**Assignment 2: Cloud Adoption and Migration Journey of Netflix**

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**SYST8171: Adoption and Migration Planning for Virtualization**

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**21-05-2024**

**Introduction**

The cloud Journy of Netflix started in August 2008, when they faced a huge database corruption. That is when they realized that they had to move from relational database on date centers towards horizontally scalable, highly reliable, and distributed system in cloud. Amazon Web Services (AWS) as the cloud provider was the main choice of Netflix as it provided them scalability and a broad spectrum of features and services. Most of the systems had been migrated to the cloud before 2015. In early 2016 Netflix reported that they finished the cloud migration and the remaining data center used by the streaming service was shut down. Migrating to cloud was one of the greatest decisions for Netflix and it has brought numerous benefits for them. Now they have 10 times as many streaming members than they did in 2008. This assignment highlights the key challenges that Netflix faced during its cloud adoption and migration journey, the techniques used to resolve these challenges and key lessons learned from Netflix.

**Key Challenges to Netflix Cloud Journey**

1. **Scalability:**

Before Netflix’s migration to cloud, they experienced some issues for handling huge range of person demand especially during the peak hours. The traditional on-prem infrastructure faced difficulty to serve such varying workloads in other words they could not scale rapidly to meet the loads, which resulted in significant downtime and poor user experience.

1. **Global Reach:**As Netflix expanded its range of contents to worldwide target market and one of the most demanding situations was ensuring that green material distribution across multiple regions. (PRAJAPATI, 2023)
2. **Cost-Effectiveness:**

For hastily growing companies like Netflix, traditional infrastructures requires large upfront investments and continuous maintenance cost, which has proven to be unaffordable. (PRAJAPATI, 2023)

1. **Data-Driven Insights:**

Netflix is known for its ability to deliver personalized content recommendations for entertainment is legendary. This is possible with the amount of personal data they accumulate and examine. (PRAJAPATI, 2023)

1. **Improved Security and Reliability**Security is an important aspect of any business enterprise managing sensitive personal data or statistics. Handing huge amount of user data posed significant challenge for Netflix and it is crucial for them to ensure data security and compliance regulations. (PRAJAPATI, 2023)
2. **Quality of Service (QoS) Logging**There was too much traffic going into the data centre database and because of that it was overflowing and there was not enough space for storage to store the content that they wanted to save. And Netflix servers did not have the capacity to store the petabytes of content present in Netflix Library. (PRAJAPATI, 2023)

**How does Netflix resolve these challenges?**

1. **Scalability**With the adoption of cloud technologies, Netflix gained exceptional scalability. Netflix leveraged AWS to achieve this unimaginable scalability. They dynamically regulate resources to ensure a smooth streaming experience for billions of viewers across the globe. Netflix was able to manage large volumes of traffic by utilizing AWS’s elastic load balancing which helped in automatically distributing incoming traffic across multiple targets. (cloudvisor, 2024)
2. **Accelerating Content Delivery**By using the cloud, they were able to create a worldwide network of Content delivery networks (CDNs) and statistics centres. Amazon CloudFront ( a global content delivery network) stores and cashes content across a worldwide network of data centres. The movies, series, and TV shows are made available from regions closest to the consumers and which considerably decrease latency and enhance the final streaming experience. As a result, Netflix can provide high-quality and buffer-free experience for its viewers. (cloudvisor, 2024)
3. **Pay-as-You-Go Model**This cross version delivered by cloud computing, lets organizations pay only for the resources they use. Netflix eliminated pointless infrastructure and hardware costs, optimizing its fee structure, resulting in significant savings. In order to ensure effective usage of resources Netflix uses AWS’s sophisticated cost monitoring as well as measurement strategies. (cloudvisor, 2024)
4. **Personalized Recommendations**Netflix relies on Amazon DynamoDB to provide personalized viewing experience and for database management with high performance. The NoSQL database service of DynamoDB lets quick and flexible data retrieval. This enables Netflix to predict relevant contents based on watching history, search query and other relevant data points. Furthermore, Netflix also use Amazon Elastic MapReduce (EMR) for processing of big data and its analysis. It helps in analysing user behaviour and recommendations. (Sambhoji, 2023)
5. **Improved Security and Reliability**Netflix utilize some AWS’s security services to manage and secure its data. Some examples of these services are as follows: AWS Identity and Access Management (IAM) is used to securely control access to AWS resources.  
   Whereas, KMS ensures encryption and key management services. (Identity and access management for AWS Key Management Service, n.d.)
6. **Quality of Service Logging (QoS)**In order to fix the storage space issue they moved their entire storage infrastructure to S3 and moved the log analysis to Elastic MapReduce. (Migrating to Cloud- Lessons from Netflix, Brought Up to Date, 2018)

**Key lessons learnt from Netflix.**

1. **Create Micro-services:**The Main goal of Netflix is to reduce the effect of service failure and downtime by creating the smallest level of abstraction for its application. It effectively reduces the blast radius of cloud outage. Netflix quickly achieved advantages in scaling, higher business agility and unbelievable profits. (Shah, 2024)
2. **Build in Redundancy**Netflix horizontally scaled its services globally and deployed each service to at least three Availability Zones (AZs) withing Amazon’s Cloud. With respect to AWS, they recommend deploying to a minimum of two AZs for service-level agreement (SLA). The Netflix service is replicated across U.S East and EU West these are two regions inside the Amazon’s cloud. This ensures availability even when an entire region fails.
3. **To be Resilient**Even though Netflix had an efficient monitoring and alert system that covers all the operations of Netflix, still failures persist. For this reason, they had built a platform to monitor its services and correcting mistake. This platform was built using open-source tools like Simian Army, Chaos Gorilla, and Chaos Kong. These tools where utilized to test fault tolerance, failures in application layer, high availability, and region shutdowns. Netflix emphasizes on testing and monitoring. Here the developers are accountable for the entire life cycle of code and application which is known as the company’s distribution model, allows a more resilient approach to manage its operations. (Butler, 2013)
4. **Least priority for Cost Saving**An interesting factors of the Netflix cloud is that they highlight the importance of cloud computing. Netflix emphasized on scaling advantages and reliability in leveraging AWS, rather than focusing on cost saving. According to the company avoiding fixed cost of scaling their private data centre for peak loads is considered as a better choice. By providing elasticity in applications, they where able to accumulate more benefit of cost saving. (Townsend, 2016)
5. **Change Management**As comparedtotraditional migration undertaking a cloud migration is very complex process. The 2012 Christmas Eve outage, caused due To AWS maintenance on elastic load balancers, highlighted the challenges of migrating change management and controls. Organizations should take this into consideration, as it evaluates the impact of sub-systems on a distributed system. (Townsend, 2016)
6. **Availability**Netflix was successful in achieving four nines availability in its cloud-based application, even though it demonstrated the difficulty of achieving five nines availability in a private data centre. Netflix was careful in the services they migrated to the cloud, from this its clear that organizations should consider the effect of service availability during migration to the cloud. (Townsend, 2016)

**Boosting Cloud Adoption with the Cloud-Native Maturity Model**

Organizations use the cloud-native maturity model to assess their cloud adoption journey. Cloud professionals can enhance their cloud adoption journey in the following ways:

1. **Defining the cloud goals and assess the current state**Before starting evaluating the cloud maturity, it is essential to have a clear understanding of why there is a need for cloud services and how they will help the business objectives and digital transformation roadmap. Another important aspect to be assessed is the current state and gaps between the existing capabilities and the desired cloud outcomes. (Khangura, 2023)
2. **Determining the cloud maturity level**Based on the cloud readiness assessment cloud maturity level can be determined. This reflects how well the cloud services are utilized to achieve the business goals and optimize the performance. There are several models to measure cloud maturity. This helps to benchmark the cloud maturity against industry standards and identify areas of improvement. (Khangura, 2023)
3. **Plan the cloud migration and adoption**Once the cloud maturity level is determined, then next step is to plan the cloud migration and adoption. This involves moving the applications and data to the cloud and optimizing them for cloud performance and scalability. Adopting cloud native design pattern such as microservices, containerization and serverless. By leveraging containerization and orchestration tools, organizations can scale the services based on demand easily, deploy them across various environments and provide high availability. (Khangura, 2023)
4. **Automate Everything:**

Organizations can achieve greater efficiency, consistency, and scalability in managing the resources on the cloud with the help of cloud automation. This also ensures reduction in manual errors, accelerates cloud deployment, and improve operational agility. Furthermore, Cloud automation tools can enhance resource optimization and cost management. (How do you assess your cloud readiness and maturity level?, 2024)

1. **Implement the cloud solutions and best practice**The next phase is implementation which includes setting up, maintaining, and monitoring the cloud-based services and resources. For effective implementation using DevOps methodology and Infrastructure as Code (IaC) enables to manage the infrastructure consistently and efficiently through code. By adhering to cloud-native principles it ensures that the applications are optimized for scalability, resilience, and performance. (How do you assess your cloud readiness and maturity level?, 2024)
2. **Evaluate and improving the cloud performance**The final step is to evaluate and improve the cloud performance and outcomes. Relevant metrics and indicators (such as Key Performance Indicators (KPIs) and the Return on Investment (ROI)) should be used to measure, analyse and optimize the cloud results. Feedback from stakeholders and customers should be collected. To enhance cloud capabilities and values its essential to continuously learn and innovate. (How do you assess your cloud readiness and maturity level?, 2024)

**Conclusion**

Netflix’s experience of moving its services to the cloud underlines the problems and answers encountered when a company decides to migrate from an on-premises infrastructure. To facilitate this process, Netflix managed their cloud transition successfully by making use of Amazon Web Services (AWS), adopting a microservices architecture and following a culture of innovation. Other companies can also learn from what Netflix journey. Cloud professionals can improve their cloud strategies, streamline operations, and embrace continuous learning using this model. Thus, increasing scalability, reliability, and innovation in the cloud environment.

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