

**CLOUD COMPUTING  
(SE-414)  
MTE PROJECT**



**Comparative  
Study of Cloud  
Computing  
Service Models**

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# 1. ABSTRACT

Cloud computing has many security flaws which need to look upon by the researchers so that it can gain trust by the users. In this paper, we'll look at three cloud computing service models: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS) (IaaS). The article will focus on the security issues associated with each model, their benefits, and a comparative study will be conducted between them to evaluate their capabilities so that selecting the best one for the R&D phase will be straightforward and simple. The motivation behind this research is to provide the beginner with in-depth information about these Cloud Computing Service Models and after that they can decide which is appropriate for them at right place.

A thick yellow diagonal stripe runs from the top right corner towards the bottom left, separating the white background on the left from the solid yellow background on the right.

# 2.

## Introduction



Cloud computing is a method of distributing hardware and software resources such as software applications, CPU, and storage to consumers as a service over the internet. Cloud computing is a rapidly growing field that corporate IT companies go ahead of old IT infrastructures and they start relying on web-based services. Cloud computing is offered in three different service models and they are:

- Software as a service (SaaS),
- Platform as a service (PaaS) and
- Infrastructure as a service (IaaS)

# 3.

## Cloud Computing Models

1. Software as a service (SaaS),
2. Platform as a service (PaaS) and
3. Infrastructure as a service (IaaS)



# Software as a Service(SaaS)

- It is a model which allow the clients to use and rent the applications from the provider without install it on their own PC. This is mean the licensed applications which been provided to clients are running on cloud infrastructure through the interface of thin/thick client such as Google chrome, internet explorer and many others.
- The management and control of the infrastructure will be under the provider responsibility, only limit number of customers would have their own configurations
- SaaS model is classified as a best way to get the lightweight applications such as Microsoft word, Microsoft access, media player and so on.

## Advantages:

- Reduce the application software licensing cost.
- Reduce distribution and maintenance costs and minimal end-user generally makes SaaS application easy to use.
- SaaS supports multiple users that means one application could be run by many clients at the same time.
- The applications provider will be responsible to control and limit the use of applications.
- The applications of SaaS has these features: automated upgrades and updates, patch management and faster rollout of changes.
- Secure socket layer (SSL) used in SaaS model.

## Security issues:

- Security of data
- Locality of data
- Data Privacy
- Integrity of Data
- Accessibility of Data
- Sniffing of data on the network
- Authentication, Authorization
- Web Application Security
- Availability
- Backup



# Platform as a Service(PaaS)

- It an environment or platform in which the developer can develop the applications and software to deploy them through the internet without any need for install or manage the development environment.
- PaaS allows the customer to rent virtualized servers and attached services.
- The customer has no control over servers, networks, storage or OS.  
However, the customer has the control over the deployed applications and their configurations.

## Advantages:

- Increase the flexibility for the development process and decrease the server storage overhead.
- The security is provided, containing data security, recovery and backup.
- Reduce the cost by rent the physical and removing the need of expert people to manage the infrastructure.
- Adaptability, that mean it has the ability to change if the circumstances are altered.
- PaaS is working on basis of one-to-many; so many developers can work on same application.
- Flexibility: Developers can customize apps without the headache of maintaining the software.

## Security issues:

- Third party relationships
- Rapid change of application
- Security of underlying Infrastructure





# Infrastructure as a Service(IaaS)

- It provides virtual infrastructure with raw hardware, as well as the ability to create, manage, remove storage & virtual machines (VMs) through web-based service. IaaS delivers cloud computing infrastructure, including servers, network, operating systems, and storage, through virtualization technology.
- The IaaS provider provides the customer with a virtual server and one or more CPUs that run a variety of operations.
- In order to service the client, the provider is responsible for operating, hosting, and maintaining the infrastructure.
- The client has control over the IP address, CPU, Memory, Storage, installed apps, OS, and a limited number of networking components.

## Advantages:

- The client has the ability to scale up or down the infrastructure as needed.
- The client is able to run a virtual computer as a result of Virtualization service.
- Easy to automate deployment of storage, networking, servers, and processing power.
- Network as a service is offered, which comprises of load balancing, router and firewall technology.
- Lowering the cost of HR and equipment.

## Security issues:

- Virtualization Attacks.
- Shared resource Vulnerability.
- Malicious Code.
- Data Loss and Leakage.



## 4. RESULTS AND FINDINGS





# RESULTS AND FINDINGS

Models Factors	SaaS	PaaS	IaaS
Characteristics	<ul style="list-style-type: none"><li>• Users are provided with applications that are accessible anytime and from anywhere, these applications are provided in one-to-many mechanism.</li><li>• Access via web to commercial software.</li><li>• User does not need to manage the software such as upgrade and patches.</li><li>• Application Programming Interfaces is giving the ability the different pieces of software to be integrated</li><li>• SLAs.</li><li>• UI powered by “thin client” Applications like Microsoft word, Microsoft access, media player.</li><li>• Modular.</li><li>• Semantic interoperability.</li><li>• Centralized Hosting / Delivery.</li><li>• Uniform Platform for Delivery.</li><li>• Open Collaboration / Sharing</li></ul>	<ul style="list-style-type: none"><li>• Users are provided with a platform for developing applications hosted in the Cloud.</li><li>• Services to develop Test Deploy host and maintain applications in the same development environment.</li><li>• Web based user interface creation tools help to modify, create, deploy and test different UI scenarios.</li><li>• Same development application could be utilize by many users.</li><li>• Web service and database are integrated with PaaS via common standards.</li><li>• Support for development team collaboration.</li><li>• Tools available to handle billing and subscription management.</li><li>• User interface is Customizable /Programmable.</li><li>• Database Customizations are unlimited.</li><li>• Flexible “services-enabled” integration model.</li></ul>	<ul style="list-style-type: none"><li>• virtualized hardware and storage on top of which they can build their infrastructure</li><li>• Allows for dynamic/self scaling.</li><li>• It has alterable cost, utility pricing model.</li><li>• Ability to provide single hardware to many users.</li><li>• Supported OS and Platform independent.</li><li>• The costs are less due to the share of infrastructure.</li><li>• (SLA) Service level agreements.</li><li>• Pay as you go.</li><li>• Applications/ frameworks</li></ul>



Consumer/ Client activities	User and configures cloud service.	Test, develop, manage and deploy cloud based solutions and cloud services.	Configure and setup bare infrastructure, install, manage and monitor any required software.
Provider activities	Manage, maintain and implement cloud service monitor usage by consumer of cloud.	Pre-configure platform and provision underlying infrastructure, middleware and other required IT resources as requisite monitor usage by consumer of cloud.	Manage the storage, physical processing, hosting and networking the required monitor usage by the consumer of cloud.
Services provided	Email, CRM, website testing, Virtual desktop, Wiki, Blog, automation.	Service and application test, development, integration and deployment.	Virtual machine, operating system, message queue, network, storage, CPU, memory, backup service.
Vendors	Salesforce.com, Google documents, Clarizen.com, Facebook.com, Gmail, Hotmail, Quicken online, Netsuite, , IBM.	Google AppEngine, Microsoft Azure, Yahoo developer Network, MSFT, Heroku, Engine Yard, force.com.	Amazon EC2 and S3, Gogrid, RACKSPACE, IBM BlueHouse, Linode, VMWare.

**TABLE 1: COMPARISON TABLE AMONG THE THREE MODELS OF CLOUD SERVICES SAAS, PAAS AND IAAS**



## 5. Conclusion





## Conclusion

We looked at the three cloud computing service models in this study i.e. SaaS, PaaS, IaaS. This paper focused on the security concerns of each model, as well as the benefits connected with them, and a comparison study was conducted among them.

This comparative analysis aided cloud clients in determining what kind of service features they require, as well as the types of risks associated with each model. Despite the numerous benefits associated with each model, each model also has a number of security, service level agreement, and privacy challenges that discourage users from moving their own work to cloud computing.

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# THANK YOU