INTERNATIONAL JOURNAL ON ORANGE TECHNOLOGY

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 9 | Sep 2022

Portraying Monitoring in Federation of Heterogeneous Clouds

Ekta Dureja
Assistant Professor, Department of Computer Science, S.D. (PG) College, Panipat, Haryana, India

----------***----------

Annotation: The heterogeneity of infrastructure, heterogeneity of interface, heterogeneity of objectives are few inherent features of a federation of clouds. To ensure the smooth and supportive interaction between various components or entities of the federation can only be ensured with the constant monitoring of each unit of federation. Monitoring in different clouds is undertaken in different styles and purpose. Commercial cloud like Amazon monitors for the optimal performance of resources. Microsoft Azure Cloud does monitor various activities for the user. Not only the purpose, but also the functionality of monitoring is different. The variety of methods and metrics for monitoring, objectives of monitoring in various federations motivated this study of monitoring subsystem. This analysis of monitoring component in diverse federation architectures is done with a view to highlight the effect of monitoring system in major federation architectures such as FCM (Federated Cloud Management).

Keywords: Federation on Clouds, Amazon, Azure, FCM.

I. INTRODUCTION

A federation of heterogeneous clouds has many entities involved in it. There are multiple CSPs having many DCs. These data centers need to interact and communicate very frequently with each other, hence, enhancing the complexity that needs to be managed. Although federated clouds do offer better service availability and fault resilience, it also poses some challenges in terms of load balancing, autonomic scalability, SLA management etc. Such a huge complex system requires constant monitoring and paper administration to keep it running efficiently. Monitoring the federation requires real time monitoring and alerting the cloud status, regular reporting of the usage of virtual resources, ability to track historical events and maintaining record performance metrics. Based on these metrics, appropriate decisions of the federation may be taken. E.g. selection of a particular CP. Proper monitoring of all facets of federation not only enables the ability of controlling the behavior of federation but also ensures the capability of auditing, authenticating the cloud service registry, SLA adherence, logging, accounting and service management of the inter-cloud environment. In order to deal with such jobs, proper monitoring solutions have become a must.

II. RELATED WORK

GMonE Cloud Monitoring System has a modular architecture with a bunch of monitoring plug-ins for service providers. It monitors the status of VMs, network connections, usage patterns of application, storage, workload etc. for each specific server, service and user. GMonE monitors a cloud infrastructure for performance and scalability with acceptable overhead but its implementation/simulation on federated clouds has not been done.

WSLA framework is designed to establish and enforce SLA for web services. For this purpose, services are measured for any possible SLA violation. Once the violation is detected, it is reported and corrective action is taken. The monitoring is carried out using a set of metrics that involves maximum response time of a service, average availability of a service, system uptime, system outage period etc.

Amazon's Cloud Watch is a commercial cloud monitoring solution that allows tracking metrics for resource utilization and services' performance. It offers few basic metrics to be calculated for free that includes CPU/disk utilization and do offers the ability to collect and track more composite and aggregated metrics for an additional

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 9 | Sep 2022

charge. For even detailed monitoring, it has a huge set of pre defined metrics and custom designed metrics for EC2 instances, load balancers, service queues etc. This enriched monitoring solution is vendor specific that means it works only for the services or application that run over Amazon's private clouds.

Azure Management Studio is another commercial diagnostic API by Microsoft. It maintains the performance counters for infrastructure resources. It has the ability to track each even using the infrastructure logs maintained by it.

Nagios XI is an infrastructure monitoring solution having built-in alert system, monitors and report generation. It provides the monitoring of all IaaS components including network infrastructure, hence allows the users to efficiently utilize server resources and healthy network environment.

Monitoring in Layered architecture of Cloud Federation undertakes the monitoring of entire federation by maintaining the information about hardware resource, virtual resources. Few major metrics calculate execution time, transfer cost and such information is exchanged with other clouds being approached for federation. The monitoring component in this federation maintains the log, metric information and such information is exchanged with other CSPs with the aim of managing the federation.

III. MONITORING IN FCM

A correct selection of cloud for a job in federated environment calls for an effective monitoring component based on efficient metrics.

FCM architecture of federated clouds environment has a great niche over its peers because of its ease of implementation in terms of interoperability. This architecture does not require for each CSP to adopt interoperability standards, rather this is taken care by a Global-Meta- Broker-System. This transparent approach removes the need of additional software for enabling inter-cloud communication. This centralized GMBS component of FCM has the responsibility to manage the federation. Hence, the need arises to regularly monitor and assess the infrastructure, services' behavior, security, energy consumption, SLA deployment and Resources' performance of the data center.

The FCM architecture of federation of clouds has a core component called GMBS. This GMBS is a centralized entry point that acts as a top level broker to select the cloud infrastructure to forward the job request. This GMBS has five major components that are responsible for inter- cloud and user interactions. The optimal performance realization of GMBS is dependent on its vital component called Information System (IS) agent. IS is implemented as a listener service of GMBS and its duty is to update the static information on service availability from FCM repository at regular intervals. This component also collects the dynamic information from various cloud brokers such as service execution time and average VA deployment time. All the scheduling related properties such as estimated availability time for each VM etc. are maintained for all cloud brokers in Performance Metrics field using Basic Property Description Language (BPDL). The information thus collected is used to calculate a rank for all cloud brokers and then optimal scheduling decision is made based on this rank. This sequence of metrics collection and rank calculation is regularly monitored to select the best cloud broker for each input job.

At lower level, each VA is also monitored using a dedicated monitoring component that monitors the memory usage, disk usage, network usage, CPU load and current status of other running resources. It also monitors the average VA deployment time etc. for IS component of GMBS.

FCM architecture has been extended in [11] to facilitate self adoptability with the help of some rule based techniques as its Knowledge Management (KM) solution. This integrated reaction KM approach enables the FCM architecture to autonomously operate the cloud federation by controlling their behavior. This KM sub system aggregates the monitoring metrics namely though put, awt, cvmratio, load and stcost etc. —for the identification

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 9 | Sep 2022

of those cases when the architecture encounters unsatisfactory behavior. At such times, the KM subsystem may suggest autonomous actions such as extend or shrink or rearrange VM queue or VA storage or even trigger rescheduling service calls at GMBS level.

Another enhancement to FCM has been articulated in [10] with an integrated service monitoring approach, SALMon. This monitoring framework monitors the reliability, QoS of all services. This SALMon framework validates each service for quality and feed this information to IS agent of GMBS. SALMon is prepared light enough to be executed in a VM to be deployed in each cloud managed by FCM. SALMon uses the response time of few basic set of methods such as ping, stress cpu, stress in out band width, stress output band width to express the reliability of the particular cloud. The IS agent of GMBS queries the monitored values and updates them.

IV. CONCLUSION AND FUTURE WORK

In this paper, one of the pioneer reference architecture of federation of clouds has been investigated that offers autonomous cloud management and also consists of a sophisticated service monitoring approach. It has been observed that FCM architecture has monitoring sub system that is integrated in its GMBS that is liable to assess the services performance at regular intervals. GMBS collects the static information from FCM repository and dynamic information from various cloud brokers. This monitoring of information leads to optimization of services' performance.

Whereas monitoring is required to be quite versatile in any Inter-Cloud architecture and it should commission right from service registry and discovery, continues with actual SLA realization and keeps happening during execution in real time to monitor the cloud performance. Such real time monitoring may result in VM migration or fine tuning of other run time resources to optimize the performance. The investigation in this paper paves the path to pin point the further requirements in implementation of monitoring sub system of Inter-Cloud architecture. Further work will definitely be in the direction of bridging the gaps that have been traced during this study.

V. REFERENCES

1. G. Eason, B. Noble, and I.N. Sneddon, - On certain integrals of Lipschitz- Hankel type involving products of Bessel functions,‖ Phil. Trans. Roy. Soc. London, vol. A247, pp. 529-551, April 1955. (*references*).
2. E. Carlini, M. Coppola, P. Dazzi, L. Ricci, and G. Righetti. Cloud Federations in Contrail. Euro-Par 2011 Workshops, LNCS 7155, pp. 159168, 2012.
3. A. Keller and H. Ludwig. The WSLA framework: Specifying and monitoring service level agreements for web services. Journal of Network and Systems Management, 11(1), pp. 57–81, 2003.
4. J. Montes, A. Sanchez, B. Memishi, M. Perez, G. Antoniu. GMonE: A complete approach to cloud monitoring. Future Generation Computer Systems, In Press, Corrected Proof, Available online 5 March 2013.
5. http://aws.amazon.com/cloudwatch/,2009
6. http://www.cerebrata.com/Products/AzureDiagnosticsManager
7. Nagios XI monitoring solution. http://www.nagios.com/products /nagiosxi/, 2012.
8. A. Cs. Marosi, G. Kecskemeti, A. Kertesz and P. Kacsuk. FCM: an Architecture for Integrating IaaS Cloud Systems. In Proceedings of The Second International Conference on Cloud Computing, GRIDs, and Virtualization. Rome, Italy. September, 2011.
9. Kertész, Attila, et al. "Enhancing federated cloud management with an integrated service monitoring approach." *Journal of grid computing* 11.4 (2013): 699-720.

https://journals.researchparks.org/index.php/IJOT e-ISSN: 2615-8140 | p-ISSN: 2615-7071
Volume: 4 Issue: 9 | Sep 2022

10. Kecskemeti, Gabor, et al. "Facilitating self-adaptable Inter-Cloud management." *Parallel, Distributed and Network-Based Processing (PDP), 2012 20th Euromicro International Conference on*. IEEE, 2012.
11. D. Villegas, N. Bobroff, I. Rodero, J. Delgado, Y. Liu, A. Devarakonda,L. Fong, S. Masoud Sadjadi, and M. Parashar, ―Cloud federation in a layered service model,‖ Journal of Computer and System Sciences, vol. 78, no. 5, pp. 1330– 1344, 2012.
12. Demchenko, Y., C.Ngo, M.Makkes, R.Strijkers, C. de Laat, Defining Inter- Cloud Architecture for Interoperability and Integration. The 4th IEEE Conf on Cloud Computing, (CloudCom2012), 3- 6 December, 2012, Taipei, Taiwan.