CE644 Cloud Computing and Applications

Cloud Types- IaaS, PaaS, SaaS

- IaaS: Compute, Network and Storage

- **Cloud provider is Exempted** from maintaining data center or infrastructure.
- **End user are responsible** for managing applications that are running on top of the service provider cloud.
- End user access IaaS using CLI or API
- Examples: AWS, Google Compute Engine, OpenStack and Eucalyptus.

- PaaS: Development platform.

- Programmers develop and deploy the applications.
- **Developer is exempted** from managing the development platform and the underlying infrastructure.
- **Developers are responsible** for managing the deployed application & configuring the developed environment.
- Developers access PaaS using CLI, UI and IDE
- Examples: Google App Engine, Force.com, Red Hat OpenShift, Heroku, and Engine Yard.

IT evolution leading to the cloud

- Mainframe Computers.
- IBM PC 1981
- Commercialisation of web in 1995.
- ISP’s – Reduced cost, Less server administration, Less hardware purchase and maintenance, High system uptime, Potential scalability.
- Servers

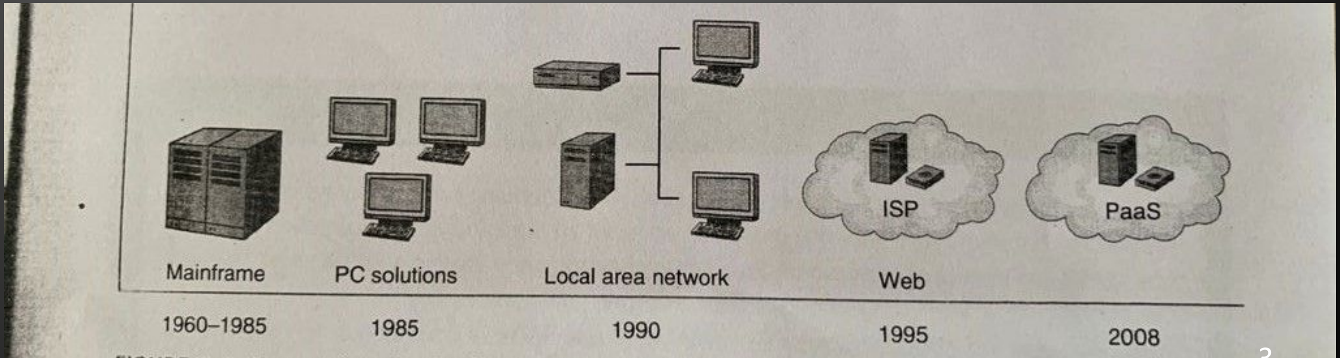

FIGURE 3-6 The evolution of technology leading to cloud PaaS solutions.

PaaS - Platform as a Service

- PaaS changes the application development from local machine to online.
- PaaS providers provide the development PaaS from the data center.
- The developers can consume the services over the Internet as shown in Figure.

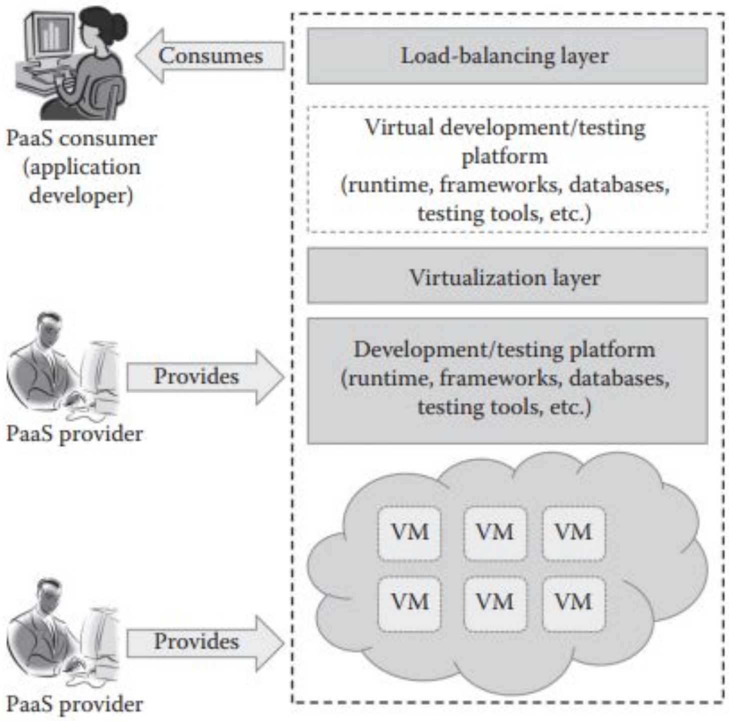
Consumes
Load-balancing layer
PaaS consumer (application developer)
Virtual development/testing platform (runtime, frameworks, databases, testing tools, etc.)
Virtualization layer
Provides
Development/testing platform (runtime, frameworks, databases, testing tools, etc.)
PaaS provider
VM
VM
VM
VM
VM
VM
Provides
PaaS provider

FIGURE 5.6
Overview of PaaS.

PaaS Provides Services such as:

- Programming languages: provided to developers to develop applications. Eg. Java, Perl, PHP, Python, Ruby, Scala, Clojure, and Go
- Application frameworks: Simplify the application development. Eg. Node.js, Rails, Drupal, Joomla, WordPress, Django, EE6, Spring, Play, Sinatra, Rack, and Zend.
- Database: Eg. ClearDB, PostgreSQL, Cloudant, Membase, MongoDB, and Redis.
- Other tools: All tools that are required to develop, test, and deploy an application.

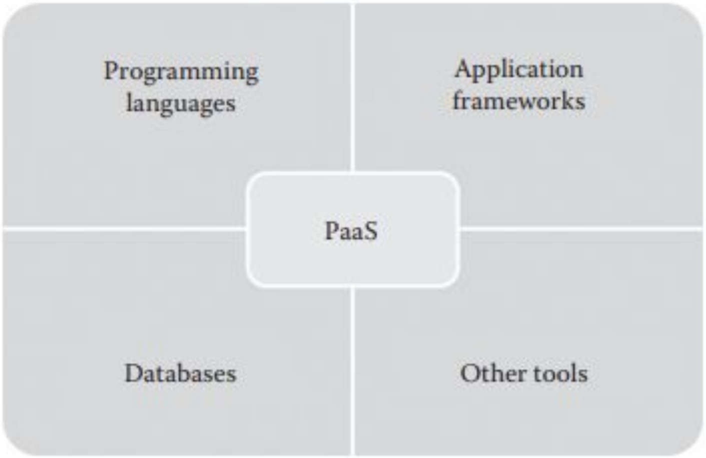

FIGURE 5.7
Services provided by PaaS providers.

Characteristics of PaaS

1. All in one: Most of the PaaS providers offer services to **develop, test, deploy, host, and maintain applications** in the same IDE. Additionally, many service providers provide **all the programming languages, frameworks, databases, and other development-related services** that make developers choose from a wide variety of development platforms
2. Web access to the development platform: PaaS provides web access to the development platform. Using web **UI**, any developer can get access to the development platform. The web-based UI helps the developers **create, modify, test, and deploy** different applications on the same platform.
3. Offline access: Some of the PaaS providers allow the developer to **synchronize their local IDE with the PaaS services**. The developers can develop an application locally and deploy it online whenever they are connected to the Internet.

4. Built-in scalability: PaaS services provide built-in scalability to an application that is developed using any particular PaaS. This ensures that the application is capable of handling varying loads efficiently

5. Collaborative platform: Most of the PaaS services provide support for collaborative development. To enable collaboration among developers, most of the PaaS providers provide tools for project planning and communication.

6. Diverse client tools: PaaS providers provide a wide variety of client tools to help the developer. The client tools include CLI, web CLI, web UI, REST API, and IDE.

Suitability of PaaS

1. Collaborative development: PaaS services provide a collaborative development environment, it is a suitable option for applications that need collaboration among developers and other third parties to carry out the development process.
2. Automated testing and deployment: Most of the PaaS services offer automated testing and deployment capabilities. The development team needs to concentrate more on development rather than testing and deployment.
3. Time to market: PaaS services are the best option for application development that uses agile development methodologies. If the software vendor wants their application to be in the market as soon as possible, then the PaaS services are the best option for the development.

Non-Suitability of PaaS

1. Frequent application migration: The major problem with PaaS services are **vendor lock-in**. Since there are no common standards followed among PaaS providers, it is very **difficult to migrate** the application from one PaaS provider to the other.

2. Customization at the infrastructure level: It is not possible to customize the underlying infrastructure with PaaS. If the application development platform needs any configuration at the hardware level, it is not recommended to go for PaaS.

Non-Suitability of PaaS

1. Flexibility at the platform level: PaaS provides template-based applications where all the different programming languages, databases, and message queues are predefined.

2. Integration with on-premise application: Since many PaaS services use their **own proprietary technologies** to define the application stack, it may not match with the on-premise application stack. This makes the integration of application hosted in on-premise platform and PaaS platform a difficult job.

Pros and Cons of PaaS:

Pros/Advantages:

1. Quick development and deployment:Most of the PaaS services automate the testing and deployment process as soon as the developer completes the development. This speeds up application development and deployment than traditional development platforms.
2. Reduces TCO (Total Cost of Ownership): PaaS allows the developers to rent the software, development platforms, and testing tools to develop, build, and deploy the application. PaaS does not require high-end infrastructure also to develop the application, thus reducing the TCO of the development company
3. Supports agile software development: PaaS services support agile methodologies that the ISVs and other development companies are looking for.

Pros and Cons of PaaS:

Pros/Advantages:

1. Different teams can work together: PaaS services support developers from different places to work together on the same project. This is possible because of the online common development platform provided by PaaS providers.
2. Ease of use: PaaS provides a wide variety of client tools such as CLI, web CLI, web UI, APIs, and IDEs. The developers are free to choose any client tools of their choice.
3. Less maintenance overhead: overhead is eliminated by the PaaS services as the underlying infrastructure is maintained by the infrastructure providers. This gives freedom to developers to work on the application development
4. Produces scalable applications: PaaS services are providing built-in scalability to the application that is developed using the PaaS platform.

Cons/dis-advantages:

1. Vendor lock-in: PaaS vendors use the proprietary technologies that are not compatible with the other PaaS providers. The vendor lock-in problem of PaaS services does not allow the applications to be migrated from one PaaS provider to the other.
2. Security issues:When selecting the PaaS provider, the developer should review the regulatory, compliance, and security policies of the PaaS provider with their own security requirements.
3. Less flexibility: Only some of the PaaS providers allow developers to extend the PaaS tools with the **custom or new programming languages**. Still most of the PaaS providers do not provide flexibility to the developers.
4. Depends on Internet connection: Even though some of the providers allow offline access, most of the PaaS providers do not allow offline access. With slow Internet connection, the usability and efficiency of the PaaS platform do not satisfy the developer requirements

Thank you