IaaS, PaaS and SaaS

Unit objectives

After completing this unit, you should be able to:

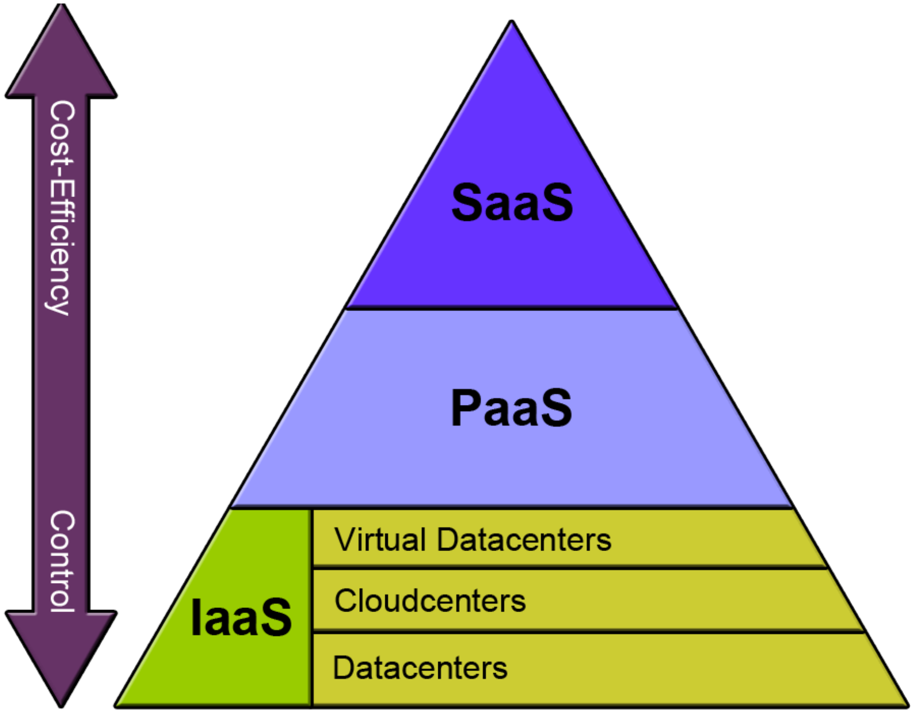
- Understand the characteristics of IaaS
- Gain knowledge on the characteristics of PaaS and the integrated lifecycle platform
- Gain an insight into the characteristics of SaaS
- Understand the different types of SaaS platform

Infrastructure as a Service (IaaS)

- The IaaS delivery model is defined around providing infrastructure hardware components as a service to the end-user.

- The infrastructure components comprise of compute time (CPU, Memory), storage or network bandwidth.

- In addition, other hardware facilities for example load balancers, high availability deployments, disaster recovery, backup hard data centre are also provided as service either service.



Characteristics of IaaS

- Characteristics of IaaS are:
  - Virtualization.
  - Cloud-bursting.
  - Multi-tenancy.
  - Resource pooling.

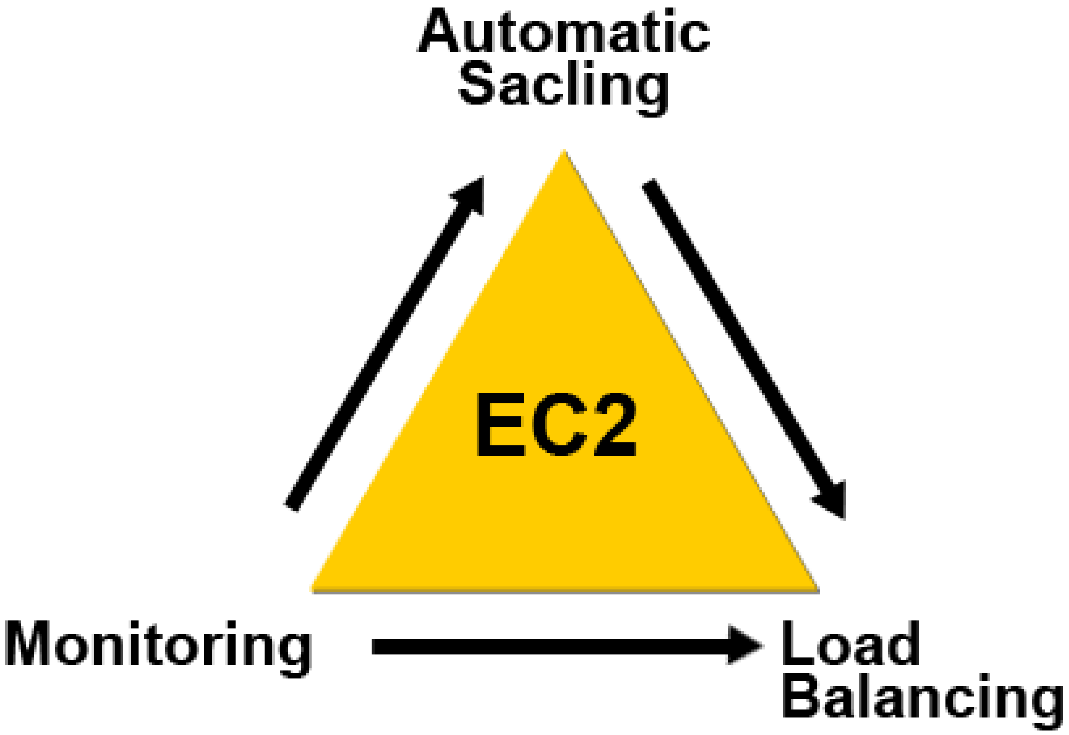
Figure: IaaS characteristics

Comparing ISPs and IaaS

- The main reasons that the companies rent external infrastructure to run their websites are:
  - Price.
  - Aggregation of resources.
  - Speed to deployment.
  - Security.

IaaS case studies

- Case study 1: Amazon EC2
- Amazon's EC2 features:
  - Operating systems.
  - Persistent storage.
  - Elastic IP addresses.
  - Amazon CloudWatch.
  - Automated scaling.
- EC2 reliability.
- Amazon's EC2 issues/problems.



IaaS enabling technology

- The capability to provide IaaS needs software which can achieve the arrangement that's being circulated.

- The following are two technologies worth sketching to:
  - App Logic from 3Tera.
  - Eucalyptus, an open source initiative.

The trusted cloud

- The trusted cloud includes services that are:
  - Crystal clear mechanism and outcome (whether it delivers a complete consumer crossing point so that you can realize how all works).
  - Capable to deliver proof that systems function as publicized (whether it absolutely encounters the facilities heights it is made-up to be circulating).
  - Secure.

Figure: Cloud security

IaaS as the best option

- IaaS is best suited:
  - Where the organization grows rapidly, and hardware escalation would be problematic.
  - Where there is pressure on the organization to limit capital expenditure and move to operational expenses.
  - For new organizations without capital investment in hardware.
  - For specific needs of the business line, test or temporary infrastructure.
  - Where demand is very volatile: Each time there are significant peaks and valleys in terms of demand in the infrastructure.

IaaS may not be the best option

- IaaS may not be suited:
  - Where the highest levels of performance are required and the infrastructure hosted on the site or dedicated can meet the needs of the organization.
  - When regulatory compliance hinders the transfer or outsourcing of data storage and processing.

PaaS: Platform as a Service

- PaaS provides a platform to its end-users to deploy and run their software applications. The application software, licenses and management of these applications is solely the responsibility of the enduser. PaaS only provides a platform or middleware to run these applications. Platform services may include the following components or more:
  - Operating system environment. For example: A Redhat Enterprise OS environment.
  - A web hosting environment with the complete stack (web server, servlet container, database etc).
  - Secure computing environments (with all the security protocols audited and compliance laws adhered to).
  - Software version control platforms. For example, GIT, SVN, CVS etc.
  - Development environments: A platform ready with all the development tools - compiler, debuggers, test scripts etc.
  - Test environment with the right configuration pre-done to suit a test run.

PaaS characteristics

- The PaaS must use the Internet to its full extent.

- These environments need a way to monitor and measure resource usage and track the overall performance of the provider platform.

- PaaS must offer some kind of development language so that professional developers (and in some cases common users) can add value.

- A PaaS environment must be compatible with the development life cycle and the team development process, including tests.

- Almost all PaaS platforms are based on a multi-tenancy architecture (which allows multiple clients to make copies separately from each other through virtualization) so that each customer's code or data is isolated from the others.

Integrated lifecycle platforms

- Combined PaaS enterprises often comprise the following:
  - Development tools.
  - A workflow engine.
  - Third-party tools and services.
  - A testing environment.
  - An ability to integrate databases.

- Two noticeable examples of combined lifecycle platforms are Google App Engine and Microsoft’s Azure.

Anchored lifecycle platforms

- Although anchored platforms have most of the same characteristics as the integrated lifecycle platform, there is a fundamental difference:
  - The most important example of a docked platform is Salesforce.com and its Force.com platform.
  - Similarly, Intuit is leveraging its QuickBooks financial software environment to create a docked platform.
  - These environments have business software integrated into the kernel.

Enabling technologies as a platform

- Other enabling technology environments (such as the RightScale) provide an integrated management platform designed for the cloud.

- Some of these features can be a specific tool. For example, although Amazon.com offers a complete IaaS platform, it also offers platform tools such as SimpleDB and Simple Query Service (SQS).

- Hyperic, a division of the spring source (an acquired VMWare), offers a cloud-based monitoring environment.

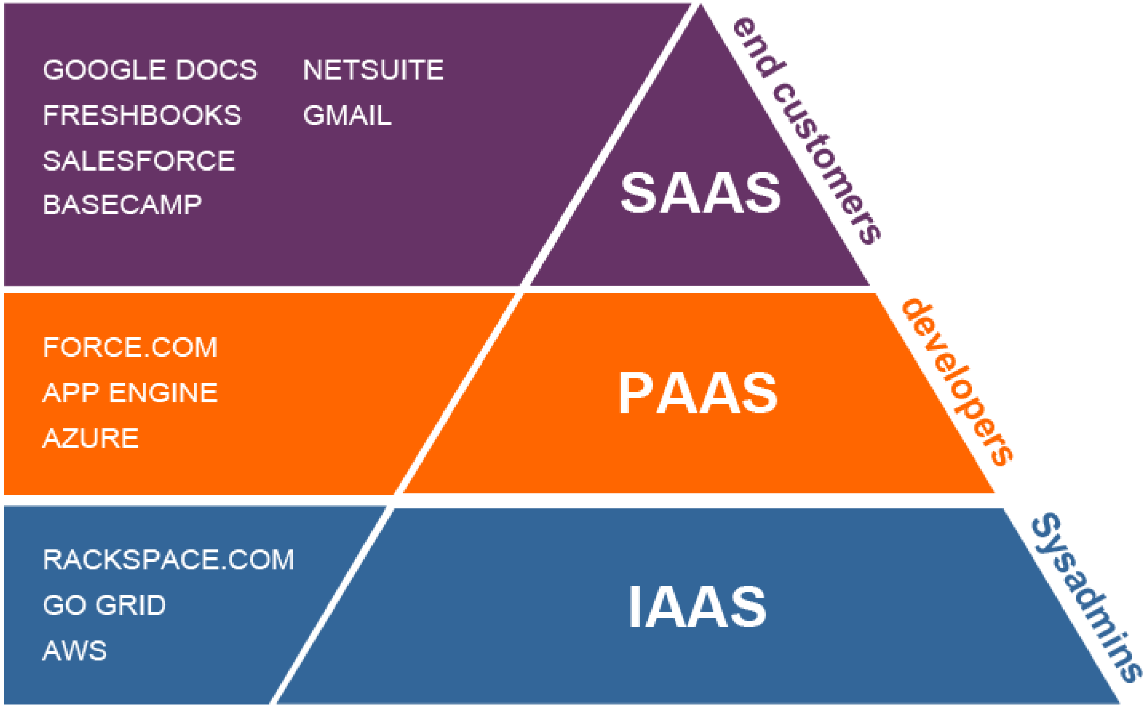
- Not all platforms in the cloud include a complete lifecycle environment. Some platforms focus on providing specialized features.

- There are also services based on tests based on social networks.

- WaveMaker allows users to customize their platform and allows developers to reuse existing code within the PaaS environment.

Case studies: Integrated lifecycle platform

- Google App engine.
- Microsoft Azure.



PaaS as the best option

- PaaS is particularly beneficial in any condition where several programmers will work on improvement projects or where other extrinsic organizations want to act with the improvement procedure.

- As the following case survey enlarge, it has been beneficial to those who have an existent information point. For example, income information from a client relationship management agency and deprivation to act applications that take advantage of the data.

- Eventually, PaaS is beneficial when programmer's lack to automate test and execution services.

- The demand of agile software evolution, a group of software development methodologies basis on repetitive and additive development, will also increase the acceptance of PaaS as it relieves the trouble surrounding the speedy improvement and looping of the software.

- Some illustration of PaaS includes Google App Engine, Microsoft Azure Services and the Force.com platform.

PaaS as may not be the best option

- We argue that PaaS will be the predominant idea to software development. The capabilities to automate processes, use prementioned elements and developing blocks and automatically implement them in a production. This will provide enough value to be highly persuasive.

- There are situations in which PaaS may not be ideal, examples include:
  - Where the software requires being extremely portable in the position of where it is hosted.
  - Where proprietary languages or approaches would impact development process.
  - Where software efficiency needs to be tailored to the fundamental hardware and software.
  - Where a patented language would hind later moved to another supplier concerns are elevated about seller lock-in.

Software as a Service (SaaS)

- Introduction:
  - SaaS provides a web/internet based, access to software applications.
  - The user is relieved of maintaining any licenses, patches for the provided software.
  - The user can use the software on a subscription basis and pay for only the duration it was used.

SaaS origin

- In one way, we can think that when the time-sharing scheme was every ruling for fewer than 30 years ago, all application was distributed to consumers as a service.

- Later after a couple of decades PCs, minicomputers and servers changed the market dynamics completely.

- The two main events united together to generate the prototype that we nowadays demand Software as a Service (SaaS):
  - Firstly, the Internet turned as a marketable stage.
  - Second, the reimbursement and complexity of the software became so hard that moving, updating and pull off the software becomes too convoluted for numerous institution to pull off. Which in turn made these companies to surround and accept the new generation of SaaS.

Evolution of SaaS: Salesforce.com's approach

- Below, list of modules is described in the Salesforce.com software environment:
  - Multi-tenancy foundation.
  - Metadata.
  - Infrastructure.
  - Database.
  - Integration.
  - Logic.
  - User interface.

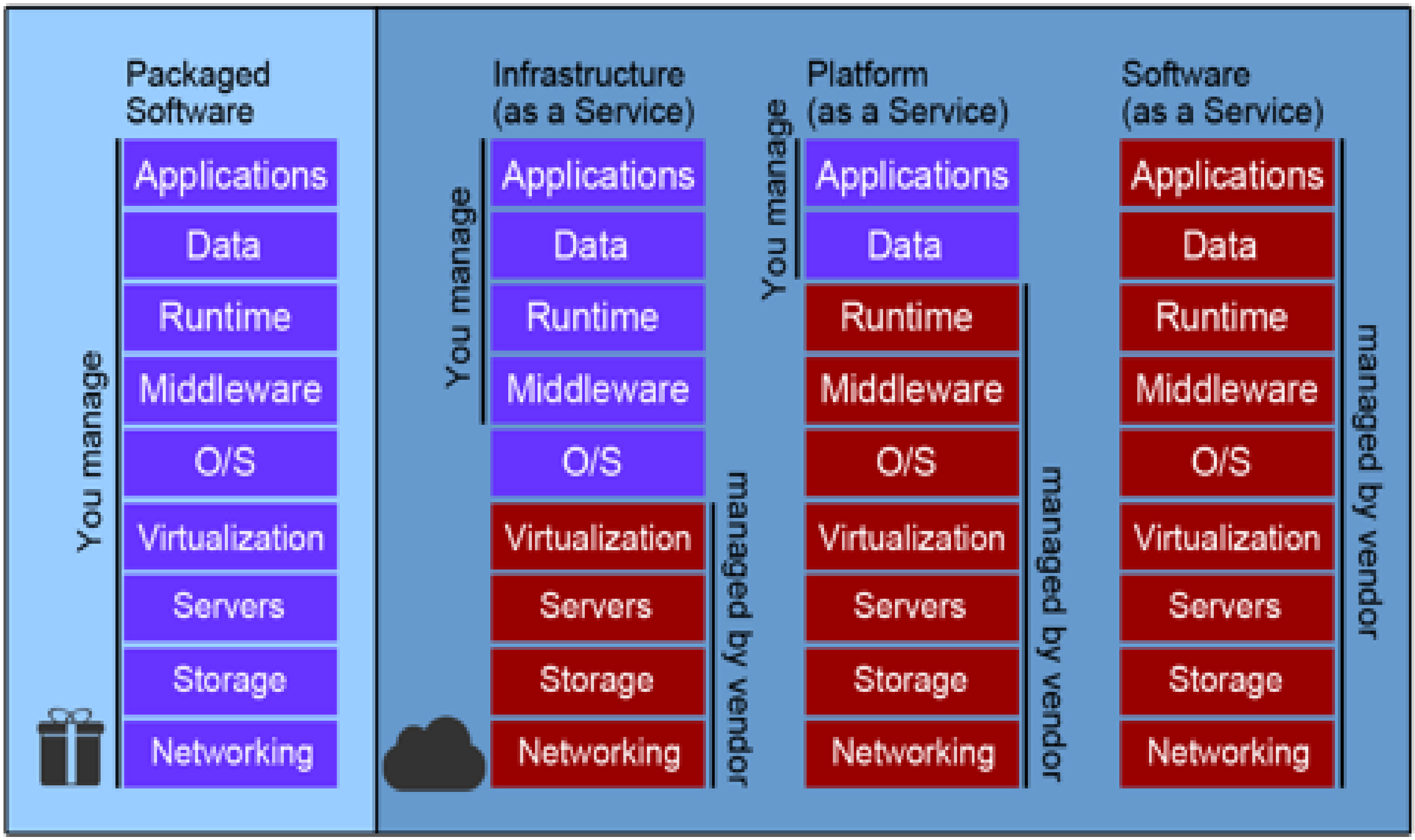


Figure: Cloud service model

Source: Microsoft Azure

Characteristics of Software as a Service (SaaS)

- SaaS application must include measuring and monitoring so that consumers can make real use.
- A SaaS application must have built-in billing service.
- Introduces information for SaaS applications and the partners' environment that requires the company to expand the reach of the customer base and market.
- The SaaS application should be quite simple so that most consumers are interested in the service.
- Advanced navigation and ease of use for SaaS applications.
- SaaS application requires modular and service-based.

SaaS economics and the ecosystem

- Thinking as a customer.

- The value of the ecosystem.

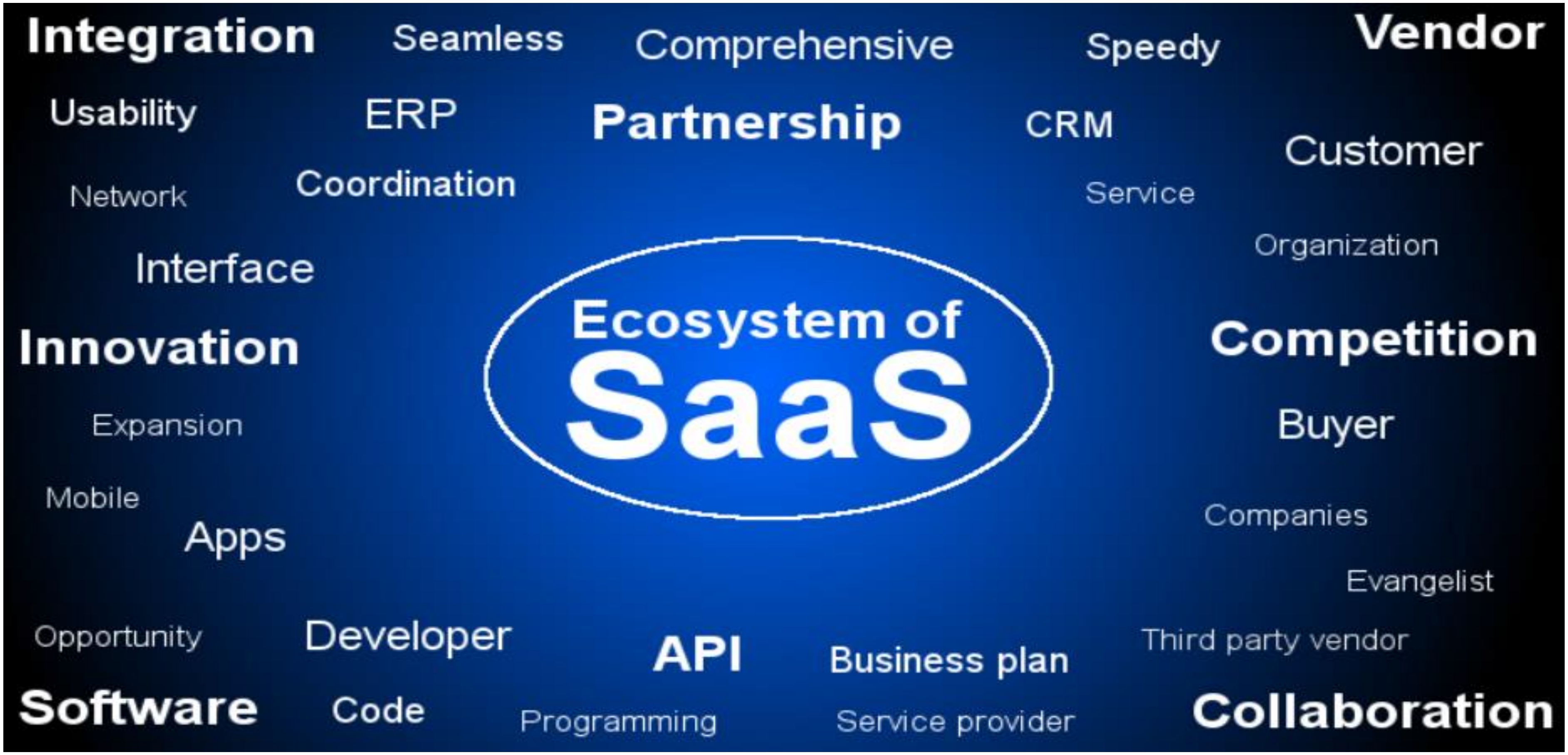
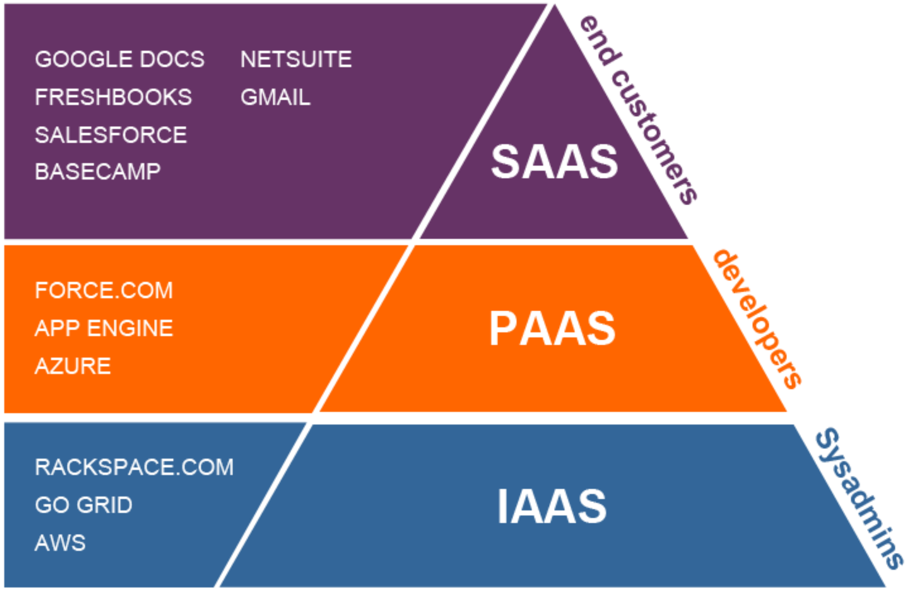


Figure: SaaS - ecosystem

Source: http://www.planmill.com/wp-content/uploads/2018/03/Understanding-ecosystem-of-SaaS1.png

Types of SaaS platforms

- The SaaS is divided into three categories:
  - Packaged software.
  - Collaborative software.
  - Enabling and management tools.



SaaS: Providers

- We learnt a lot as a case study, Salesforce.com, which created Customer Relationship Management (CRM) as a service.

- Likewise, many companies that have succeeded as software providers in their facilities are gradually entering the SaaS market and could eventually become viable competitors.

- Here are a few companies which are offering SaaS:
  - Netsuite.
  - Intuit.
  - RightNow.
  - Concur.
  - Taleo.
  - SugarCRM.
  - Webroot.
  - Atlanta technologies.
  - Citrix online.
  - Constant contact.
  - Microsoft.
  - SAP.
  - Oracle.

Collaboration as a service

- Collaboration is one of the natural SaaS markets where more companies have remote offices and workers all over the world.

- The following are few companies which are focused on collaboration as a service:
  - Lotus Live is IBM's collaborative environment.
  - Microsoft Live is Microsoft's collaborative environment.
  - Cisco Webex collaboration platform.
  - Google Apps of Google.
  - Zoho, an open source collaboration platform.
  - Citrix GoToMeeting.

Enabling and management tools as a service

- The five main different services area, namely:
  - Testing as a service.
  - Monitoring and management as a service.
  - Development as a service.
  - Security as a service.
  - Compliance and governance as a service.

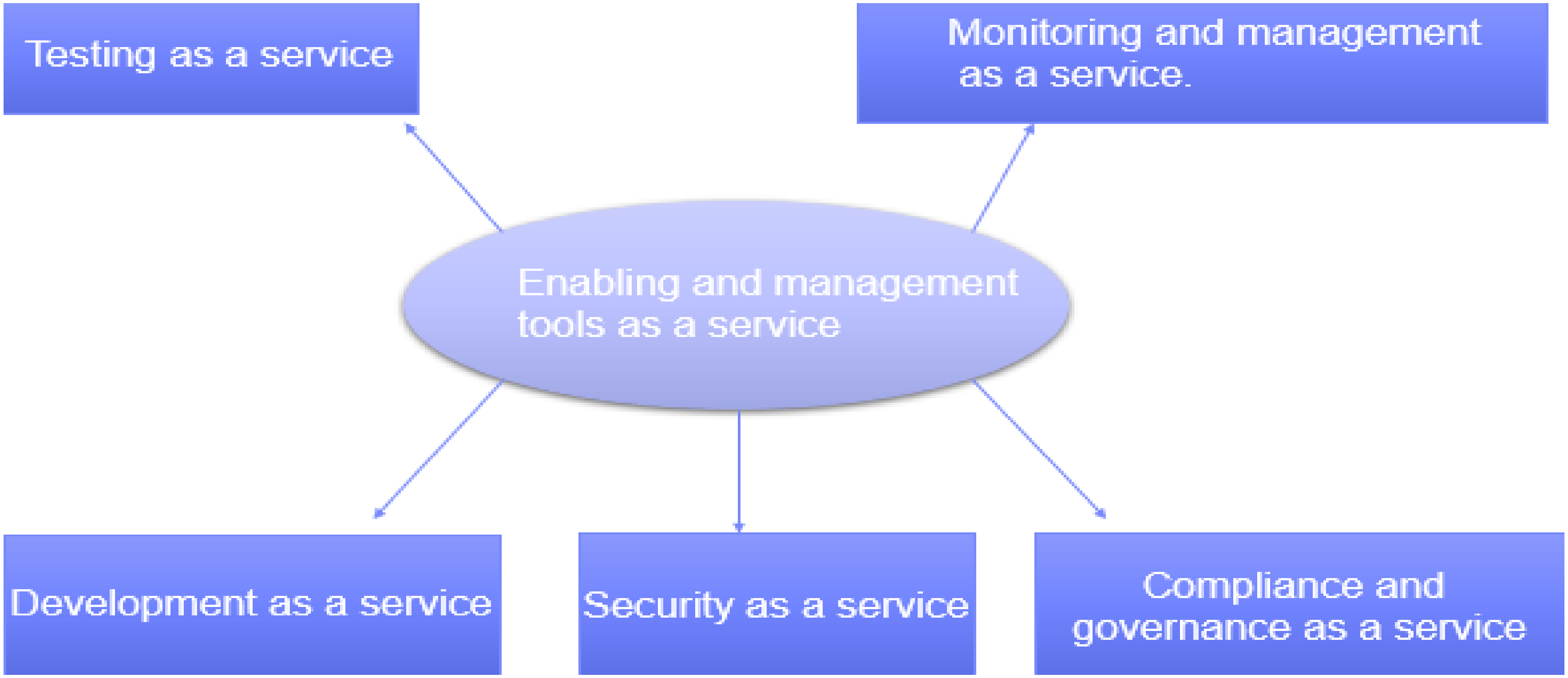

Testing as a service
Monitoring and management as a service.
Enabling and management tools as a service
Development as a service
Security as a service
Compliance and governance as a service

Figure: Enabling and management tools as a service

Monitoring and management tools as a service

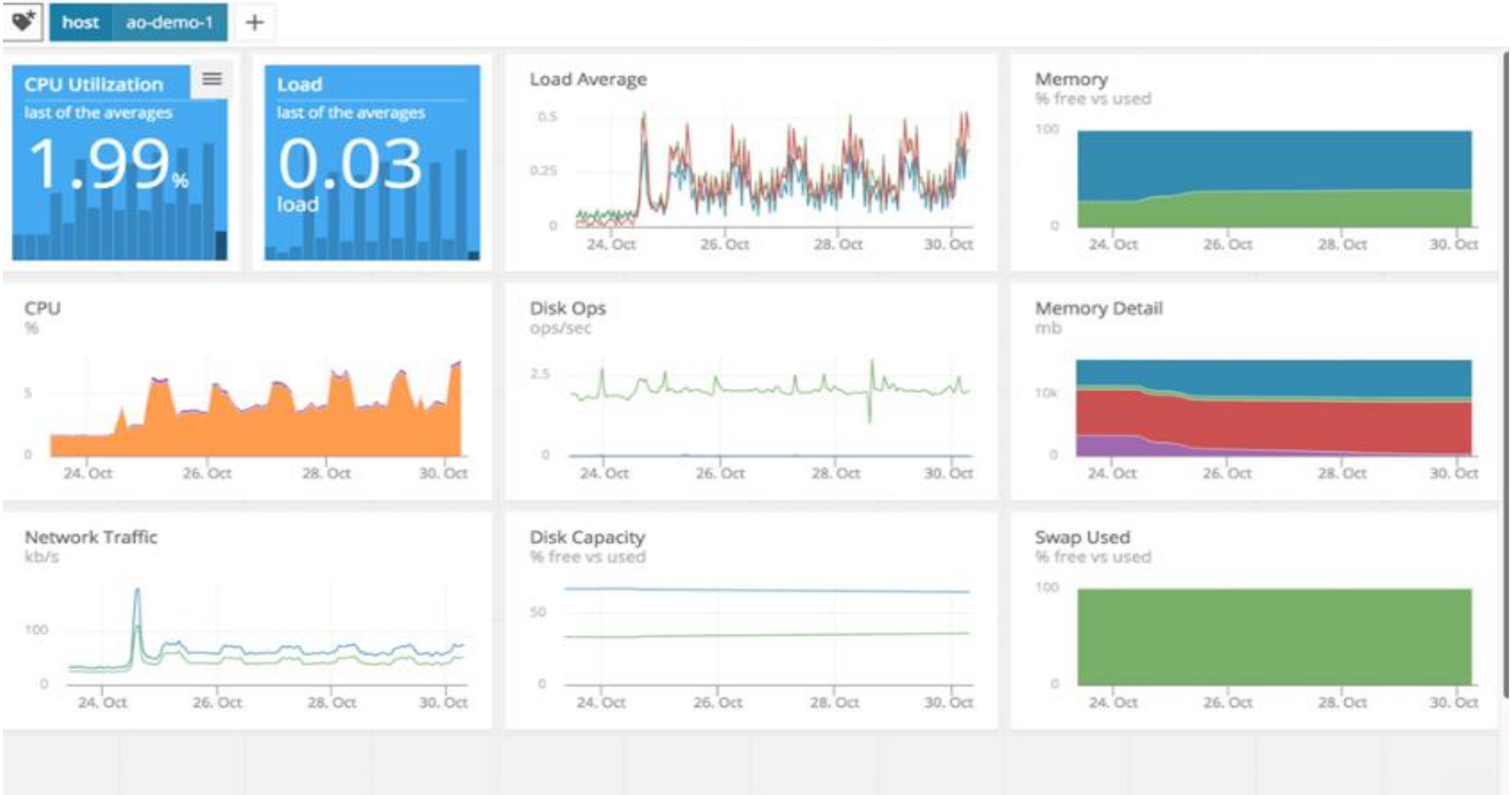


Figure: Cloud monitoring tool

Source: https://www.google.com/url?sa=i&source=images

SaaS as the best option

- The main candidate for the first movement towards SaaS:
  - "Vanilla" offers in which the solution is largely undifferentiated. A good example of a standard offer would include e-mail, in which competitors often use the same software because this fundamental technology is a requirement for doing business but does not confer a competitive advantage.
  - Applications in which there is a significant interaction between the organization and the outside world. For example, the campaign newsletter software via e-mail.
  - Applications that have a great need for web or mobile access. An example would be mobile sales management software.
  - Software that will be used only for short-term needs. An example would be collaboration software for a specific project.
  - Software where the demand increases significantly, such as billing or billing software that is used once a month.

SaaS may not be the best option

- Although SaaS is a very valuable tool, there are some situations where we believe it is not the best option for software delivery. Examples where SaaS may not be appropriate include:
  - Applications where extremely fast data processing is required in real time.
  - Applications where legislation or other regulations do not allow data to be hosted externally.
  - Applications in which an existing local solution meets all the needs of the organization.

Checkpoint (1 of 2)

Multiple choice questions

1. ___________ provides facilities as a properly combined and properly regulated stack along with its personal programming interfaces and middleware.
   a) Anchored life cycle platform
   b) Agile life cycle management
   c) Integrated life cycle management
   d) All the above
2. ____________ is one of the natural Software as a Service (SaaS) markets.
   a) Enabling
   b) Monitoring
   c) Testing
   d) Collaboration
3. If companies are using more than one _________ application, then it will be more difficult to monitor.
   a) IaaS
   b) PaaS
   c) SaaS
   d) None of the above

Checkpoint solutions (1 of 2)

Multiple choice questions

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Checkpoint (2 of 2)

Fill in the blanks:

1. Eucalyptus stands for _____________.
2. _________fills up any unutilized slack by optimizing the overall usage of the infrastructure.
3. _________ provides a platform as a service to its end-consumers to deploy and run their own software requests.
4. ________ is the collaboration environment of IBM, which consists of a set of tools that contain instant messaging.

True or false:

1. Salesforce, a product of Enterprise Relationship Planning (ERP), has presented the business world with a widely accepted SaaS. True/False
2. The PaaS layer is sub-divided into two main components – the computing platform and the middleware stack. True/False
3. SaaS application must include measuring and monitoring so that consumers can make real use. True/False

Checkpoint solutions (2 of 2)

Fill in the blanks:

1. Eucalyptus stands for **Elastic Utility Calculating Structural design for Connecting own Courses to Beneficial Structures**.
2. **Resource pooling** fills up any unutilized slack by optimizing the overall usage of the infrastructure.
3. **PaaS** provides a platform as a service to its end-consumers to deploy and run their own software requests.
4. **Lotus Live** is the collaboration environment of IBM, which consists of a set of tools that contain instant messaging.

True or false:

1. Salesforce, a product of Enterprise Relationship Planning (ERP), has presented the business world with a widely accepted SaaS. True/**False**
2. The PaaS layer is sub-divided into two main components – the computing platform and the middleware stack. **True**/False
3. SaaS application must include measuring and monitoring so that consumers can make real use. **True**/False

Question bank

Two mark questions:

1. Define resource Pool.
2. Define collaboration as a service.
3. What is SalesForce.com ecosystem?
4. Define the value of the ecosystem in SaaS?

Four mark questions:

1. Difference between integrated lifecycle platform and anchored life cycle platform.
2. What is packaged software?
3. Explain SaaS economic and ecosystems.
4. Explain the concept of Salesforce.com software environment.

Eight mark questions:

1. Explain characteristics of IaaS.
2. Explain different types of SaaS platform with example.

Unit summary

Having completed this unit, you should be able to:

- Understand the characteristics of IaaS
- Explain the characteristics of PaaS and the integrated lifecycle platform
- Describe the characteristics of SaaS
- Identify the different types of SaaS platform