Survey on Service Migration to Cloud Architecture

Girish L S

PG Scholar, Dept. of ISE
BMS College of Engineering
Bangalore, India
girishskambaka.bmsce@gmail.com

Dr. H S Guruprasad

Professor and Head, Dept. of ISE
BMS College of Engineering
Bangalore, India
drhsguru@gmail.com

Abstract—This paper contributes to the growing knowledge of how to migrate existing systems to cloud computing environment. An increasing number of companies are expected to migrate their systems to cloud enabled infrastructures. Since migration is likely to encounter several kinds of challenges, it is important to identify and share the process and requirements of migration projects in order to build appropriate process, methods, and tools.

Keywords-cloud computing; PaaS; IaaS; DaaS; Service Migration; Virtual Machines;

I. INTRODUCTION

Cloud computing is an emerging computation paradigm with the goal of freeing up users from the management of hardware, software, and data resources and shifting these burdens to cloud service providers. Software and hardware services are hosted at widely distributed sites. This increases the network traffic and unexpected delays due to network congestions. This problem can be solved by considering service migration. In this paper, we consider the problem of service selection and migration in a cloud.

II. LITERATURE SURVEY

Stephen et. al. [6] explains the concept of service migration to the Cloud Computing Environment (CCE). This paper addresses the mechanisms to solve migration issues such as Acquisition, Implementation, Security, Usage, Reporting, Valuation and Legal. Muhammad et. al. [15] propose a process framework for supporting migration to cloud computing and it is proposed that PaaS clouds would have long term commitments because of unavailability of alternative solutions. To meet the quality effectively and efficiently, cloud should support for defined SLA and this paper discusses Hackystat systems for migration. Kishore et. al. [16] discuss about the Deployment of various services like software, web services and virtualized infrastructure and it is suggested that selection of the hypervisors and networking affects the capability to migrate application. Open switch is used as a tool in multi-tier application migration to the cloud and cloud application (cloud app) is an application program that functions in cloud.

Wei Hao et. al. [1] considered service and migration as a problem and proposed a frame work which facilitates service migration. They also designed a cost model and the decision algorithm to determine the tradeoffs on service migration and selection. The paper also focuses on the placement of migrated services by considering the migration, maintenance and communication costs. Gopi et. al. [21] discuss about the Auto script generation for mapping data elements to cloud entities for on demand bulk data transfer. The system can host an application on Microsoft cloud Azure platform and can be used to enable bulk data transfer on cloud. The paper also discusses advanced distributed query processing engine that utilizes elastic grid infrastructure to provide scalable on-demand data aggregation. Prashant et. al. [22] discuss about the database schema migration which ensures the completeness of the schema, creating database user, role assignment, changing object names and portioning of database tables. The paper also discuss about the database stored program migration which includes cleaning and optimizing code, handling errors in stored procedures. Farah et. al. [23] propose another cloud service called Database as a Service (DaaS) and Requirements for DaaS are divide into two domains. The first is user centric requirements which require less governance and management and hence it can provide high performance in terms of throughput, scalability, latency availability and reliability. The second one is provider centric which focuses on workload handling, effective resource allocation, data security and cost benefit analysis. The paper also discusses about a cloud system which stored data on multiple machines which introduce redundancy using relational cloud architecture.

Erik Elmroth et. al. [2] analyze the current state of the VM standard and interfaces. It proposes additional interfaces needed to support the migration functionality such as placement, integration and monitoring interfaces. A component called Transfer Proxy is introduced to carry out the file transfer. VMs are used to configure a general monitoring system. Muhammad et. al. [3] proposes Hackystat as an open source framework for automated collection analysis and virtualization. In order to support the large number of distributed software, migration is done by open Source Software product and process. Hackystat is a migrated architecture from client-server web application to a SOA using Represented State Transfer (REST). Parastoo et. al. [7] propose REMICS (Reuse and Migration of legacy application to Interoperable Cloud Services), which provides agile, model driven, tool supported methodology for Cloud paradigm service. First phase of REMICS stands for the art and analysis of software methodologies. A comparison between Windows Azure and Google App as PaaS providers is made. For IaaS, a comparison between amazon EC2, Eucalyptus and open stack is made. Suresh et. al. [8] explains the context of thread switching when the application is deployed in the multicore cloud. The results indicate a performance hike of 30% when the thread parameter is suitably fine-tuned. Johnson et. al. [10] propose a model which decides whether a service has to be migrated to the cloud or not based on the factors like business economics, security and availability. The paper focuses on the decision support models, problem statements and hypothesis to support this. Soren et. al. [11] proposes an Extensible architecture for modeling the Cloud Environment Constraints (CEC) and another model for detecting Cloud Environment Model (CEC violations). The validation process is done through the model called Cloud Environment Model (CEM). CloudMIG (Cloud Migration approach) is an approach for supporting re-engineering to semi-automatically migrating existing software systems to cloud based applications. It Includes Extraction, Generation, Selection, Adaption, Evaluation and Transformation.

Yan et. al. [12] proposes Cloud rack which is implemented with the concept of Mobitopolo and it is built on Kernel based Virtual Machine (KVM). KVM connects through L1 tunnel protocols to manage the virtual links provided as a service called Topology Central Control Service (TCCS) and Cloud rack is visible solution for providing portable architecture over LAN. Konstantinos et. al. [17] addresses the service placement problem in large and dynamic networking environment. The paper discuss about a traditional technology in which it requires global network topology, but proposed approach requires only local network topology based on three proposed policies. Samer et. al. [19] discussed a distributed high throughput data de-duplication algorithm. A migration system called VMFlockMS is designed and implemented for flocks of virtual machines and this VMFlockMS uses data de-duplication algorithm to reduce the volume of data transferred over the network. Rashmi et. al. [20] discuss about Cloud offers like dynamic scaling, high availability, multi-tenancy and effective resource allocation and the challenges for migration include business factors, technical factors and ease of implementation. A Five Phased Waterfall Model is proposed which is based on the iterative waterfall model from software development life cycle. Harjit et. al. [25] proposes a cloud computing architecture with the characteristics of on-demand, self-services, resource pooling, rapid elasticity and measured service. The paper proposes a technology transfer model for migration and stated benefits of cloud.

Ying chen et. al. [4] discusses a strategy to ensure that VM's with sensitive data and different security needs do not co-exist on same virtualization platform. For this, the cloud platform needs to be as trusted and reliable. The paper proposes an architecture called Trusted cloud Security Layer [TCSL] with Reliable Migration Protocol. Resources in the cloud are divided into the several security levels. Lars et. al. [5] addresses the management issues that specifically arise in cloud federations. Service Provider (SP) should have a sufficient amount of control over service development in cloud federations with specific service structure and placement constraints. This paper presents scheduling model that optimizes VM placement and a semantic monitoring data distribution architecture which provides interoperability between different cloud infrastructure monitoring systems. Ward et. al. [9] discusses about the Darwin Frame work approach and this approach is basically used for large IT service in non-cloud environment which reduces the cost and risk with its integrated automated frame work. This frame work includes major migration steps like Discover, Analysis and Design, Map, Provision, Migrate, Remediate/Test. Some of the migration tools discussed are VMware Vcenter Converter, Plate spin migrate, Double-Take more and Unix configuration migration (UCM). Scott et. al. [13] propose SMART decision frame work for migrating software testing frame work to the cloud and it is based on the SOA migration, Adoption and Reuse technique (SMART). This SMART helps organization to identify their current testing process and also describe the requirements of the target cloud computing environment for performing software testing.

Ioannis et. al. [14] discuss about the distributed system in which job scheduler is responsible for allocation of jobs to server. For this, VMs are used which lead to better cost-to- performance ratio. Gang-scheduling is a special case of parallel job scheduling approach where tasks must be scheduled to run simultaneously as well as concurrently. The requirement is one-to-one mapping between tasks to avoid possible bottleneck and deadlocks and for this job scheduling, two algorithms are used namely Adaptive First Come First Serve (AFCFS) and Largest Job First Served (LJFS). Timothy et. al. [18] discuss about the CloudNet, which is a prototype of cloud computing and it provides connectivity between the enterprise and also data center sites.

CloudNet supports the live WAN migration of virtual machines and WAN migration which handles the storage with connections and memory state with minimal downtime even in the low bandwidth and high latency settings. CloudNet is optimized to minimize the amount of data transferred and lowers both the migration time and application experienced downtime. CloudNet supports both synchronous and asynchronous disk replication. Bram et. al. [24] presents a test method to determine the viability and value of deployment in the cloud. The essential characters of the cloud discussed are on-demand, self-service, broad network access, resource pooling, rapid elasticity and measured service. The paper also proposes a migration model called Adopted cloud migration toolkit.

III. CONCLUSION

This paper surveys the challenges, scope, approaches and solutions in the area of Cloud Migration. The paper focuses on Data Migration, Mechanisms for cloud migration and the frameworks for cloud migration.

ACKNOWLEDGMENT

REFERENCES

[1] Wei Hao, I-Ling Yen, Bhavani Thuraisingham, "Dynamic Service and Data Migration in the Clouds", 33rd Annual IEEE International Computer Software and Applications Conference, Seattle, WA, 20-24 July 2009, pp 134-139,Print ISBN: 978-0-7695-3726-9, DOI: 10.1109/COMPSAC.2009.127.

[2] Erik Elmroth, Lars Larsson, "Interfaces for Placement, Migration, and Monitoring of Virtual Machines in Federated Clouds",8thInternational Conference on Grid and Cooperative Computing, Lanzhou, Gansu, 27-29 Aug. 2009,pp253-260,Print ISBN:978-0-7695-3766-5,DOI:10.1109/GCC.2009.36.

[3] Muhammad Aufeef Chauhan, Muhammad Ali Babar, "Migrating Service-Oriented System to Cloud Computing: An Experience Report",4th International Conference on Cloud Computing, Washington, DC, 4-9 July 2011, pp 404-411,Print ISBN: 978-1-4577-0836-7, DOI:10.1109/CLOUD.2011.46.

[4] Ying Chen, Qingni Shen, Pengfei Sun, Yangwei Li, Zhong Chen, Sihan Qing, "Reliable Migration Module in Trusted Cloud based on Security Level - Design and Implementation",26th International Parallel and Distributed Processing Symposium Workshops and PhD Forum, Shanghai, 21-25 May 2012, pp 2230-2236,Print ISBN: 978-1-4673-0974-5,DOI: 10.1109/IPDPSW.2012.275.

[5] Lars Larsson, Daniel Henriksson, Erik Elmroth,"Scheduling and Monitoring of Internally Structured Services in Cloud Federations", IEEE Symposium on Computers and Communications (ISCC), Kerkyra, June 28 2011-July 1 2011, pp173-178, Print ISBN: 978-1-4577-0680-6, DOI: 10.1109/ISCC.2011.5984012.

[6] Stephen Kaisler, William H. Money, "Service Migration in a Cloud Architecture",44th Hawaii International Conference on System Sciences - 2011, Kauai, HI, 4-7 Jan. 2011, pp1-10,Print ISBN:978-1-4244-9618-1,DOI:10.1109/HICSS.2011.371.

[7] ParastooMohagheghi,Thor Saether, "Software Engineering Challenges for Migration to the Service Cloud Paradigm",2011 IEEE World Congress on Services, Washington, DC, 4-9 July 2011,pp 507-514,Print ISBN:978-1-4577-0879-4,DOI:10.1109/SERVICES.2011.26.

[8] Suresh Venugopal, SravanDesikan,KarthikeyanGanesan, "Effective Migration of Enterprise Applications in Multicore Cloud",4th IEEE International Conference on Utility and Cloud Computing, Victoria, NSW, 5 - 8 Dec 2011, pp 463-468,Print ISBN:978-1-4577-2116-8,DOI:10.1109/UCC.2011.76.

[9] C. Ward, N. Aravamudan, K. Bhattacharya, K. Cheng, R. Filepp, R. Kearney,B. Peterson, L. Shwartz, C. C. Young, "Workload Migration into Clouds - Challenges, Experiences, Opportunities",3rd International Conference on Cloud Computing, Miami, FL, 5-10 July 2010,pp 164-171,Print ISBN:978-1-4244-8207-8,DOI:10.1109/CLOUD.2010.84.

[10] Johnson B,Yanzhen Qu,"A Holistic Model for Making Cloud Migration Decision", 10th IEEE International Symposium on Parallel and Distributed Processing with Applications, Leganes, 10-13 July 2012, pp 435-441, Print ISBN: 978-1-4673-1631-6,DOI: 10.1109/ISPA.2012.63.

[11] Soren Frey ,Wilhelm Hasselbring,"An Extensible Architecture for Detecting Violations of a Cloud Environment's Constraints During Legacy Software System Migration",15th European Conference on Software Maintenance and Reengineering, Oldenburg, 1-4 March 2011, pp 269-278,Print ISBN: 978-1-61284-259-2,DOI:10.1109/CSMR.2011.33.

[12] Yan Pu, Yilong Deng, Aki Nakao, "Cloud Rack: Enhanced Virtual Topology Migration Approach with Open vSwitch",International Conference on Information Networking(ICOIN), Barcelona, 26-28 Jan 2011,pp160-164,Print ISBN: 978-1-61284-661-3,DOI:10.1109/ICOIN.2011.5723171.

[13] Scott Tilley,TauhidaParveen, "Migrating Software Testing to the Cloud", IEEE International Conference on Software Maintenance (ICSM), Timisoara, 12-18 Sept. 2010, pp 1,Print ISBN: 978-1-4244-8630-4, DOI:10.1109/ICSM.2010.5610422.

[14] Ioannis A. Moschakis ,Helen D. Karatza, "Performance and Cost evaluation of Gang Scheduling in a Cloud Computing System with Job Migrations and Starvation Handling",IEEE Symposium on Computers and Communications (ISCC), Kerkyra, June 28 2011-July 1 2011, pp 418-423,Print ISBN: 978-1-4577-0680-6, DOI: 10.1109/ISCC.2011.5983873.

[15] Muhammad Aufeef Chauhan,Muhammad Ali Babar, "Towards Process Support for Migrating Applications to Cloud Computing",2012 International Conference on Cloud Computing and Service Computing, Shanghai, 22-24 Nov 2012, pp 80-87,Print ISBN: 978-1-4673-4724-2, DOI:10.1109/CSC.2012.20.

[16] C.Kishor Kumar Reddy,P.R Anisha, B.Mounika,V.Tejaswini, "Resolving Cloud Application Migration Issues",International Journal of Engineering Inventions,September 2012,pp01-07,ISSN: 2278-7461.

[17] Konstantinos Oikonomou,IoannisStavrakakis, "Scalable Service Migration in Autonomic Network Environments",IEEE Journal on Selected Areas in communications, New jersey,Jan2010,pp 84-94,ISSN:0733-8716,DOI:10.1109/JSAC.2010.100109.

[18] Timothy Wood,Prashant Shenoy,K.K.Ramakrishnan Jacobus,Van der Merwe, "CloudNet: Dynamic Pooling of Cloud Resources by Live WAN Migration of Virtual Machines", 7th ACM SIGPLAN/SIGOPS international conference on Virtual execution environmentsNewport Beach, California, USA,March 9-11 2011, pp121-132,Print ISBN: 978-1-4503-0687-4, DOI:10.1145/1952682.1952699.

[19] Samer Al-Kiswany, Dinesh Subhraveti, Prasenjit Sarkar, MateiRipeanu, "VMFlock: Virtual Machine Co-Migration for the Cloud", 20th international symposium on high performance distributed computing, New York USA, 2011, pp 159-170, Print ISBN: 978-1-4503-0552-5, DOI:10.1145/1996130.1996153.

[20] Rashmi,Dr.Shabana,Mehfuz, Dr.G.Sahoo, "A five-phased approach for the cloud migration",International Journal of Emerging Technology and Advanced Engineering,April 2012, ISSN 2250-2459.

[21] B. Gopi Krishna, E.Vengal Reddy, K.Jagadamba,Srikumar Krishnamurthy, P. Radha Krishna, "A Unified and Scalable Data Migration Service for the Cloud Environments", 15th International Conference on Management of Data,Mysore, India,December 9-12, 2009.

[22] Prashant Pant, Sanjeev Thakur, " Data Migration Across The Clouds", International Journal of Soft Computing and Engineering (IJSCE), May 2013, ISSN: 2231-2307.

[23] Farah Habib Chanchary, Samiul Islam, "Data Migration: Connecting Databases in the Cloud",ICCIT 2012.

[24] Bram Rongen, "Making the case for migration of information systems to the cloud",16thTwente Student Conference on IT, Enschede, The Netherlands, Jan 27 2012, Copyright 2011, University of Twente, Faculty of Electrical Engineering,Mathematics and Computer Science.

[25] Harjit Singh, "Technology Transfer Model To Migrate E-Governance To Cloud Computing", International Journal of Advanced Technology and Engineering Research (IJATER), July 2012, ISSN No: 2250-3536.

AUTHOR BIOGRAPHY

Mr. Girish L S is a PG Scholar in Computer Networks and Engineering at B.M.S College of Engineering, Bangalore. My research areas are Cloud Computing and Computer Networks, Cloud Infrastructure Management.

Dr. H S Guruprasad is working as Professor and Head, Information Science Department at BMS College of Engineering, Bangalore. He has twenty four years of teaching experience. He has been awarded with Rashtriya Gaurav award in 2012. His research areas are Network Communications, algorithms, Cloud Computing and Sensor Networks