

## International Journal of Computer Science and Mobile Computing



A Monthly Journal of Computer Science and Information Technology

ISSN 2320-088X

*IJCSMC, Vol. 3, Issue. 4, April 2014, pg.335 – 339*

### **RESEARCH ARTICLE**

# Layered Mapping of Cloud Architecture with Grid Architecture

**Pardeep Seelwal**

Department of Computer Science and Application, Chaudhary Devi Lal University, Sirsa, India  
pardeepseelwal@gmail.com

---

*Abstract—Cloud computing is a type of computing that relies on sharing computing resources rather than having local servers or personal devices to handle application. Cloud computing is a comprehensive solution that delivery IT as a service. It is an internet-based computing solution where shared resources are provided like electricity distributed on the grid electrical grid. On the other hand, Grid is an infrastructure that involves the integrated and collaborative use of networks, databases, computers owned and managed by multiple organizations. Grid computing allows an application to run on different machine and also utilize the grid resources. This paper describes the layered mapping of cloud model with grid model in terms of their services.*

*Keywords: Cloud computing, Mapping, Architecture, Grid computing*

---

## I. INTRODUCTION

Cloud computing is internet based computing where virtual shared servers provide software, infrastructure, platform, devices and other resources and hosting to customers on a pay-as-you-use basis. Cloud computing customers do not own the physical infrastructure; rather they rent the usages from a third-party provider. The cloud computing model is comprised of a front end and back end. These two elements are connected through a network (mostly internet). The user interacts with the system with front end. The back end provides the applications, computers, data storage, servers that create the cloud of services. The characteristic of cloud computing include on-demand self service, broad network access, resources pooling and measured service. Cloud services are popular because they can reduce the cost and complexity of owning and operating computers and networks. Some other benefits to users include scalability, reliability and efficiency.

Today, nearly all the technologies being used is changing as the use of internet is increasing all over the world. To have great command on those changes surely new technologies having greater flexibility or required. So the idea of having features like cost, reusability, speed and quality like super computers, which is made by connecting many computers through a computer bus having fast speed, are gaining fame in which several machines work together by linking through a network for a common task, is known as grid computing. Grid

computing is defined in literature as “system and applications that integrate and manage resources and services distributed across multiple control domains. Grid computing instead of relaying of high performance focuses on sharing networks. Grid computing creates a pool of computing resources. The complexity of grid computing is more than normal distributed computing. Normal distribution of computing has an environment in which machines are distributed and managed separately. Those machines rely on their own resources like own memory, processing and much more. While the grid computing tries to make use of linked machines work for same tasks.

## II. CLOUD COMPUTING ARCHITECTURE

Clouds services are typically made available via a private cloud, community cloud, public cloud or hybrid cloud. The figure below shows the architecture of cloud computing.

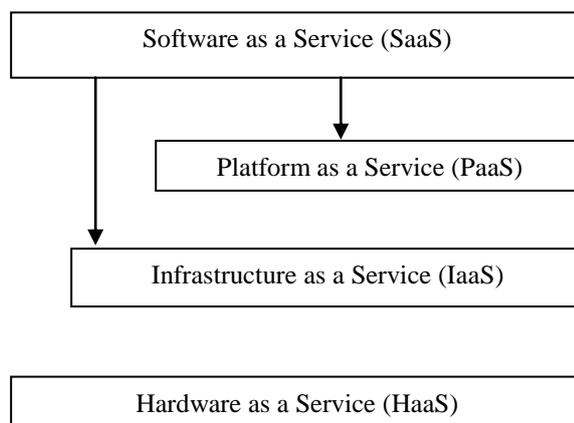


Figure 1

### A. *Software as a Service (SaaS)*

SaaS as a service features a complete application offered as a service on demand. A single instance of the software runs on the cloud and services multiple and users. It eliminates the burden of the user from installation of the software on the host system and reduces the maintenance cost of the user. Benefits of the SaaS model include easier administration, automatic updates, easier collaboration, global accessibility and much more. SaaS is closely related to the Application Service Provider (ASP) and on demand computing software delivery models. Users of network based application are completely dependent on the underlying network.

### B. *Platform as a Service (PaaS)*

PaaS encapsulates a layer of software and provides it as a service that can be used to build higher level services. Cloud application developers are the users of this layer. PaaS offers a well suited environment to developers to develop, deploy and test custom application using tools supplied by the provider. The applications are managed for customers and support is available. Services are constantly updated, with existing features upgraded and additional features added. Benefits of PaaS model include server software, DBMS, server-side scripting environment, support and hosting.

### C. *Infrastructure as a Service (IAAS)*

Infrastructure as a Service delivers basic storage and computer capability as standardized services over the network. The service provider owns the equipment and is responsible for housing, running and maintaining it. The client typically pays on a per-use basis. Components and characteristics of IaaS includes; Utility computing service and billing model, Internet connectivity, dynamic scaling and much more. This layer has become more efficient due to virtualization which allows higher utilization of resources. This layer is composed of computational resources, storage and communication.

D. *Hardware as a Service (Haas)*

HaaS refers to managed services, where computing power is leased from a central provider. In each case, the HaaS model is similar to other service-based models, where uses rent, rather than purchase, a provider’s tech assets. HaaS provides a complete end to end managed service solution. This can include servers, notebooks, desktops, components and much more. Large enterprises, organizations are responsible to operate, manage and upgrade the hardware.

III. GRID ARCHITECTURE

Grid applications often involves large amount of data and computing resources that require secure sharing across organizational boundaries. This makes grid application deployment and management a complex understanding. Figure below shows the architecture of grid computing.

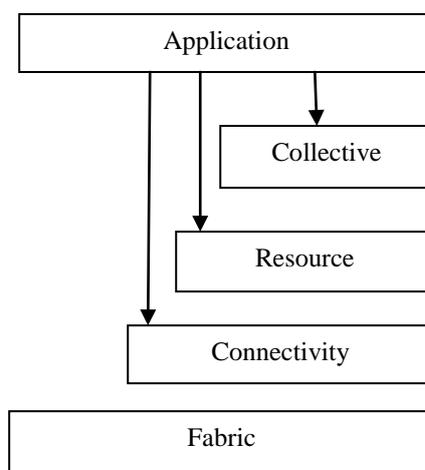


Figure 2

A. *Application layer*

The final layer consists of the user application and programs and which call upon another layer. This layer comprises the user applications that operate within virtual organization environment. This is the layer that grid users “see” and interact with. It includes applications in science, engineering, business, finance and development toolkits to support the applications. It also consists of grid programming environment, other software which support direct access file and database.

B. *Collective layer*

Responsibility of this layer is to interaction across the collection of resources and overall resources management. The Grid collective layer focuses on the coordination of multiple resources. Collective layer includes data replication services, monitoring and diagnostics services. This layer is different from the resource layer in the sense, while resource layer concentrates on interaction with single resource; this layer helps in coordinating multiple resources.

C. *Resource layer*

Sharing a single resource is its main function. Resource layer need access to resource such as invoke remote computation, monitor computation, discover resources and to perform data transport. Resource layer offers Globus Grid Resource Allocation and Management (GRAM), Globus Monitoring and Discovery Service (MDS-2), secure initiation, auditing and payment for sharing operation of single resource. It allows partial file access with Globus GridFTP. It is a good old FTP but it is faster and has

integrated security. The grid resource layer builds on the connectivity layer to implement protocols that enable the use and sharing of individual resource.

*D. Connectivity layer*

Connectivity layer provide secure grid communication and authentication for specific network transactions. Connectivity layer assumes trust in based on user, not on service providers. It use public key infrastructure. In it, User is recognized by a certificate authority within grid and allows users to authenticate only once. In delegation, create proxy credentials to allow services to act on a user’s behalf. Authentication protocols provide the secure mechanism to identify the resources and users while communication between fabric resources possible due to communication protocols. It uses standardized mechanism for proxy credential creation and mapping to local access authentication scheme. Connectivity layer integrate and obey local security policies in global view.

*E. Fabric layer*

Fabric layer is the bottom layer or the lowest layer of grid architecture. Responsibility of this layer is to manage a resource like to reserve usage in advance and allocate apace. Grid fabric layer provides standardized access to local resources-specific operation. Fabric layer diverse resources such as computers, storage media, networks and sensors. It is a Globus General-purpose Architecture for Reservation and Allocation (GARA). Grid network uses grid protocols for interfaces local control.

IV. MAPPING

The table below describes the services provided by cloud and grid architecture. It also shows which are responsible to offer these services.

TABLE 1. LAYRED MAPPING

	<i>Cloud Computing Architecture</i>		<i>Grid Computing Architecture</i>	
<i>Service</i>	<i>Layer</i>	<i>Responsibility</i>	<i>Layer</i>	<i>Responsibility</i>
Deployment and Development of Application	Platform as a Service (PaaS)	Cloud Application Developer	Application	Virtual Organizational Environment
Communication	Infrastructure as a Service (IaaS)	Communication as service	Collective and Connectivity	Connectivity layer protocol
Costing	Infrastructure as a Service (IaaS) and Software as a Service (SaaS)	IaaS and SaaS providers in Clouds	Resource	Resource layer protocol
Hardware	Hardware as a Service (HaaS)	Big Organizations	Fabric	Grid Protocol
Data Storage	Infrastructure as a Service (IaaS)	Cloud Data Storage as a Service	Fabric	Local Resources Interface

V. CONCLUSION

This paper shows the mapping of different layers of cloud and grid models in terms of services. The cloud provides many options for the everyday computer user as well as large and small businesses. It opens up the world of computing to a broader range of uses and increases the ease of use by giving access through any internet connection. Grid computing allows exploiting underutilized resources run an existing application on idle machine, to aggregate the unused storage, load balancing on the resources. It is found that these models are different in terms of application, computation, data storage, and much more.

## REFERENCES

1. A. Nassiry, and A. Kardan, "Grid Learning; Computer Grid Joins to e-Learning", World Academy of Science, Engineering and Technology, 2009, Vol. 49, pp. 280-284.
2. Ian Foster, Yong Zhao, Ioan Raicu, and Shiyong Lu, "Cloud Computing and Grid Computing 360-Degree Compared", 2008 Grid Computing Environments Workshop (GCE), 2008, Vol.1, pp. 60-69.
3. Qinghai Bai, and Ying Zheng. "Research on Grid Architecture and Its Application", Modern Applied Science, Vol. 5, No. 1, 2011, pp. 165-168.
4. Christina Hoffa, Gaurang Mehta, Timothy Freeman, Ewa Deelman, Kate Keahey, Bruce Berriman, and John Good, "On the Use of Cloud Computing for Scientific Workflows", eScience '08. IEEE Fourth International Conference, 2008, pp. 640-645.
5. Luis Ferreira, Viktors Berstis, Jonathan Armstrong, Mike Kendzierski, Andreas Neukoetter, Masanobu Takagi, Richard Bing-Wo, Adeeb Amir, Ryo Murakawa, Olegario Hernandez, James Magowan, and Norbert Bieberstein, Introduction to Grid Computing with Globus, USA: International Business Machines Corporation, 2003.
6. Luis M. Vaquero, Luis Rodero-Merino, Juan Caceres, and Maik Lindner. "A Break in the Clouds: Towards a Cloud Definition", ACM SIGCOMM Computer Communication Review, Vol. 39, No. 1, 2009, pp. 50-55.
7. Liang-Jie Zhang and Qun Zhou. "CCOA: Cloud Computing Open Architecture", IEEE International Conference on Web Services, 2009, pp. 607-616.
8. Syed A. Ahson, and Mohammad Ilyas, Cloud Computing and Software Services Theory and Techniques, New York: CRC Press, 2010.
9. Rajkumar Buyya, David Abramson, and Jonathan Giddy, "A Case for Economy Grid Architecture for Service Oriented Grid Computing", Parallel and Distributed Processing Symposium, Proceedings 15th International, 2000, pp. 776-790.
10. Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, Randy Katz, Andy Konwinski, Gunho Lee, David Patterson, Ariel Rabkin, Ion Stoica, and Matei Zaharia, "A View of Cloud Computing", Communications of the ACM, Vol. 53, No. 4, 2010, pp. 50-58.
11. Lizhe Wang and Gregor von Laszewski, "Scientific Cloud Computing: Early Definition and Experience", in 10th IEEE International Conference High Performance Computing and Communications, HPCCC '08, 2008, pp. 825-830.
12. Archie Hendryx, "Cloudy Concepts: IaaS, PaaS, SaaS, MaaS, CaaS&XaaS", Available from: <http://www.zdnet.co.uk/blogs/the-sanman-10014929/cloudy-concepts-iaas-paas-saas-maas-caas-and-xaas-10024679/>
13. J. Joseph, M. Ernest, and C. Fellenstein. "Evolution of grid computing architecture and grid adoption models", IBM Systems Journal, Vol. 43, No. 4, 2004, pp. 624-645.
14. Grid architecture is the way in which a grid has been designed, Available from: <http://www.gridcafe.org/grid-architecture.html>.
15. Bhaskar Prasad Rimal, Eunmi Choi, and Ian Lumb, "A Taxonomy and Survey of Cloud Computing System", Fifth International Joint Conference on INC, IMS and IDC, 2009, pp. 44-51.
16. Michael Armbrust, Armando Fox, Rean Griffith, Anthony D. Joseph, Randy Katz, Andy Konwinski, Gunho Lee, David Patterson, Ariel Rabkin, Ion Stoica, and Matei Zaharia, "A View of Cloud Computing", Communications of the ACM, Vol. 53, No. 4, 2010, pp. 50-58.