Unit-V

Syllabus: Cloud Service Providers(CSPs)

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  - Google App Engine
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Cloud Service Providers(CSP)

- you will get
  - Know about different companies that support cloud computing
  - Understand open source/proprietary tools offered by the companies
  - Know cloud services offered by the companies
  - Understand the features and available architecture of different tools

- Cloud Computing is one of the most popular buzzwords used these days, and it is the upcoming technology where it provides resources to the consumers in the form of different services like s/w, infrastructure, platform and security.

- Services are made available to users on demand via the Internet from a cloud computing provider's servers as opposed to being provided from a company's own on-premise servers.

Cloud Service Providers(CSP)

- Cloud services are designed to provide easy, scalable access to applications, resources, and services and are fully managed by a cloud service provider.

- A cloud service can dynamically scale to meet the needs of its users, and because the service provider supplies the hardware and software necessary for the service, there is no need for a company to provision or deploy its own resources or allocate information technology (IT) staff to manage the service.

- Examples of cloud services include online data storage and backup solutions, web-based e-mail services, hosted office suites and document collaboration services, database processing, and managed technical support services.

Cloud Service Providers(CSP)

- Cloud services can be broadly classified into three types:
  - Software as a Service (SaaS),
  - Platform as a Service (PaaS), and
  - Infrastructure as a Service (IaaS).
  - With growing technologies, many more services are emerging in this field, such as Security as a Service (SeaaS), Knowledge as a Service, and Data Analytics as a Service.

- Many companies have come forward to adapt the cloud environment and ensure that the users as well as the companies benefit from this. Amazon, Microsoft, Google, Yahoo, EMC, Salesforce, Oracle, IBM, and many more companies provide various tools and services in order to give cloud support for their customers.

EMC

- EMC, founded in 1979 by Richard Egan and Roger Marino (the E and M of EMC)
- Dell EMC (EMC Corporation) is an American multinational corporation headquartered in United States.
- Dell EMC sells data storage, information security, virtualization, analytics, cloud computing and other products and services that enable organizations to store, manage, protect, and analyze data.
- EMC is one of the leading global enterprises that require dynamic scalability and infrastructure agility to meet changing applications as well as business needs.
- EMC chose cloud computing as the ideal solution to reduce the complexity and optimize the infrastructure.
- Offering Information Technology as a Service (ITaaS) reduces the energy consumption through resource sharing.

EMC

- Figure 1 gives an overview of the services offered by EMC

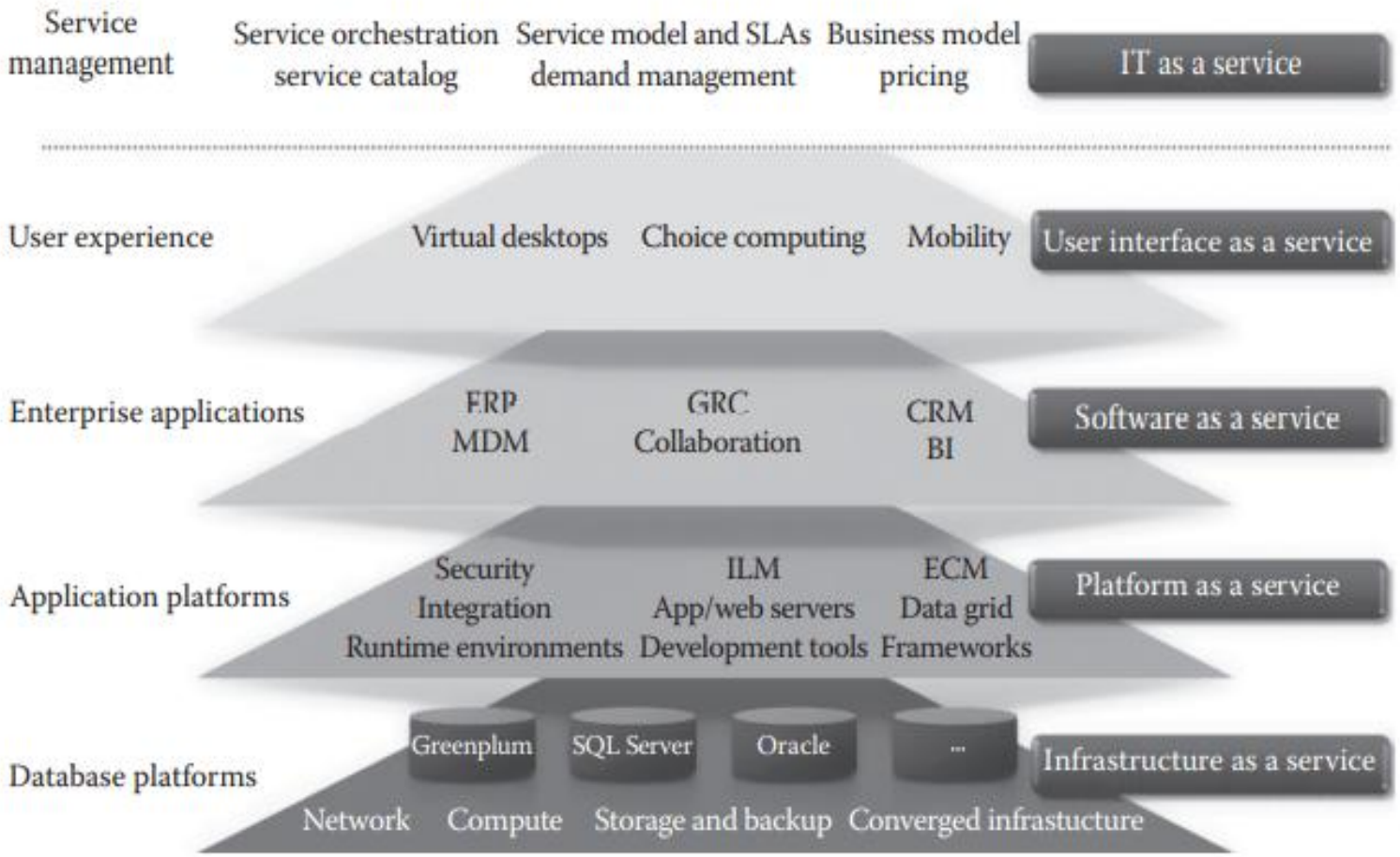


Fig1: Cloud services by EMC

EMC IT

- Virtualization is the main concept behind the success of EMC IT.
- By virtualizing the infrastructure, allocation of the resources on demand is possible. This also helps to increase efficiency and resource utilization.
- EMC IT provides its business process units with IaaS, PaaS, and SaaS.

Captiva Cloud Toolkit

- It is a easy Scan-Capture-Enablement Tool.
- EMC offers a tool called Captiva Cloud Toolkit to help in the development of software's.
- EMC Captiva Cloud Toolkit is a Software Development Kit (SDK) comprised of modules that help web application developers to quickly add scanning and imaging functionality directly to their web-based business applications.
- It is ideal for document capture vendors, commercial software developers, and enterprises that want to create custom web-based applications that are fully scan enabled, complimenting their business solution offerings.
- Using Captiva Cloud Toolkit, developers can quickly create a working scan-enabled web-based business application

Captiva Cloud Toolkit

- These are basic modules that import images from various sources like fax, e-mail, or scanner or from any repository.
- A few of these modules are as follows:
  - 1. Scan: Scanning is importing activity of documents into Captiva from a scanner. Basically, scanning happens at page level to bring images page by page into Captiva. Scanning is the entry point to Captiva where one can import any kind of document like pdf, tiff, and jpg.
  - 2. MDW: Multi Directory Watch is another entry point to Captiva. MDW can be pointed to any folder/repository from where Captiva could import documents directly.

Captiva Cloud Toolkit

- 3. IE: Image enhancement is a kind of filter or repairing tool for images that are not clear. It enhances the image quality, so it could be processed easily through Captiva. One can configure IE as per business requirement and images being received. The functionalities of IE are deskew, noise removal, etc.
  - De-skewing is a process where the computer detects and corrects the skew in an image file.
- 4. Index: Indexing is a data capturing activity in Captiva through which one can capture key data from various fields.

  For example, if bank form is being processed, the A/C no. and sort code could be the indexing field. Indexing could be added as per requirement of business. A validation field could be added to avoid unwanted data entry while indexing any document.

Captiva Cloud Toolkit

- 5. Export: Export is the exit point of Captiva where images/data are sent to various repositories like file, net, document, or data.

  The exported data are used for business requirements of various business divisions. For example, if we are capturing the A/C no. and sort code for a bank application, this could be mapped to any department where it is needed.

- 6. Multi: Multi is the last process in Captiva to delete batches that have gone through all modules and exported value successfully.

  Multi could be configured as per need of business. In the case when it is required to take a backup of batches, this module could be avoided.

Google

- Google is one among the leading cloud providers that offer secure storage of user's data.
- Google has one of the largest and most advanced networks across the globe.
- It provides

  1. cloud platform,
  2. cloud storage,
  3. cloud connect,
  4. cloud print,
  5. app engine and

many more features that are scalable, reliable, as well as secure.

1. Google Cloud Platform

- Google Cloud Platform enables developers to build, test, and deploy applications on Google's highly scalable and reliable infrastructure.

- Software infrastructures such as **MapReduce**, **BigTable**, and **Dremel** are the innovations for industrial development.

- Google Cloud Platform includes virtual machines, block storage, NoSQL datastore, and big data analytics.

- It provides a range of storage services that allow easy maintenance and quick access of user's data.

1. Google cloud platform

- The cloud platform offers a fully managed platform as well as flexible virtual machines allowing the user to choose as per the requirements.

- Google also provides easy integration of user's application within the cloud platform.

- Applications hosted on the cloud platform can automatically scale up to handle the most demanding workloads and scale down when traffic subsides.

2. Google Cloud Storage

- Google Cloud Storage is a RESTful online file storage web service for storing and accessing one's data on Google's infrastructure.

- Representational state transfer (REST) is an architectural style consisting of a coordinated set of architectural constraints applied to components, connectors, and data elements within a distributed system.

- The following are the few tools for Google Cloud Storage:

– Google Developers Console is a web application where one can perform simple storage management tasks on the Google Cloud Storage system.

– gsutil is a Python application that lets the user access Google Cloud Storage from the command line.

3. Google Cloud Connect

- Google Cloud Connect is a feature provided by Google Cloud by integrating cloud and the application programming interface (API) for Microsoft Office.

- After installing a plug-in for the Microsoft Office suite of programs, one can save files to the cloud. The cloud copy of the file becomes the master document that everyone uses.

- Google Cloud Connect assigns each file a unique URL that can be shared to let others view the document. If changes are made to the document, those changes will show up for everyone else viewing it.

- When the user uploads a document to Google Cloud Connect, the service inserts some metadata into the file. Metadata is information about other information

4. Google Cloud Print

- Google Cloud Print is a service that extends the printer's function to any device that can connect to the Internet.

- To use Google Cloud Print, the user needs to have a free Google profile, an app, a program, or a website that incorporates the Google Cloud Print feature, a cloud-ready printer or printer connected to a computer logged on to the Internet.

- When Google Cloud Print is used through an app or website, the print request goes through the Google servers. Google routes the request to the appropriate printer associated with the user's Google account.

5. Google App Engine

- Google App Engine lets the user run web applications on Google's infrastructure.
- App Engine applications are easy to build, easy to maintain, and easy to scale as traffic and data storage needs grow. With App Engine, there are no servers to maintain: Just upload the application, and it is ready to serve users.

- Figure 2 shows the different modules in Google App Engine. Integration of cloud computing services with support services and client capabilities is shown in the diagram

5. Google App Engine

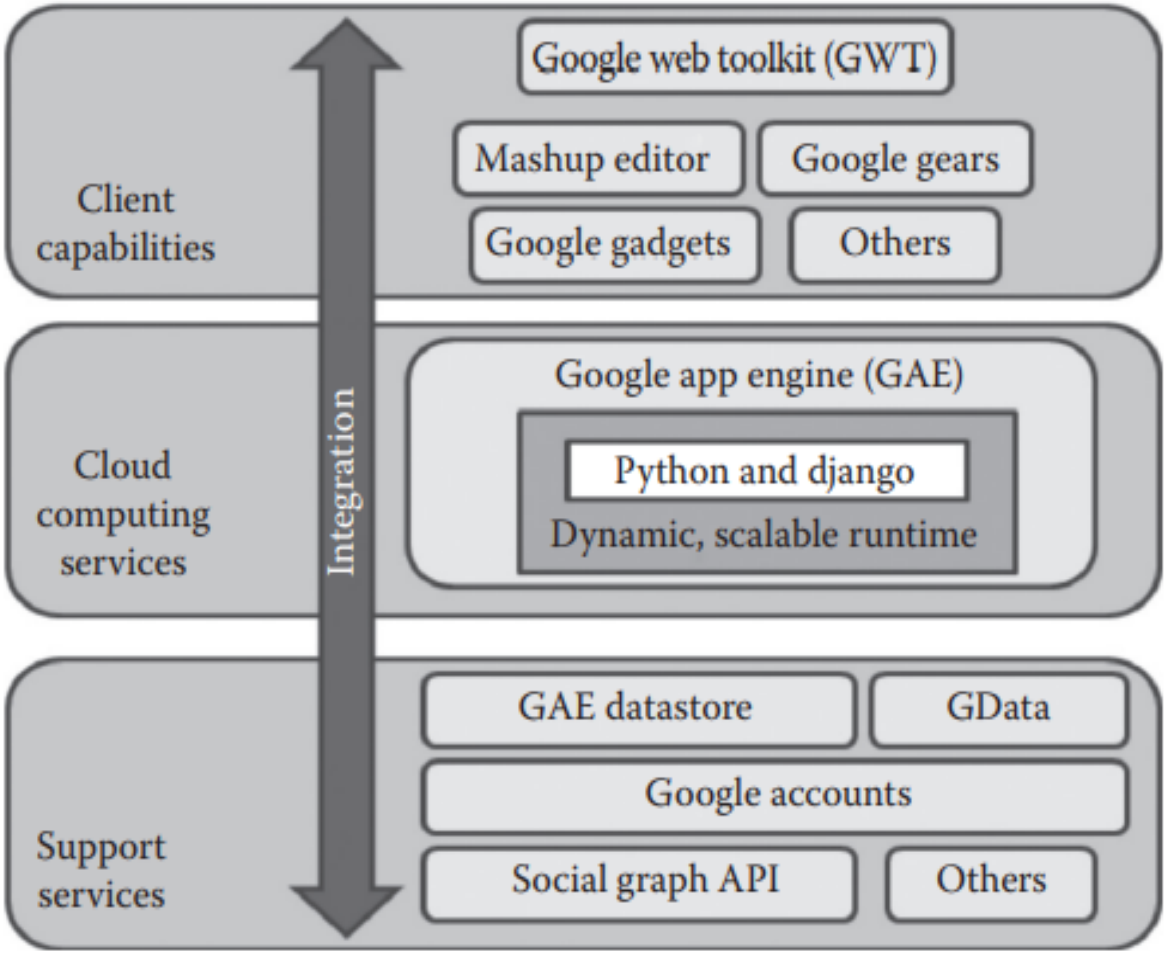


Fig2: Google App Engine

Amazon Web Services(AWS)

- Amazon Web Services (AWS) is a collection of remote computing services (also called web services) that together make up a cloud computing platform, offered over the Internet by Amazon.com.

The most central and well known of these services are

1. Amazon Elastic Compute Cloud (Amazon EC2),
2. Amazon Simple Queue Service (Amazon SQS), and
3. Amazon S3

- Amazon EC2 is a computing service, whereas Amazon SQS and Amazon S3 are support services as shown in fig.3

Amazon Web Services(AWS)

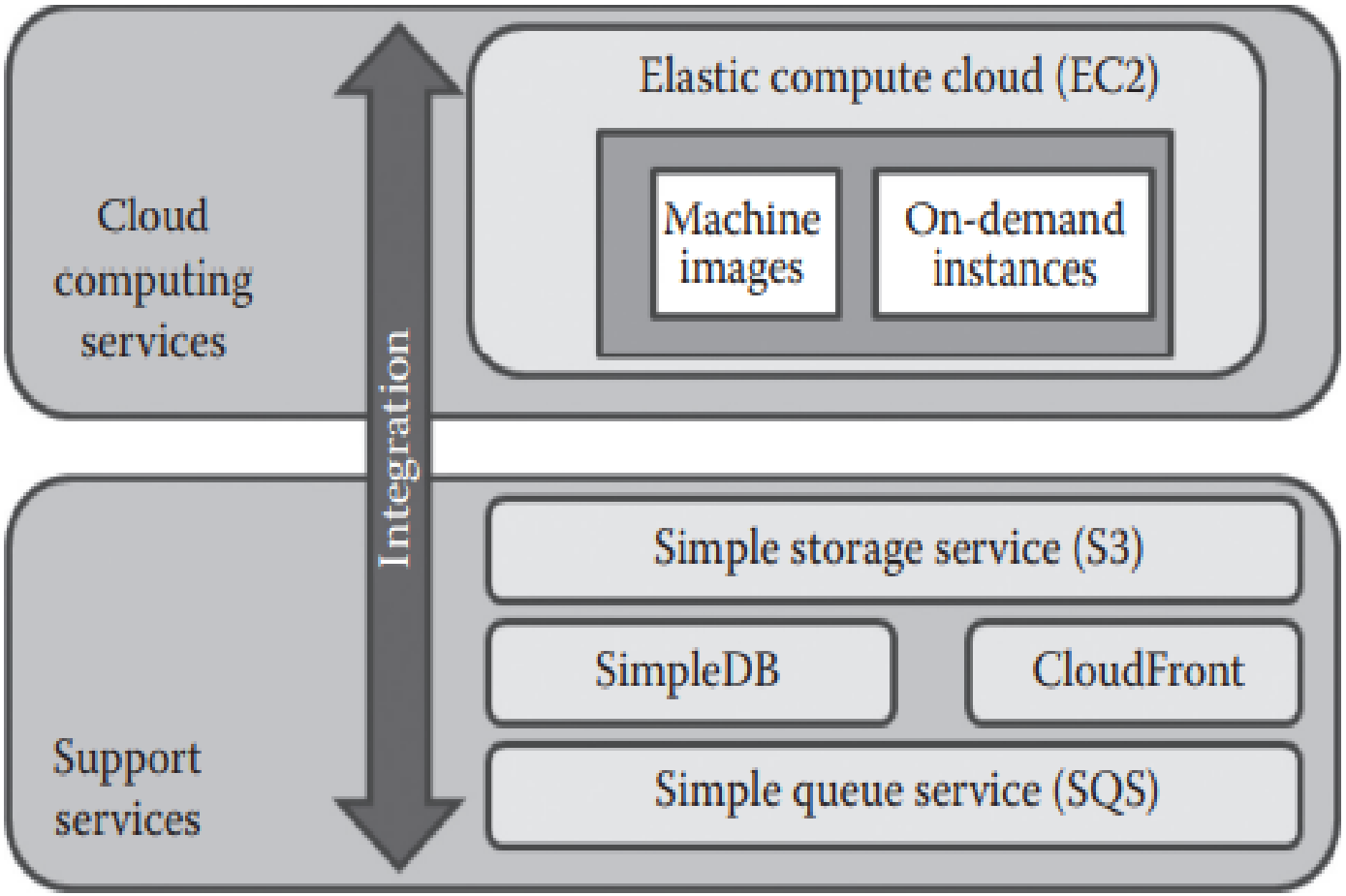


Fig3:AWS

1. Amazon Elastic Compute Cloud(EC2)

- Amazon EC2 is an IaaS offered by AWS and is the leading provider of IaaS in the current market. Powered by a huge infrastructure that the company has built to run its retail business.

- Amazon EC2 provides a true virtual computing environment. By providing a variety of virtual machine or instance types, operating systems, and software packages to choose from, Amazon EC2 enables the user to instantiate virtual machines of his choice through a web service interface.

- The user can change the capacity and characteristics of the virtual machine by using the web service interfaces, hence named elastic.

1. Amazon Elastic Compute Cloud(EC2)

- Computing capacity is provided in the form of virtual machines or server instances by booting Amazon Machine Images (AMI), which can be instantiated by the user.

- An AMI contains all the necessary information needed to create an instance. The primary Graphical User Interface (GUI) interface is the AWS Management Console (point and click) and a web service API that supports both Simple Object Access Protocol and Query Requests.

1. Amazon Elastic Compute Cloud(EC2)

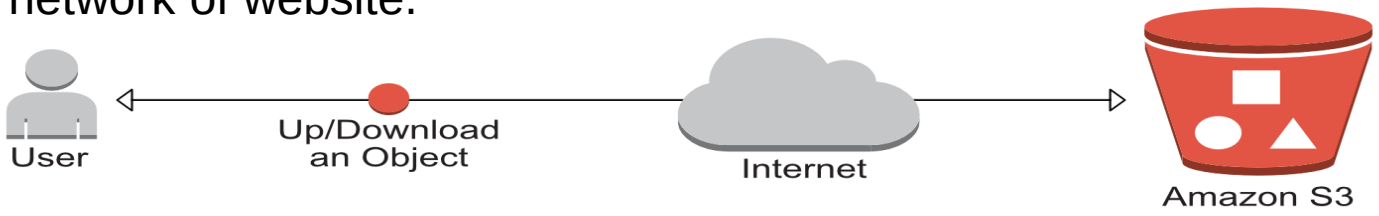
- The API provides programming libraries and resources for Java, PHP, Python, Ruby, Windows, and .Net.

- The infrastructure is virtualized by using Xen hypervisor, and different instance types are provided as follows:

    - Standard instances—suitable for most applications
    - Micro instances—suitable for low-throughput applications
    - High-memory instances—suitable for high-throughput applications
    - High-CPU instances—suitable for compute-intensive applications
    - Cluster compute instances—suitable for HPC applications

2. Amazon Simple Storage Service(S3)

- Amazon Simple Storage Service known as Amazon S3, is the storage for the Internet.
- It is designed to make web-scale computing easier for developers. Amazon S3 provides a simple web service interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web.
- It gives any developer access to the same highly scalable, reliable, secure, fast, inexpensive infrastructure that Amazon uses to run its own global network of website.



2. Amazon Simple Storage Service(S3)

- Amazon S3's Reduced Redundancy Storage (RRS) feature provides for sharing content that is either easily reproduced or where one needs to store an original copy elsewhere.

- Amazon S3 offers a scalable, secure, and highly durable solution for backup and archiving critical data.

- For data of significant size, the AWS Import/ Export feature can be used to move large amounts of data into and out of AWS with physical storage devices.

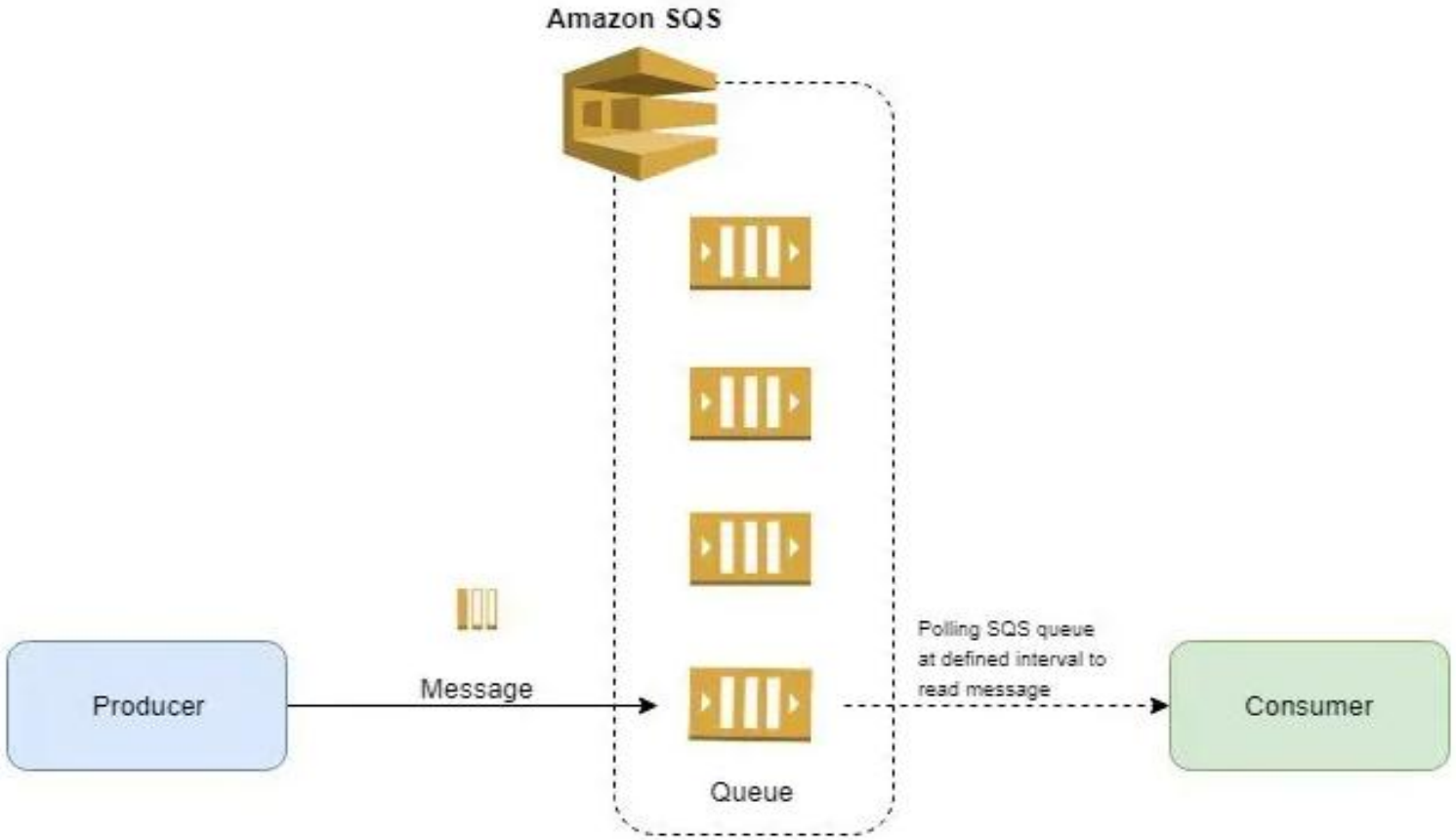
- This is ideal for moving large quantities of data for periodic backups, or quickly retrieving data for disaster recovery scenarios.

3. Amazon Simple Queue Service(SQS)

- Amazon Simple Queue Service (SQS) is a fully managed distributed message queuing service that enables you to decouple and scale microservices, distributed systems, and serverless applications.

- Asynchronous workflows have always been the primary use case for SQS. Using queues ensures one component can keep running smoothly without losing data when another component is unavailable or slow.

3.Amazon SQS-How does works?



- Amazon SQS works on the concept like any other messaging queue with minor enhancements.

- Producer creates a message and puts it into a queue. We can have multiple producers and add multiple messages to the queue at the same time – **you don't have to worry about the traffic or peaks, SQS handles that for you.**

3.Amazon SQS-Types

SQS offers two types of message queues.

Standard queues offer maximum throughput, best-effort ordering, and at-least-once delivery.

SQS FIFO queues are designed to guarantee that messages are processed exactly once, in the exact order that they are sent.

3. Amazon SQS-Features

- It is a fast, reliable, scalable, fully managed message queuing service. SQS makes it simple and cost effective to decouple the components of a cloud application.

- SQS can be used to transmit any volume of data, at any level of throughput, without losing messages.

- Amazon SQS is a distributed queue system that enables web service applications to quickly and reliably queue messages that one component in the application generates to be consumed by another component.

- A queue is a temporary repository for messages that are waiting to be processed.

3. Amazon SQS-features

- Amazon SQS offers various features like allowing multiple readers and writers at the same time, providing access control facilities, guaranteeing high availability of sending, and retrieving messages due to redundant infrastructure.

- It also gives provision for having variable length messages as well as configurable settings for each queue.

3. Amazon SQS-features

- SQS is a distributed queue and it is possible that messages won't be deleted by a consumer, the message can be received **"at least once"**.
- Once message is processed it must be deleted to prevent deduplication of messages.
- The message size is limited to 256KB (the body and all attributes).
- Messages are not retained indefinitely in the queue. By default, messages are deleted after 4 days, but you can extend this time to 14 days.
- SQS, being a distributed queue, can return messages to the consumers randomly, with no defined order.
- You can add your own identifier as a part of the message, but the approximate order is probably enough to work with in most cases.

Microsoft

- **Microsoft Corporation** is an American multinational technology corporation which produces computer software, consumer electronics, personal computers, and related services.

- Its best-known software products are the Microsoft Windows line of operating systems, the Microsoft Office suite, and the Internet Explorer and Edge web browsers

Microsoft Azure

- Microsoft Azure, formerly known as Windows Azure, is Microsoft's public cloud computing platform.
- It provides a range of cloud services, including compute, analytics, storage and networking.
- Users can pick and choose from these services to develop and scale new applications, or run existing applications in the public cloud.
- Cloud computing provides a new way of looking at IT at Microsoft called Microsoft IT (MSIT).

Microsoft Azure

- MSIT has developed a methodology and a set of the best practices for analyzing their current application portfolio for possible candidates to migrate to cloud computing.

- Microsoft Azure, often referred to as Azure is a cloud computing service operated by Microsoft for application management via Microsoft-managed data centers.

- It provides software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS) and supports many different programming languages, tools, and frameworks, including both Microsoft-specific and third-party software and systems.

Microsoft Azure

- Windows Azure Cloud Services (web and worker roles/PaaS) allow developers to easily deploy and manage application services.

- It delegates the management of underlying role instances and operating system to the Windows Azure platform.

- The Migration Assessment Tool (MAT) for Windows Azure encapsulates all the information to be aware of before attempting the application migration to Windows Azure.

Microsoft Azure

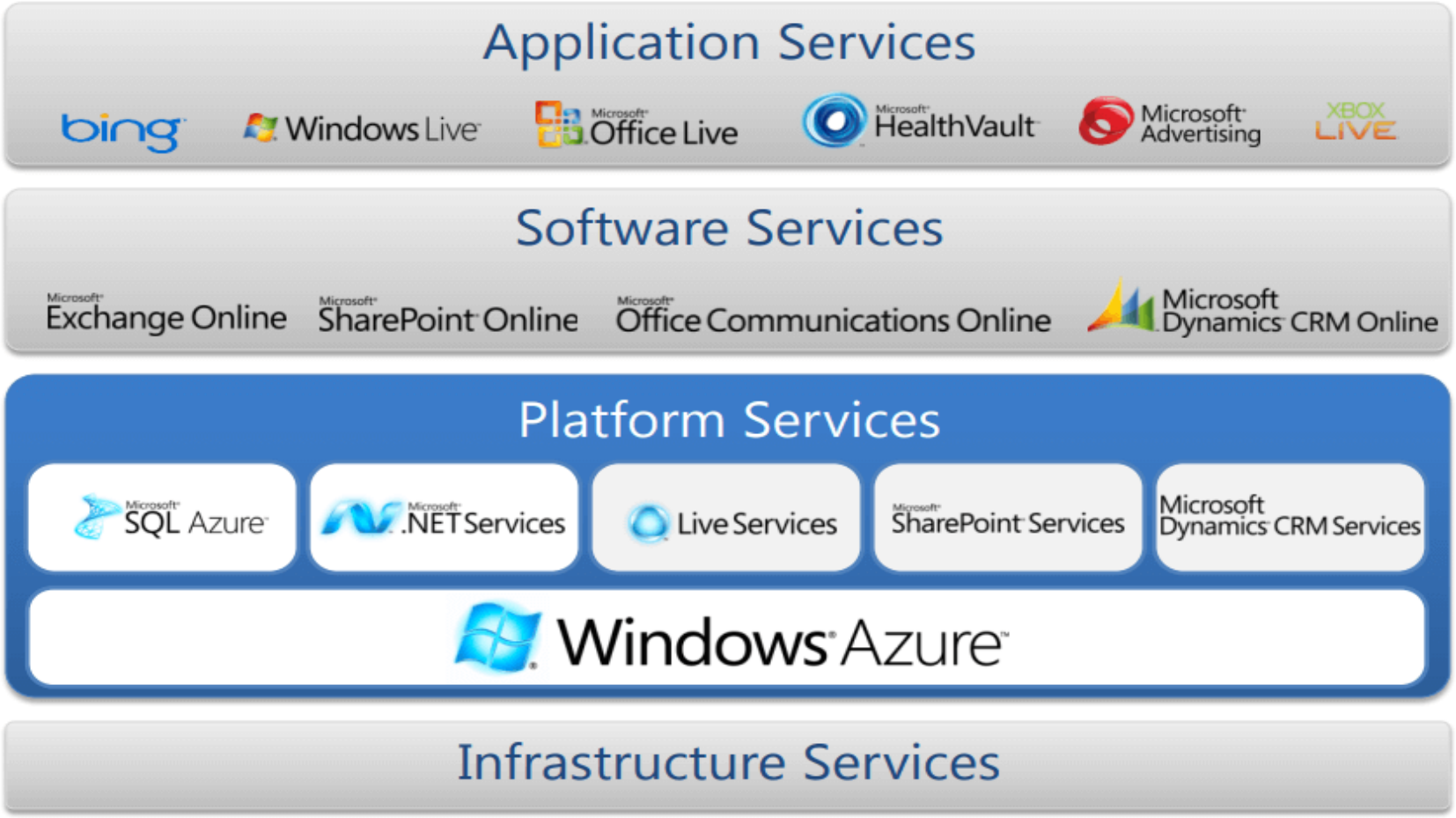
- The Windows Azure Pricing Calculator analyzes an application's potential public cloud requirements against the cost of the application's existing infrastructure.

- This tool can help to compare current operational costs for an application, against what the operating costs would be on Windows Azure and SQL Azure.

- Windows Azure Pack for Windows Server is a collection of Windows Azure technologies available to Microsoft customers at no additional cost for installation into their data center. It runs on top of Windows Server 2012

Microsoft Azure

- R2 and System Center 2012 R2 and, through the use of the Windows Azure technologies, it allows you to offer a rich, self-service, multitenant cloud, consistent with the public Windows Azure experience



Microsoft Assessment and Planning Toolkit

- The Microsoft Assessment and Planning Toolkit (MAP) is an agentless, automated, multiproduct planning and assessment tool for cloud migration.

- MAP provides detailed readiness assessment reports, executive proposals, and hardware and software information.

- It also provides recommendations to help organizations accelerate the application migration process for both private and public cloud planning assessments.

- MAP analyzes server utilization data for server virtualization and also server consolidation with Hyper-V.

- Microsoft Hyper-V, codenamed Viridian, and briefly known before its release as Windows Server Virtualization, is a native hypervisor; it can create virtual machines on x86-64 systems running Windows

SharePoint

- Microsoft offers its own online collaboration tool called SharePoint.
- SharePoint: Your mobile, intelligent intranet
- Share and manage content, knowledge, and applications to empower teamwork, quickly find information, and seamlessly collaborate across the organization.
- SharePoint empowers teamwork with dynamic and productive team sites for every project team, department, and division. Share files, data, news, and resources. Customize your site to streamline your team's work.
- Collaborate effortlessly and securely with team members inside and outside your organization, across PCs, Macs, and mobile devices.

SharePoint

- Microsoft SharePoint is a web application platform that comprises a multipurpose set of web technologies backed by a common technical infrastructure.

- By default, SharePoint has a Microsoft Office–like interface, and it is closely integrated with the Office suite. The web tools are designed to be usable by nontechnical users.

- SharePoint can be used to provide intranet portals, document and file management, collaboration, social networks, extranets, websites, enterprise search, and business intelligence.

SharePoint

- It also has system integration, process integration, and workflow automation capabilities.

- Unlike Google Cloud Connect, Microsoft SharePoint is not a free tool. But it has additional features that cannot be matched by Google or any other companies.

IBM

- International Business Machines Corporation (IBM) is an American multinational technology corporation headquartered in New York, with operations in over 171 countries.

- IBM produces and sells computer hardware, middleware and software, and provides hosting and consulting services in areas ranging from mainframe computers to nanotechnology

- IBM is one among the players in the field of cloud computing offering various cloud services to the consumers.

- IBM cloud computing consists of cloud computing solutions for enterprises as offered by the global IT company IBM.

IBM

- All offerings are designed for business use, marketed under the name IBM SmartCloud.

- IBM cloud includes IaaS, SaaS, and PaaS offered through public, private, and hybrid cloud delivery models, in addition to the components that make up those cloud.

IBM Cloud Models

- Cloud computing is the best choice for mobile software. IBM offers five different cloud provision models:

  1. Private cloud, owned and operated by the customer

  2. Private cloud, owned by the customer but operated by IBM

  3. Private cloud, owned and operated by IBM

  4. Virtual private cloud services, based on multitenant support for individual enterprises

  5. Public cloud services, based on the provision of functions to individuals

IBM SmartCloud

- IBM SmartCloud is a branded ecosystem of cloud computing products and solutions from IBM.
- It includes IaaS, SaaS, and PaaS offered through public, private, and hybrid cloud delivery models.

- IBM places these offerings under three umbrellas:

  1. SmartCloud Foundation,
  2. SmartCloud Services, and
  3. SmartCloud Solutions.

- Figure briefly explains the architecture of IBM SmartCloud.

IBM SmartCloud

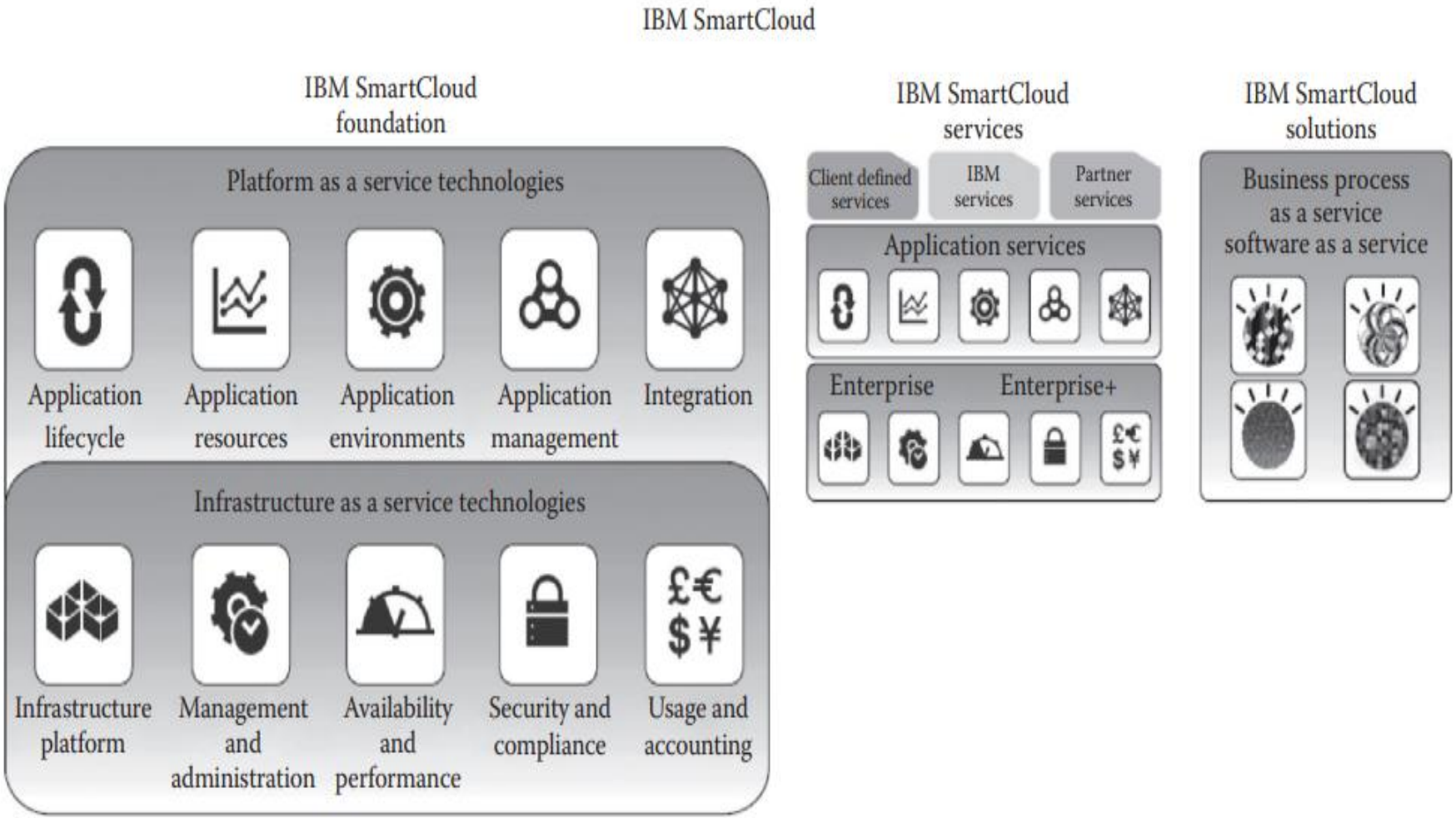


Fig : Architecture of IBM SmartCloud

SAP Lab

- Systems, Applications & Products(SAP) in Data Processing
- **SAP** is a German multinational software corporation based in Walldorf, Baden-Württemberg, that develops enterprise software to manage business operations and customer relations.
- The company is especially known for its ERP software.(Enterprise Resource Planning)
- The world's third-largest publicly-traded software company by revenue, and the largest German company by market capitalization.

SAP Lab-HANA

- SAP HANA (**High-performance ANalytic Appliance**) is an in-memory, column-oriented, relational database management system developed and marketed by SAP.
- Its primary function as the software running a database server is to store and retrieve data as requested by the applications.
- SAP Labs makes enterprise software to manage business operations and customer relations.
- SAP is the leader in the market of enterprise applications in terms of software and software-related service.
- The company's best-known software products are
  - SAP Enterprise Resource Planning(SAP ERP)
  - SAP Business Warehouse (SAP BW),
  - SAP Business Objects Software (SAP BOS)
  - Sybase mobile products and
  - in-memory computing appliance SAP HANA.

Features of SAP HANA

The main features of SAP HANA are given below −

- SAP HANA is a combination of software and hardware innovation to process huge amount of real time data.
- Based on multi core architecture in distributed system environment.
- Based on row and column type of data-storage in database.
- Used extensively in Memory Computing Engine (IMCE) to process and analyze massive amount of real time data.
- It reduces cost of ownership, increases application performance, enables new applications to run on real time environment that were not possible before.
- It is written in C++, supports and runs on only one Operating System Suse Linux Enterprise Server 11 SP1/2.

SAP HANA Cloud Platform

- The main features of SAP HANA Cloud Platform are as follows:
  - Enterprise platform built for developers
  - Native integration with SAP and non-SAP software
  - In-memory persistence
  - Secure data platform
  - Lightweight, modular runtime container for application

- SAP HANA Cloud Platform lets the users quickly build and deploy business and consumer applications that deliver critical new functionality to meet emerging business needs.

SAP HANA Cloud Platform

- SAP HANA Cloud Platform is an open-standard, Eclipse-based, modular PaaS.
- In SAP HANA Cloud Platform, applications are deployed via command-line tools to the cloud as web application archive (WAR) files or OSGi (Open Services Gateway initiative) bundles.
- OSGi bundles are normal jar components with extra manifest headers. The applications run within the Java-based SAP HANA Cloud Platform runtime environment.
- It is powered by SAP HANA and can be maintained using web-based management tools.

SAP HANA Cloud Platform

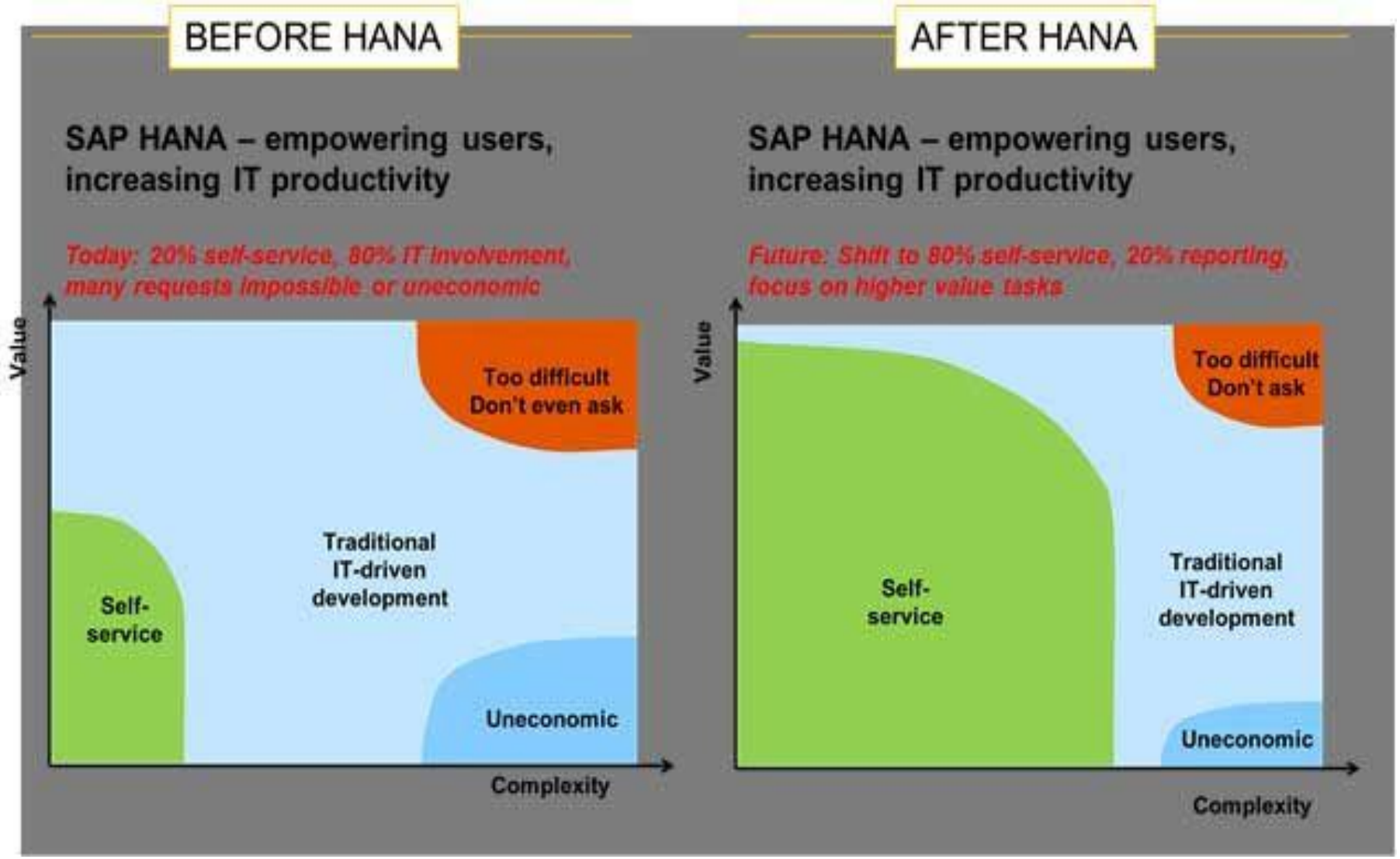
- SAP HANA is a combination of HANA Database, Data Modeling, HANA Administration and Data Provisioning in one single suite.

- SAP HANA Cloud Platform lets the users quickly build and deploy business and consumer applications that deliver critical new functionality to meet emerging business needs.

SAP HANA-Types

SAP HANA Platform Edition	SAP HANA Enterprise Edition	SAP HANA Extended Edition
It is meant for customers who prefer using ETL-based replication and have a license for SAP Business Objects Data Services.	It is meant for customers who prefer using trigger-based replication or ETL-based replication and do not have a license for SAP Business Objects Data Services.	It is meant for customers who prefer using the full potential of replication scenarios that are available as well as the log-based replication.
It integrates SAP component such as SAP HANA database, SAP HANA Studio and SAP HANA clients.	It includes data provisioning components such as SLT, BODS, DXC including core database technology	It contains data provisioning features such as Sybase more than Platform and Enterprises edition.

SAP HANA


BEFORE HANA
SAP HANA – empowering users, increasing IT productivity
Today: 20% self-service, 80% IT involvement, many requests impossible or uneconomic
Value
Too difficult
Don't even ask
Traditional
IT-driven
development
Self-
service
Uneconomic
Complexity
AFTER HANA
SAP HANA – empowering users, increasing IT productivity
Future: Shift to 80% self-service, 20% reporting, focus on higher value tasks
Value
Too difficult
Don't ask
Self-
service
Traditional
IT-driven
development
Uneconomic
Complexity

Virtualization Services Provided by SAP

- ERP(Enterprise Resource Planning) virtualization increases a project's return on investment by maximizing hardware utilization.

- The business benefits of virtualization of applications are shorter development cycles, reduction in IT costs, improved availability, and energy saving.

- A joint service from SAP and VMware helps in transition to a more open and flexible private cloud platform based on proven virtualization technology

Salesforce

- Salesforce.com is a cloud computing and social enterprise SaaS provider based in San Francisco.

- The company is best known for its Salesforce CRM product, which is composed of Sales Cloud, Service Cloud, Marketing Cloud, Force.com, Chatter, and Work.com.

- In addition to its products and platforms, Salesforce.com created AppExchange, a custom application building and sharing platform. The company also has consulting, deployment, and training services.

Sales Cloud

- Sales Cloud refers to the sales module in Salesforce.com.
- It includes Leads, Accounts, Contacts, Contracts, Opportunities, Products, Pricebooks, Quotes, and Campaigns.
- **Chatter** is a **Salesforce real-time collaboration application** that lets your users work together, talk to each other, and share information.
- **Salesforce.com** created the Sales Cloud to be as easy to use as a consumer website like Amazon and built it in the cloud to eliminate the risk and expense associated with traditional software.
- By continuing to innovate and embrace technologies like mobile, collaboration, and social intelligence, the Sales Cloud has continued to pull ahead of the competition

Service Cloud: Knowledge as a Service

- Service Cloud refers to the service (as in customer service) module in Salesforce. com.
- It includes Accounts, Contacts, Cases, and Solutions. It also encompasses features such as the public knowledge base, web-to-case, call center, and self-service portal, as well as customer service automation

- Service Cloud includes a call center–like case tracking feature and a social networking plug-in for conversation and analytics.

- The Service Cloud delivers the world's first enterprise-grade knowledge base to run entirely on an advanced, multitenant cloud platform.

- Service Cloud has to offer all the tools one needs to run the entire service operation. When the consumer's knowledge base is a core part of CRM solution, knowledge as a process can be managed.

- The Service Cloud gives the tools that are needed to manage knowledge at enterprise scale. But it also delivers the same great ease of use that Salesforce. com is known for. That means user will benefit no matter what size or how complex the business is.

Rackspace

- Rackspace Cloud, a part of Rackspace, is another player in the cloud computing market.
- Offering IaaS to clients, it has been used by a large number of enterprises.
- Rackspace Cloud offers three cloud computing solutions—Cloud Servers, Cloud Files, and Cloud Sites.

  Cloud Servers provide computational power on demand in minutes;

  Cloud Sites are for robust and scalable web hosting, and

  Cloud Files are for elastic online file storage and content delivery.

- Cloud Servers is an implementation of IaaS where the computing capacity is provided as virtual machines that run in the Cloud Servers system
- The Cloud Servers systems are virtualized using the Xen Hypervisor for Linux and Xen Server for Windows.

Rackspace

- Backup schedules can be created to define when to create server images.
- Cloud Servers can be run through the Rackspace Cloud Control Panel (GUI) or programmatically via the Cloud Server API using a RESTful interface.
- Cloud Servers scale automatically to balance load.
- Cloud Servers are provided persistent storage through RAID10 disk storage; thus, data persistency is enabled leading to better functioning.

VMware

- VMware, Inc. is an American cloud computing and virtualization technology company headquartered in California.
- VMware was the first commercially successful company to virtualize the x86 architecture.
- VMware's desktop software runs on Microsoft Windows, Linux, and macOS, while its enterprise software hypervisor for servers.
- VMware ESXi, is a bare-metal hypervisor that runs directly on server hardware without requiring an additional underlying operating system.

VMware

- VMware, a leader in virtualization technology, has come up with enterprise cloud computing solutions.

- VMware is currently providing a range of products for the development of private and public clouds and for leveraging the services offered by both as a hybrid cloud, such as VMware vCloud Director, VMware vCloud Datacenter Services, VMware vSphere, and VMware vShield

- Private clouds enable the better usage and management of internal IT infrastructure than the traditional method.

- Private clouds can be created by using the VMware vSphere and VMware vCloud Director. VMware vSphere is a robust virtualization platform used to transform IT infrastructures into virtual storage, compute, and network resources and provide them as a service within the organization.

VMware

- The VMware vCloud Director, coupled with VMware vSphere, is a software solution that enables enterprises to build secure, multitenant private clouds by pooling infrastructure resources into virtual datacenters and exposing them to users through web-based portals and programmatic interfaces as fully automated, catalog-based services

- Public and hybrid cloud solutions are provided by VMware by partnering with other companies, certified as service providers.

VMware

- VMware vCloud Director (VMware vCD) is a platform with multi-tenant support for managing software-defined data centers (SDDC) and providing infrastructure as a service (IaaS) to customers.

Manjrasoft

- Manjrasoft is one of the non-major providers of cloud services. But it has come up with a platform called Aneka that provides a set of services that help the development of applications in an easier way.

- Manjrasoft develops market oriented cloud computing platforms that allow one to build, accelerate, and manage the applications ultimately saving one's time and money, leading to enhanced business productivity and profit

Aneka Platform

- Aneka provides a set of services that make enterprise cloud construction and development of applications as easy as possible without sacrificing flexibility, scalability, reliability, and extensibility.

- The key features supported by Aneka are as follows:

- 1. A configurable and flexible execution platform (container) enabling pluggable services and security implementations. Multiple authentication/ authorization mechanisms such as role-based security and Windows domain–based authentication are considered for this purpose.

- 2. Multiple persistence options including Relational Database Management System (RDBMS), Structured Query Language (SQL) Express, MySQL, and flat files.

- 3. Software development kit (SDK) supporting multiple programming models including object-oriented thread model, task model for legacy applications, and MapReduce model for data-intensive applications.

- 4. Custom tools such as Design Explorer for parameter sweep studies.

Aneka Platform

- 5. Easy to use management tool for SLA and Quality of Service (QoS) negotiation and dynamic resource allocation.

- 6. Supports deployment of applications on private or public clouds in addition to their seamless integration

- Aneka allows servers and desktop PCs to be linked together to form a very powerful computing infrastructure. This allows companies to become energy efficient and save money without investing in a number of computers to run their complex applications.

- Each Aneka node consists of a configurable container that includes information and indexing, scheduling, execution, and storage services. Aneka supports multiple programming models, security, persistence, and communications protocols.

Aneka Platform

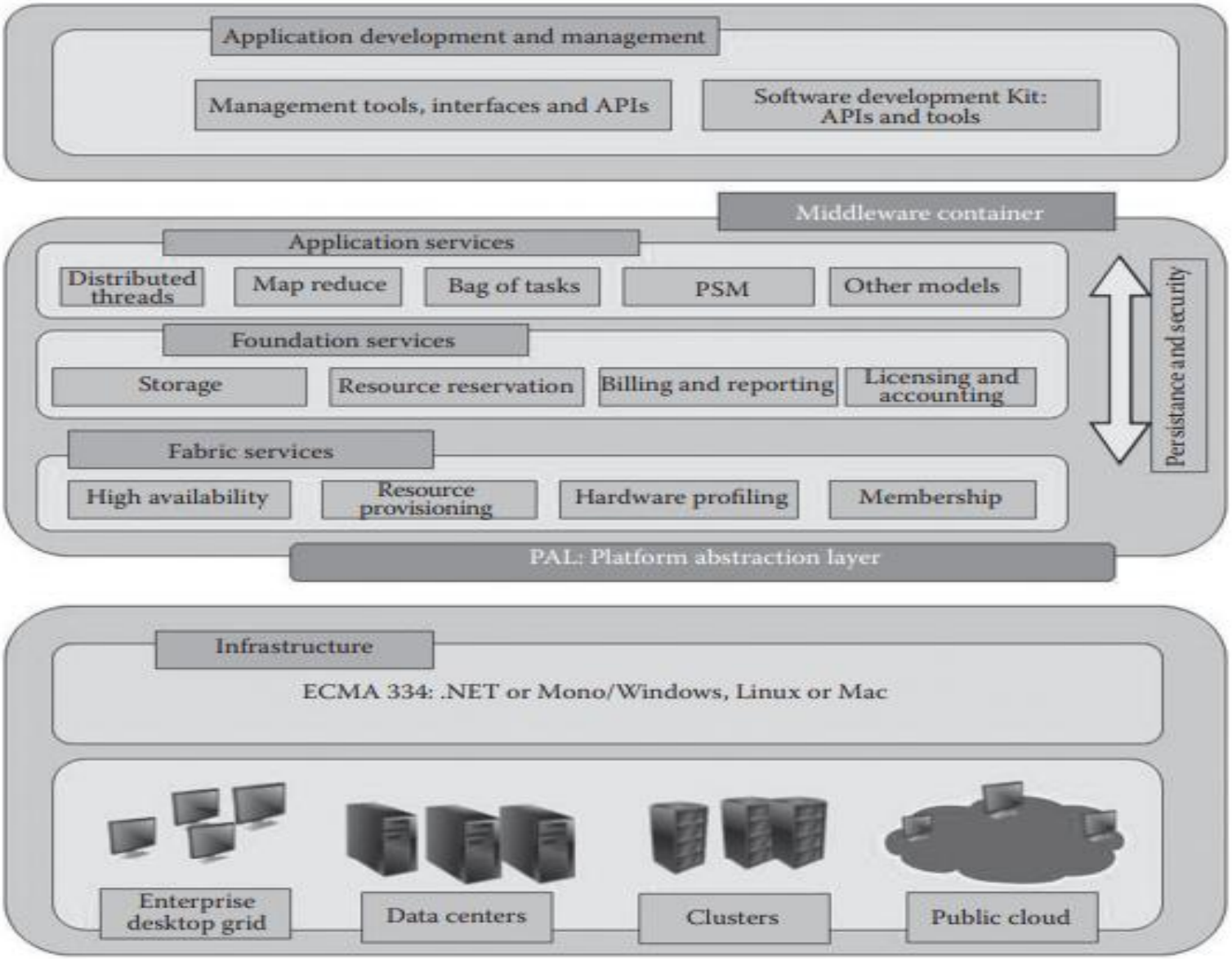


Figure : overview of the Aneka platform.

Cloud Services Offered by Companies

Tools and Services Offered by Companies

Company Name	Tools/Services
EMC	Captiva Cloud toolkit
Google	Google App Engine, Google Docs, Google Cloud Connect Google Cloud Print
Amazon	Amazon EC2, Amazon S3, Amazon SQS
Microsoft	Microsoft Assessment and Planning Toolkit, Windows Azure Sharepoint
IBM	IBM Smart Cloud
Salesforce	Sales Cloud, Service Cloud
SAP LABS	SAP HANA Cloud
VMware	vCloud
Manjrasoft	Aneka Platform
Red Hat	OpenShift Enterprise, OpenShift Origin
Gigaspaces	Cloudify

Cloud Service Providers-Summary

Details of Cloud Service Providers

Provider Name	Service Model	Deployment Model	Server Operating System
Amazon Web Services	IaaS	Public	Widows, Linux
Google App Engine	PaaS	Public	Windows
Windows Azure	IaaS	Public	Widows, Linux
IBM Cloud	IaaS	Private, hybrid	Widows, Linux
Salesforce Platform	PaaS	Public	Widows, Linux
Rackspace	IaaS	Public, private, hybrid	Widows, Linux
SAP HANA Cloud	PaaS	Public	Linux