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A Reliability Model for Cloud Migration

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***Abstract**: Cloud computing is the most adopted service delivery method in the field of IT services, now days. Cloud is best known service delivery method due to its core conceptual properties like on-demand usage, high scalability, & low maintenance cost. It is well suited model for small as well as medium to large enterprises to reduce the project initiation cost due to resource provisioning and improve their return on investment. So enterprises are moving forward for migrating their legacy systems to the cloud. Migration provides new environment to the legacy application so it becomes compatible with new environment. In proposed research, a reliability model has been implemented using concepts of migration & reliability. It will also calculate reliability of different components. Proposed technique showed better results in terms of execution time & reliability, when compared with results of on-premise components. The results show that the proposed algorithm is more efficient to calculate & compare reliability of on-premise & cloud components.*

***Keywords:** Cloud simulator, Cloud Migration, Reliability, Legacy applications, RMCM.*

1. INTRODUCTION

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. The term Cloud refers to an Internet. Cloud offers services over network, i.e., on public networks or private networks, i.e., WAN, LAN. Cloud computing is a type of computing that relies on sharing computing resources. In Cloud computing, applications are handled by the Cloud server and data is stored remotely in the Cloud configuration. All processing and storage is handled by the Cloud server. In this way it provides the facility to users to do not download and install applications on their own computers. The on-line services provided by a Cloud provider or a private organization. Cloud computing is a natural evolution of virtualization, service oriented architecture, autonomic, and utility computing. Details are distracted from end- users; the cloud technology infrastructure supports them.

2. CLOUD MIGRATION

Migration is defined as the process in which system is migrated from one environment to another. Legacy system migration is the process in which target system is developed which has functionality and data of the original legacy system but which can be easily maintained and designed to meet future business requirements. The legacy application migration process includes migration from on-premise to Cloud or from Cloud to Cloud. Fig 1 below shows the migration of application from a non-Cloud environment to a Cloud environment.

Figure 1: Migration from Non-Cloud to Cloud Environment

Figure 2 below shows the migration of application from a non-Cloud environment to a Cloud environment.

Figure 2: Cloud to Cloud

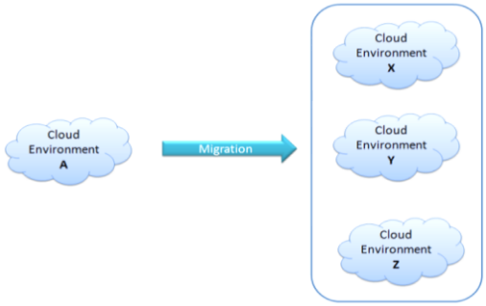

Figure 3: Cloud to Multi-Cloud

3. CLOUD MIGRATION APPROACHS

a) Re-host- Re-host migrate the legacy system on new hardware environment but with the changes of system infrastructure configuration.

b) Re-factor- Re-factor migrate the system on different/same hardware environment by retaining the same behavior of the system and provides the new platform (Cloud) to the application.

c) Revise- In this type the code is modified or some additional features are made in the code to make it compatible with new environment. After modification re-host and re-factor technique is used for migration.

d) Rebuild- In this type code is rejected for an application; application architecture is modified and migrated on new platform.

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e) Replace –In this the whole application is rejected and re-design from the start or exchanged with the off-shelf product.

4. RELATED WORK

Khadija Sabiri et al. discussed the methods for migration from enterprise to cloud. The architecture is proposed that helps in the process of the cloud migration. The migration process is started by analyzing the architecture of application. Then Cloud type is chosen for migration. Next application is identified and categorized for migration. And migration solutions are taken for component migration. Meta model is proposed for analyzing the system and divide the system into three layers business, application layer and technical layer.

Zibin Zheng et. al. proposed a reliability based approach for migration of legacy components on Cloud Computing. They defined the component ranking algorithm for migration of two clouds - public and hybrid. They discussed the optimization challenges for migration of application as well as discussed the impact and failure rate of components. Optimal fault tolerance technique is selected for the components on the basis of ranking of components. Due to the security requirements less sensitive components are migrated to the cloud on the other hand more sensitive components remains on-premise.

Sanjeev Kumar Yadav and Dr. Akhil Khare discussed the process framework for migration of legacy application to the Cloud. Change is necessary for the applications to make it compatible with new environment. With the migration new environment is provided to the applications and resources can be handled efficiently on the basis of pay-as-you-use method. Migration decision is based on business or technology. Framework defines the four layers for the migration - Pre-migration, Migration, Post-migration and Governance. Enterprise have three goals - Migrate, Replace and Re-develop for the long-term evaluation of the application.

Miguel et. al. surveyed different migration types, strategies and approaches. They analyzed the previous studies and showed results on the basis of use of the types, strategies and approaches. MDD was used only 2% for the migration. Partially migrate was used only 14%. Rebuild was used only 15%. Reliability was considered only 21%. MDD provide more level of abstraction than the traditional one. Although MDD have more advantages but the study shows that MDD is less used for migration.

Nikita Yadav et. al. Presented a model based on the reliability. Reliability is the main factor in cloud computing. Cloud reliability is defined as the successfully working of the cloud when some of the components of the cloud leads to fail. There are timeout failure, overflow failure, network failure, resource missing failure, hardware failure, database failure and software failure in the cloud computing. They defined the exponential approach for calculating failures and reliability.

5. METHODOLOGY

To propose and verify our concept of reliable automated cloud migration, first we will assign legacy workload for the purpose of migration on cloud. Then we will design a category based reliability assurance model for each separately identified critical component of the application workload. Modular identification of the migrated application will also be a design component of our proposed model.

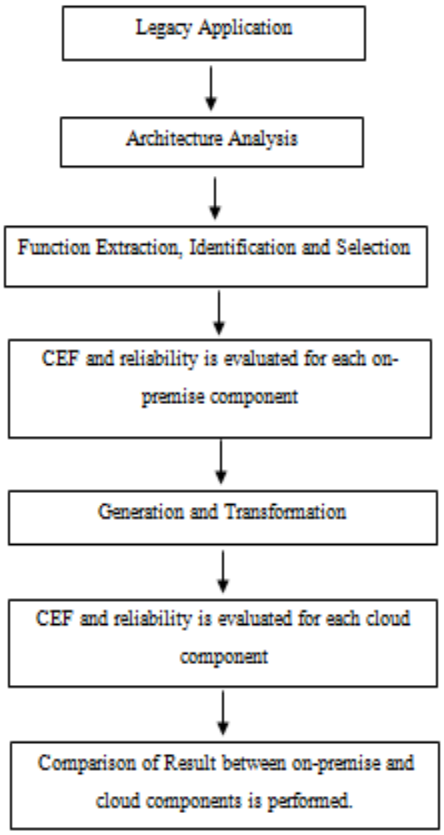

Figure 4: Step by step procedure

Step 1: This step includes the designing of Legacy application. Legacy application is designed on the non-cloud environment.

Step 2: In this step we are going to analyze the application architecture.

Step 3: On the basis of step 2, components are extracted from the analysis of application. Less sensitive and more sensitive components are identified and less sensitive components are selected for the migration.

Step 4: In this step we are going to evaluate the component effectiveness factor and reliability of the non-cloud components.

Step 5: In this step we are going to generate and evaluate the target architecture for migration on cloud. The different components are migrated on different virtual machine.

Step 6: In this step, we are going to evaluate the component effectiveness factor and reliability of the components that are migrated to cloud.

Step 7: In this step we verify and evaluate the results between on-premise components and cloud components

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6. PROPOSED MODEL

The proposed model consists of set of methods to migrate legacy components into cloud environment. The model provides a way in which components reliability is monitored in two parts - before and after migration to the cloud. The figure below shows an overview of the proposed model.

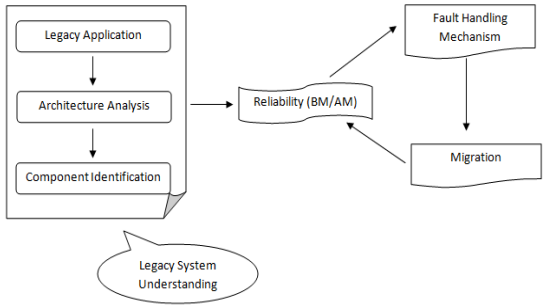

Figure 5: Proposed model

As in the first step, architectural analysis of legacy application should be done. And then components are selected for migration. Reliability is evaluated for every on-premise components. Fault Handling is introduced for the components that fail in Before Migration (BM). Then components are migrated to the cloud. Migration is achieved with Model Driven Development approach. Then After Migration (AM) reliability is evaluated for components that are migrated to Cloud.

7. RESULTS AND EXPLANATION

To implement the proposed reliability model and proposed algorithm, a non-cloud and simulated scenario has been developed, which is executed in Eclipse and in simulated cloud environment. The network scenario has been developed using Cloud Simulator and Eclipse. Eclipse provides non-cloud environment to the application. Cloud Sim provides novel support for modeling and simulation of virtualized Cloud based data center environments such as dedicated management interfaces for VMs, memory, storage, and bandwidth. Cloud Sim manages the instantiation and execution of core entities (VMs, hosts, data centers, application) during the simulation period.

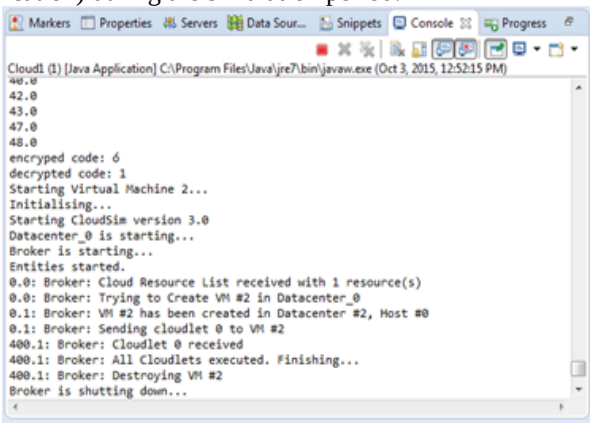

Figure 6: Terminal output of component1

8. CONCLUSION AND FUTURE WORK

It has been concluded that the Reliability of the Cloud components outperforms as compared to Non-Cloud components. According to the experimental results the proposed model has the best integrate reliability on migration. The model consists of three parts: reliability analysis of on-premise components, migration and reliability analysis of migrated Cloud Components. C-R algorithm is proposed to compute the reliability of non-cloud and cloud components on the basis of CEF. The results are compared on the basis of execution time and reliability. In future the proposed work can be integrated with the data migration as well as with cost of migration.

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