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Cloud Computing: Overview of PaaS with Force.com Platform

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Abstract: ***Cloud Computing is middle-of-road for many technology companies for computing resources. Cloud computing is classified into three kinds Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS). Cloud platforms are pay-as-you-use, on-demand, easy to design, deploy, data storage, backup, and other utilities. In the year 2015 Platform-as-a-Service came into buzz it established its strong roots to provide technical service. This paper gives an overview of cloud computing and focuses on platform-as-a-Service (PaaS) along with an example of the Force.com platform. The paper also discusses the architecture, stack implementation, pros, and cons of Force.com.***
Keywords: Cloud computing, Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), Infrastructure-as-a-Service (IaaS)

I. INTRODUCTION

The 'cloud' is a world picture of the Internet. Cloud symbols are repeatedly used to depict the Internet on diagrams [1]. The Cloud Computing environment provides an internet-based platform that is used for computer technology. Cloud Computing gather computing resources and manages them instinctually. Cloud computing also offers a low barrier to entry for system administration, providing a simple interface to manage multiple computers [2]. Data are stored on virtual servers, the data is controlled and maintained by the cloud provider for example amazon and other AWS products [3]. These cloud applications use large data centers and powerful servers that host Web applications and Web services [4]. The device with an upstanding Internet connection and a standard browser can access a cloud application.

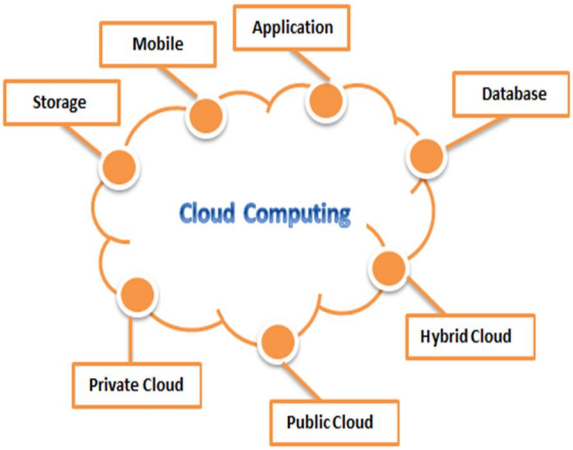


Fig.1: General representation of cloud computing

A. Benefits of Cloud Computing

1) Cloud computing permits employees to be more elastic in their work practices.
2) Organizations can store more data than on private computer systems [4].
3) Data can be accessed through mobile or desktop, which is easy to access.
4) IT developer can keep software up to date and not worry about other things
5) Cloud computing extends flexibility to other computing methods.
6) Developers can access information wherever they are, rather than having to remain at their desks.

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B. Layers of Cloud Computing

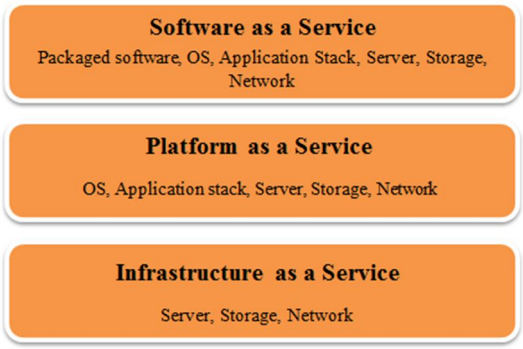


Fig.2: layers of cloud computing

1) *Software as a Service:* One of the most popular forms of cloud computing is software-as-a-service (SaaS). A software distribution model in which a service provider deploys applications for customers and makes them available via the internet. The SaaS offers email and collaboration, customer relationship management, and healthcare-related applications. Few enterprises software vendors build their application in SaaS for additional course of revenue to gain an additional advantage
2) *Platform as a Service:* This component builds on the previous one but with an additional layer of capability that allows organizations to develop, build, and deploy their applications to support their own specific business needs.
3) *Infrastructure as a Service:* Cloud Infrastructure as a Service (IaaS), are self-service models for accessing, monitoring, and managing remote data centers, such as computers (virtualized or bare metal), storage, networking, processor, gaming module. Instead of purchase the hardware outright, users can purchase IaaS based on consumption, similar to electricity or other utility billing.

II. PLATFORM AS A SERVICE (PAAS) IN THE CONTEXT OF CLOUD COMPUTING

Platform as a Service is a cloud computing model that offers on-demand service of virtual resources, scalable, and elastic pool of cloud Services. A defined interface helps users to access resources like data storage, networks, operating systems, software, and other applications. The best example of PaaS is Google App. Google App engine helps the developer to write and run their applications on the platform, apart from execution it also provides storage and manage the server. In figure 3 the general architecture of PaaS shows how PaaS operates at the core level.

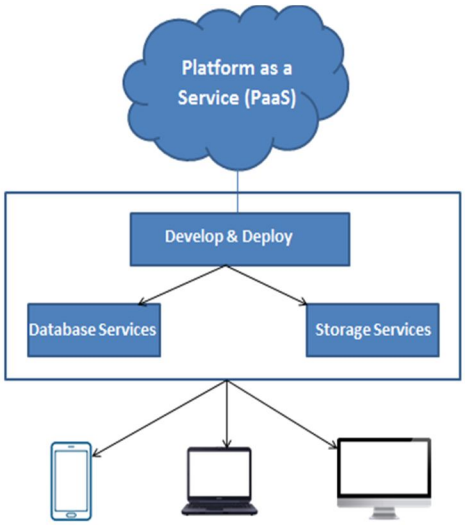


Fig.3: General Architecture of PaaS

PaaS offers Operating System, Server-side scripting environment, database management system, server software, support, storage, network access, Tools for design and development, hosting.

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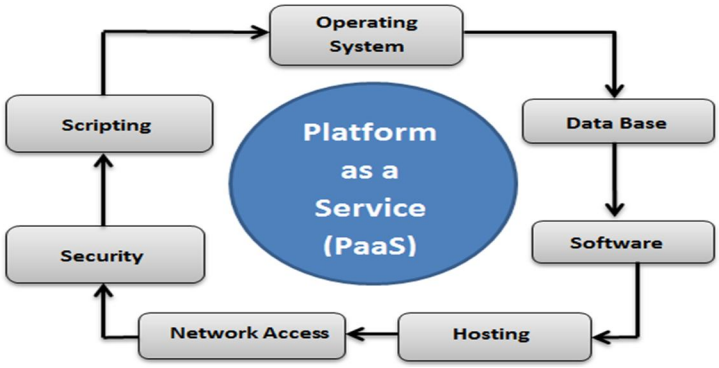


Fig.4: key features of cloud PaaS

A. Key Features of PaaS

1) PaaS is a platform to build and deploy the application – E.g., decide the size of the VM, where they are located, etc.
2) PaaS supports different programming language: PHP, Java, Ruby
3) Web-based console to create a web application
4) Developers can use IDE to develop the application and use either an SDK or CLI to deploy the application
5) Main players: – Google's app engine, OpenShift, Windows Azure, and many more [5]

B. Types of PaaS

1) *Standalone Application Platforms:* Standalone application provides tools for designing and deploying software. It also provides computing resources and services needed for hosting applications.
2) *Social Application Development Platforms:* The Platform helps to develop add-on applications for social websites such as Google+ and Facebook, It provides integrated API with social websites, PaaS can be extended to SaaS platforms. Some service allows using the application through API for instance YouTube and Twitter.
3) *Open-computing Platforms:* Platform as a Services support open-source tool, as mentioned it supports numerous languages, the share of the operating system, database, storage, network access, and other tools. Flickr is an example of photo storage that allows you to store your photos in one location and it is delivered as a PaaS. According to other authors Social application, Web application, Business application, Computing Platforms will also come under the type of PaaS.

C. PaaS Characteristics

1) It is integrated with web services, database, vendor lock-in, built-in scalability of deployment software.
2) PaaS is Multi-tenant architecture
3) creating and deploying applications
4) Simplifies prototyping and deploying startup solutions
5) Pay as you use
6) It provides tools to handle billing and subscription management
7) Builds on virtualization technology, so that resources can easily be scaled up and down as your business changes.

D. Key Benefits of building apps with a PaaS

1) *Data Agility:* Developers develop an application using solutions with a reliable database in PaaS and it is easy to integrate with data, allow for the creation of data-centric apps. The frameworks put a heavy focus on data, it is easy for low –code developers which enables developers to build an application.
2) *Enterprise Cloud Services:* The developer needs Integration, security, authentication, and other API's add on to develop the project.
3) *Support for any Device:* PaaS supports many frameworks to deploy the application it benefits of using a single all-purpose development framework. In the business, world developers need a cross-platform solution that can be used to build web applications, support for both desktop and mobile devices.

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4) *Declarative App Building Tools:* PaaS enables non-coders to develop high-quality applications within a short period. Force.com is an advanced and user friendly that is drag-and-drop tools. A developer can control the application GUI sing Mouse controllers, selecting and adding elements to their application templates with one click.
5) *Flexibility and Scale:* Force.com cloud platform provides flexible, open, and scalable to developers to use PaaS, The application framework includes Java, HTML5, Ruby, PHP, CSS, and other applications. Additionally, the framework includes built-in services for testing, analytics, and deploying the applications.

III. PAAS LIMITATIONS AND CONCERNS

1) *Data Security:* Using PaaS solutions organizers can run their applications and service, the data stored in third-party, is controlled in cloud servers which pose towards security concern. Based on Hosting policies, customers can deploy services.
2) *Integrations:* As the usage of application increases and the complexity of connecting the data stored onsite centers will also increase. Separate legacy IT system is built for the cloud, integration with existing services.
3) *Vendor Lock-in:* Once the customer builds his business on the PaaS platform companies business and technical requirements drive the decision for a specific pass solution, the same may not be applied in the future. If the customer has not provisioned convenient migration policies, switching to alternative PaaS options may not be possible without affecting the present business.
4) *Customization of the Legacy System:* Some PaaS platforms may not provide plug-and-play solutions.

A. *Operational Limitations*

1) *PaaS solution platform tends to limited capabilities for end-users. Pros of the PaaS platform are*
a) Deployment of the app is easy and faster
b) Scalable
c) Pay-as-you-use policy
2) *Cons of PaaS*
a) No control over the infrastructure
b) It's difficult to migrate large applications
c) Code may not be adopted, partially the code has to be rewritten

IV. PAAS EXAMPLE: FORCE.COM

Force.com is the world's first platform for the platform as a service (PaaS) which is provided by Salesforce.com. It allows developers to design, develop, and deploy their applications on the cloud. Force.com is new knowledge in cloud computing which is convenient for many companies for their ideas to deploy the application in record time. Force.com platform is an optimized driven architecture that is remarkable in performance, customized, scalable, secure, and on-demand service. In Force.com a developer will get all necessary applications to develop their project. In the force.com platform, the software is stored in.
In the form of metadata, the engine can use and generate the virtual application components at a run time. For example, if the developer needs reports, workflows, business logic, or data tables such data/tools are customized and stored in metadata, developers use such tools through the virtual application while execution. Metadata is a key ingredient in force.com.

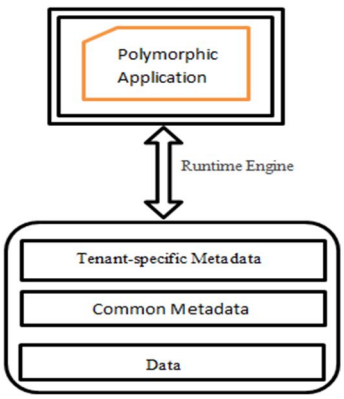


Fig. 5 key ingredient in force.com

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A metadata-driven application had a clear separation between the runtime engine, data, common application metadata, and tenant-specific metadata. In force.com developer scan, create applications and websites through Cloud IDE, and deploy them to force.com. It is a social and mobile app development platform on the cloud.

A. Architecture of Force.com

The following architecture is a basic representation of Force.com

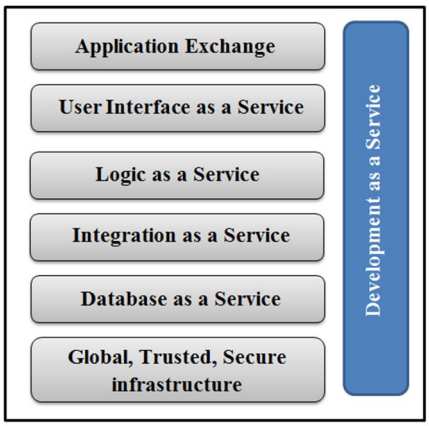


Fig.6: Infrastructure- Represent servers and data centers

1) *Database:* Both business data and metadata
2) *Application Logic:* Logic of workflow, algorithm, It is the application-specific coordination of domain and infrastructure components according to the requirements of that particular application.
3) *Controller:* It controls the flow of application execution. It is Responsible for returning a response to the request made to an application.
4) *APIs:* External programmatic access. To make client-side web service calls through javascript represented in the view.
5) *Views:* Components for defining the user interface of the application.

B. Force.com Platform Stack

Force.com platform is mainstreamed with development stack, Metadata architecture. Platform Stack includes Views, Controller, Application logic, Database, Infrastructure, API.

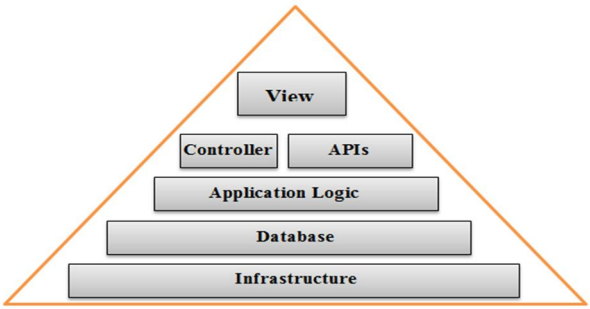


Fig.7: Platform Stack of Force.com

1) *Views:* It includes Apps, Lists, Languages (HTML, Javascript, AJEX). It defines the user interface
2) *Controllers:* declaration Standards, programming layout. It is responsible for returning a response to the request made by an application.
3) *Application Logic:* Flow of validation, SOAP messaging.
4) *Database:* Relationship and constraints, Documents/Reports, Transaction, Relational business database. The database used for both business data and Metadata
5) *API's :* Application program Interface (API's) include APEX web services SOAP, REST, Metadata API and etc.
6) *Infrastructure:* Data centers with security.

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C. Development stack

1) *Services Stack:* It provides Memory management, Metadata Synchronization, Messaging, Notification service like Email and outbound messages, Multi-Featured sales, and Service Cloud CRM
2) *Architectural Stack:* It is top of the stack, the architectural stack is scalable, easy for adding additional service
3) *Core Components of force.com:* Multi-tenancy, Meta Data, Polyglot Persistence
4) *Multi-tenancy:* IT resources like database, Networking, Server.
5) *Polyglot Persistence:* Transaction details, meta caching, full-text multilingual search engine
6) *Meta-data:* The kernel present in Multi-tenant application separate tenants into 2 forms first is the run time engine and Second is the Metadata of Tenant.

D. Multitenant Architecture.

1) Metadata has driven development model.
2) Force platform Web Services API.
3) APEX.
4) Visual force.
5) Force.com platform sites.
6) App Exchange directory.

E. Advantage of Force.com

a) It is faster and more active development.
b) Easier to obtain started
c) Simple and less expensive
d) Conceived with the future of the web in mind

Force.com is the best platform for PaaS and it is free for developers. Force.com is priced primarily by the usage of storage and the number of unique users.

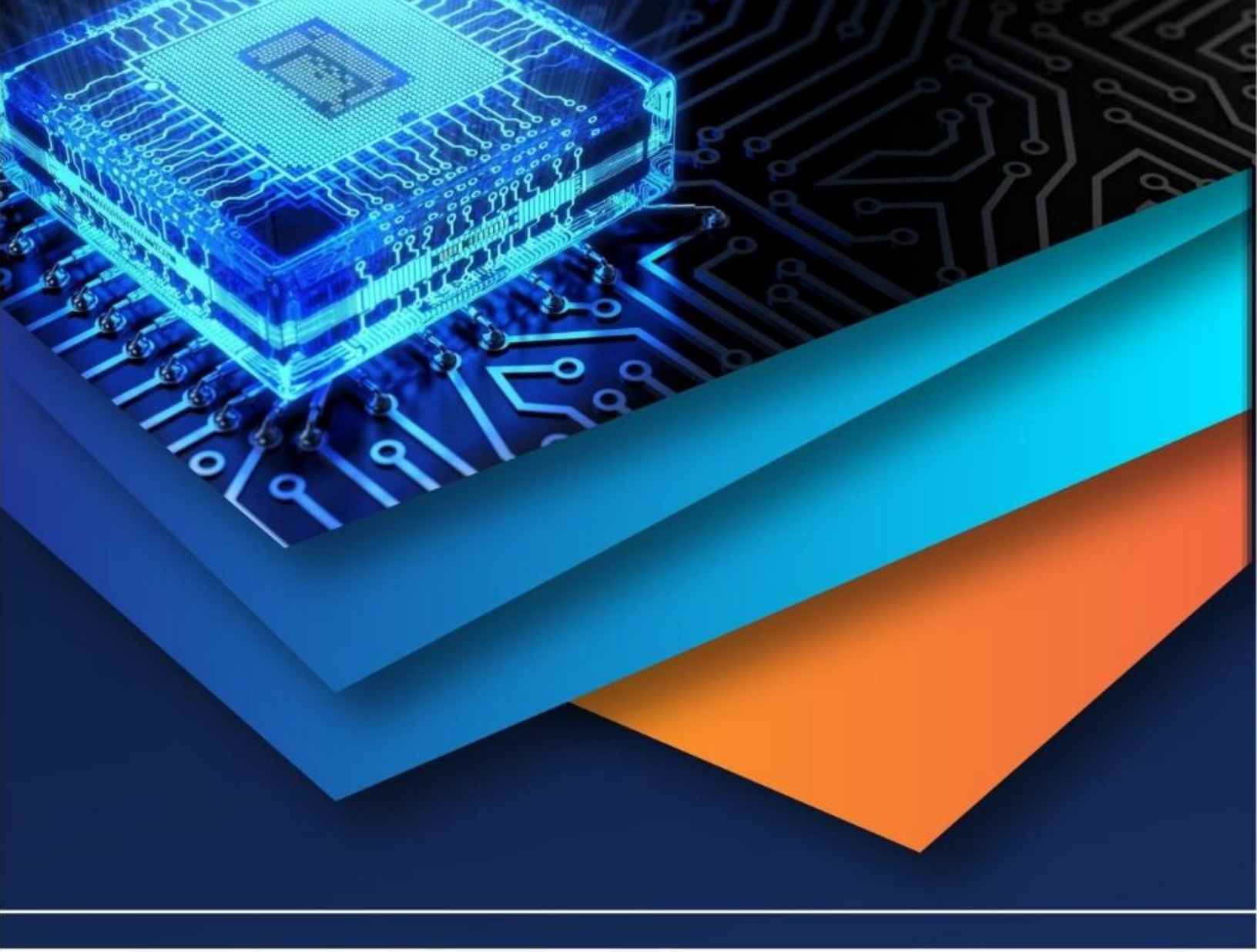
V. CONCLUSION

Platform as a Service (PaaS) is a domain for developers to host, create, store, and run their applications and it helps the developer to improve their productivity. It helps customers to focus on applications without any issues. Platform-as-a-Service is an on-demand cloud service. One of the Best company offering PaaS is Force.com it contains virtual software access via the cloud for building an application as compared to other PaaS platform Force.com is Cost-Effective, secured, pay-as-you-use, on-demand, Underlying Frameworks**,** support for custom pages using VF, JS, CSS, etc. the main target audience for force.com are developers, once they register they will easy access to all the objects. Developers will get a great experience while using the Force.com platform.

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