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# HYBRID E-GOVERNMENT FRAMEWORK BASED ON CLOUD COMPUTING AND SERVICE ORIENTED ARCHITECTURE

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**ABSTRACT**

The increase use of E-Government is a challenge goal for many governments. Through E-Government, an interactive service can be provided to the citizens and businesses. Due to citizens consciousness of internet, E-Government allows citizens to entrance governmental services, information and participate in governmental decision-making process. However, many challenges may prohibit the success of E-Government that may lead to the failure of e-government. Most important of these challenges include shrinking of budgets, increasing of the demand for services, unqualifying of the human resources and changes of scalability demands. Cloud Computing offers more choices to help in implementing and improving E-Government and creating new business and jobs opportunities. Nowadays Cloud Computing and Service Oriented Architecture (SOA) are becoming ubiquitous, the main goal of this research is to propose a Cloud Oriented E-Government Architecture based on Cloud Computing and Service Oriented Architecture that enables citizens to obtain governmental services easily and efficiently regardless the time and geographical barriers. To verify the proposed framework and study the successful implementations, CloudSim simulator was used. The results show that the proposed framework is a powerful framework for E-Governments that provides reusability and discovery of government services and provides solutions to some cloud computing issues.

***Keywords:*** *Cloud Computing, E-Government, Service Oriented Architecture (SOA), Hybrid E-Government Framework.*

## 1. INTRODUCTION

The growth of the Information and Communication Technology (ICT) has significant effects on the way of offering services. Due to citizens consciousness of internet, the online public services have increased rapidly. E-Government has been adopted to simplify and facilitate the functioning of the government for the convenience and easy access to its citizens [1]. Many studies revealed that the E-Government not only improves the efficiency of public administration but also the practice of good governance, such as increasing transparency, deducing administrative corruption, improving service delivery, improving civil service performance, citizens empowerment and improving government finance [2]. E-Government projects face a lot of challenges, these challenges include the unqualified human resources, infrastructure cost, scalability of adapting with new technology and transparent way of providing its services. These problems could be solved by applying cloud oriented architecture-computing with service (SOA). Cloud computing and SOA are coexisting, complementing, and supporting each other. SOA is an architectural pattern that guides business solutions to create, organize and reuse its computing components, while cloud computing is a set of enabling technology that services a bigger, more flexible platform for enterprise to build their SOA solutions [3].

## 2. CLOUD COMPUTING

In 1960, the concept of Cloud computing is initiated by John McCarthy who anticipated that computation may sometime be prepared as a public utility similar to electric power, gas, water and telephone utilities at home [4]. The National Institute of Standards and Technology defined Cloud Computing as a model for enabling convenient to access to networks and applications quickly, common set of configurable computing resources (e.g.,

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networks, servers, storage and applications) that can work with little or interfere with the service provider to provide or be released immediately. The five key features of cloud computing are service demand on self, ubiquitous network access, location-independent resource pooling, scalability (rapid elasticity), and measured service as shown in figure 1 [5].

Moreover, in cloud computing, Multi-tenancy means it is easy for sharing resources and costs across a large pool of users. This permits for: (1) Centralization of infrastructure in locations with lower costs (2) Peak-load capacity rises and (3) Utilization and efficiency developments for systems that are frequently only 10-20% utilized [6].

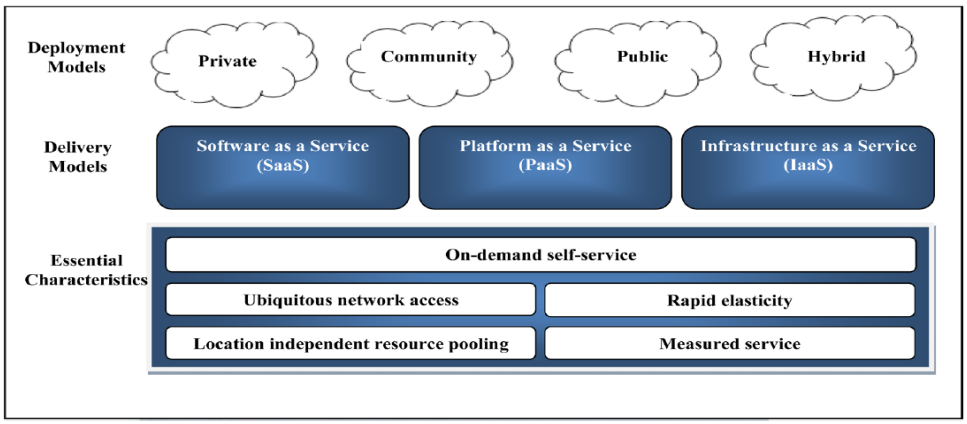


*Figure 1. NIST Cloud Computing Definition.*

## 3. SERVICE ORIENTED ARCHITECTURE

The concept of SOA is approached by dividing big problems into smaller set of services that aim to solve specific problems [7]. SOA is a design pattern which is consisted of loosely coupled, discoverable, reusable services in which each of these services obey a well-defined standard. Each of these services can be bound or unbound at any time and as needed [8]. The main idea of SOA is to provide the functionality of applications as a service and to allow a simple mechanism to access this service via a web infrastructure. A typical SOA is shown in figure 2 [9].

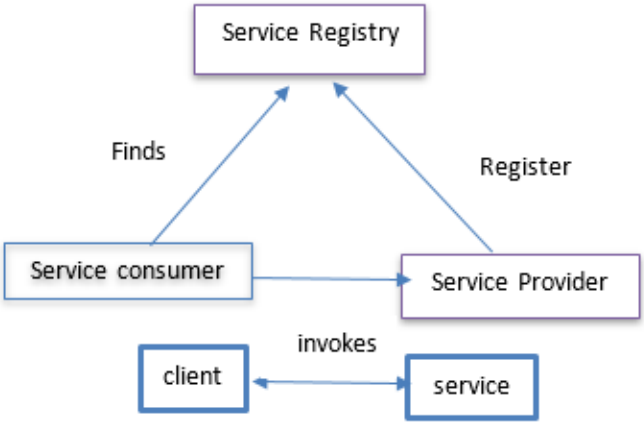


*Figure 2. A Typical SOA.*

SOA and cloud computing are complementary activities; both will play important roles in IT planning for E-Government. Cloud computing and SOA can be pursued independently or concurrently, where cloud computing's platform and storage service offerings can provide a value-added underpinning for SOA efforts. However, the main issues and challenges for adopting cloud computing for the E-Government are: Security and privacy, Data protection and compliance, Interoperability and open standards, Internet dependency, Business continuity, and Auditing [10], [11], [12], [13], [2], [14].

## 4. RELATED WORK

[3] proposed a service-oriented cloud computing architecture SOCCA consists of four layers that supports both SOA and cloud computing. SOCCA provides easy application migration from one cloud to another and service redeployment to different clouds by separating the roles of service logic provider and service hosting/cloud providers. It supports an open platform on which open standards are comprised. In 2012, [8], used [3] architecture (SOCCA) and applied it in health care, whereas, in 2014, [9] used (SOCCA) and applied it in e-learning systems.

[15] proposed a new model for E-Government development, consists of five stages;

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assessment stage, re-construct the applications of services according to (SOA), Classification of Services Stage, Aggregation Stage and Legal Contract Stage. The results showed that the deployment of the proposed stages have different success level: classification of services 100%, legal contract stage 91.6%, assessment stage 83.3%, re-construct the applications of services according to SOA stage 75%, and lastly the aggregation stage 66.6%.

[4] introduced a model to allow a national governmental cloud computing provision in Egypt. She suggested a hybrid cloud computing model to be used nationwide. The aim of the proposed model is to decrease cloud computing risks without ignoring any of its current practices. The hybrid model includes three types of cloud computing, which are Intra-Cloud computing, Extra-Cloud computing and Inter-Cloud computing. The proposed model allows each of three clouds to set a number of constraints and restriction yet permits maximum integration, communication and collaboration among them.

[16] built architecture model using SOA and deployment the services via private cloud computing unified professional management of operation and maintenance, cost efficiency, and high safety. The platform can fully meet the information construction demand of the regional department, reduce the financial burden on the input of government procurement in information construction, enable the government procurement staff to channel energy to their core business, and reduce resource investments and operation and maintenance costs. Moreover, it can realize data sharing to further promote the transparency of government procurement, management innovation, and service innovation, improve the efficiency of the government procurement market, and prevent corruption.

[18] proposed a very reliable Citizen Centric Service Oriented Architecture (CCSOA) for the E-Government Implementation which is a reliable and a better framework for the Government of Nepal and other developing countries to implement effective and efficient e-Government. The proposed framework includes five layers that are Access Layer, E-Government Layer, Application Layer, Information and Data System Layer and Infrastructure Layer and their functions. Nepal Government can use this framework to establish the effective and efficient E-Government System to provide the citizen centric services for the peoples and businesses.

with cooperated e-government environment. Through architecture, GSB is depended on ESB and Web Services, service management methods and service interaction function in a distributed heterogeneous environment are given for SOA-based E-Government system. This architecture includes three parts: to include the specific E-Government legacy application into services: to permits all kinds of E-Government applications; to communicate and interoperate seamlessly; to adapt and shield the heterogeneity of E-Government applications to provide a wealth of service access for outside world.

[17] propose the Government procurement cloud platform that based on the management level and content of integration of government procurement information resources. This platform is based on cloud computing and SOA. It consists of Physical Resource Layer, Virtual Resource Control Layer, Cloud Service Layer and Cloud Security design of the platform. The platform combined standardized and personalized business, concentrated deployment of hardware facility, centralized data management,

[1] proposed a cloud-based model for implementation of e-Governance services. The proposed model is constructed based on cloud computing and service-oriented architecture. The model consists of five layers: integration layer, cloud manager, virtualize infrastructure, physical infrastructure, centralized control. they found that the implementation of cloud-based E-Government architecture cost-saving of Information and Communication Technology (ICT) investment in India.

**The previous frameworks use the cloud computing and SOA for implementing framework for the E-Government. However, they are still suffered from security, privacy and management. This research propose framework to overcome these problems.**

## 5. PROPOSED FRAMEWORK

The proposed Framework called Cloud Oriented E-Government Architecture (COEGA). It is inspired by [19], [20], [21], [22], [23], [3], [24], [25], [26], [27], [28], [29], [30], [1], [31], [32], [33]. It supports both SOA and cloud computing infrastructure, it delivers a physical infrastructure that

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can be leveraged by both worlds, which is a multi-tenant, virtualized infrastructure that holds SOA principles and the infrastructure components (e.g., server, network, devices, etc.) as the building blocks to simplify an agile and re-usable infrastructure over the Internet. COEGA is a layered architecture that consists of five layers: user, accessibility, services, infrastructure and governance as shown in the figure 3.

<table>
<tr><td>Presentation Layer</td><td>Provider - user - Business partner – Regulator</td><td rowspan="11">Control Layer</td><td rowspan="11">Governance</td><td rowspan="11">Management</td><td rowspan="11">QoS</td></tr>
<tr><td rowspan="4">Accessibility Layer</td><td>Access</td></tr>
<tr><td>Facilities</td></tr>
<tr><td>The SLA Resource Allocator</td></tr>
<tr><td>Cloud access security broker (CASB)</td></tr>
<tr><td rowspan="5">Cloud Services Layer</td><td>Business process as a service (BpaaS)</td></tr>
<tr><td>Software as a service (SaaS)</td></tr>
<tr><td>Platform as a service (PaaS)</td></tr>
<tr><td>Infrastructure as a service (IaaS)</td></tr>
<tr><td>Regulation as a service (RaaS)</td></tr>
<tr><td rowspan="2">Physical Layer</td><td>Hardware</td></tr>
<tr><td>Virtualization</td></tr>
</table>

*Figure 3. Cloud Oriented E-Government Architecture (Coega).*

### 5.1 Presentation Layer

In presentation layer, there are four stakeholders that play the main role in cloud environment as shown in figure 4.

| | |
|---|---|
| **Presentation Layer** | **User - Regulator - Provider - Business partner** |

*Figure 4. Presentation Layer.*

1. **Users:** Cloud service users following up for their benefit submit service requests from anyplace in the world to the Data Center and Cloud to be handled. E-Government contains three fundamentals users which are government, business/enterprise, and citizen. therefore, three relationships must be introduced in cloud environment: Government to Government (G2G), Government to Business (G2B), and Government to Citizen (G2C).
2. **Regulator:** Regulator oversees different stakeholders, so the cloud environment can accessible with regulations. thus, it acts as government institution who responsible for IT strategy in a country.
3. **Provider:** Provider is an outsider or third party that presents all elements that required for building cloud environment for E-Government. They in charge of operate, manage, and maintain all services and system in cloud.
4. **Business Partner:** Government Business Partners are organizations or companies both state and private that has a high capacity and validity in the field of ICT. collaboration amongst government and business partners detailed as far as the agreement's scope, objectives, benefits, etc.

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### 5.2 Accessibility Layer

Through this layer, the end users can interact with government public services. It consists of four parts as shown in the figure 5.

| | |
|---|---|
| **Accessibility Layer** | **Access** |
| | **Facilities** |
| | **The SLA Resource Allocator** |
| | **Cloud access security broker (CASB)** |

*Figure 5. Accessibility layer.*

1. **Access***:* COEGA supports multi-tenancy feature of cloud computing. Multitenancy alludes to a software architecture in which a single instance of software serves multiple tenants. A tenant is a set of users who share a typical access with privileges to the software instance. So, through this layer, the end users can interact with government public services using E-Government portal or public portal. This layer can be rich-client, mobile, portal, or Web-based to invoke public services as shown in figure 6.

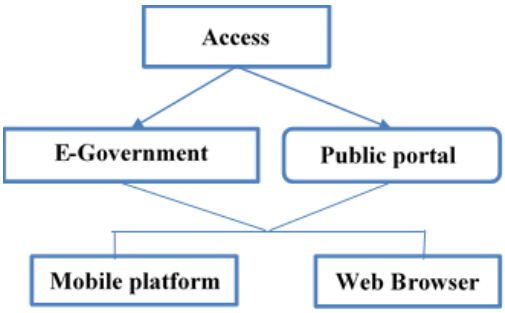


*Figure 6. Access Layer.*

2. **Facilities:** This layer presents facilities for better access. it includes Routers firewalls, LAN / WAN, Internet Access and Hosting Centers.
3. **SLA Resource Allocator:** Service level agreement (SLA) is an important aspect to notice for anyone using cloud computing. the SLA includes the terms a user has to agree on when starting to use cloud computing. the SLA Resource is the interface between the Data Center/Cloud service provider and external users.

Furthermore, it can provide other services such as performance, identity, and search. They may also control access to internal company resources. A This needs the association of the following mechanisms to support SLA-oriented resource management are

- **Service Request Examiner and Admission Control:** When a service request is first submitted, it interprets the submitted request for QoS requirements before determining whether to accept or reject the request. also, it allocates requests to VMs and determines resource entitlements for allocated VMs based on the latest status information regarding resource availability (from VM Monitor mechanism).
- **Pricing:** Serves as a basis for managing the supply and demand of computing resources within the Data Center and facilitates in prioritizing resource allocations effectively.
- **Accounting:** Saves the actual usage of resources by requests so that the final cost can be computed and charged to the users.
- **VM Monitor:** Oversees of the availability of VMs and their resource entitlements.
- **Dispatcher:** Begins the execution of accepted service requests on allocated VMs.
- **Service Request Monitor:** Observes the execution progress of service requests.

**Cloud Access Security Brokers (CASBs):** As a result, Cloud Computing is a comparatively new computing model, there is a great deal of uncertainty about how security at all levels (e.g., network, host, application, and data levels) can be achieved and how applications security is moved to Cloud Computing. That uncertainty has consistently drive information executives to state that security is their number one concern with Cloud Computing. So, one of the most important barriers to adoption of cloud is security, followed by issues regarding compliance, privacy and legal matters. The proposed solution is called **Cloud Access Security Brokers (CASBs)** are security enforcement points between consumers and service providers that offers security controls such as authentication (credentials and passwords), authorization intrusion prevention, antimalware filters, security logging/auditing, and encryption, that can monitor the use of services by users, and can execute malware detection when users access cloud applications. It acts as gatekeeper for allowing E-Government to extend the reach of their security policies.

CASBs offers four distinct deployment models to meet almost every security requirement, each

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providing a different set of features: Log collection, Forward proxy Reverse proxy and API.

### 5.3 Cloud Services Layer

This layer is the outermost layer that react with users. A cloud-based services offer shared pool of computing resources on-demand delivery of Information and Communication Technologies (ICT) services over a network specially Internet. Cloud services provide opportunities for government to achieve better value, flexibility and reliability, and make prospective service delivery improvements There are five service delivery models in this layer as shown in figure 7.

| | |
|---|---|
| **Cloud Services Layer** | **Business process as a service (SaaS)** |
| | **Software as a service (PaaS)** |
| | **Platform as a service (BpaaS)** |
| | **Infrastructure as a service (IaaS)** |
| | **Regulation as a service (RaaS)** |

*Figure 7. Cloud Services Layer.*

1. **Business process as a service (BPaaS)**: BPaaS is considered as the following level of abstraction above SaaS and furthermore as a group of loosely coupled elementary. Web services that connect with one another to shape a higher-level functional system. These services are offered by various enterprises and run on the cloud provider infrastructure. The execution of these services in a dynamic cloud environment creates frequent variations in the offered Quality of Service (QoS). Subsequently, obtaining the expected results mentioned in pre-established contracts in the Service Level Agreements (SLAs) that represent QoS goals. In this layer, interoperability between heterogeneous independent ministries' is achieving by allowing isolated, independent, heterogeneous computing systems to cooperate and work together sharing information and integrating processes across all boundaries surrounding their isolated computing systems. as shown in the figure 8.

2. **Software as a service (SaaS):** Software deployment model where an application is licensed by providers to for use as a service on demand. the provider's applications are used by COEGA uses running on a Cloud infrastructure and accessible from various client devices through a thin client interface such as a Web browser. the underlying Cloud infrastructure is not controlled or managed by the government agencies. In COEGA, SaaS mainly contains Virtual desktop, Wikis/Blogs, Core mission app, office automation, Collaboration app, Social networking, agency website hosting, Legacy applications, Business synchronic applications, Productivity app and Email/IM.

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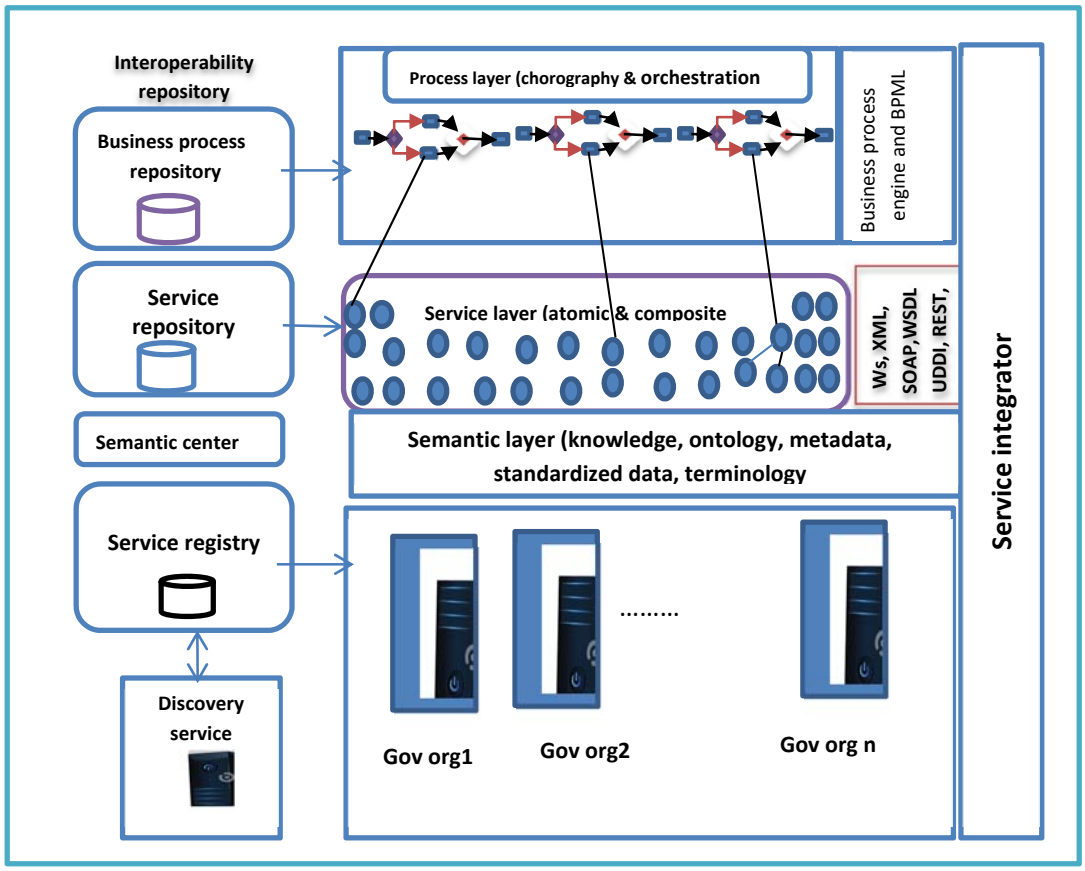


*Figure 8. Business process as a service (BPaaS).*

3. **Platform as a service (PaaS)**: Provision of computing platform & solution stack as a service. PaaS deploys onto the Cloud infrastructure consumer-created applications using programming languages and tools supported by the provider (e.g., java, python, .Net). COEGA controls over the deployed applications and possibly application hosting environment configurations. In COEGA. PaaS mainly contains: Database Testing tools, Development tools, Core mission apps, Directory services and backup services.

4. **Infrastructure as a service (IaaS)**: provide computer infrastructure (typically a platform virtualization environment) as a service. IaaS presents processing, storage, networks, and other fundamental computing resources where COEGA can deploy and run arbitrary software, which can include operating systems and applications. In COEGA, IaaS mainly includes: Web servers, Virtual machines, Server hosting, Hardware (CPU) services and Server hosting – DNS.

5. **Regulation as a Service (RaaS):** Policy and standard regulation in government are provided in these services. From these services, Users can gain certificate and agreement after completed the requirements. For example, business license for a company. These services contain three categories based on the users:
   - Regulation for government institution,
   - Regulation for enterprise,
   - Regulation for citizen.

Moreover, these services can be used to degree maturity level (technology readiness) of institutions/enterprise/citizen in E-Government. These services amount the maturity level (technology readiness) of institutions/enterprise/citizen in E-Government.

### 5.4 Physical Layer

It consists of two parts: Hardware and virtualization as shown in the figure 9.

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| Physical Layer | Hardware |
|---|---|
| | Virtualization |

*Figure 9. Physical layer*

1. **Hardware:** It is base layer which presents all physical elements / hardware needed on cloud service provider, including server, storage, and network.

2. **Virtualization:** Virtualization is construction of flexible substitute for physical resources with the same functions and external interface but with different attributes such as size and efficiency. this substitute is named virtual resources and usually operating systems are not aware of substitution made. Resources virtualization includes the following modules as
   - Virtualization of file access
   - Virtualization of block access
   - Virtualization of data communication networks
   - Virtualization of computing resources.

   Typically, system virtualization is fulfilled with the help of hypervisor technology. Hypervisor (irrespective of type) is a multilayer application, which separates hardware from its guest systems. Each guest operating system instead of physical equipment sees virtual machine.

### 5.5 Control Layer

Cloud control is applied to all connected parties and business processes in a secure way, to assure that the organization's Cloud supports the goals of organization strategies and objectives. Moreover, it monitors all performance of the cloud and the servers and ensures that the cloud servers are running efficiently. This layer consists of three parts as shown in the figure 10.

| | |
|---|---|
| **Governance** | **Control Layer** |
| **Management** | |
| **QoS** | |

*Figure 10. Control layer.*

1. **Governance:** COEGA defines Cloud governance as the controls and processes that make sure that policies are enforced, and data are secured outside organization premises. It makes the decision emerging Cloud Computing infrastructure and application services [34]. The framework of easier and balances the investments and risks while gaining the Cloud benefits. COEGA consists of four steps to establish an effective cloud computing governance:
   a. Set Up Cloud Computing Policies and Standards,
   b. Evaluate Risks Associated with Cloud Computing,
   c. Involve Management in the Process of Cloud Computing Governance,
   d. Evaluate Performance.

2. **Management:** It emphases on management, supervision and resource scheduling to confirmed high efficiency and security during utilization of government cloud. It is comprised of two modules: operational and business as shown in the figure 11.

3. **Quality of service:** The quality of service (QoS) is determined by the fulfillment of both functional and non-functional requirements. Meeting user's requirements about the functionality depends on the service's description. The amount of non-functional quality attributes that must be considered is very high in the case of cloud services. The most common QoS requirements of (distributed/grid based) workflow applications include time (performance), usability, flexibility, reliability and security. QoS includes two sides of service quality, side for the service quality during consuming e-government service from the citizen and other side from the government investor to achieve level of service demanding during provide the E-government service for the public.

## 6. CASE STUDY

To verify the proposed framework and study the successful implementations, data was collected from Center of Communications and Information Technology (CITC), Zagazig University. An extensive review was done for the services offered by the center and the available infrastructure. The center is suffering from huge academic and administrative data beside a huge number of requests per day. To examine the proposed framework, CloudSim simulator is used, it can be defined as a new, generalized, and extensible simulation framework that permits seamless modelling, simulation, and experimentation of

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CloudSim involves multiple layers starting from the lowest layer of SimJava up to the top layer of User Code, as shown in Figure 12.

According to CloudSim, Datacenter consists of same or varied configuration hosts (servers) which represent hardware in the framework. The host in a datacenter is categorized by host ID, RAM, storage, bandwidth, processing power (MIPS) and number of processing elements (PE). The hosts are in charge of dealing with the VM creation, VM migration, VM destruction and VM provisioning. VM represent virtualization in the framework. The distribution of VMs to host is based on the allocation policy adopted by VM provisioner, default policy being first come first serve. These policies describe QoS in the framework. The applications or cloudlets are handled by VMs (SaaS) that are allocated a share of processing power and memory on datacenter hosts. The number of VMs created on a host relies on the VM RAM. The VMs are portrayed by image size, RAM, processing power, bandwidth and number of PEs while the cloudlets are described by length, file input size and file output size. For service or cloudlet mapping to VM, the host utilizes the time-shared or space shared allocation policy [35]. Time is a critical factor for the center to execute services and produce results. So, in this study, a combination of cloudlets and VM to reduce the overall execution time. In this scenario, the study simulates a Datacenter (physical host only) and creates 15 virtual machines (VMs) on the host and 100 cloudlets. The aim is recorded and compared the time taken by a Cloudlet (considered Job) on the virtual machines.

## 7. RESULTS

Table 1 shows the parameters of the VM, the Cloudlet and Host used to simulate the case study, whereas Appendix A shows the average CPU time with respect to cloudlet and VM.

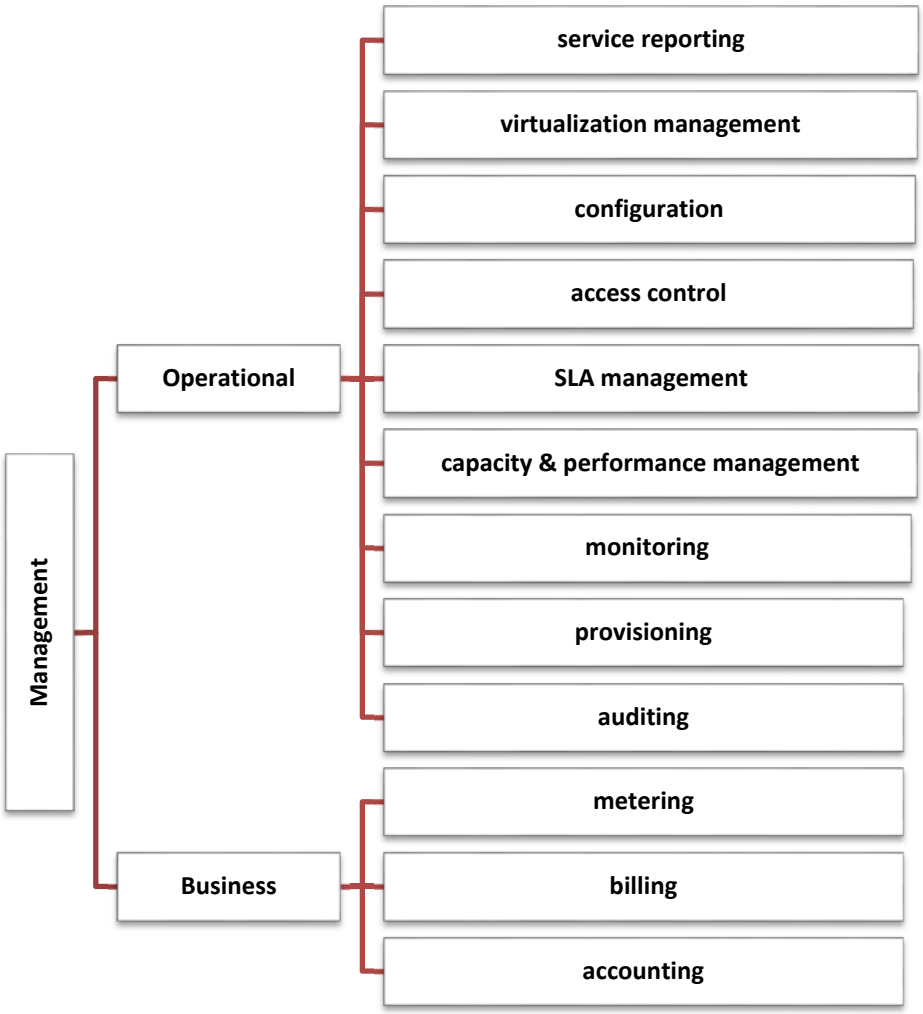


*Figure 11. COEGA Management Layer.*

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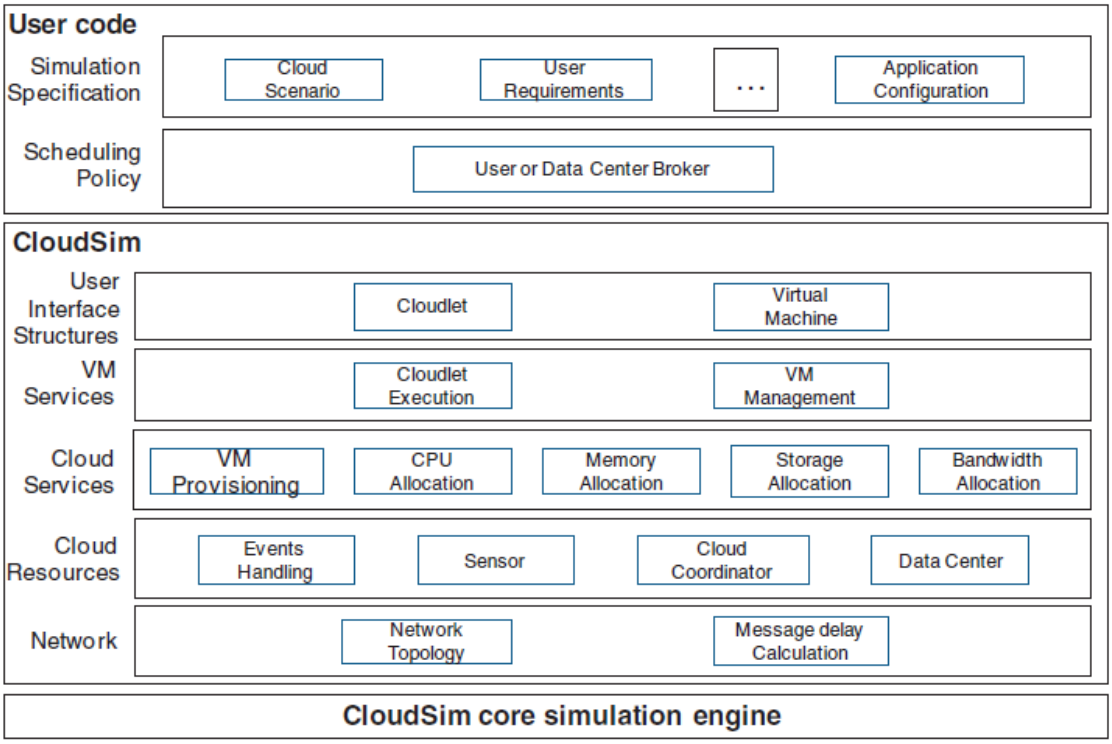


*Figure 12. Layered CloudSim architecture.*

*Table 1. Parameters of VMs, Cloudlet and host.*

| **VM Description** | |
|---|---|
| **mips = 1000** | Million instructions per second |
| **size = 10000** | Image size (MB) |
| **RAM = 512** | VM memory (MB) |
| **bw= 1000** | Bandwidth |
| **pesNumber = 1** | Number of CPUs |
| **String vmm = "Windows"** | VMM name |
| **Cloudlet Properties** | |
| **length = 1000** | Length of this Cloudlet (size) |
| **File Size = 300** | Input file size of this Cloudlet BEFORE submitting to a Cloud Resource |
| **Output Size = 300** | Output size of this Cloudlet AFTER submitting and executing |
| **Pes Number = 1** | Number of CPUs |
| **Host description** | |
| **ram = 2048** | host memory (MB) |
| **storage = 1000000** | host storage |
| **bw= 10000** | Bandwidth |

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Figure 13(a-d) show the average CPU time with respect to cloudlets using deferent numbers of VMs (1, 5, 10 & 15). Whereas, Figure 14(a-h) show the average CPU time with respect to number of VMs for deferent numbers of cloudlets (1,5, 15, 25, 35, 55, 75 & 100). Figure 15 shows 3D diagram for the average CPU time with respect to cloudlets and #VM.

The results show that:

- The CPU time is directly proportional to the number of cloudlets (straight line relation).
- The CPU time is inversely proportional to the number of VMs.
- The CPU time decreased sharply from one second per cloudlet for 1VM to about 0.128 second per cloudlet for 8VMs and then the CPU time be constant and there is no effect of number of VMs.
- The increase of number of VMs decrease the total operating time.
- It is costly to use number of VMs more than the number of cloudlets.

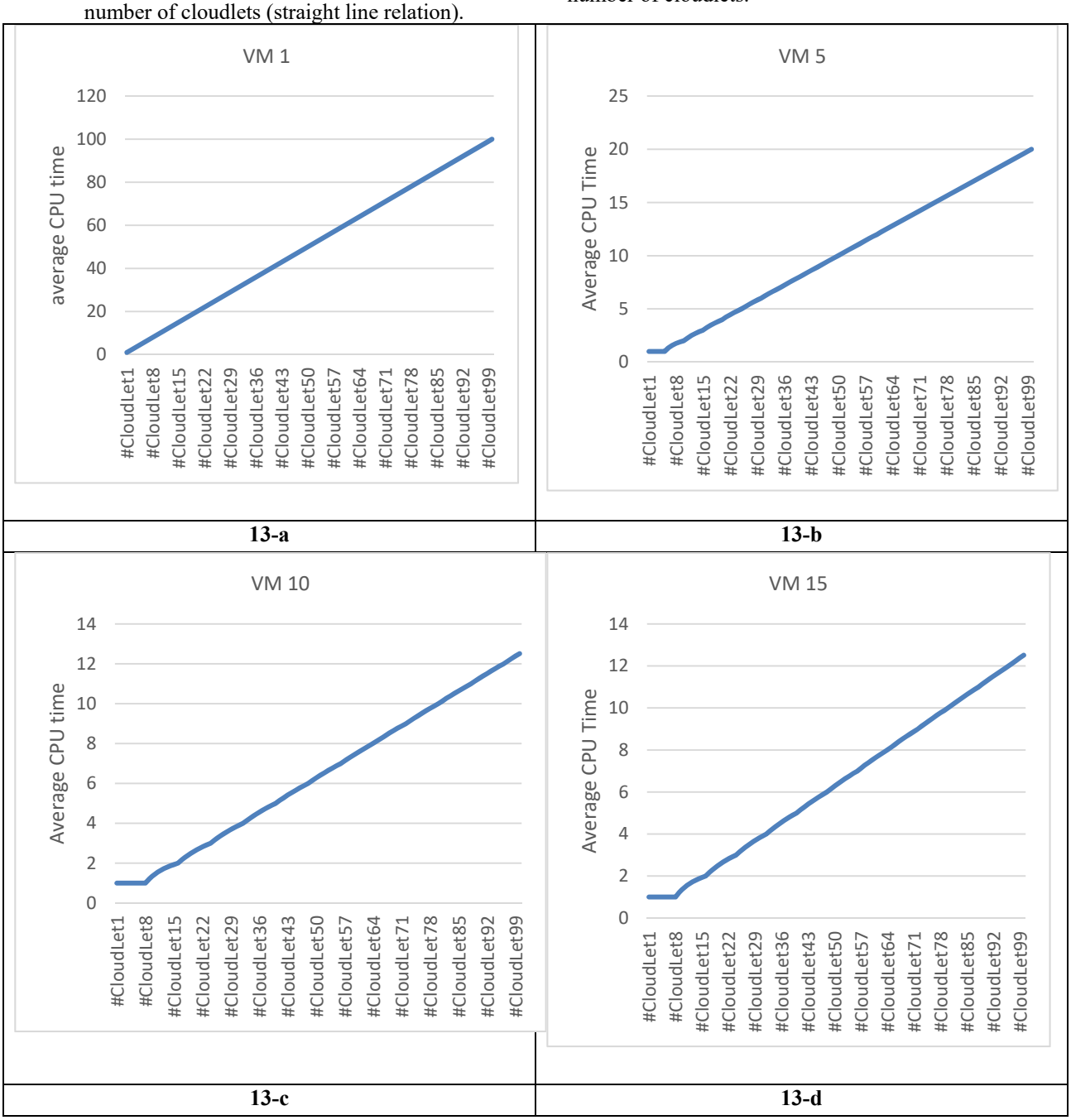


*Figure 13. The Average CPU Time With Respect To Cloudlets.*

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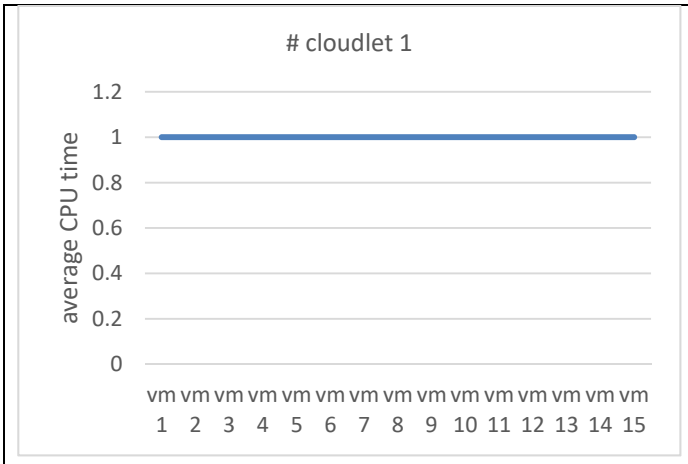
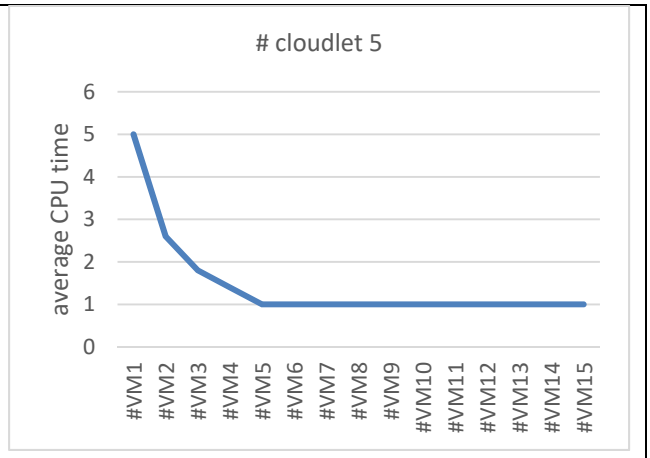



14-a

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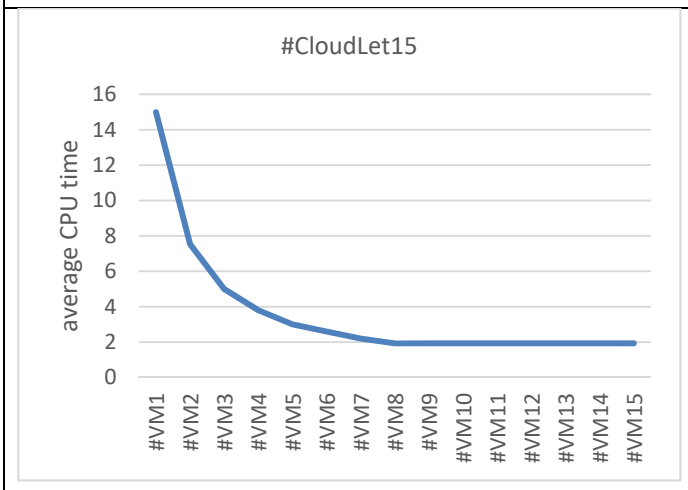
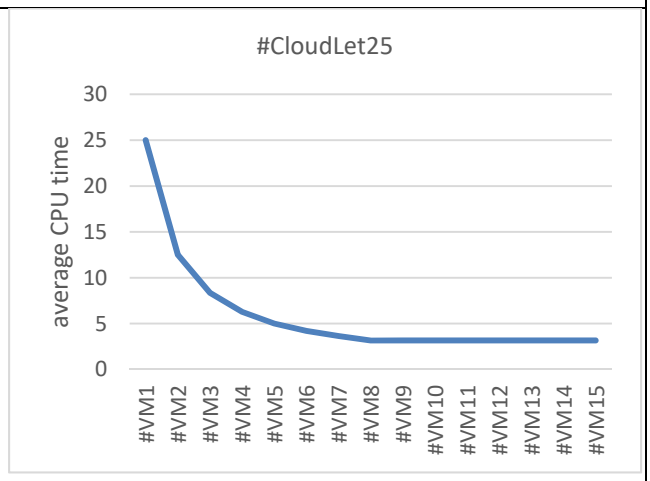
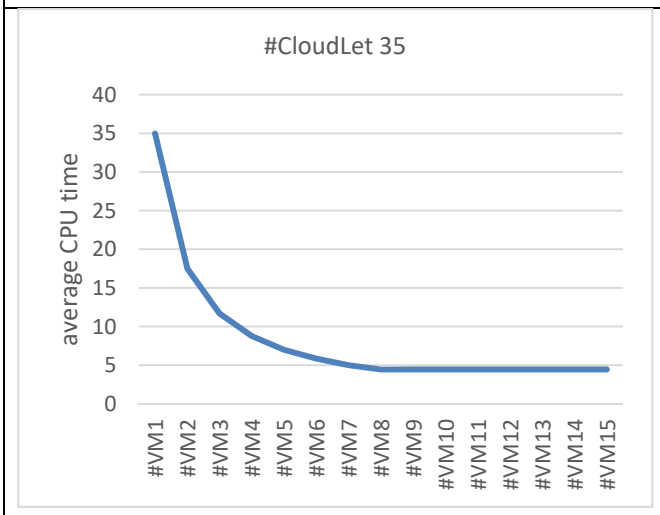
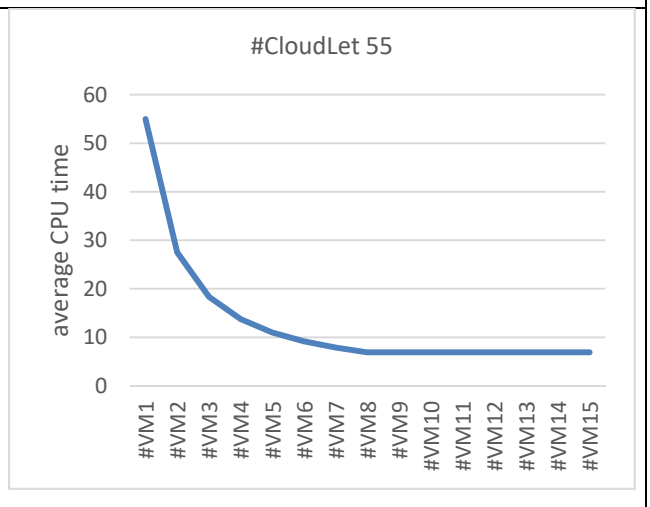



14-c




14-d



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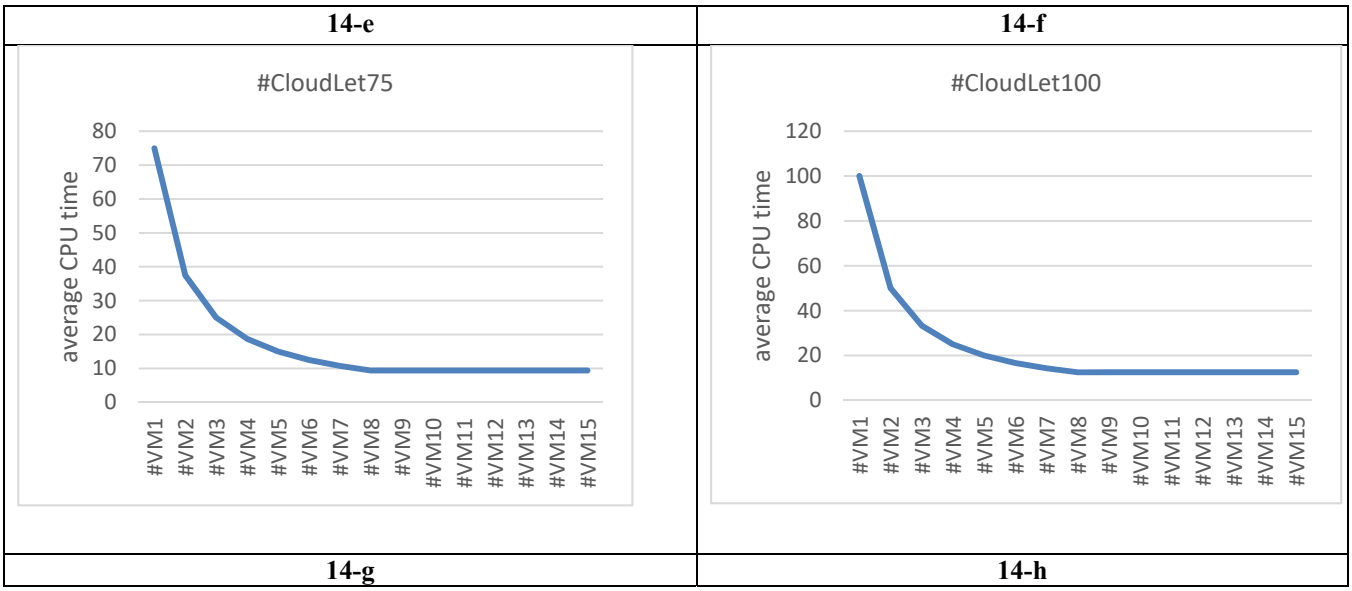


*Figure 14. The average CPU time with respect to number of VMs*

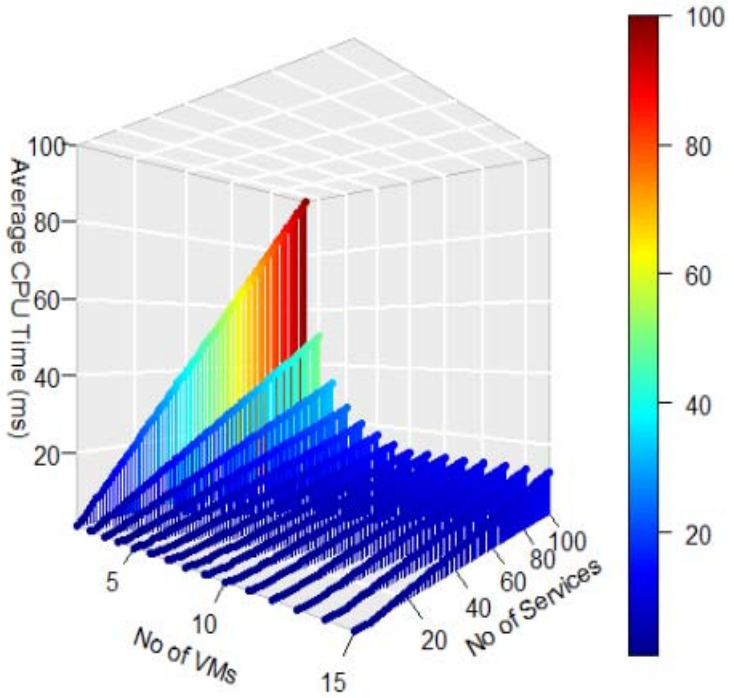


*Figure 15. the average CPU time with respect to #cloudlets and #VM.*

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## 8. CONCLUSIONS AND FUTURE WORK

The service cloud platform can reconstruct the business process of all kinds of information resources in various regions and structures, integrated business applications, and platforms as services. The previous models for E-government that based on cloud computing and SOA don't provide solutions of the cloud computing problems. The proposed Framework (COEGA) is a powerful framework for E-Governments. It's based-on cloud computing and SOA. It has a powerful control through the governance, QoS and management and effective SLA to overcome business continuity.

Moreover, COEGA offers security controls through using SLA and CASB for protection. COEGA permits integration, open standards, information sharing and information exchange among different government organization through using SOA (ESB).
Also, COEGA provides reusability and discovery of government services.

For Limitations, CloudSim needs to have a basic background in Java programming language. Also, it requires to write some code to use the components from its library in order to simulate the desired scenarios.

For future work, it is important to re-examine the framework with more than 100 cloudlets to find out the cost-efficient number of cloudlet (services) per VM. Also, Because of the limitation of the CloudSim, it is required to use other cloud simulator and make comparison among them. It is needed to Make questionnaire for the framework to take the opinions of the experts for the proposed framework.

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**Appendix A: The Average CPU Time With Respect To Cloudlet And VM.**

| | | average CPU time | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #CloudLet1 | #CloudLet2 | #CloudLet3 | #CloudLet4 | #CloudLet5 | #CloudLet6 | #CloudLet7 | #CloudLet8 | #CloudLet9 | #CloudLet10 | #CloudLet11 | #CloudLet12 | #CloudLet13 | #CloudLet14 | #CloudLet15 |
| | #VM1 | 1 | 2 | 3 | 4 | 5 | 6 | 6.99 | 8 | 8.99 | 10 | 10.99 | 11.99 | 12.99 | 13.99 | 14.99 |
| | #VM2 | 1 | 1 | 1.67 | 2 | 2.6 | 3 | 3.57 | 4 | 4.56 | 5 | 5.54 | 6 | 6.54 | 6.99 | 7.53 |
| | #VM3 | 1 | 1 | 1 | 1.5 | 1.8 | 2 | 2.43 | 2.75 | 3 | 3.4 | 3.73 | 4 | 4.38 | 4.71 | 5 |
| | #VM4 | 1 | 1 | 1 | 1 | 1.4 | 1.67 | 1.86 | 2 | 2.33 | 2.6 | 2.82 | 3 | 3.31 | 3.57 | 3.8 |
| | #VM5 | 1 | 1 | 1 | 1 | 1 | 1.33 | 1.57 | 1.75 | 1.89 | 2 | 2.27 | 2.5 | 2.69 | 2.86 | 3 |
| | #VM6 | 1 | 1 | 1 | 1 | 1 | 1 | 1.29 | 1.5 | 1.67 | 1.8 | 1.91 | 2 | 2.23 | 2.43 | 2.6 |
| | #VM7 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.25 | 1.44 | 1.6 | 1.73 | 1.83 | 1.92 | 2 | 2.2 |
| | #VM8 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM9 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM10 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM11 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM12 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM13 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM14 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |
| | #VM15 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1.22 | 1.4 | 1.55 | 1.67 | 1.77 | 1.86 | 1.93 |

| | | #CloudLet16 | #CloudLet17 | #CloudLet18 | #CloudLet19 | #CloudLet20 | #CloudLet21 | #CloudLet22 | #CloudLet23 | #CloudLet24 | #CloudLet25 | #CloudLet26 | #CloudLet27 | #CloudLet28 | #CloudLet29 | #CloudLet30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #VM1 | 15.99 | 16.98 | 17.98 | 18.98 | 20 | 20.98 | 21.98 | 22.98 | 23.98 | 25 | 25.98 | 26.97 | 27.98 | 28.97 | 29.98 |
| | #VM2 | 8 | 8.53 | 8.99 | 9.52 | 10 | 10.52 | 10.99 | 11.52 | 11.99 | 12.51 | 12.99 | 13.51 | 13.99 | 14.51 | 14.99 |
| | #VM3 | 5.37 | 5.7 | 6 | 6.36 | 6.7 | 6.99 | 7.36 | 7.69 | 8 | 8.36 | 8.69 | 8.99 | 9.35 | 9.68 | 10 |
| | #VM4 | 4 | 4.29 | 4.56 | 4.79 | 5 | 5.28 | 5.54 | 5.78 | 6 | 6.28 | 6.54 | 6.77 | 6.99 | 7.27 | 7.53 |
| | #VM5 | 3.25 | 3.47 | 3.66 | 3.84 | 4 | 4.24 | 4.45 | 4.65 | 4.83 | 5 | 5.23 | 5.44 | 5.64 | 5.82 | 6 |
| | #VM6 | 2.75 | 2.88 | 3 | 3.21 | 3.4 | 3.57 | 3.73 | 3.87 | 4 | 4.2 | 4.38 | 4.56 | 4.71 | 4.86 | 5 |
| | #VM7 | 2.37 | 2.53 | 2.67 | 2.79 | 2.9 | 3 | 3.18 | 3.35 | 3.5 | 3.64 | 3.77 | 3.89 | 4 | 4.17 | 4.33 |
| | #VM8 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM9 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM10 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM11 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM12 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM13 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM14 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |
| | #VM15 | 2 | 2.18 | 2.33 | 2.47 | 2.6 | 2.71 | 2.82 | 2.91 | 3 | 3.16 | 3.31 | 3.44 | 3.57 | 3.69 | 3.8 |

| | | #CloudLet31 | #CloudLet32 | #CloudLet33 | #CloudLet34 | #CloudLet35 | #CloudLet36 | #CloudLet37 | #CloudLet38 | #CloudLet39 | #CloudLet40 | #CloudLet41 | #CloudLet42 | #CloudLet43 | #CloudLet44 | #CloudLet45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #VM1 | 30.97 | 31.98 | 32.97 | 33.97 | 34.97 | 35.97 | 36.96 | 37.96 | 38.96 | 40 | 40.96 | 41.96 | 42.96 | 43.96 | 44.96 |
| | #VM2 | 15.51 | 15.99 | 16.51 | 16.98 | 17.5 | 17.98 | 18.5 | 18.98 | 19.49 | 20 | 20.51 | 20.98 | 21.5 | 21.98 | 22.5 |
| | #VM3 | 10.35 | 10.68 | 10.99 | 11.35 | 11.68 | 11.99 | 12.34 | 12.68 | 12.99 | 13.34 | 13.68 | 13.99 | 14.34 | 14.67 | 14.99 |
| | #VM4 | 7.77 | 8 | 8.27 | 8.53 | 8.77 | 8.99 | 9.26 | 9.52 | 9.76 | 10 | 10.27 | 10.52 | 10.76 | 10.99 | 11.26 |
| | #VM5 | 6.22 | 6.43 | 6.63 | 6.82 | 6.99 | 7.22 | 7.43 | 7.63 | 7.82 | 8 | 8.22 | 8.43 | 8.63 | 8.81 | 8.99 |
| | #VM6 | 5.19 | 5.37 | 5.54 | 5.7 | 5.85 | 6 | 6.19 | 6.36 | 6.54 | 6.69 | 6.85 | 6.99 | 7.18 | 7.36 | 7.53 |
| | #VM7 | 4.48 | 4.62 | 4.76 | 4.88 | 5 | 5.17 | 5.32 | 5.47 | 5.61 | 5.75 | 5.87 | 6 | 6.16 | 6.31 | 6.46 |
| | #VM8 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM9 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM10 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM11 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM12 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM13 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM14 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |
| | #VM15 | 3.9 | 4 | 4.15 | 4.29 | 4.43 | 4.56 | 4.68 | 4.79 | 4.9 | 5 | 5.15 | 5.28 | 5.42 | 5.54 | 5.66 |

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| | | average CPU time | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | #CloudLet46 | #CloudLet47 | #CloudLet48 | #CloudLet49 | #CloudLet50 | #CloudLet51 | #CloudLet52 | #CloudLet53 | #CloudLet54 | #CloudLet55 | #CloudLet56 | #CloudLet57 | #CloudLet58 | #CloudLet59 | #CloudLet60 |
| | #VM1 | 45.96 | 46.95 | 47.96 | 48.95 | 50 | 50.95 | 51.95 | 52.95 | 53.95 | 54.95 | 55.95 | 56.94 | 57.94 | 58.94 | 59.96 |
| | #VM2 | 22.98 | 23.49 | 23.98 | 24.49 | 25 | 25.5 | 25.98 | 26.48 | 26.97 | 27.49 | 27.98 | 28.49 | 28.97 | 29.49 | 29.98 |
| | #VM3 | 15.34 | 15.68 | 15.99 | 16.34 | 16.67 | 16.98 | 17.33 | 17.67 | 17.98 | 18.33 | 18.67 | 18.98 | 19.33 | 19.66 | 20 |
| | #VM4 | 11.52 | 11.76 | 11.99 | 12.26 | 12.51 | 12.76 | 12.99 | 13.25 | 13.51 | 13.76 | 13.99 | 14.25 | 14.51 | 14.75 | 14.99 |
| | #VM5 | 9.21 | 9.42 | 9.62 | 9.81 | 10 | 10.21 | 10.42 | 10.62 | 10.81 | 10.99 | 11.21 | 11.41 | 11.62 | 11.81 | 11.99 |
| | #VM6 | 7.69 | 7.85 | 8 | 8.18 | 8.36 | 8.53 | 8.69 | 8.84 | 8.99 | 9.17 | 9.35 | 9.52 | 9.69 | 9.84 | 10 |
| | #VM7 | 6.6 | 6.74 | 6.87 | 6.99 | 7.15 | 7.31 | 7.46 | 7.6 | 7.74 | 7.87 | 8 | 8.16 | 8.31 | 8.46 | 8.6 |
| | #VM8 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM9 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM10 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM11 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM12 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM13 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM14 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |
| | #VM15 | 5.78 | 5.89 | 6 | 6.14 | 6.28 | 6.41 | 6.53 | 6.66 | 6.77 | 6.89 | 6.99 | 7.13 | 7.27 | 7.4 | 7.53 |

| | | #CloudLet61 | #CloudLet62 | #CloudLet63 | #CloudLet64 | #CloudLet65 | #CloudLet66 | #CloudLet67 | #CloudLet68 | #CloudLet69 | #CloudLet70 | #CloudLet71 | #CloudLet72 | #CloudLet73 | #CloudLet74 | #CloudLet75 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #VM1 | 60.94 | 61.94 | 62.94 | 63.94 | 64.94 | 65.94 | 66.93 | 67.94 | 68.93 | 69.94 | 70.93 | 71.94 | 72.93 | 73.93 | 74.95 |
| | #VM2 | 30.48 | 30.97 | 31.49 | 31.98 | 32.5 | 32.97 | 33.49 | 33.97 | 34.48 | 34.97 | 35.48 | 35.97 | 36.47 | 36.96 | 37.48 |
| | #VM3 | 20.34 | 20.67 | 20.98 | 21.33 | 21.67 | 21.98 | 22.33 | 22.66 | 22.98 | 23.32 | 23.66 | 23.98 | 24.33 | 24.66 | 25 |
| | #VM4 | 15.25 | 15.51 | 15.76 | 15.99 | 16.25 | 16.51 | 16.76 | 16.98 | 17.25 | 17.5 | 17.75 | 17.98 | 18.25 | 18.5 | 18.75 |
| | #VM5 | 12.21 | 12.41 | 12.61 | 12.8 | 12.99 | 13.2 | 13.41 | 13.61 | 13.8 | 13.99 | 14.2 | 14.41 | 14.61 | 14.8 | 14.99 |
| | #VM6 | 10.18 | 10.35 | 10.52 | 10.68 | 10.84 | 10.99 | 11.17 | 11.35 | 11.52 | 11.68 | 11.84 | 11.99 | 12.17 | 12.34 | 12.51 |
| | #VM7 | 8.73 | 8.87 | 8.99 | 9.15 | 9.3 | 9.45 | 9.59 | 9.73 | 9.87 | 10 | 10.15 | 10.3 | 10.45 | 10.59 | 10.73 |
| | #VM8 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM9 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM10 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM11 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM12 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM13 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM14 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |
| | #VM15 | 7.65 | 7.77 | 7.89 | 8 | 8.14 | 8.27 | 8.4 | 8.53 | 8.65 | 8.77 | 8.88 | 8.99 | 9.13 | 9.26 | 9.39 |

| | | #CloudLet76 | #CloudLet77 | #CloudLet78 | #CloudLet79 | #CloudLet80 | #CloudLet81 | #CloudLet82 | #CloudLet83 | #CloudLet84 | #CloudLet85 | #CloudLet86 | #CloudLet87 | #CloudLet88 | #CloudLet89 | #CloudLet90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | #VM1 | 75.93 | 76.92 | 77.92 | 78.92 | 79.96 | 80.92 | 81.92 | 82.92 | 83.92 | 84.92 | 85.92 | 86.91 | 87.92 | 88.91 | 89.92 |
| | #VM2 | 37.96 | 38.48 | 38.96 | 39.47 | 40 | 40.5 | 40.96 | 41.47 | 41.96 | 42.48 | 42.96 | 43.47 | 43.96 | 44.48 | 44.96 |
| | #VM3 | 25.34 | 25.67 | 25.98 | 26.32 | 26.65 | 26.97 | 27.32 | 27.65 | 27.98 | 28.32 | 28.66 | 28.97 | 29.32 | 29.66 | 29.98 |
| | #VM4 | 18.98 | 19.24 | 19.49 | 19.74 | 20 | 20.26 | 20.51 | 20.75 | 20.98 | 21.24 | 21.5 | 21.75 | 21.98 | 22.24 | 22.5 |
| | #VM5 | 15.2 | 15.41 | 15.61 | 15.8 | 15.99 | 16.2 | 16.41 | 16.61 | 16.8 | 16.98 | 17.19 | 17.4 | 17.6 | 17.79 | 17.98 |
| | #VM6 | 12.67 | 12.83 | 12.99 | 13.17 | 13.34 | 13.51 | 13.67 | 13.83 | 13.99 | 14.17 | 14.34 | 14.51 | 14.67 | 14.83 | 14.99 |
| | #VM7 | 10.86 | 10.99 | 11.15 | 11.3 | 11.44 | 11.58 | 11.72 | 11.86 | 11.99 | 12.15 | 12.29 | 12.44 | 12.58 | 12.72 | 12.86 |
| | #VM8 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM9 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM10 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM11 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM12 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM13 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM14 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |
| | #VM15 | 9.52 | 9.65 | 9.77 | 9.88 | 10 | 10.13 | 10.27 | 10.39 | 10.52 | 10.64 | 10.76 | 10.88 | 10.99 | 11.13 | 11.26 |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | |
| 2 | | #CloudLet91 | #CloudLet92 | #CloudLet93 | #CloudLet94 | #CloudLet95 | #CloudLet96 | #CloudLet97 | #CloudLet98 | #CloudLet99 | #CloudLet100 |
| 3 | #VM1 | 90.91 | 91.91 | 92.91 | 93.91 | 94.91 | 95.91 | 96.9 | 97.9 | 98.9 | 100 |
| 4 | #VM2 | 45.47 | 45.96 | 46.48 | 46.95 | 47.46 | 47.96 | 48.48 | 48.95 | 49.46 | 50 |
| 5 | #VM3 | 30.32 | 30.65 | 30.97 | 31.32 | 31.66 | 31.98 | 32.32 | 32.66 | 32.97 | 33.31 |
| 6 | #VM4 | 22.75 | 22.98 | 23.24 | 23.49 | 23.74 | 23.98 | 24.24 | 24.49 | 24.74 | 25 |
| 7 | #VM5 | 18.19 | 18.4 | 18.6 | 18.79 | 18.98 | 19.19 | 19.39 | 19.59 | 19.8 | 20 |
| 8 | #VM6 | 15.17 | 15.34 | 15.51 | 15.67 | 15.83 | 15.99 | 16.17 | 16.34 | 16.51 | 16.67 |
| 9 | #VM7 | 12.99 | 13.14 | 13.29 | 13.44 | 13.58 | 13.72 | 13.86 | 13.99 | 14.14 | 14.29 |
| 10 | #VM8 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 11 | #VM9 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 12 | #VM10 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 13 | #VM11 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 14 | #VM12 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 15 | #VM13 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 16 | #VM14 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |
| 17 | #VM15 | 11.39 | 11.51 | 11.64 | 11.76 | 11.88 | 11.99 | 12.13 | 12.26 | 12.39 | 12.51 |