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Contents

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Cloud Based Implementation of Mashup of Web Based Agriculture and Irrigation Services

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India is a land of villages and agriculture still remains the main source of livelihood for the majority of the population. With an average annual growth rate of 3.3%, a major challenge this sector is facing is the lack of timely information about crop varieties, production techniques, production and yield strategies. Farmers need to make efficient use of modern technology to achieve maximum yield from available land. Therefore this paper mainly aims at providing a mashup of web based services (namely agriculture service and irrigation service) hosted on cloud platform to help the farmers gain beneficial information regarding farming in India. The web services provide information regarding the current agricultural and irrigational practices in India. It provides detailed information to the end user about various crops and the irrigation techniques that include weather conditions, type of soil, fertilizers, potential diseases and the best places in India to grow a particular crop and also the type of irrigation techniques to be used for particular regions on a single cloud platform.

Key Words: **Cloud computing, mashup service, Agriculture and Irrigation.**

1. Introduction

Cloud computing has emerged as an essential model for managing and delivering the new promising applications in the field of agriculture , education, finance and healthcare etc. efficiently over the internet. However, providing dedicated cloud services that ensure application's dynamic Quality of Service (QoS) requirements and user satisfaction is a big research challenge in cloud computing. As dynamism, complexity and heterogeneity of applications is increasing rapidly, this makes cloud systems unmanageable in service delivery. To overcome these problems, cloud systems require self-management of services. Autonomic cloud computing systems provide the environment in which applications can be managed efficiently by fulfilling QoS requirements of applications without human involvement [11].

India is a land of villages and agriculture still remains the main source of livelihood for the majority of the population. With an average annual growth rate of 3.3%, a major challenge this sector is facing is the lack of timely information about crop varieties, production techniques, production and yield strategies. Farmers need to make efficient use of modern technology to achieve maximum yield from available land.

Emergence of ICT (Information and Communication Technologies) plays an important role in agriculture sector by providing services through computer based agriculture systems [12]. But these agriculture systems are not able to fulfill the needs of today's generation due to lack of important requirements like processing speed, lesser data storage space, reliability, availability, scalability etc. and even the resources used in computer based agriculture systems are not utilized efficiently [13]. To solve the problem of existing agriculture systems, there is a need to develop a cloud based service that can easily manage different types of agriculture related data based on different domains (crop, weather, soil, pest, fertilizer, productivity, irrigation, cattle and equipment) through these steps: i) gather data from various users through preconfigured devices, ii) classify the gathered data into various classes through analysis, iii) store the classified information in cloud repository for future use, and iv) automatic diagnose of the agriculture status. In addition, cloud based autonomic information system is also able to identify the QoS requirements of user request and resources are

allocated efficiently to execute the user request based on these requirements. Cloud based services can significantly improve reliability, availability and customer satisfaction.

Therefore this paper mainly aims at providing a mashup of web based services (namely agriculture service and irrigation service) hosted on cloud platform to help the farmers gain beneficial information regarding farming in India. The web services provide information regarding the current agricultural and irrigational practices in India. It provides detailed information to the end user about various crops and the irrigation techniques that include weather conditions, type of soil, fertilizers, potential diseases and the best places in India to grow a particular crop and also the type of irrigation techniques to be used for particular regions on a single cloud platform. This paper is organized into the following sections: Section 2 describes the features of mashup service and cloud platform. Section 3 shows the implementation of mashup service on cloud platform. Section 4 contains the applications of mashup service and section 5 contains conclusion and future work.

2. Features of Mashup Service and Cloud Platform

The main features of this system are:

Agriculture service - Region in India is taken as input and the best crop that can be grown in that region is determined. The service also takes the crop as input and provides detailed information required to grow that crop.

Irrigation service- Takes region and crop as input and determines the best-suited irrigation facility for it.

Crop Analysis Graphs - These graphs help the farmer gain an insight to the production rates of the major crops of India in different states over the past years. This will help the farmer make efficient decisions regarding the crop to be grown in his region. The graphs are created using SAP Lumira.

Cloud Platform - These features are put on a cloud platform. In networking, cloud computing is computing that involves a large number of computers connected through a communication network such as the Internet. In science, cloud computing is means a distributed computing system over a network. It means the ability to run a program or application on many connected computers at the same time. Cloud computing provides features such as agility, device independence, location independence, scalability, reliability, virtualization, elasticity and performance. This paper is hosted on Amazon EC2 Cloud that provides the aforementioned features.

3. Implementation of Mashup Service

The implementation of mashup service can be done as follows:

3.1 Mashup Architecture

The Fig. 1 shows the mashup architecture.

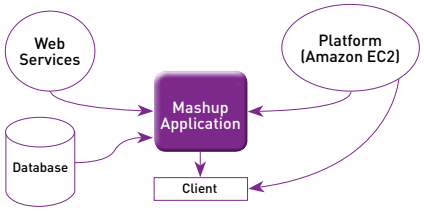

Fig. 1 : Mashup Architecture

The mashup application combines the following to provide the web service that can be accessed by various types of devices with a connection to the internet.

Web Service - The web services include Agriculture service, Irrigation service and Crop Analysis Graphs.

Database - various datasets of agriculture and irrigation in India are combined to form the database tables.

Platform - cloud platform used is Amazon EC2.

Client Application - Web service displayed on varied types of browsers.

3.2 Amazon EC2 Cloud Architecture

The Fig. 2 shows the Amazon Elastic Compute Cloud Architecture.

Amazon EC2 Platform - An Amazon Machine Image is booted and a virtual image is got. This is known as an 'instance'. Once the instance is launched, access to remote cloud server is got. The website can then be launched in cloud server by using WAMPP server. Hence access to Amazon S3 Cloud Storage is achieved, on which our databases can be put.

Amazon EC2 provides elastic and computing services.

Elasticity - the instances can be created, launched and terminated as and when required and charges are paid based on active hourly usage.

Optimizes computing and access latency - Amazon allows us to choose the geographical location of the instance.

3.3 Data Analysis using SAP Lumira

The Fig. 3 shows the Data Analysis using SAP Lumira visualization tool

SAP Lumira is a visualization tool that helps us to analyze our datasets (datasets can be in varied formats such as Excel, CSV or SQL databases) and build graphs to illustrate the analysis. The graph types include pie chart,

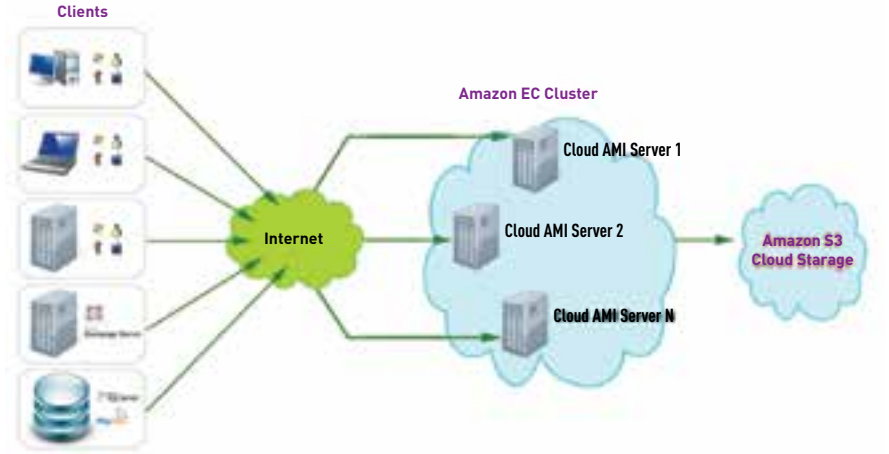

Fig. 2 : Amazon Elastic Compute Cloud Architecture

Fig. 3 : Data Analysis using SAP Lumira visualization tool

bar graph, line graphs, radar chart, heatmaps. These graphs help us to pick up minute analysis details of the datasets that we may have missed.

To create graphs in SAP Lumira:

Extract- the dataset you are going to use in the form of a new document and save it.

Prepare- the dataset to include only the columns or attributes that you require in your analysis and exclude the rest.

Visualize- choose the measures and parameters of the co-ordinate (x and y axis). Visualize the prepared dataset in the form of a graph - choosing the type of graph required.

Story boarding and sharing of these graphs can also be done.

Requirement and Implementation of the web service:

1. **Inputs:**

Agriculture and irrigation datasets, back end databases.

Agriculture service - Region in India is taken as input and the best crop that can be grown in that region is determined. The service also takes the crop as input and provides detailed information required to grow that crop.

Irrigation service- Takes region and crop as input and determines the best-suited irrigation facility for it.

Crop Analysis Graphs - These graphs are created using SAP Lumira, an analysis and visualization tool. The inputs taken are the datasets of different agricultural practices in Indian states including the crop production rates.

2. **Implementation:**

It provides mashup of web services namely- agriculture, irrigation service and crop analysis graphs. Agricultural and irrigational datasets are used to provide crop information and irrigation facilities as output.

Web service is implemented using php, javascript, html and python languages. Backend databases are implemented using Mysql.

SAP Lumira - Data analysis is done on crop datasets to analyze the best crop depending on the production rate in the different states of India. This is done using an analysis and visualization tool known as SAP Lumira.

Amazon EC2 Platform - Amazon EC2 provides elastic and computing services. The entire web service is launched on this platform.

3. **Output:**

Crop Analysis Graphs - Crop analysis for production rate of crops in India across the states over the years is displayed. Farmers can make the decision of growing the suitable crop based on the production rate in their region.

Agricultural Service Output - The detailed information about any given crop is given or the farmer can view

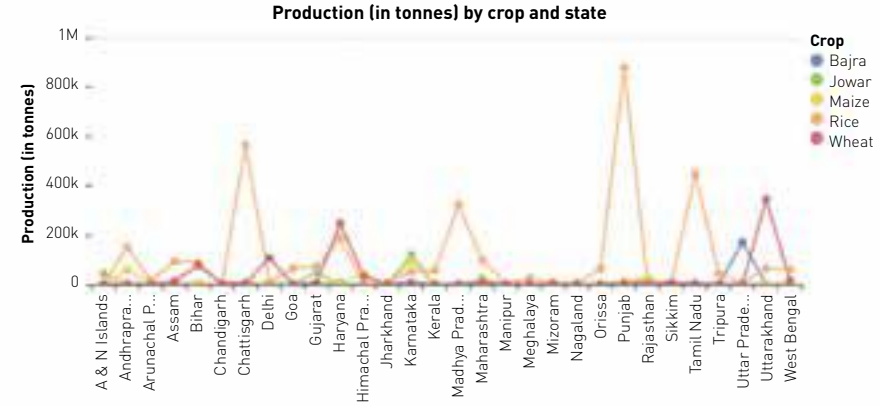

Fig. 4 : Line Chart showing crop production vs states of India (using SAP Lumira)

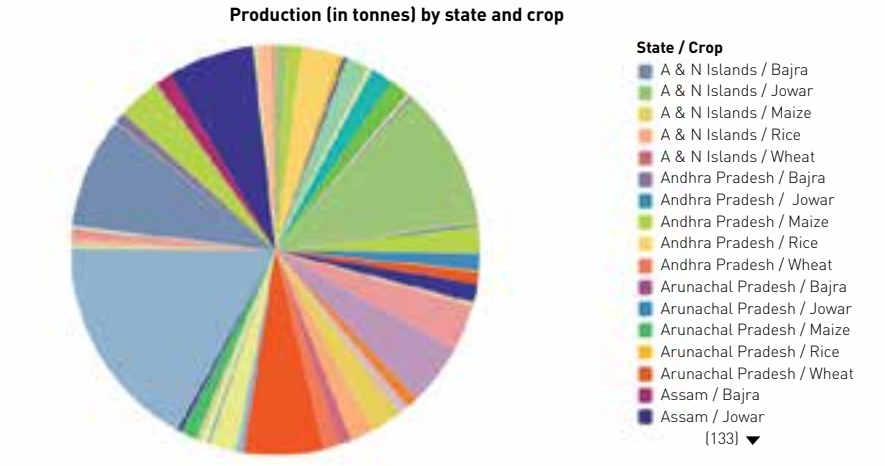

Fig. 5 : Pie Chart showing the maximum and minimum crop productions in different states of India (using SAP Lumira)

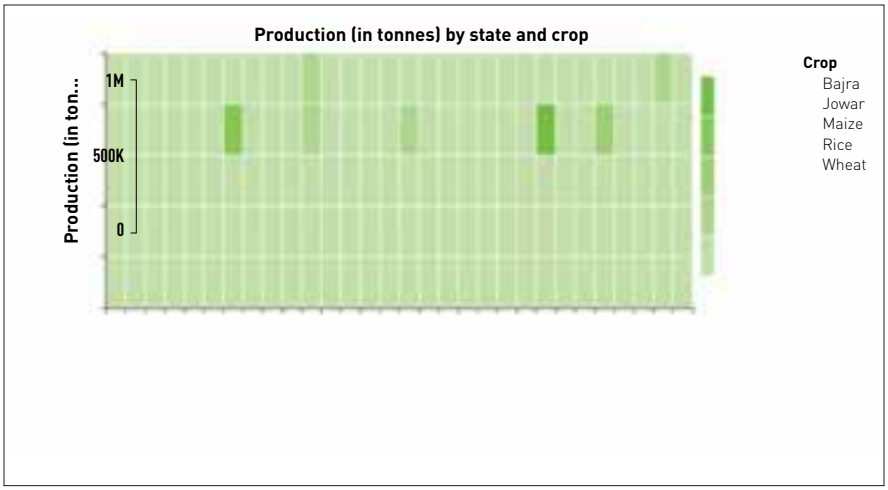

Fig. 6: RadarChart showing production of crops vs states of India (using SAP Lumira)

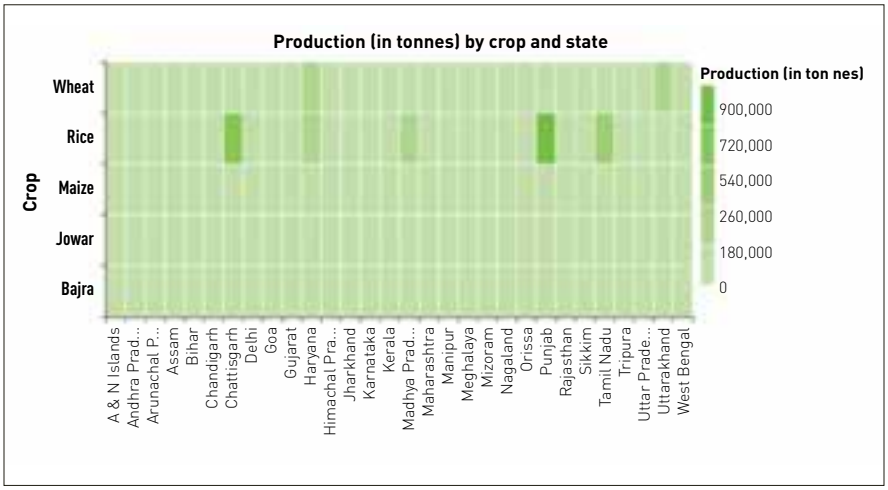

Fig. 7 : Heat Map showing the density of production rates across Indian states for the various crops (Using SAP Lumira)

the entire information table containing all the crops grown in India along with the climatic conditions suitable for them, rainfall required, season, major producer states, diseases the crops may be prone to and the fertilizers to avoid them are displayed.

Figure 8: Agriculture service output

Irrigation Service Output - The irrigation service compares the region and the crop and displays the irrigation method that complies with both crop and state in India.

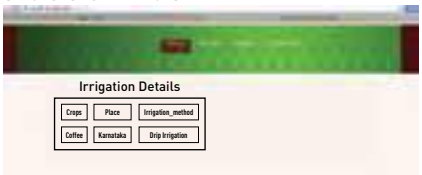

Figure 9: Irrigation Service Output

4 Applications of Mashup Service

This paper will mainly help farmers by providing them detailed information about crops that includes the best producer states for the crop in India, the amount of rainfall required.

It will enable the farmers to maximize the yield by adopting the best methods and practices.

Since the paper is web-service based it can be utilized by a large number of people for any information regarding the crop and its production.

And since this paper provides information in a detailed manner any person mainly a prospective farmer will benefit largely from it.

5 Conclusion

This paper will mainly help farmers by providing them detailed information about crops and will enable the farmers to maximize the yield by adopting the best methods and practices. The crop analysis graphs show the production of major crops of India in various states of India over the years. This will help the farmer to decide the crop that will give the best yield depending on his region. There is path for further improvement by extending it to regional languages.

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Tech Talk

August 4th 2017, "Security Concerns in a Networked World"

Speaker : Sri. Jayakrishnan K, Director of Xtend Technologies (P) Ltd, Kochi.

Topic and Gist : Department of Computer Science & IT, Amrita School of Arts & Sciences, Kochi campus, in association with Computer Society of India (CSI) organized a technical talk on "Security Concerns in a Networked World" on 4th August, 2017 in the College CIR Seminar Hall. Dr. U Krishnakumar, Director, welcomed the gathering. The session was handled by Sri. Jayakrishnan K, Director of Xtend Technologies (P) Ltd. He talked on various areas like buffer overflow, ransomware, phishing, issues related to data breach, two factor authentications etc. The session was very informative and students from MCA Third semester attended the session.

Prof Babu K, immediate past chairman, inaugurated the workshop. Mr. Sreekant P Krishnan, past chairman also spoke on the occasion. Dr. Brijesh Madhavan, CEO, Curvelogics Pvt. Ltd was the lead faculty of the workshop. The content of the workshop were Introduction to Analytics, Predictive Analytics, Machine Learning with R and Python, Cognitive Computing using Cloud Platforms and Use Cases. The workshop was attended by 30 delegates from industries, academics and research organizations.

VELLORE CHAPTER

The Chapter organized one day seminar on Virtual Reality and Game Development on 11th August 2017. Mr Pronay Peddiraju, Game Developer, Metarverse, Chennai explained the basics of animation, creating virtual objects creation, manipulation of objects with animation tool called "Vcasmo" and extended his support to CSI student branches for free seminar and to conduct workshops. Around 50 members participated. The event was organized by Prof K Govinda, Prof K S Sendhil Kumar.

REGION-V

Lendi Institute of Engineering & Technology, Vizianagaram

22-7-2017 - Prof Pallam Shetty delivering Guest Lecture on IoT & WoT

29-7-2017 - Workshop on Android Application Development

RajaRajeswari College of Engineering, Bangalore

1-8-2017 to 3-8-2017 - FDP on Network Engineering

Bharat Institute of Engg. and Tech., Hyderabad

29-7-2017 - One Day Workshop on Tableau Software : A Real Time Data Warehousing Tool Implementation