraries.

rovides wireless voice, messaging, and data services in the United States, Puerto Rico, and the U.S.

Virgin Islands under the T-Mobile and Metro by T-Mobile brands. The company operates as the third largest wireless network in the U.S. market with over 65.5 million customers and annual revenues of $32 billion. Its nationwide network reaches 98 percent of Americans through its EDGE 2G/HSPA 3G/HSPA+ 4G/4G LTE networks, as well as, through roaming agreements.

3 P

The existing A10 LTM pool manager (Figure 1) that holds legacy WebLogic instances were left untouched. An additional pool PKS load balancer member was added to connect PKS clustered pods. Custom scripts were designed on A10 LTM router to check the health of the PKS pool member, also known as PKS load balancer to K8 cluster. Custom code extensions were implemented on the exiting EIP application to check application health of routing rules.

To achieve complete roll out, A10 software configuration was used to disable each pool member in the WebLogic EIP pool manager and load was gradually transitioned to PKS.

DTT minimized the risk of migration and spread the development effort over time. With the façade safely routing users to the correct application, new functionality was added to the new system incrementally, while ensuring the legacy application continues to function. Over time, as features are migrated to the new system, the legacy system is eventually "strangled"

The DTT journey took 3 months. Traffic was slowly rolled out in increments bi-weekly and an impactfree transition was achieved.

Beyond Twelve Factor Principles: Refer to content in link below.https://content.pivotal.io/blog/beyond-the-twelvefactor-app

The high-level visual Figure 1, including the transition to PKS cloud stack, used to achieve 'Digital Torque Transformation' is given below;

4 b) The Results

The idea to not impact existing customer-facing applications was attractive. Legacy applications can continue to call the same services and still achieve the business and enterprise goal of moving to anew digitalized service platform.

EIP (online) is now containerized in Production taking 100% traffic enabling us to achieve full benefits of containerization including elastic scale and No patching for security vulnerabilities.

Over 55 security vulnerabilities that required constant patching were reduced to less than 5.Autoscaling is achieved, and the application is reactive to A total of 60 PODS with 30% faster response times and 40% fewer resources and throughput of scaling from 0-60 PODS in less than 5 seconds is a tremendous feat.

NO NEW DEFECTS reported during the transition phase.

5 NO Code Change.

The Figure 2 graph below, denotes # of transactions for "Charge Injection" functionality Before the DTT and After the DTT. The system sustained an increase of almost two and half times load with better processing times. Before the DTT method ~4 millions at the rate of over 3K transactions per minute. After the DTT method over 10 million at over ~7.5K transactions per minute.

6 Discussion

The customized strangulation pattern to transition legacy system to new system is seamless to the enterprise without interrupting business.

The methodology explains to move away from legacy bare metal hardware in to cloud elastic VMs. Dockerize an application and Heavy weight application server in to containerization and make as light weight and to CI/CD.

Leverages all benefits of kubernetes on PaaS PKS cloud-native container. Kubernetes provides a simple and cost-effective solution for developers seeking to deploy and run their containerized applications on a Kubernetes cluster.

Most of the big enterprises tends to use PaaS as it provides better data security, accelerate product innovation, control, focus resources, get the best monitoring, get the best support and do your project right.

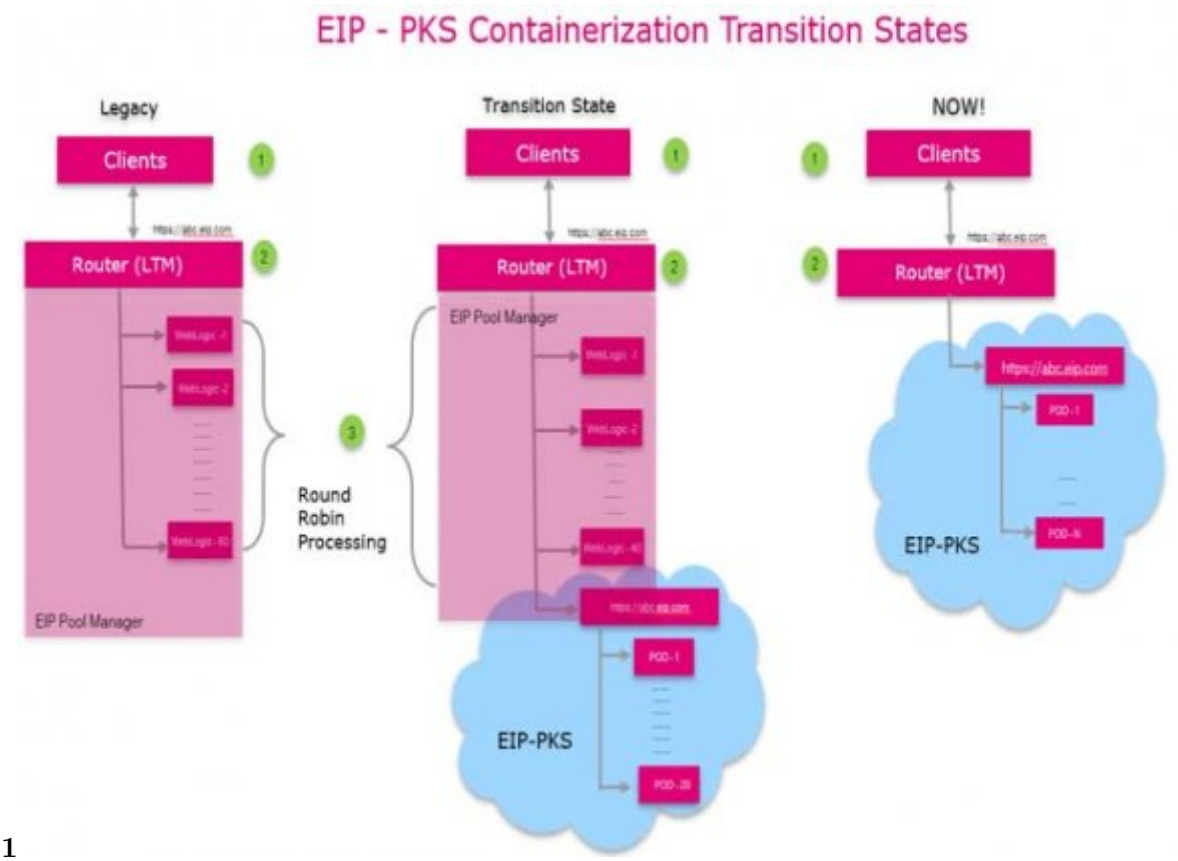
To keep pace with our un-stoppable growth, we needed to raise the stakes for how we manage customer loans, leases and lifecycle information on Equipment Installment Plans (EIP).

7 III.

8 Conclusion

The scenario we narrated is not unique. Many companies are lumbered with systems that are not easily wholesale replaced the new platform, yet in many cases, they are critical systems for the company (i.e. the applications companies rely on for profits). In the age of digital transformation, systems must adapt faster than ever before to meet demanding capability and performance needs. A DTT approach of system delivery empowers organizations to meet these challenges while accelerating the pace of innovation, all in a risk averse and sustainable way.

Investing in PKS reduces the time spent keeping systems operational and allows teams to work towards the future-the time and money savings cannot be emphasized enough! For us, watching the technology come to life within six weeks was an amazing thing to see! [1]



1

Figure 1: Figure 1 :

[1] © 2019 Global JournalsDigital Torque Transformation

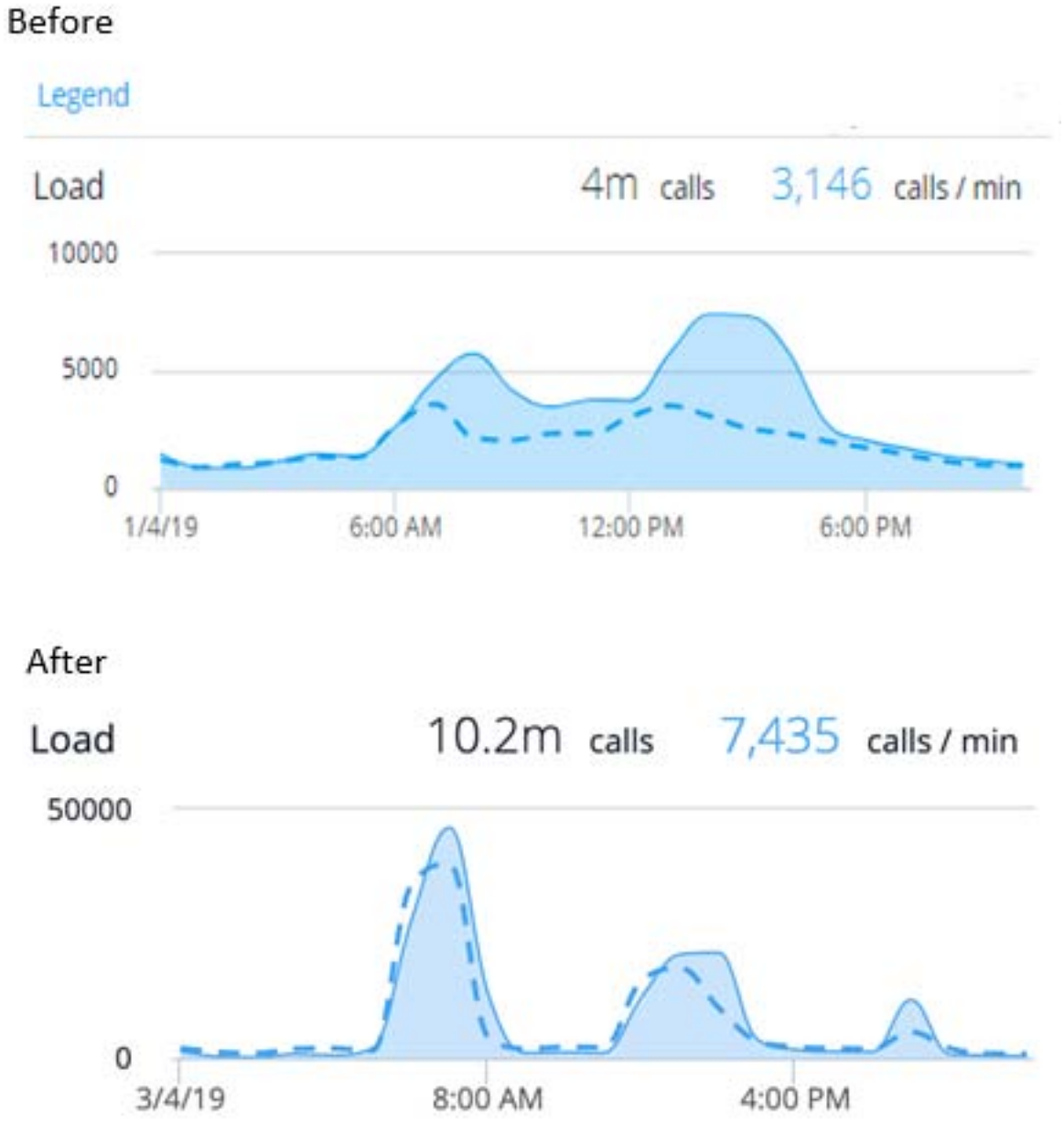

Before
Legend
Load
4m calls
3,146 calls / min
10000
5000
0
1/4/19
6:00 AM
12:00 PM
6:00 PM
After
Load
10.2m calls
7,435 calls / min
50000
0
3/4/19
8:00 AM
4:00 PM

Figure 2:

3

Figure 3: Figure 3

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It takes a team to build a village, and the team was nothing but exceptional. Special Thanks to Ram Sadasivam and AnuMahanty for allowing the team to experiment an innovative idea and making it work! We made it! We have completed the journey for taking the monolithic EIP application and replatforming and modernizing it to be a cloud native application. Through this journey, we took a legacy system that was hard to maintain and modernized it into an efficient, cloud native system that is ready to take full advantage of what cloud computing has to offer. Perhaps the best of all, we made it much easier to maintain going forward.

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