UNIT V

CLOUD SERVICE PROVIDERS

I. EMC:

- EMC was founded in 1979 by Richard **E**gan, Roger **M**arino, and John **C**urly, named for the initials of its founders.
- 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 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.**
- Figure gives an overview of the services offered by EMC, which are explained in the following:

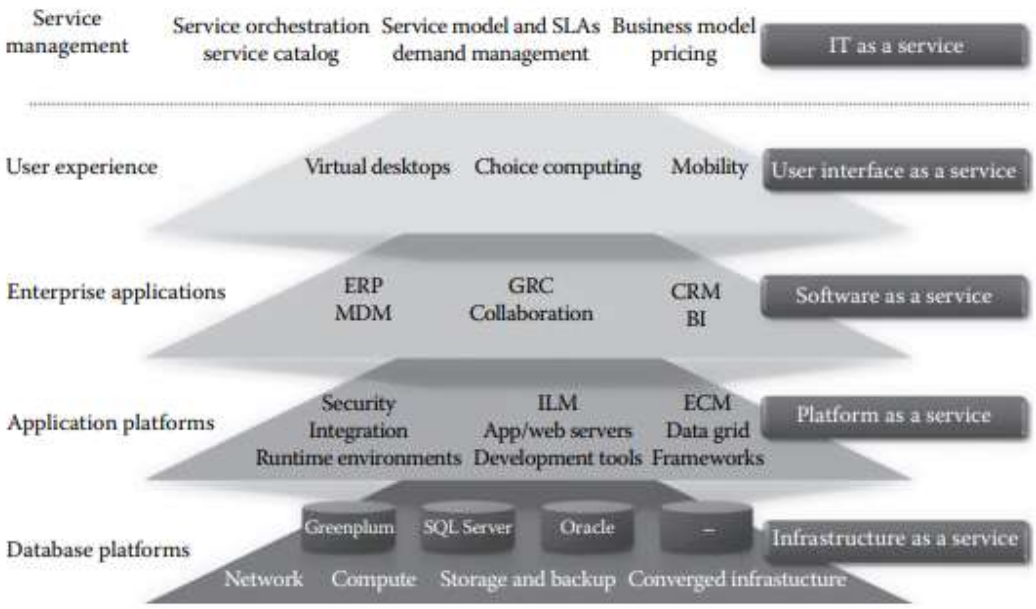

FIGURE
Cloud services by EMC.

1.Infracture as a Service:

IaaS offers EMC business units the ability to provision **infrastructure components such as network, storage, computing, and operating systems** individually or as integrated services.

2.Platform as a Service:

PaaS provides the secure application and information **frameworks on top of application server, web server, database, unstructured content management, and security components** as a service to business units from which to develop solutions. **EMC IT offers database platforms** (Oracle Database as a Service, SQL Server as a Service, Greenplum as a Service) and **application platforms** (application development, Enterprise Content Management as a Service, Information Cycle Management as a Service, Security PaaS, Integration as a Service) for the purpose of development.

3.Software as a Service:

SaaS provides applications and tools in a service model for business enablement. EMC IT brought together several existing business solutions under the unified **architecture named as Business Intelligence as a Service**. **It also offers Enterprise Resource Planning (ERP) and Customer Relationship Management (CRM) as a Service.**

4. User Interface as a Service:

User Interface as a Service (UIaaS) provisions user and interface experience, rather than provisioning the actual device used.

Captiva Cloud Toolkit:

- **EMC offers a tool called Captiva Cloud Toolkit to help in the development of softwares.**
- **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 in as early as 1 week.**
- **As a result, time to market is shortened and development, testing, and support costs are greatly reduced.**
- Also, the enterprise's return on investment is quickly achieved, and its ability to compete in an increasingly competitive distributed document capture market is accelerated.

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):

Multi Directory Watch is another entry point to Captiva. **MDW can be pointed to any folder/repository from where Captiva could import documents directly.** MDW is very useful if business is getting documents in the form of a soft copy, for example, as an attached file in an e-mail.

3. IE (Image enhancement):

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.

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. I**ndexing could be added as per requirement of business.

5. Export:

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

6. Multi:

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

II.Google:

- Google is one among the leading cloud providers that offer secure storage of user's data.
- It provides **Cloud Platform, Cloud Storage**, **Cloud Connect**, **Cloud Print**, **App Engine** and many more features that are scalable, reliable, as well as secure.
- **Google offers many of these services for free or at a minimum cost making it user friendly.**

Google Cloud Platform:

- **Google Cloud Platform enables developers to build, test, and deploy applications on Google's highly scalable and reliable infrastructure.**
- Google has one of the largest and most advanced networks across the globe.
- **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.
- **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.
- The cloud platform is designed to scale like Google's own products, even when there is a huge traffic spike.
- Managed services such as App Engine or Cloud Datastore provide autoscaling that enables application to grow with the users. **The user has to pay only for what he or she uses.**

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 service combines the performance and scalability of Google's cloud with advanced **security and sharing capabilities.**
- **Google Cloud Storage is safe and secure**. Data are protected through redundant storage at multiple physical locations.

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.

gsutil is fully open source.

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 multiple people make changes to the same section of a document, Cloud Connect gives chance to the user to choose which set of changes to keep.
- When the user uploads a document to Google Cloud Connect, the service inserts some metadata into the file.
- Metadata is information about other information. In this case, the metadata identifies the file so that changes will track across all copies.
- The back end is similar to the Google File System and relies on the Google Docs infrastructure.
- As the documents sync to the master file, Google Cloud Connect sends the updated data out to all downloaded copies of the document using the metadata to guide updates to the right files.

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.**
- **Assuming the respective printer is on and has an active Internet connection, paper, and ink, the print job should execute on the machine.**
- **The printer can be shared with other people for receiving documents through Google Cloud Print.**
- Google Cloud Print is an extension built into the Google Chrome Browser, but it should be enabled explicitly.
- Once enabled, the service activates a small piece of code called a connector. The connector's job is to interface between the printer and the outside world.
- The connector uses the user's computer printer software to send commands to the printer.
- If one has a cloud-ready printer, one can connect the printer to the Internet directly without the need for a dedicated computer.
- The cloud printer has to be registered with Google Cloud Print to take advantage of its capabilities.
- Because Google allows app and website developers to incorporate Google Cloud Print into their products as they see fit, there is no standard approach to executing a print job.

- Google Cloud Print depends on developers incorporating the feature into their products.
- Not every app or site will have Google Cloud Print built into it, which limits its functionality.

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.
- The app can be served from the user's own domain name (such as http:// www.example.com/) using Google Apps.
- Otherwise, it can be served using a free name on the appspot.com domain. An application can be shared with the world or limit access to members of an organization.

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

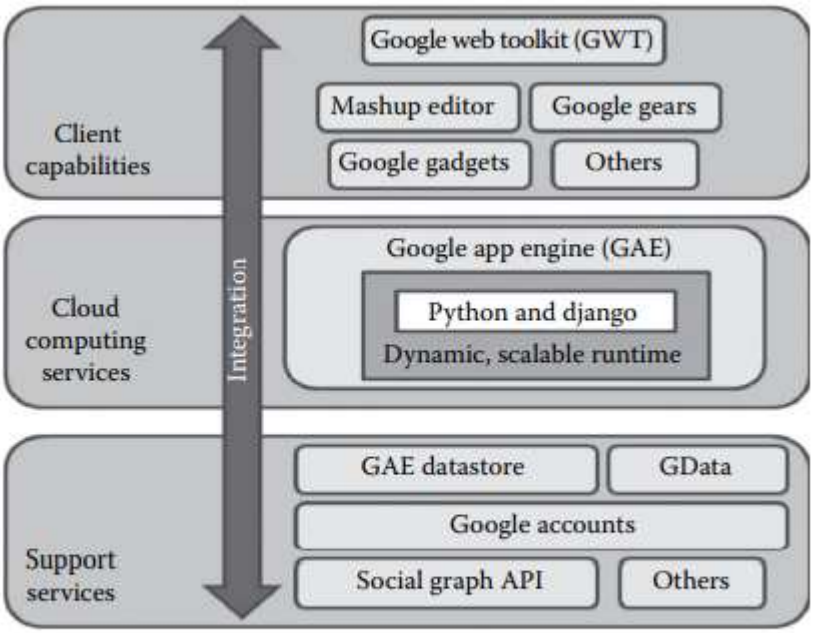

FIGURE
Google App Engine.

- **Google App Engine supports apps written in several programming languages.**
- With App Engine's Java runtime environment, one can build one's app using standard Java technologies, including the JVM, the Java servlets, and the Java programming language—or any other language.
- App Engine also features a Python runtime environment, which includes a fast Python interpreter and the Python standard library.
- App Engine also features a PHP runtime, with native support for Google Cloud SQL and Google Cloud Storage that works just like using a local MySQL instance and doing local file writes.

- Finally, App Engine provides a Go runtime environment that runs natively compiled Go code. These runtime environments are built to ensure that your application runs quickly, securely, and without interference from other apps on the system.
- With **App Engine also, the user has to only pay for what he or she uses.**
- There are no setup costs and no recurring fees. The resources used by the application such as storage and bandwidth are measured in gigabyte and billed at competitive rates.
- One has to control the maximum amount of resources one's app can consume, so it always stays within one's budget.
- App Engine costs nothing to get started. All applications can use up to 1 GB of storage and enough CPU and bandwidth to support an efficient app serving around five million page views a month, absolutely free.
- When billing is enabled for the application, free limits are raised, and one has to only pay for resources one uses above the free levels.

III.Amazon Web Services:

- **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 Amazon Elastic Compute Cloud (Amazon EC2), Amazon Simple Queue Service (Amazon SQS), and Amazon S3 as shown in Figure.**

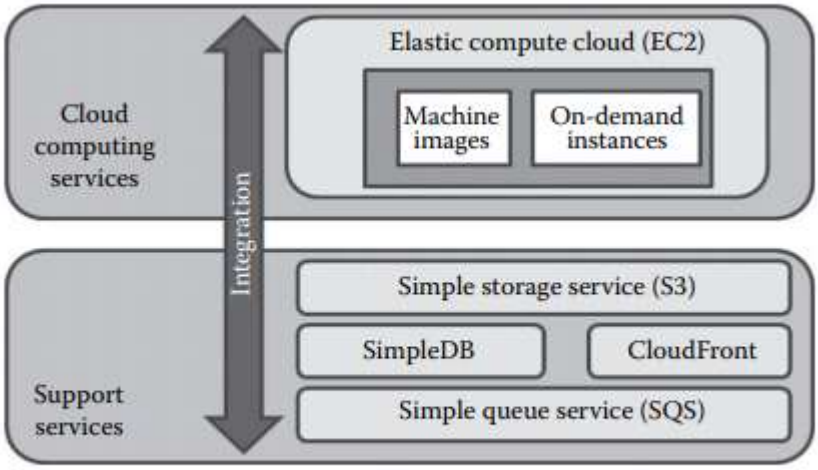

FIGURE
AWS.

- Amazon EC2 is a computing service, whereas Amazon SQS and Amazon S3 are support services.
- The service is advertised as providing a large computing capacity much faster and cheaper than building a physical server farm.
- Amazon's data centers are located at Ashburn, Virginia, Dallas/Fort Worth, Los Angeles, Miami, Newark, New Jersey, Palo, Alto, California, Seattle, St. Louis, Amsterdam, Dublin, Frankfurt, London, Hong Kong, Singapore, Tokyo, etc.

Amazon Elastic Compute Cloud:

- **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.
- 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 Qu ery Requests.
- 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 high-performance computing (HPC) applications

The Amazon EC2 instances can be monitored and controlled by the AWS Management Console and the web service API

Amazon Simple Storage Service:

- **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 websites.
- It also takes care of other features like security, scalability, reliability, performance, and cost.
- Amazon S3 is a highly scalable, reliable, inexpensive, fast, and also easy to use service that meets design requirements and expectations.
- **Amazon S3 provides a highly durable and available store for a variety of content**
- It allows users to offload storage where one can take advantage of scalability and payas-you-go pricing.
- For sharing content that is either easily reproduced or where one needs to store an original copy elsewhere, Amazon S3's Reduced Redundancy Storage (RRS) feature provides a compelling solution.
- It also provides a better solution in the case of storage for data analytics.
- Amazon S3 is an ideal solution for storing pharmaceutical data for analysis, financial data for computation, and images for resizing.
- 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.
- Another feature offered by Amazon S3 is its Static Website Hosting, which is ideal for websites with static content, including html files, images, videos, and client-side scripts such as JavaScript.

Amazon Simple Queue Service:

- **Amazon SQS 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 or requiring other services to be always available.**
- 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.
- 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.

IV.Microsoft:

- **Cloud computing provides a new way of looking at IT at Microsoft called Microsoft IT (MSIT).**
- Cloud computing is now the preferred and default environment for new and migrated applications at Microsoft.
- 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.
- This analysis enables MSIT to select the ideal cloud computing–based environment for each application.
- **MSIT has captured these best practices and documented them for other Microsoft customers who wish to migrate their organizations to cloud computing.**

Windows 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**.
- Based on the response to a series of simple binary questions, the tool generates a report that outlines the amount of development effort involved to migrate the application, or the architecture considerations for a new application
- 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 R2 and System Center 2012 R2 and, through the use of the Windows Azure technologies, it allows 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.

SharePoint:

- **Microsoft offers its own online collaboration tool called 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.
- 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.

V.IBM:

- **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.**
- **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 clouds.**
- IBM offers an entry point to cloud computing whether a client is designing their own virtual private cloud, deploying cloud service, or consuming cloud workload applications.
- The IBM cloud framework begins with the physical hardware of the cloud.
- IBM offers three hardware platforms for cloud computing, which offer built-in support for virtualization. The next layer of the IBM framework is virtualization.
- IBM offers IBM Websphere application infrastructure solutions that support programming models and open standards for virtualization.
- The management layer of the IBM cloud framework includes IBM Tivoli middleware.
- IBM offers tools for cloud-based collaboration, development and test, application development, analytics, business-to-business integration, and security.

Cloud Models:

- IBM offers a spectrum of cloud delivery options ranging from solely private cloud to solely public cloud and numerous variations in between.
- IBM gives the option to build a customized cloud solution out of a combination of public cloud and private cloud elements.
- Hybrid cloud options allow for some processes to be hosted and managed by IBM, while others are kept on a private cloud or on a VPN or Virtual Local Area Network.
- IBM also offers planning and consultation throughout the deployment process.

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 (or another provider)

3. **Private cloud,** owned and operated by IBM (or another provider)

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

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

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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.

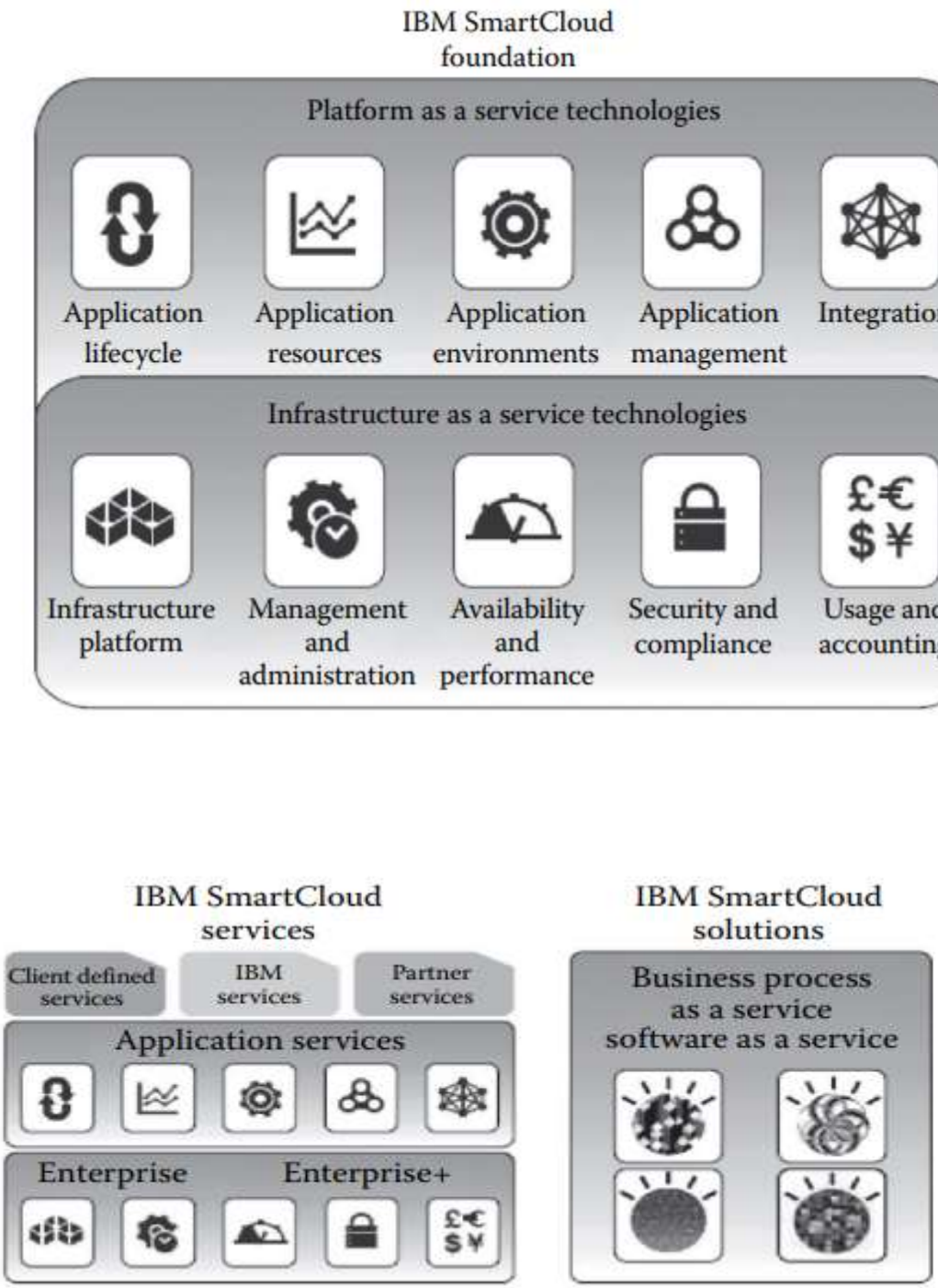

Fig:Architecture of IBM Smart Card

1.SmartCloud Foundation:

SmartCloud Foundation consists of the infrastructure, hardware, provisioning, management, integration, and security that serve as the underpinnings of a private or hybrid cloud.

2.SmartCloud Services:

Built using those foundational components, PaaS, IaaS, and backup services make up SmartCloud Services.

3.SmartCloud Solutions:

Running on this cloud platform and infrastructure, SmartCloud Solutions consist of a number of collaboration, analytics, and marketing SaaS applications.

Along with IaaS, PaaS, and SaaS, IBM also offers **Business Process as a Service (BPaaS).** Business process cloud services are any business process(delivered through the cloud service model via the Internet with access via web-centric interfaces and exploiting web-oriented cloud architecture. **The BPaaS provider is responsible for the related business functions**

VI.SAP Labs:

- 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 its enterprise resource planning application systems and management (SAP ERP), its enterprise data warehouse product—SAP Business Warehouse (SAP BW), SAP Business Objects software, and most recently, Sybase mobile products and in-memory computing appliance SAP HANA.
- SAP is one of the largest software companies in the world.

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 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.

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 applications

- 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.
- It also helps connect users with customers in more engaging experiences.
- It provides connectivity based on the cloud connectivity service.
- As a result, the platform streamlines the integration of new applications at the lowest possible total cost of ownership.
- Support for open programming standards provides a low barrier entry for developers. This makes them productive from the start in building enterprise applications that can integrate with any SAP or non-SAP solution.
- No new coding skills are required to work with SAP HANA.

Virtualization Services Provided by SAP:

- ERP virtualization increases a project's return on investment by maximizing hardware utilization.
- The business benefits of virtualization of ERP 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.

VII.Salesforce:

- **Salesforce.com is a cloud computing and social enterprise SaaS provider based in San Francisco.**
- Its cloud platforms and applications, 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 (limits apply).
- It includes features such as web-to-lead to support online lead capture, with autoresponse rules. It is designed to be a start-to-end setup for the entire sales process.
- Sales Cloud manages contact information and integrates social media and real-time customer collaboration through Chatter.
- The Sales Cloud gives a platform to connect with customers from complete, up-to-date account information to social insights, all in one place and available anytime, anywhere.
- Everything is automatically pushed in real time, from contact information to deal updates and discount approvals.
- 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.
- With its open architecture and automatic updates, the Sales Cloud does away with the hidden costs and drawn-out implementations of traditional CRM 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.
- Unlike stand-alone applications, this knowledge base is fully integrated with everything else. 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. One can continually create, review, deliver, analyze, and improve the knowledge.
- It is delivered by the Service Cloud, user's knowledge is available wherever other customers need it.
- Agents have the right answers at their fingertips to communicate over the phone, send out through an e-mail, or share via a chat client.
- The same knowledge base serves up answers to the service website is a part of comp any's public site.
- If one wants to take advantage of social channels like Twitter or Facebook, one can easily share knowledge that is tapped into the wisdom of the crowd to capture new ideas or answers.
- The Service Cloud gives the tools that are needed to manage knowledge at enterprise scale. -

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VIII.Rackspace:

- Rackspace Cloud, a part of Rackspace, is another player in the cloud computing market.
- **It has been used by a large number of enterprises by Offering IaaS to clients.**
- **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.
- A variety of prebuilt operating system images are provided by Rackspace Cloud (64-bit Linux distributions— Ubuntu, Debian, Gentoo, CentOS, Fedora, Arch, and Red Hat Enterprise Linux) or Windows Images (Windows Server 2008 and Windows Server 2003). These images can be customized to the user's choice to create custom images.
- The event of availability of extra CPU power, Rackspace Cloud claims to provide extra processing power to the running workloads, free of cost.
- Cloud Servers can be run through the Rackspace Cloud Control Panel (GUI) or programmatically via the Cloud Server API using a RESTful interface.
- Language bindings via high-level languages like C++, Java, Python, or Ruby that adhere to the Rackspace specification will be considered as Rackspace-approved bindings.
- Cloud Servers scale automatically to balance load. This process is automated and initiated from either the Rackspace Cloud Control Panel or the Cloud Server API.
- Rackspace Cloud is working on beta version of the Cloud Load Balancing product, which provides a complete load balancing solution.

IX.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.**
- VMware services offered as a **hybrid cloud** such as

1.VMware vSphere

2.VMware vCloud Director

3. VMware vShield technologies

4. VMware vCloud Datacenter Services

5.VMware vCloud Express

Private clouds can be created by using the VMware vSphere and VMware vCloud Director.

1.VMware vSphere:

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 vSphere provides services at both the infrastructure and application levels**. At the **infrastructure level**, it provides options to perform efficient operation and management of the

compute, storage, and network resources. **At the application level**, service-level controls are provided for the applications running on the underlying infrastructures, leading to available, secure, and scalable applications.

2.VMware vCloud Director:

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. VMware vCloud Director abstracts the virtual computing environment from the underlying resources and provides a multitenant architecture that features isolated virtual resources, independent LDAP authentication, specific policy controls, and unique catalogs.

3.VMware vShield technologies:

VMware vShield technologies are used to provide security to these environments by using services like perimeter protection, port-level firewall, NAT and DHCP services, site-to-site VPN, network isolation, and web load balancing.

VMware vCloud Datacenter Services and VMware vCloud Express offer efficient solutions for utilizing IaaS either as a **public cloud or a hybrid cloud**.

4.VMware vCloud Datacenter Services:

VMware vCloud Datacenter Services provides a scalable environment, where internal resources are augmented with the external resources. VMware vCloud Datacenter Services are built on the same technology and foundations as VMware vCloud Director and VMware vSphere to enable interoperability between cloud environments. The user is free to burst his private cloud into public cloud of his preferred service provider.

5.VMware vCloud Express:

VMware vCloud Express is an **IaaS offering** delivered by leading VMware service provider partners. It is a cobranded service that provides reliable, on-demand, pay-as-you-go infrastructure. The VMware vCloud Express providers are Virtacore vCloud Express, Hosting.com, Melbourne IT, and Terremark's vCloud Express.

X.Manjrasoft:

- Manjrasoft is one of the nonmajor 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.**
- 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.

Figure gives an overview of the Aneka platform.

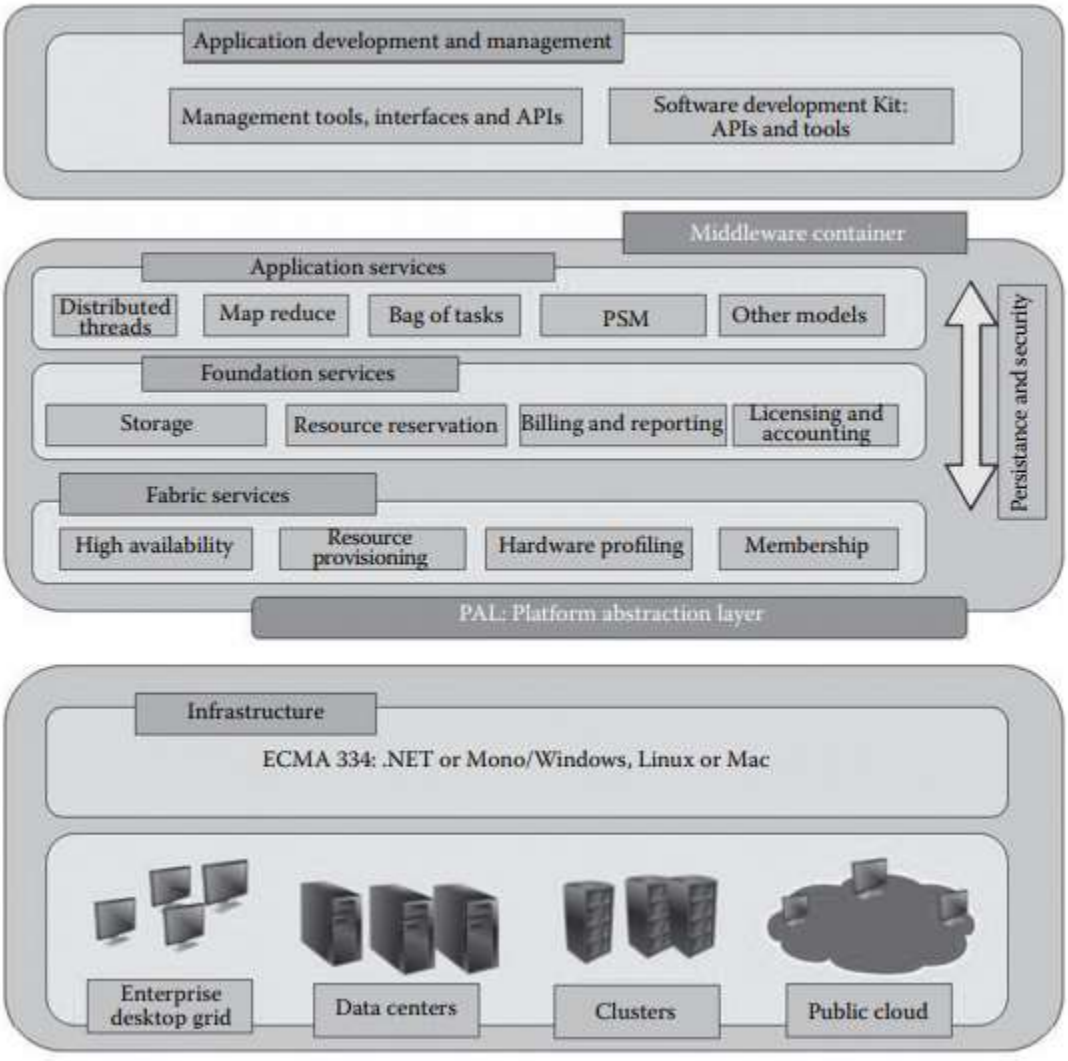

Fig: Aneka Architecture

Aneka Services:

1.Application Services:

- Distributed Threads
- Map Reduce
- Bag of Tasks
- PSM
- Other Services

2.Foundation Services

- Storage
- Resource reservation
- Billing and Reporting
- Licensing and Accounting

3.Fabric Services

- High Availability
- Resource Provisioning
- Hardware Profiling
- Membership

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.

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.

Summary:

TABLE

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

TABLE

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