# UNIT-4
# Cloud Computing Applications

Dr K Koteswara Rao

# Cntd.

- Cloud service providers provide various applications <span style="color:red">in the field of art, business, data storage and backup services, education, entertainment, management, social networking, etc.</span>

# 1. Art Applications

- Cloud computing offers various art applications for quickly and easily design **attractive cards**, **booklets**, and **images**. Some most commonly used cloud art applications are given below:

- **Moo:** is one of the best cloud art applications. It is used for designing and printing **business cards**, **postcards, and mini cards**.

- **Vista print:** allows us to easily design various printed marketing products such as **business cards**, **Postcards, Booklets, and wedding invitations cards**.

- **Adobe Creative Cloud:** is made for designers, artists, filmmakers, and other creative professionals. It is a **suite of apps which includes Photoshop image editing programming, Illustrator, InDesign, TypeKit, Dreamweaver, XD, and Audition**.

# 2.Business Applications

- Today, every organization requires the cloud business application to grow their business. It also ensures that business applications are 24*7 available to users.

- **Mail Chimp:** is an **email publishing platform** which provides various options to **design, send, and save templates for emails**.

- **Salesforce:** platform provides tools for sales, service, marketing, e-commerce, and more. It also provides a cloud development platform.

- **Chatter** : helps us to **share important information** about the organization in real time.

- **Bitrix24:** is a **collaboration** platform which provides communication, management, and social collaboration tools.

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- **Paypal** :offers the simplest and easiest **online payment** mode using a secure internet account. Paypal accepts the payment through debit cards, credit cards, and also from Paypal account holders.

- **Slack**: stands for **Searchable Log of all Conversation and Knowledge**. It provides a **user-friendly** interface that **helps us to create public and private channels for communication.**

- **QuickBooks**: works on the terminology **"Run Enterprise anytime, anywhere, on any device**." **It provides online accounting solutions for the business**. It allows more than 20 users to work simultaneously on the same system

# 3.Data Storage and Backup Applications

- Cloud computing **allows us to store information (data, files, images, audios, and videos) on the cloud and access this information using an internet connection**. As the cloud provider is responsible for providing security, so they offer various backup recovery application for retrieving the lost data.

- A list of data storage and backup applications in the cloud are

- **Box.com:** provides an online environment for **secure content management, workflow,** and **collaboration**. **It allows us to store different files such as Excel, Word, PDF, and images on the cloud**.

- **Mozy** : provides powerful **online backup solutions** for our personal and business data. It schedules **automatically back up** for each day at a specific time.

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- **Joukuu:** provides the simplest **way to share and track cloud-based backup files.** Many users use joukuu to search files, folders, and collaborate on documents

- **GoogleGSuite:**

is one of the best **cloud storage** and **backup** application. **It includes Google Calendar, Docs, Forms, Google+, Hangouts, as well as cloud storage and tools for managing cloud apps.**

# 4. Education Applications

- Cloud computing in the education sector becomes very popular. **It offers various online distance learning platforms and student information portals to the students**. The advantage of using cloud in the field of education is that it offers strong virtual classroom environments

- **Google Apps**: for Education is the most **widely used platform for free web-based email, calendar, documents, and collaborative study**.

- **Chromebook :** for Education is one of the most important Google's projects. **It is designed for the purpose that it enhances education innovation**.

- **Tablets with Google Play for Education**: It allows **educators to quickly implement the latest technology solutions into the classroom and make it available to their students**

- **AWS**: cloud provides an **education-friendly environment to universities, community colleges, and schools**

# 5.Entertainment Applications

- **Entertainment industries use a multi-cloud strategy to interact with the target audience.** Cloud computing offers various entertainment applications such as online games and video conferencing.

- **Online games:** Today, cloud gaming becomes one of the most important entertainment media. It offers various online games that run remotely from the cloud. **The best cloud gaming services are Shaow, GeForce Now, Vortex, Project xCloud, and PlayStation Now.**

- **Video conferencing:** apps provides a simple and instant connected experience. **It allows us to communicate with our business partners, friends, and relatives using a cloud-based video conferencing.**

# 6. Management Applications

- Cloud computing offers various **cloud management tools which help admins to manage all types of cloud activities, such as resource deployment, data integration, and disaster recovery**.

- **Toggl :**helps users to **track allocated time period for a particular project**.

- **Evernote :allows you to sync and save your recorded notes, typed notes,** and other notes in one convenient place. It is available for both free as well as a paid version.

- **Outright :**is used by management users for the purpose of accounts.. **It helps to track income, expenses, profits, and losses in real-time environment**

- **GoToMeeting**: **provides Video Conferencing and online meeting apps,** which allows you to start a meeting with your business partners from anytime, anywhere using mobile phones or tablets.

# 7. Social Applications

- Social cloud applications allow a large number of users to connect with each other using social networking applications such as **Facebook, Twitter, LinkedIn**, etc.

- **Facebook :** is a **social networking website** which **allows active users to share files, photos, videos, status, more to their friends, relatives, and business partners using the cloud storage system**

- **Twitter :** is a **social networking** site. It is a **microblogging** system. **It allows users to follow high profile celebrities, friends, relatives, and receive news. It sends and receives short posts called tweets**.

- **Yammer:** is the **best team collaboration** tool that **allows a team of employees to chat, share images, documents, and videos**.

- **LinkedIn :** is a **social network** for students, freshers, and professionals.

# Topics to be covered

**I)Cloud Applications:**

      **a)Scientific Applications**

      **b)Health care**

      **c)Geoscience and Biology**

**II)Business and Consumer Applications**

❖      **1CRM and ERP**

❖      **2.Social Networking**

❖      **3.Media Applications**

❖      **4.Multiplayer Online Gaming.**

# a)**Scientific Applications**

**1)High-performance computing (HPC) applications**

**2)High-throughput computing (HTC) applications**

**3)Data-intensive applications**

# Goals of High-Performance Computing

**HPC generally refers to the practice of aggregating computing power in a way that delivers much higher performance. Goals are**

➢ Provides all the resources to run the desired Omics analysis in one place.

➢ Provides software that is unavailable or unusable on your computer/local system.

➢ Minimise the execution time given the certain number of applications (strong scaling).

➢ Maximise the number of applications being completed, given a certain amount of tie (weak scaling)

# 1.High-Performance Computing(HPC)

- High-Performance Computing(HPC) is a computing technique to process computational problems, and complex data and to perform scientific simulations.

- HPC systems consist of considerably more number of processors or computer nodes, high-speed interconnects, and specialized libraries and tools.

- HPC is used in various fields such as engineering, finance, commercial applications, weather forecasting, and automotive design.

# Movie Special Effects

- High performance computing is essential to the film industry, crafting **special effects** and **computer-generated imagery (CGI)**.

- This technological prowess has been instrumental in producing blockbuster movies such as "Avatar" and "The Lord of the Rings," where HPC facilitates the creation of lifelike characters and visual environments.

- HPC serves as the driving force behind the rendering of complex visual elements.

- Since special effects demand immense computational power, HPC handles these computations efficiently and quickly.

# Augmented Reality and Virtual Reality

- AR uses a real-world setting while VR is completely virtual. AR users can control their presence in the real world; VR users are controlled by the system

- An example of using HPC in  virtual  and augmented reality is the **CAVE (Cave Automatic Virtual Environment)**.

- The CAVE is a cube-shaped room with projection screens that provide users with an immersive virtual reality (VR) setting.

- The CAVE is commonly employed for visualizing data in fluid dynamics, structural mechanics, architectural modeling, and media arts, offering a glimpse into the possibilities of working within a virtual reality realm.

# Healthcare

- Healthcare experts use HPC for various purposes, including improving screening techniques, making more accurate patient diagnoses, and streamlining administrative work.



## HPC & Healthcare

- Early diagnosis.
- Streamlined admin work.
- Medical research acceleration.
- Healthcare analytics.
- Simulation and modeling of treatment planning.

# HPC in Science

Space Science

- Applications in Astrophysics and Astronomy

Earth Science

- Applications in understanding Physical Properties of Geological Structures, Water Resource Modelling, Seismic Exploration

Atmospheric Science

- Applications in Climate and Weather Forecasting, Air Quality

# HPC in Science

## Life Science

- Applications in Drug Designing, Genome Sequencing, Protein Folding
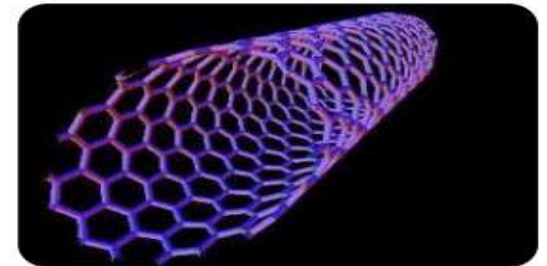
## Nuclear Science

- Applications in Nuclear Power, Nuclear Medicine (cancer etc.), Defence

## Nano Science

- Applications in Semiconductor Physics, Microfabrication, Molecular Biology, Exploration of New Materials
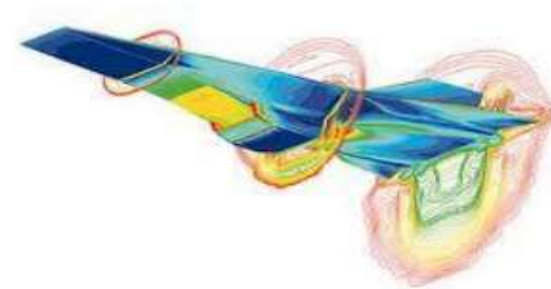
# HPC in Engineering

Crash Simulation

- Applications in Automobile and Mechanical Engineering

Aerodynamics Simulation & Aircraft Designing

- Applications in Aeronautics and Mechanical Engineering

Structural Analysis

- Applications in Civil Engineering and Architecture

# Multimedia and Animation

DreamWorks Animation SKG produces all its animated movies using HPC graphic technology



Graphical Animation Application in Multimedia and Animation

# 2.High Throughput computing

- **high**-**throughput** computing (HTC) is the use of many computing resources over long periods of time to accomplish a computational task.

- The main challenge a typical HTC environment faces is how to maximize the amount of resources accessible to its customers.

- Distributed ownership of computing resources is the major obstacle such an environment has to overcome in order to expand the pool of resources it can draw from.

- Recent trends in the cost/performance ratio of computer hardware have placed the control (ownership) over powerful computing resources in the hands of individuals and small groups.

- These distributed owners will be willing to include their resources in a HTC environment only after they are convinced that their needs will be addressed and their rights protected.

# 3. Data-intensive applications

- Data intensive applications handle large quantities of data (multiple terabytes and petabytes) that can be complex and distributed across various locations.

- Data intensive applications process data in multistep analytical pipelines, including transformation and fusion stages.

- Examples:

- Machine Learning and Artificial Intelligence: Systems that use large datasets to train machine learning models so they can support intelligent decision-making, pattern identification, and predictive analysis .

# b)Health care-ECG Analysis in the cloud

- Healthcare is a domain in which computer technology has found several and diverse applications: from supporting the business functions to assisting scientists in developing solutions to cure diseases.

- **Eg: ECG is the electrical manifestation of the contractile activity of the heart's myocardium.**

- ECG activity produces a specific waveform that is repeated over time and that represents the heartbeat.

- **The analysis of ECG Shape waveform is used to identify arrhythmias and is the most common way to detect heart disease**

- Cloud computing technologies allow the remote monitoring of a patient's heartbeat data.

- **Data analysis in minimal time, and the notification of first-aid personnel and data reveal potentially dangerous conditions by the doctors**

- This way a patient at risk can be constantly monitored without going to a hospital for ECG analysis.

- At the same time, doctors and first-aid personnel can instantly be notified of cases that require their attention
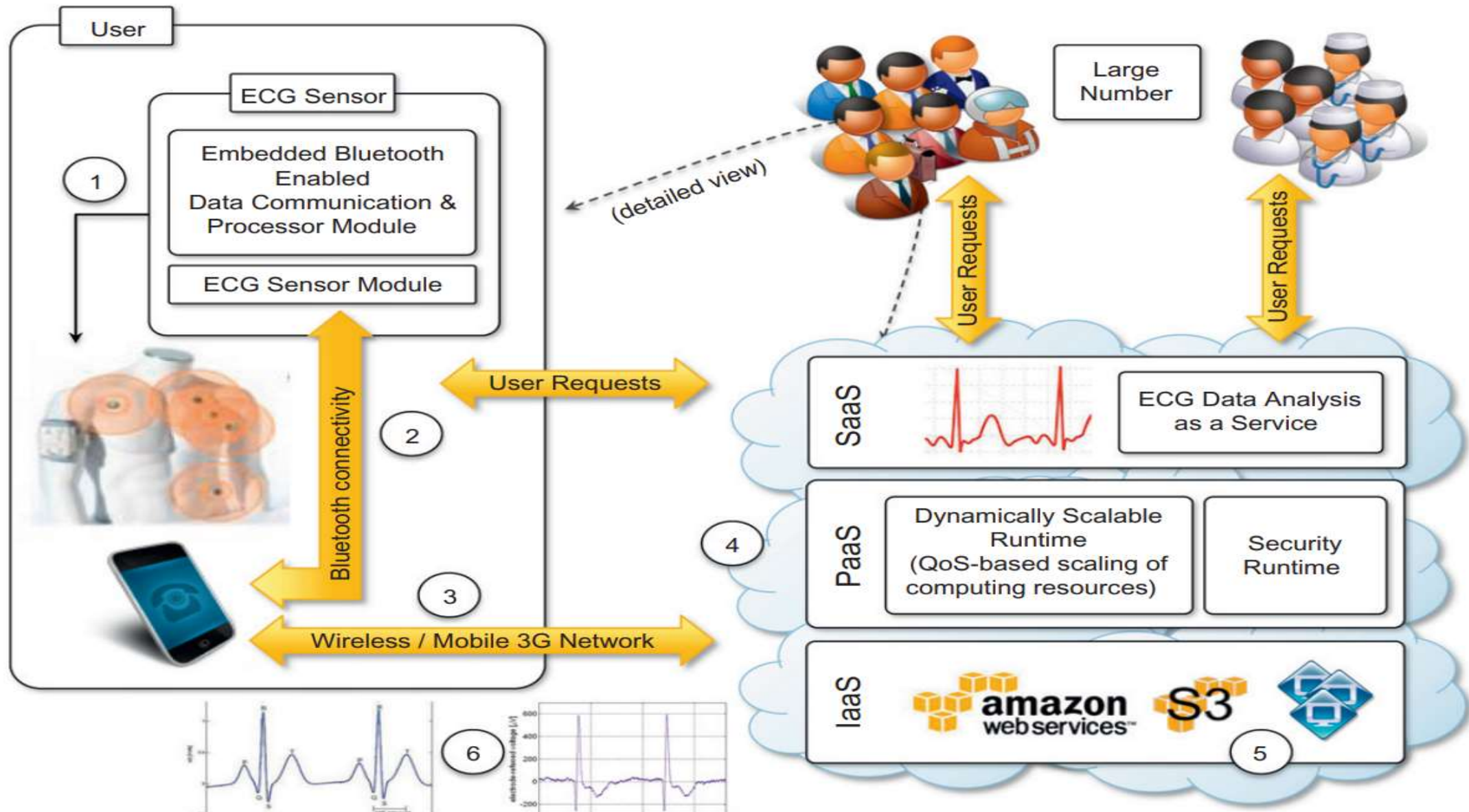
**Fig:online health monitoring system hosted in the cloud.**

# Online Healthcare monitoring system

- Wearable computing devices equipped with ECG sensors constantly monitor the patient's heartbeat.

- Such information is transmitted to the patient's mobile device, which will eventually forward it to the cloud-hosted Web service for analysis.

- **The Web service forms the front-end of a platform  is entirely hosted in the cloud and that leverages the three layers of the cloud computing stack:**

- **SaaS, PaaS, and IaaS.**

- The web service constitutes the SaaS application that will store ECG data into Amazon S3 service and  issues a processing request to the scalable cloud platform.

- 
  - **C. Geoscience and Biology**

# Biology : Protein Structure Prediction

- Applications in biology often require high computing capabilities and often operate on large datasets that cause extensive I/O operations.

- Because of these requirements, biology applications have often made extensive use of supercomputing and cluster computing infrastructures.

- Similar capabilities can be leveraged on demand using cloud computing technologies in a more dynamic fashion, thus opening new opportunities for bioinformatics applications.

- Protein structure prediction is a computationally intensive task and is fundamental to different types of research in the life sciences.

- A Project That investigates the use of Cloud Technologies for Protein structure prediction is Jeeva

- Jeeva-An integrated Web Portal that enables scientist to offload the prediction task To a CC based on Aneka
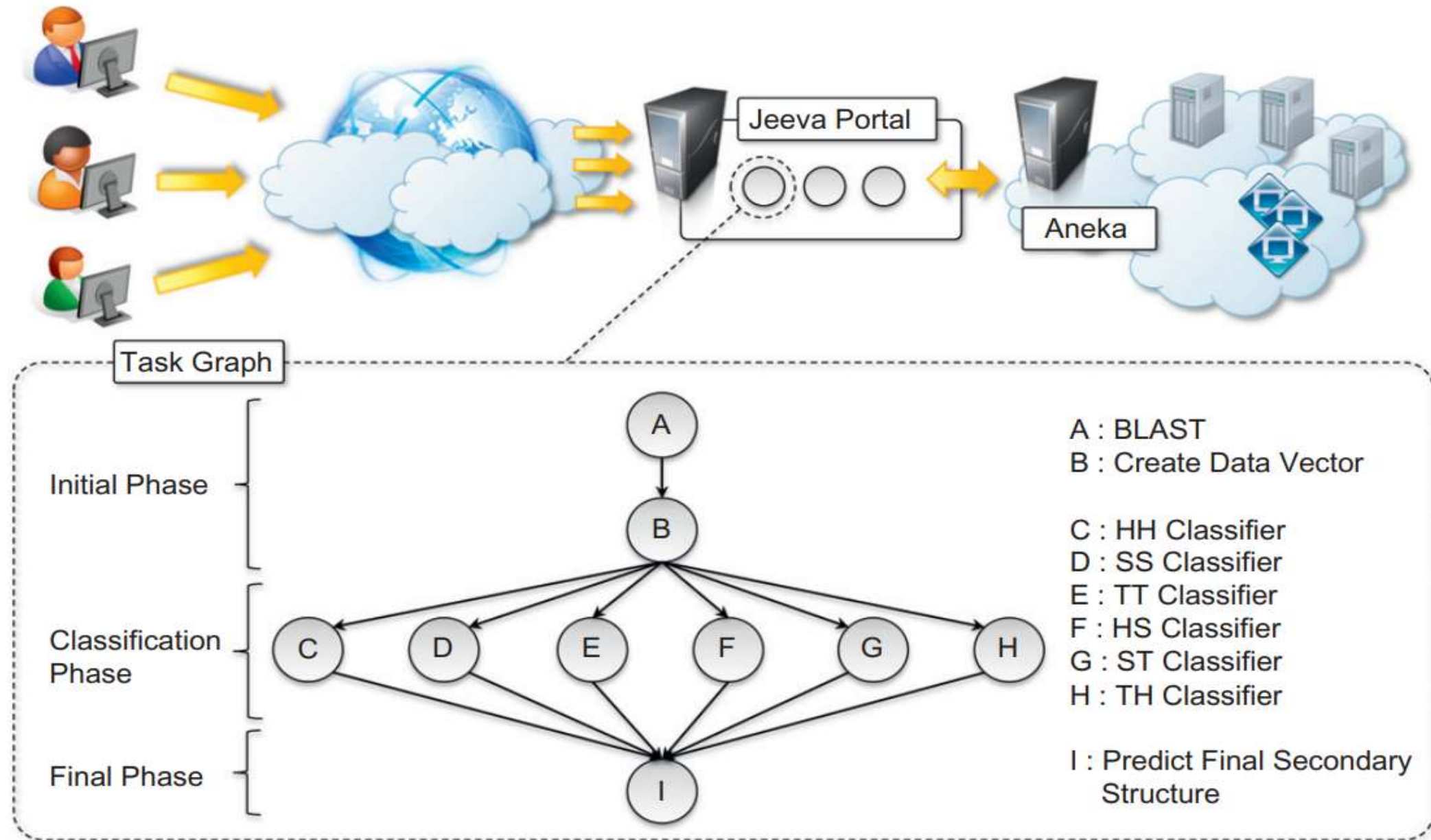
**Fig:Architecture and overview of the Jeeva Portal**

- The prediction task uses machine learning techniques (support vector machines) for determining the secondary structure of proteins.

- A popular **implementation based on support vector machines divides the pattern recognition problem into three phases**: initialization, classification, and a final phase.

- Even though these three phases have to be executed in sequence, it is possible to take advantage of parallel execution in the classification phase, where multiple classifiers are executed concurrently.

- This creates the opportunity to sensibly reduce the computational time of the prediction.

# Biology:
# Gene Expression data analysis for Cancer Diagnosis

- Gene expression profiling is the **measurement of the expression levels of thousands of genes at once** .

- It is used to understand the **biological processes for the treatment**

- Another important application of **gene expression profiling is cancer diagnosis and treatment.**

- **Cancer is a disease characterized by uncontrolled cell growth and proliferation**.

- Gene expression profiling is **utilized for more accurate classification of Tumors.**

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- This problem is often approached **with** <span style="color:red">**learning classifiers, which generate a population of condition-action rules that guide the classification process**</span>.

- Among these, <span style="color:red">**the eXtended Classifier System (XCS) has been successfully utilized for classifying large datasets in the bioinformatics and computer science domains**</span>. However, the effectiveness of XCS, when confronted with high dimensional datasets (such as microarray gene expression data sets), has not been explored in detail.

- <span style="color:red">**CoXCS divides the entire search space into subdomains and employs the standard XCS algorithm in each of these subdomains**</span>. Such a process is computationally intensive but can be easily parallelized because the classifications problems on the subdomains can be solved concurrently
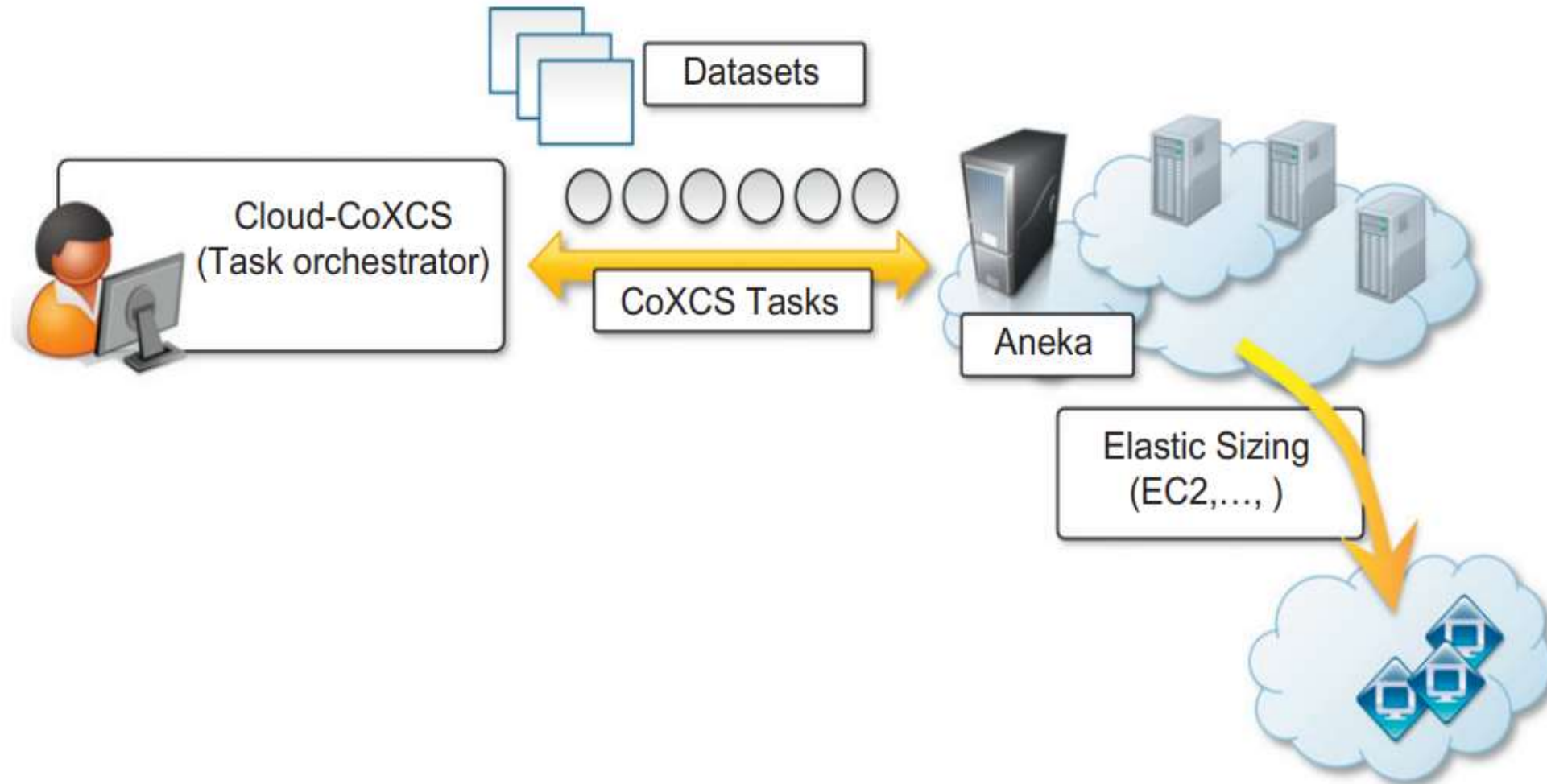
Fig:Cloud-CoXCS: An environment for microarray data processing on the cloud

# Geoscience-Satellite Image Processing

- **Geoscience applications collect, produce, and analyze massive amounts of geospatial and nonspatial data.**

- **As the technology progresses** and our planet becomes more instrumented (i.e., through the deployment of sensors and satellites for monitoring)**, the volume of data that needs to be processed increases significantly.**

- In particular, **the geographic information system (GIS) is a major element of geoscience applications**.

- **GIS applications capture, store, manipulate, analyze, manage, and present all types of geographically referenced data**.

Contd..

- **Satellite remote sensing generates hundreds of gigabytes of raw images that need to be further processed to become the basis of several different GIS products**.

- This process requires both I/O and compute-intensive tasks.

- **Large images need to be moved from a ground station's local storage to compute facilities, where several transformations and corrections are applied**

# Cloud Environment for Satellite Image Processing



A cloud environment for satellite data processing

# II.Business and Consumer Applications

# CRM and ERP

- Customer relationship management (CRM) and Enterprise Resource Planning (ERP) **applications are market segments that are flourishing in the cloud**,

- **Cloud CRM applications constitute** a great opportunity for **small enterprises and start-ups to have fully functional CRM software without large up-front costs and by paying subscriptions**.

- CRM is not an activity that requires specific needs, and it can be easily moved to the cloud.

- **The possibility of having access to business and customer data from everywhere and from any device, has fostered the spread of cloud CRM applications.**

- **ERP solutions on the cloud are less mature and have to compete with well-established in-house solutions**.

- Their goal is to **provide a uniform view and access to all operations** that need to be performed to sustain a complex organization.

- **Because of the organizations that they target, the transition to cloud-based models is more difficult**

- **For this reason cloud ERP solutions are less popular than CRM solutions at this time**.

# 1.CRM and ERP

- **Customer relationship management (CRM) and enterprise resource planning (ERP) applications are market segments that are flourishing in the cloud**, with CRM applications the more mature of the two.

- Cloud CRM applications constitute a great opportunity for small enterprises and start-ups to have fully functional CRM software without large up-front costs and by paying subscriptions.

- **CRM is not an activity that requires specific needs**

    **i)Together with the possibility of having access to your business and customer data**

    **ii) from everywhere and from any device**

    **iii) fostered the spread of cloud CRM applications**.

- **ERP solutions on the cloud are less mature** and have to compete with well-established in-house solutions.

- **ERP systems integrate several aspects of an enterprise: finance and accounting, human resources, manufacturing, supply chain management, project management, and CRM.**

- Their goal is to provide a uniform view and access to all operations that need to be performed to sustain a complex organization

# 1.a.Salesforce.com

- **Salesforce.com is probably the most popular and developed CRM solution available today**.

- today more than 100,000 customers have chosen Safesforce.com to implement their CRM solutions.

- The application provides customizable CRM solutions that can be integrated with additional features developed by third parties.

- **Salesforce.com is based on the Force.com cloud development platform**.

- This represents scalable and high-performance middleware executing all the operations of all Salesforce.com applications.

- **The architecture of the Force.com platform is shown in Figure ,Initially designed to support scalable CRM applications, which provides the system with flexibility and scalability.**
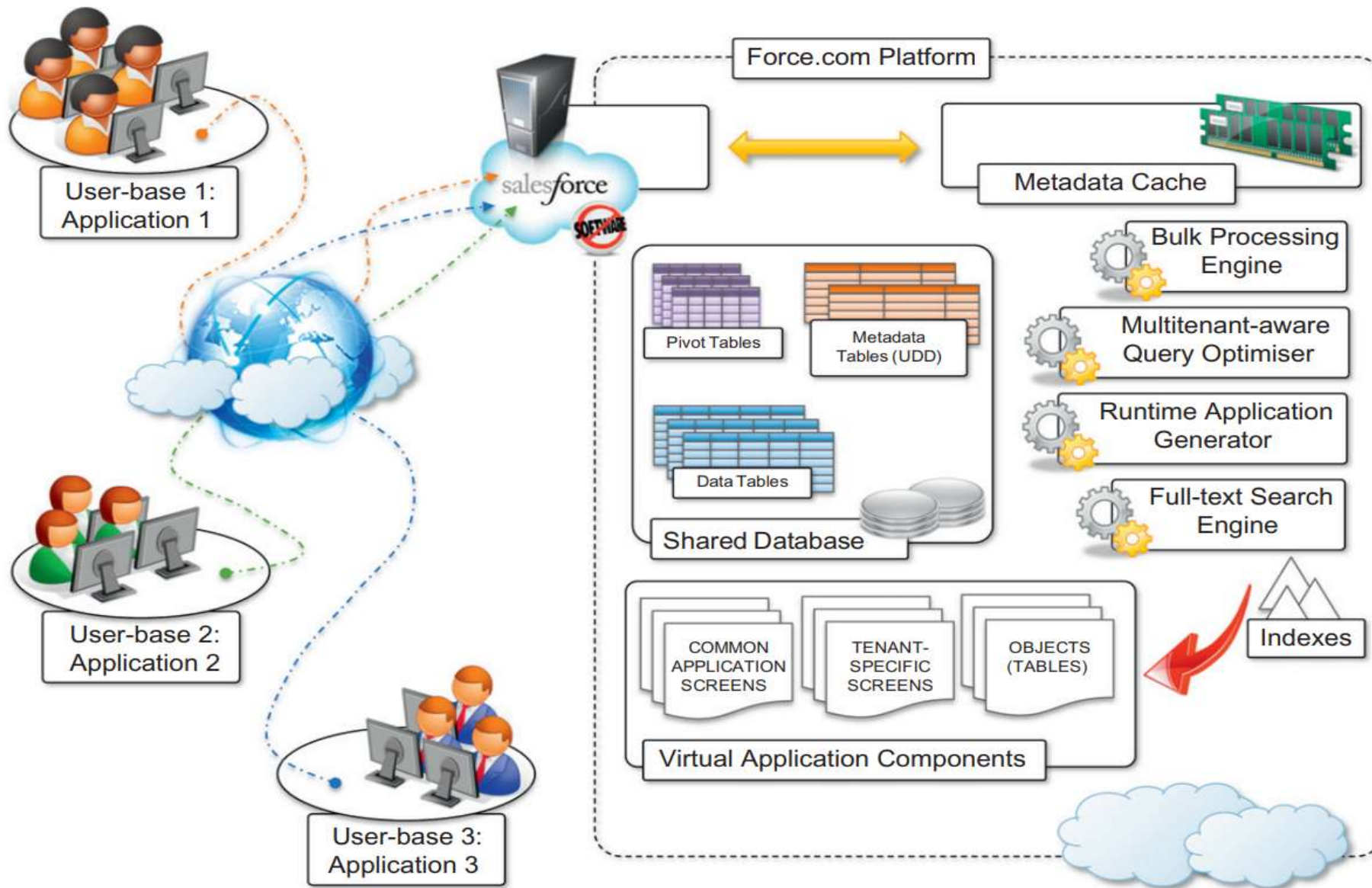
**Fig: Salesforce.com and Force.com architecture**

# Architecture of the Force.com platform

- The architecture of the Force.com platform is shown in previous slide Figure

- Initially designed to support scalable CRM applications, the platform has evolved to support the entire life cycle of a wider range of cloud applications.

-  At the core of the platform resides its metadata architecture, which provides the system with flexibility and scalability.

- Rather than being built on top of specific components and tables, application core logic and business rules are saved as metadata into the Force.com store.

# Contd.

- The application framework allows users to visually define either the data or the core structure of a Force.com application

- Customization of application processes and logic can also be implemented by developing scripts in APEX.

- This is a Java-like language that provides object-oriented and procedural capabilities for defining either scripts executed on demand or triggers.

- APEX also offers the capability of expressing searches and queries to have complete access to the data managed by the Force.com platform

# 1. b.Microsoft Dynamics CRM

- **Microsoft Dynamics CRM is the solution implemented by Microsoft for customer relationship management.**

- Dynamics CRM is available either for installation on the enterprise's premises or as an online solution.

- Dynamics CRM Online features can be accessed either through a Web browser interface or programmatically by means of SOAP and REST.

- This allows Dynamics CRM to be easily integrated with both other Microsoft products and line-of-business applications.

- **Dynamics CRM can be extended by developing plug-ins that allow implementing specific behaviors**. Dynamics CRM can also leverage the capability of Windows Azure

| CRM Online | CRM On-premise |
| --- | --- |
| This is a cloud-based solution provided by Microsoft in which all the servers and databases are managed by Microsoft. | This is an on-premise solution provided by Microsoft in which the servers and databases are managed by the customer. |
| You can get started with an online offering in a matter of few days. You pay for the users and used space on-the-go. | Setting up an on-premise offering needs technical skills as well as sufficient time to setup the CRM instance and get it running. |
| It supports relatively less customizations and extensions. | It supports relatively more customization and extensions. |
| CRM Online does not give the ability to perform manual data backup and restore options, since the database is hosted on Microsoft servers. However, Microsoft performs daily backups of the database. | CRM on-premise gives complete ability to manage your database. |
| CRM Online has various plans based on the data storage limits such as 5GB, 20 GB, etc. | CRM on-premise does not have any such limits on storage size, since the data exists on your own servers. |
| CRM Online provides inbuilt capabilities of features such as insights, social listening, analytics, etc. | CRM on-premise has extra costs for these features. |
| CRM Online supports automatic updates to future version. | CRM on-premise updates need to be installed by the administrator. |

- **Microsoft Dynamics CRM can be accessed via any of the following Options**

❖**Browser**

❖**Mobile and Tablets**

❖ **Outlook**

# Understanding CRM Functional Modules

- Entire CRM application is divided functionally for different types of users and teams.

- If an organization is using CRM to manage its processes, the users from the Sales team would use the functionalities that come under the Sales module

- **All these three functional modules come together to drive the entire lifecycle of gaining a new customer (Marketing), selling them the services (Sales) and maintaining the existing customers (Service Management)**

- **Sales & Marketing**: The bank's call center office executive receives data of potential customers; often called as Leads in CRM.

- **These Leads are captured in the CRM** system via marketing campaigns, sales drives, referrals, etc. Sales: The call center executive communicates with these Leads either through phone calls/emails/etc.

- If the customer is interested in the credit card offering, the Lead record will be converted to an Opportunity record (won Lead).

- **Service**: Once a customer becomes a part of the system, the company would assist him/her with payments, billing, refunds, etc. Whenever the customer has any queries or concerns,

# Navigating CRM Work Areas

**Step 1:** Open CRM Home Page.

**Step 2:** By default, you will see the Sales work area as selected.
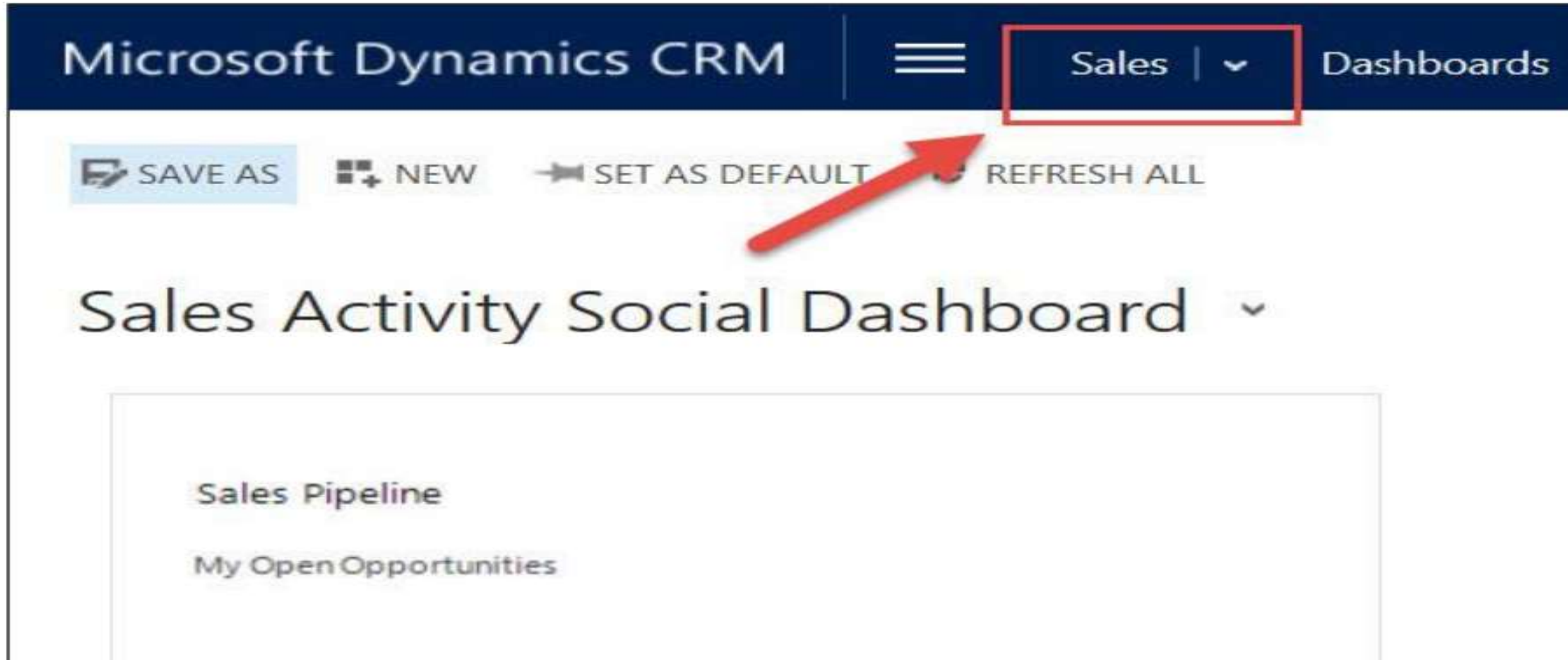
**Step 3:** To change the work area, click the Show work areas option. You will see the options for selecting Sales, Service, and Marketing.



**Step 4:** Click Sales. This will show you all the entities which fall under Sales such as Accounts, Contacts, Leads, Opportunities, Competitors, etc. Each of these entities are categorized by their business process such as My Work, Customers, Sales, Collateral, etc.
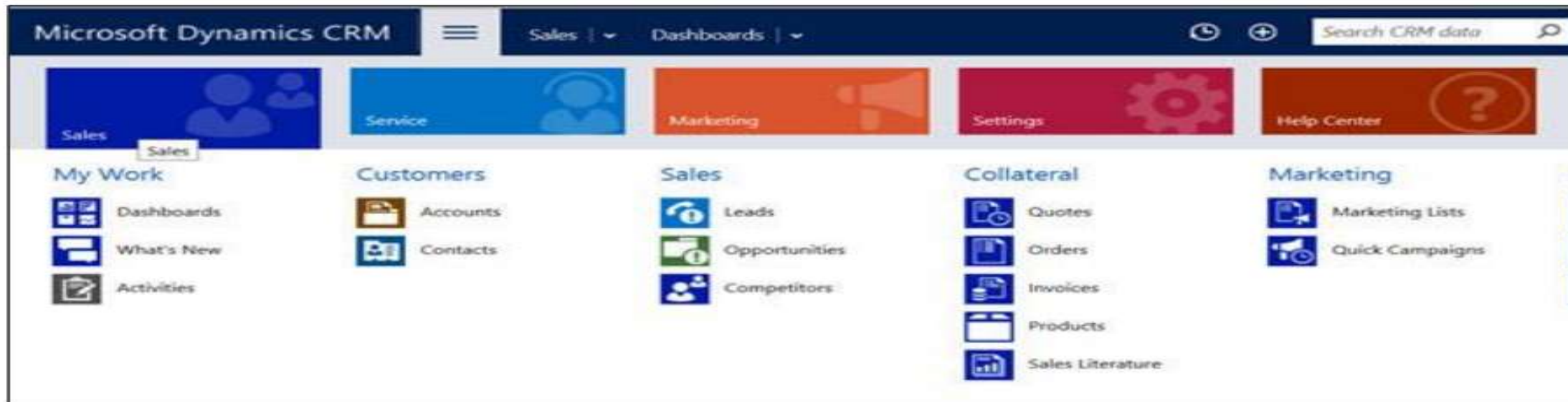
**Step 5:** Similarly, if you click the Marketing work area, you will see all the entities related to Marketing business functionalities.
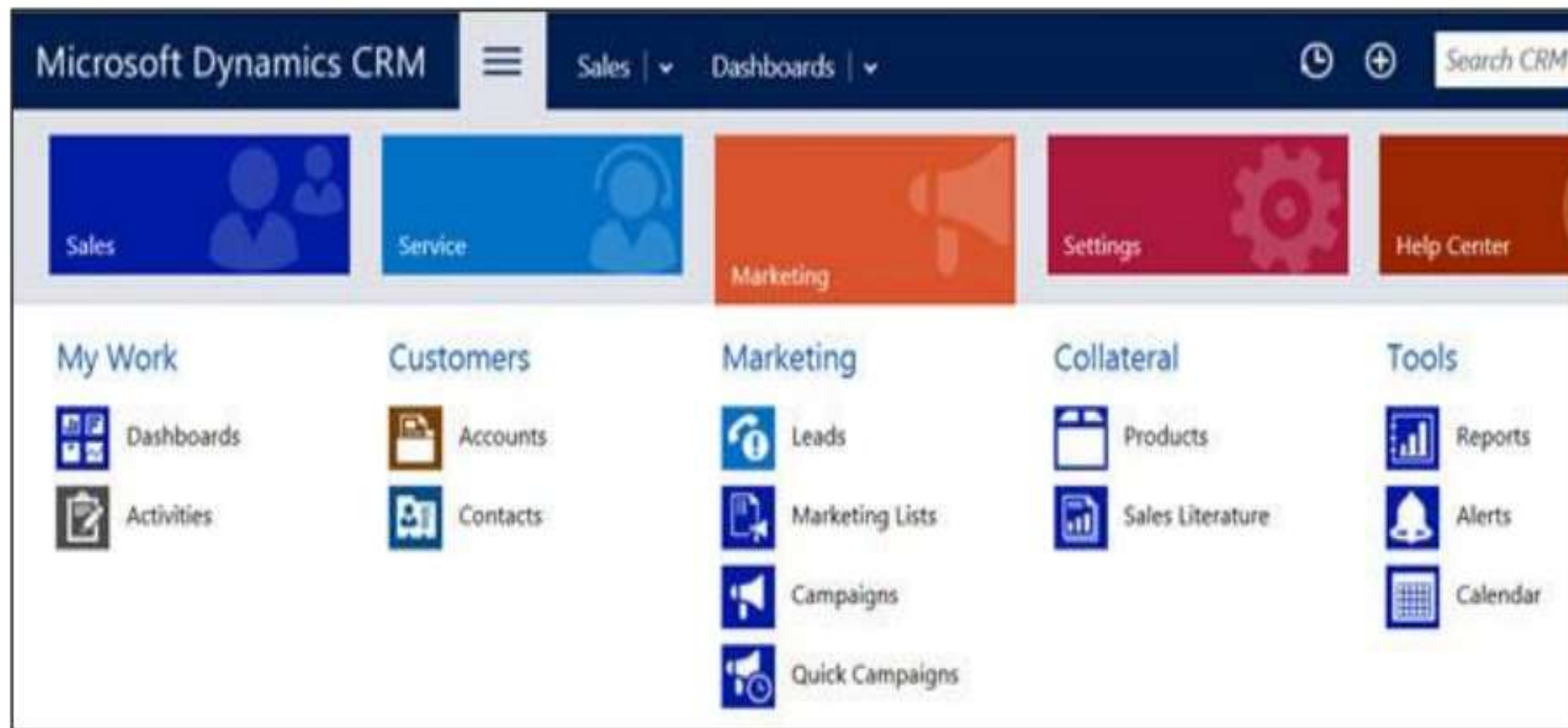
- This allows Dynamics CRM to be easily integrated with both other Microsoft products and line-of-business applications.

- Dynamics CRM can be extended by developing plug-ins that allow implementing specific behaviors triggered on the occurrence of given events.

- Dynamics CRM can also leverage the capability of Windows Azure for the development and integration of new features

# 1.c. NetSuite

- NetSuite provides a collection of applications that help customers manage every aspect of the business enterprise. Its offering is divided into three major products:

1. NetSuite Global ERP

2. NetSuite Global CRM1

3. NetSuite Global Ecommerce.

- NetSuite One World, integrates all three products together.

- The services NetSuite delivers are powered by two large datacenters on the East and West coasts of the United States, connected by redundant links.

- **NetSuite also provides an infrastructure and a development environment for implementing customized applications**

# 2.Productivity

- **Productivity applications replicate in the cloud some of the most common tasks that we are used to performing on our desktop:**

- **from document storage to office automation and complete desktop environments hosted in the cloud.**

# 2 . a. Dropbox and iCloud

popular solution for online document storage is Dropbox, an online application that allows users to synchronize any file across any platform and any device in a seamless manner (see Figure ).

Dropbox provides users with a free amount of storage that is accessible through the abstraction of a folder.

Users can either access their Dropbox folder through a browser or by downloading and installing a Dropbox client

All the modifications into this folder are silently synched so that changes are notified to all the local instances of the Dropbox folder across all the devices.
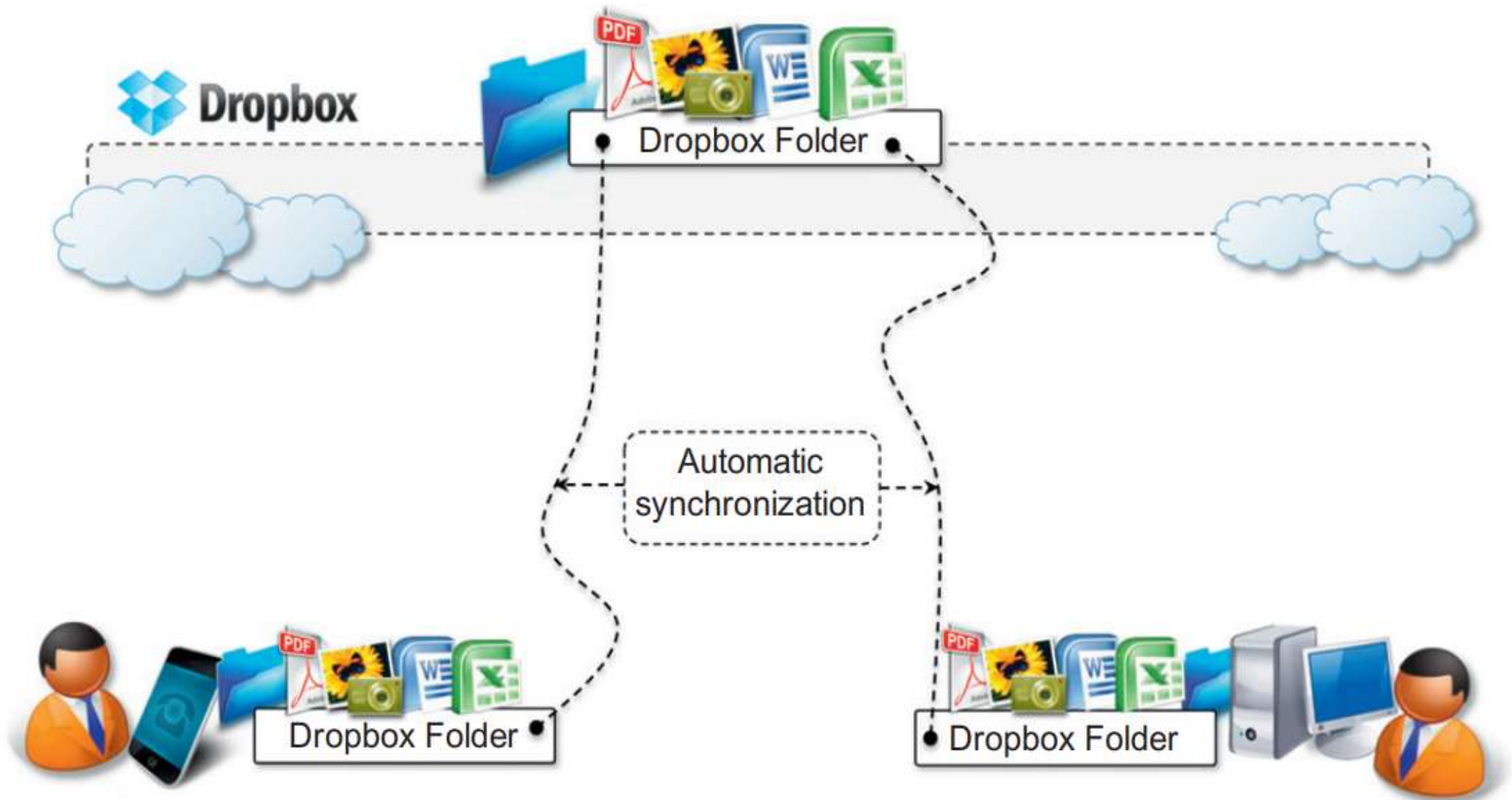
.

Fig: Dropbox usage scenario.

- **iCloud**: <span style="color:red">**a cloud-based document-sharing application provided by Apple to synchronize iOS-based devices in a completely transparent manner.**</span>

- **Dropbox**: <span style="color:red">**which provides synchronization through the abstraction of a local folder, iCloud has been designed to be completely transparent once it has been set up.**</span>

- Documents, photos, and videos are automatically synched as changes are made, without any explicit operation.

- This allows the system to efficiently automate common operations without any human intervention: taking a picture with your iPhone and having it automatically available in iPhoto on your Mac at home; editing a document on the iMac at home and having the changes updated in your iPad.

- Unfortunately, this capability is limited to iOS devices, and currently there are no plans to provide iCloud with a Web-based interface.

- There are other solutions for online document sharing, such as Windows Live, Amazon Cloud Drive, and CloudMe, that are popular

# 2.b.`Google docs`

- **Google Docs is a SaaS application that delivers the basic office automation capabilities with support for collaborative editing over the Web.**

- The application is executed on top of the Google distributed computing infrastructure, which allows the system to dynamically scale according to the number of users using the service.

- **Google Docs allows users to create and edit text documents, spreadsheets, presentations, forms, and drawings.**

- It aims to replace desktop products such as Microsoft Office and OpenOffice and provide similar interface and functionality as a cloud service.

- **Google Docs is a good example of what cloud computing can deliver to end users: ubiquitous access to resources, elasticity, absence of installation and maintenance costs, and delivery of core functionalities as a service**

# 2.c. Cloud desktops: EyeOS and XIOS/3

- This is a fundamental aspect for cloud computing, which delivers a considerable amount of its services through the Web browser.

- Together with the opportunity to leverage large-scale storage and computation, this technology has made possible the replication of complex desktop environments in the cloud and made them available through the Web browser.

- These applications, called cloud desktops, are rapidly gaining in popularity.
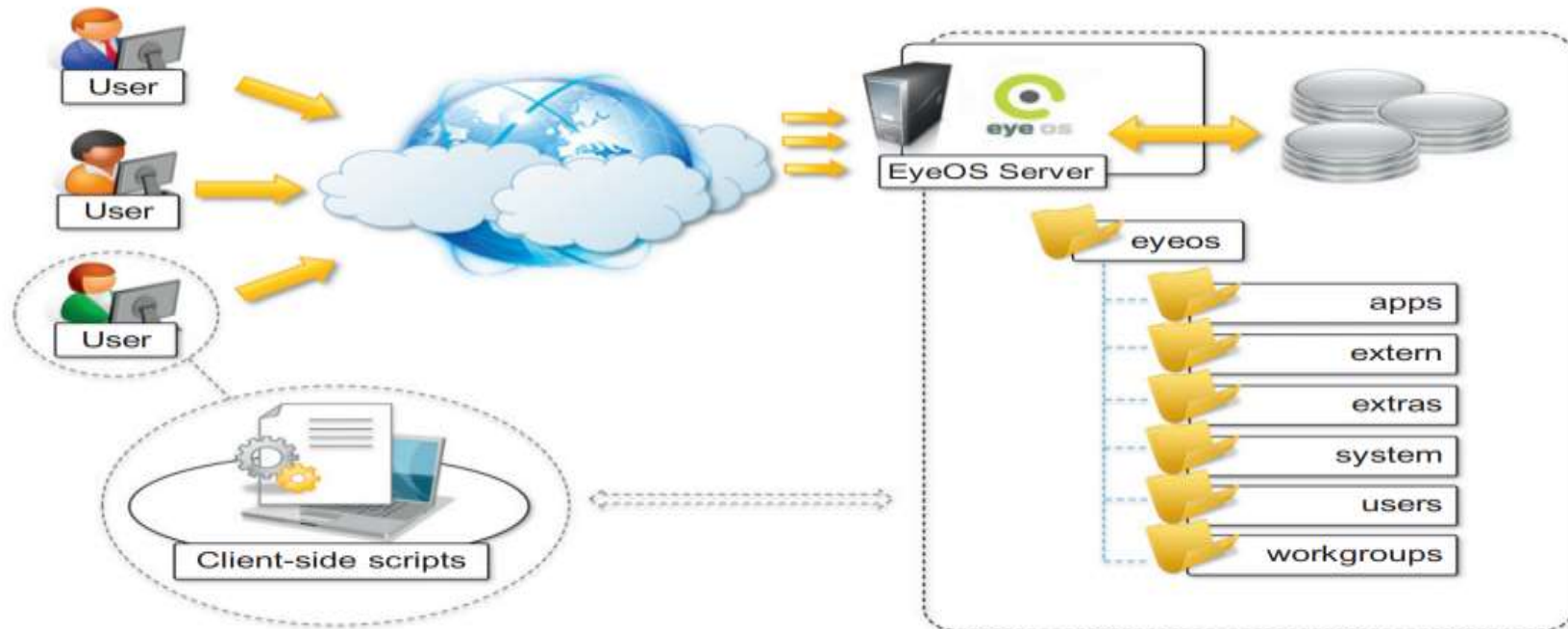
- **Single users** can access the EyeOS desktop environment from anywhere and through any Internet-connected device, whereas organizations can create a private EyeOS Cloud on their premises to virtualize the desktop environment of their employees and centralize their management.

- **The EyeOS architecture** is quite simple: On the server side, the EyeOS application maintains the information about user profiles and their data,

- **Client** side constitutes the access point for users and administrators to interact with the system.

- **User** has logged in by providing credentials, the desktop environment is rendered in the client's browser by downloading all the JavaScript libraries.

- Each application loaded in the environment communicates with the server by using AJAX

- Xcerion XML Internet OS/3 (XIOS/3) is another example of a Web desktop environment.

- The service is delivered as part of the CloudMe application, which is a solution for cloud document storage.

- The architecture of the OS concentrates most of the functionalities on the client side while implementing server-based functionalities by means of XML Web services.

- The client side renders the user interface, orchestrates processes, and provides data-binding capabilities on XML data that is exchanged with Web services.

- XIOS/3 is an advanced Web desktop environment that focuses on the integration of services into the environment by means of XML-based services and that simplifies collaboration

# 3.Social networking

- Social networking applications have grown considerably in the last few years to become the most active sites on the Web.

## 3.a.Facebook

- To sustain their traffic and serve millions of users seamlessly, services such as Twitter and Facebook have leveraged cloud computing technologies.

- The possibility of continuously adding capacity while systems are running is the most attractive feature for social networks, which constantly increase their user base.

- The reference stack serving Facebook is based on LAMP (Linux, Apache, MySQL, and PHP). This collection of technologies is accompanied by a collection of other services

- One of the core elements is Thrift,This is a collection of abstractions (and language bindings) that allow cross-language development.

- **Thrift** allows services developed in different languages to communicate and exchange data. Bindings for Thrift in different languages take care of data serialization and deserialization,

- **Communication:** simplifies the work of the developers, who can quickly prototype services and leverage existing ones.

- Other relevant services and tools are **Scribe** which aggregates streaming log feeds, and applications for alerting and monitoring

# 4. Media applications

Media applications has taken a considerable advantage from leveraging cloud computing technologies.

In particular, video-processing operations, such as encoding, transcoding, composition, and rendering, are good candidates for a cloud-based environment.

These are computationally intensive tasks

❑ **Animoto**

❑ **Maya rendering with Aneka**

❑ **Video encoding on the cloud: Encoding.com**

❑ **Multiplayer online gaming**

# 4.a.Animoto

- Animoto is perhaps the most popular example of media applications on the cloud.

- The Website provides users with a very straightforward interface for quickly creating videos out of images, music, and video fragments submitted by users.

- Users select a specific theme for a video, upload the photos and videos and order them in the sequence they want to appear, select the song for the music, and render the video.

- The process is executed in the background and the user is notified via email once the video is rendered

- A proprietary artificial intelligence (AI) engine, which selects the animation and transition effects according to pictures and music, drives the rendering operation.

-  Users only have to define the storyboard by organizing pictures and videos into the desired sequence.

-  If users don't like the result, the video can be rendered again and the engine will select a different composition, thus producing a different outcome every time.

- The service allows users to create 30-second videos www.animoto.com.

- Cloud Applications for free,by paying a monthly or a yearly subscription it is possible to produce videos of any length and to choose among a wider range of templates
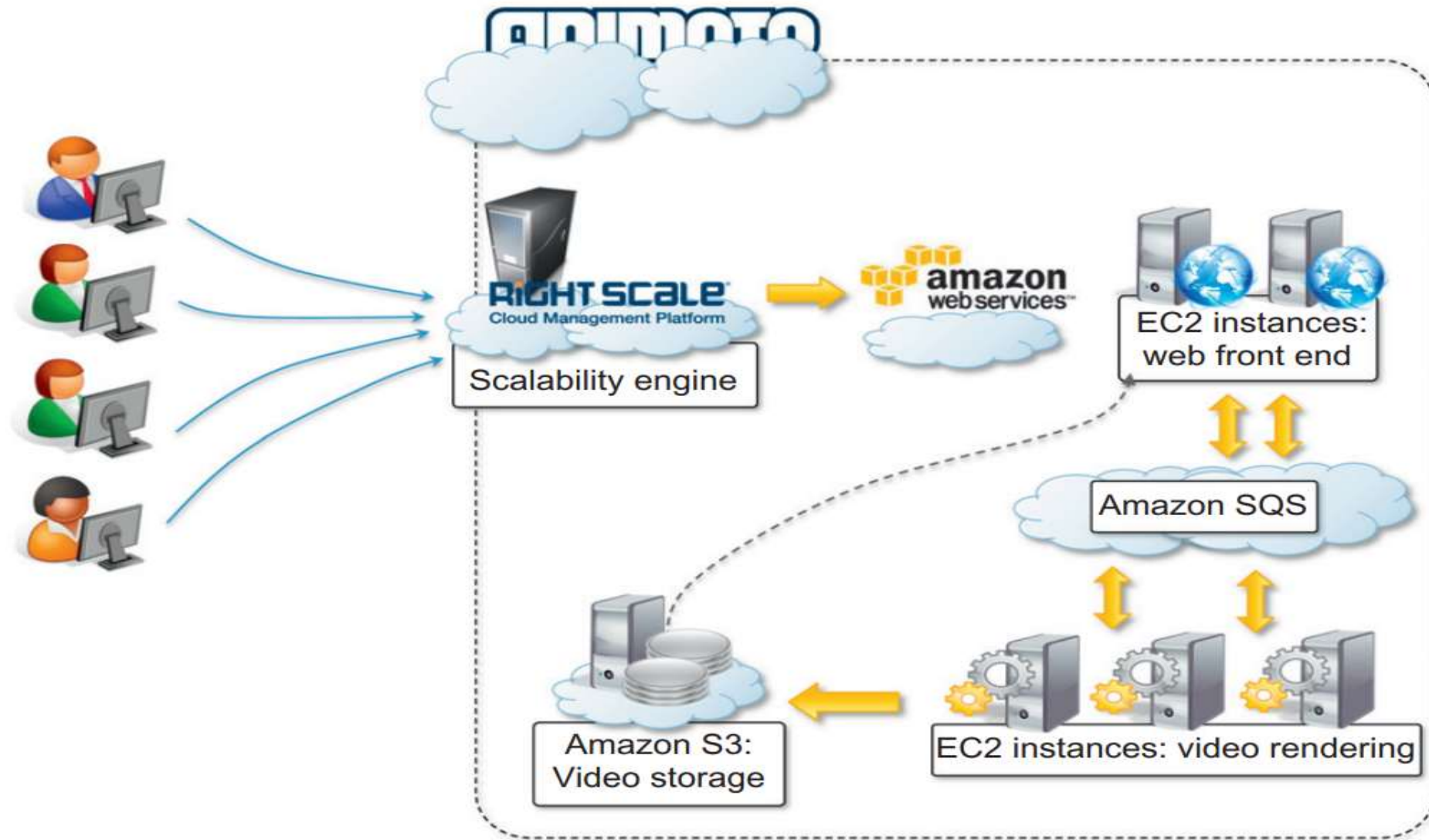
**Figure :Animoto reference architecture**

- The core function is implemented on top of the Amazon Web Services infrastructure.

- In particular, it uses Amazon EC2 for the Web front-end and the worker nodes; Amazon S3 for the storage of pictures, music, and videos

- Amazon SQS for connecting all the components. The system's auto-scaling capabilities are managed by Rightscale, which monitors the load and controls the creation of new worker instances as well as their reclaim.

- Front-end nodes collect the components required to make the video and store them in S3. Once the storyboard of the video is completed

# 4.b.Maya rendering with Aneka

- Applications of media processing are found in the engineering disciplines and the movie production industry.

- Operations such as rendering of models are now an integral part of the design workflow, which has become computationally demanding.

- The department is responsible for designing models of high-speed electric locomotives, metro cars, urban transportation vehicles, and motor trains.

- The design process for prototypes requires high-quality, three-dimensional (3D) images.

- The analysis of these images can help engineers identify problems and correct their design.

- Three-dimensional rendering tasks take considerable amounts of time, especially in the case of huge numbers of frames, but it is critical for the department to reduce the time spent in these iterations.

- This goal has been achieved by leveraging cloud computing technologies, which turned the network of desktops in the department into a desktop cloud managed by Aneka.
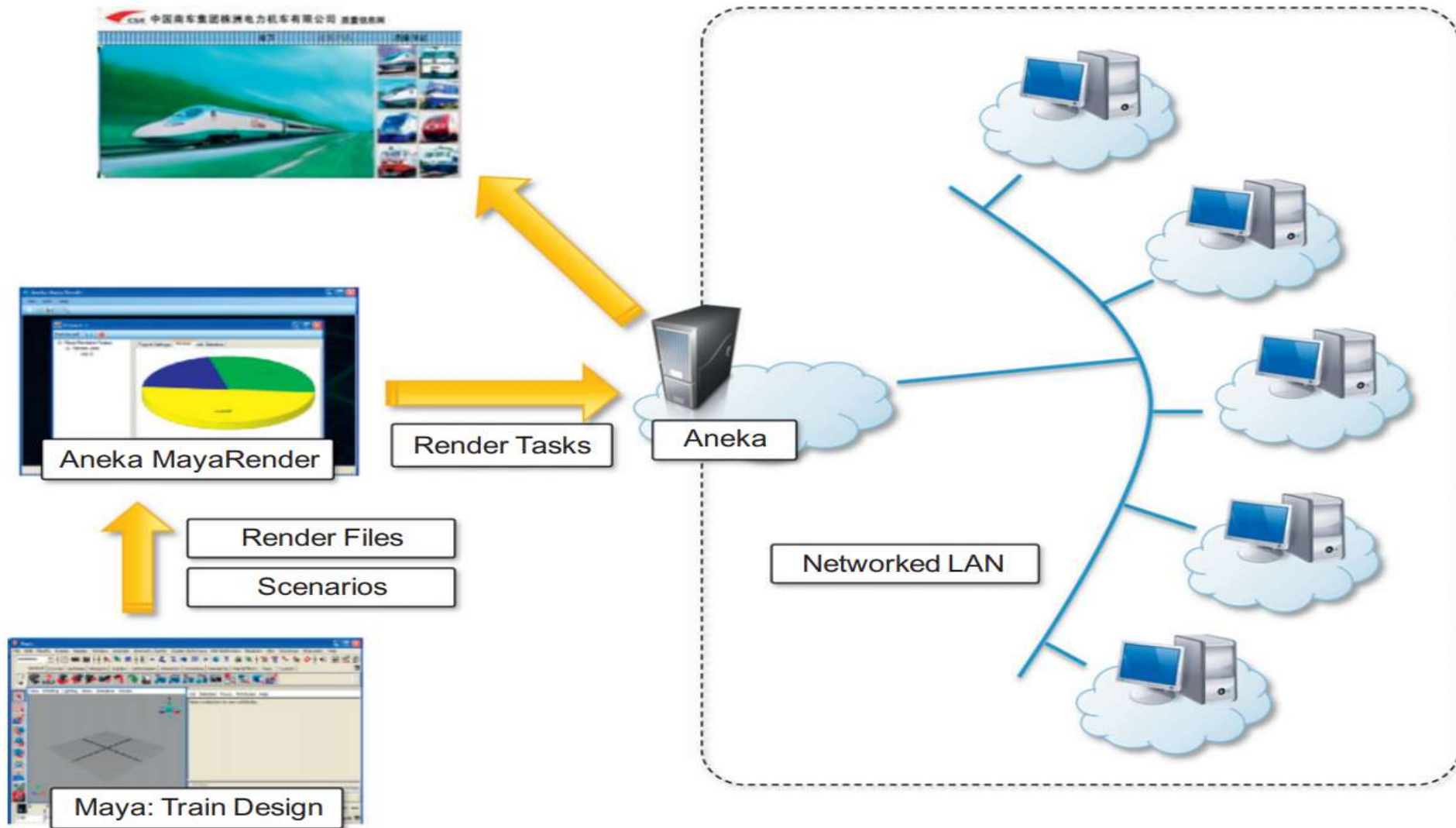
3D rendering on private clouds

- The application is used to submit the rendering tasks to the Aneka Cloud, which distributes the load across all the available machines.

- Every rendering task triggers the execution of the local Maya batch renderer and collects the result of the execution.

- The renders are then retrieved and put all together for visualization.

- By turning the local network into a private cloud, the resources of which can be used off-peak (i.e., at night, when desktops are not utilized)

# 4.c.Video encoding on the cloud: Encoding.com

- Video encoding and transcoding are operations that can greatly benefit from using cloud technologies:

- They are computationally intensive and potentially require considerable amounts of storage.

- Continuous improvement of mobile devices as well as the diffusion of the Internet, requests for video content have significantly increased

- Encoding.com is a software solution that offers video-transcoding services on demand

- Cloud technology to provide both the horsepower required for video conversion and the storage for staging videos.

- The service integrates with both Amazon Web Services technologies (EC2, S3, and CloudFront) and Rackspace (Cloud Servers, Cloud Files, and Limelight CDN access).

- Users can access the services through a variety of interfaces: the Encoding.com Website, Web service XML APIs, desktop applications, and watched folders.

- Encoding.com now has more than 2,000 customers and has already processed more than 10 million videos

# 4.d.Multiplayer online gaming

- Online multiplayer gaming attracts millions of gamers around the world who share a common experience by playing together in a virtual environment that extends beyond the boundaries of a normal LAN.

-  Online games support hundreds of players in the same session, made possible by the specific architecture used to forward interactions, which is based on game log processing.

- Players update the game server hosting the game session, and the server integrates all the updates into a log that is made available to all the players through a TCP port
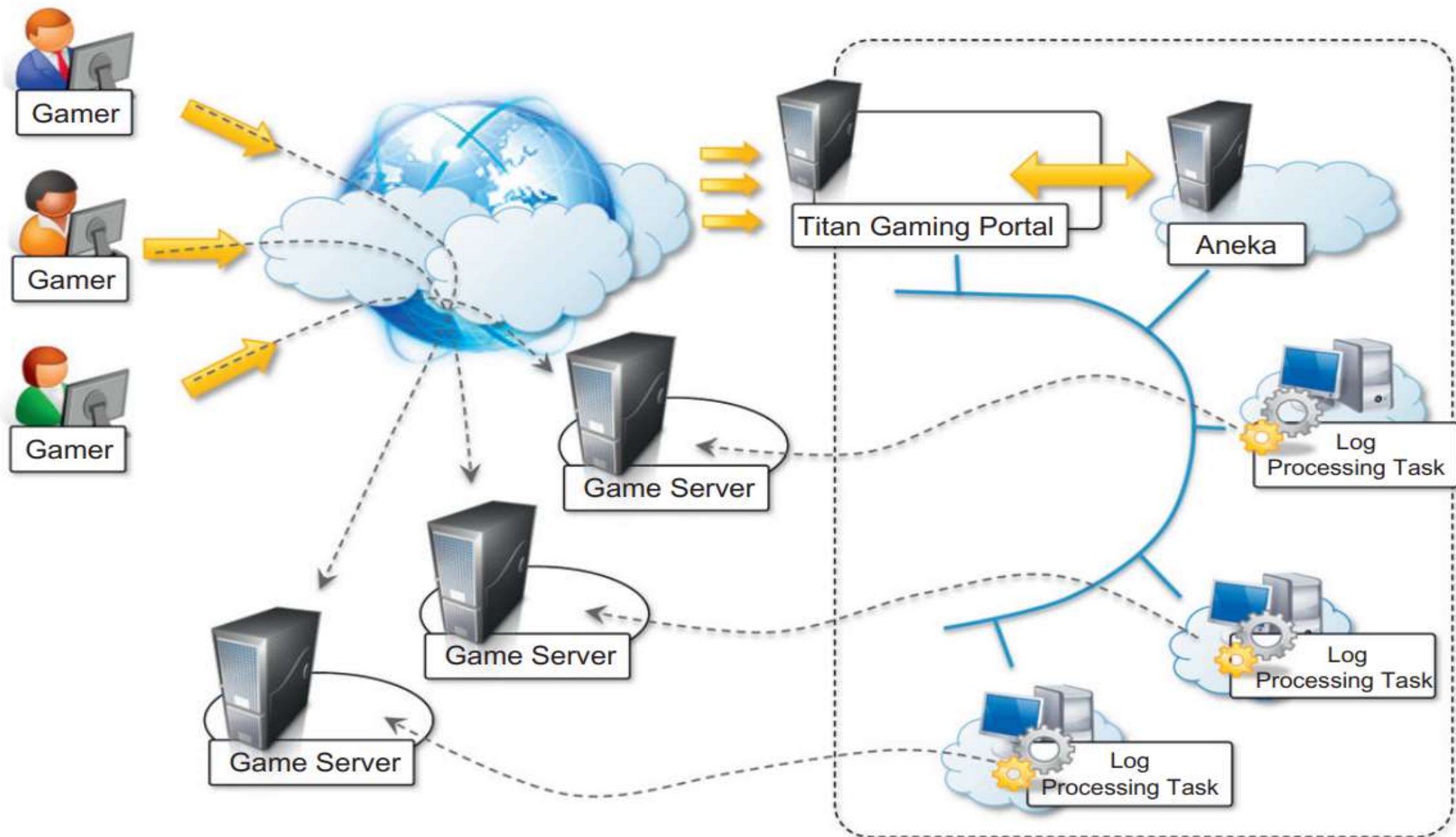
Fig:Scalable processing of logs for network games.

- Game log processing is also utilized to build statistics on players and rank them.

- These features constitute the additional value of online gaming portals that attract more and more gamers.

- The processing of game logs is a potentially compute-intensive operation that strongly depends on the number of players online and the number of games monitored.

- A prototypal implementation of cloud-based game log processing has been implemented by Titan Inc. (now Xfire)

- A company based in California that extended its gaming portal for offload game log processing to an Aneka Cloud.

- The prototype (Above shown in Figure) uses a private cloud deployment that allowed Titan Inc. to process concurrently multiple logs and sustain a larger number of users.

# THANK YOU