Cloud based Distributed Application for Analyzing and Co-ordinating Agricultural Logistics Information System

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***Abstract*—** With advent in the area of Information Technology, various new enhanced and powerful technologies and Computing trends have evolved in recent times which have got immense features to cater to our diversified requirement in different areas, Cloud Computing is one such globally accepted technology. Cloud Computing has emerged as a very significant technical paradigm with enormous capabilities to deliver and manage services over the cloud i.e Internet in the most efficient and effective manner. It is undoubtedly next technical buzzword in Information Technology which will certainly transform the way in which we use or live with the technology in today's scenario. More specifically Cloud Computing is one of the most significant and emerging technologies which provides all important services under one umbrella. In this paper a new approach has been presented which deals with Cloud Based Distributed Application system for analyzing and coordinating Agricultural Information System by using latest Cloud computing technologies which manage different types of data related with agricultural activities on different domains. The proposed system acquires various data and information through the concerned agricultural users and consequently provides the desired information to its users in a highly automated manner. In this paper, we are presenting some of the emerging trends and concepts about Cloud based Distributed Application System, its relevance and actual implementation in Agricultural Industry. These techniques and activities are further used for coordination between various entities of Agricultural Information system and hence the Process models can be implemented to enhance the quality in both people and product.

Keywords*---*Cloud Computing, Agricultural logistics system, Distributed Agricultural Data Center

I. INTRODUCTION

Cloud Computing is one of the most significant and emerging technologies which manages and delivers all important Services most efficiently over the Internet under one umbrella in the field of education, finance, agriculture, healthcare etc. Cloud Computing has got enormous capabilities which may enable the users to solve their varieties of problems and issues in various diversified applications [1]. The requirement of information technology and communication is very important for providing information related to agricultural system by using computer system [2]. In this context the main research challenge is to meet user level of Satisfaction and to provide dedicated cloud services. The distribution of agricultural products is a major issue for product delivery from producers to farmers which affects on economic system and creates risk for agricultural commodities (Yandra Rahadian, 2012) [3]. The distribution of agriculture logistics faces so many issues regarding the large marketing chain, delay of logistics availability, and delay in response time and cost increment. Agricultural information system maps the logistics flow, coordination between the production and distribution chains at all the levels. Generally, AIS optimize the logistics distribution at the right time, right location with the minimum cost by using distributed data center over cloud. AIS tracks the whole information through the distributed data centers which assist to distribute information among the farmers and agriculture suppliers for developing effective logistics demands and distribution. In local data center the distribution scenario is partial and not efficient by using centralized data center. Distributed data center gives great potential for improving the coordination between the farmers and agriculture suppliers for demanding the agriculture goods, questioning regarding the land issues and responding the farmers respectively. AIS integrate agriculture supply chain to promote logistics efficiency, traceability of agriculture goods and market environment. Such developments and improvements are required, which are major issues both technically and economically. The novelty of proposed distributed data center for AIS supports a new generation of advancement for farmers and agriculture suppliers by using cloud computing environment.

The main objectives of proposed system are:

1) To avoid manually medium between the farmers and agriculture suppliers.
2) To distribute agriculture goods on time, at exact location with right information.
3) To analyze agriculture goods demand
4) To give quickly response to farmers regarding their quires.
5) To maintain and update all required information in the cloud storage.

II. AGRICULTURAL LOGISTICS INFORMATION SYSTEM

Agricultural logistics information system (ALIS) provides some facilities such as collection of farmer's information update information on different data centers at different location regionally and update the responses by the agriculture supplier's side. It improves the agriculture logistics efficiency for better performing in cloud environment. There are four components of agricultural logistics information system.

- Facilities Location: It defines the services provided for agriculture land.
- Transport Facilities: It defines the route mapping and tracking to monitor the transport by road and railway route for delivering the agricultural logistics.
- Data Center: collects the information of agricultural areas and lands for needs of agriculture logistics from different regions.
- Distribution: It allows data centers to distribute information according to agriculture logistics needs to different data centers of agriculture data centers and agricultural commodities in systematic manner.

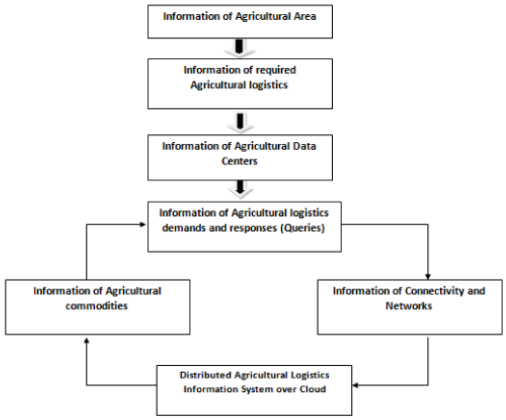

Figure.1: Agricultural Logistics Flow Process

It promotes ICT driven technology and agricultural information dissemination system for quick, effectual and cost-effective delivery of messages to all the stakeholders in agriculture. Keeping pace with the current knowledge distribution trends, it showcases current technologies, policies and other activities through print, electronic and web mode.

• It frequently delivers voice messages that cover different areas like soil management, crop management, horticultural crop management, plant protection practices, market rates, weather forecasts information, human and plants health information, employment opportunities, various government welfare schemes etc.

• The voice messages are customized according to the region and associated cooperative. The Farmers also can get solution of their queries through a helpline manned by the experts from various fields. Thus Farmers are updated with the latest developments, technologies, updates etc.

• It includes Farmers' Club that holds various beneficial schemes for the Farmers which includes Comprehensive Insurance scheme to ensure guaranteed damage cover, Agriculture Loan scheme to meet the short-term credit needs of Farmers for crop production and allied activities etc.

III. PROPOSED DISTRIBUTED AGRICULTURAL DATA CENTER OVER CLOUD

Distributed data center establishes the connectivity by using Distributed data center evaluates information on the basis of transfer time and cost by using cloud computing approaches and monitor ALIS which involves several agricultural data centers to connect agricultural commodity. The figure.2 presents the distributed agricultural logistics information system for agricultural data center, which has different data center at different location. Each data center of village is connected its own region. Each region has collects all information from its own data center and pass to ALIS for distributing information related to ALIS components to region of agricultural commodities of other locations. The transfer cost and transfer time will be reduced by using distributed data center among the agricultural data center and agricultural commodities. cloud provider to set up links between the relief data center and relief organization to distribute logistics information for agricultural logistics needs through the cloud computing. Cloud computing have some extra ordinary techniques to implement the process of data center for information distribution in multiple region at lower cost and time. ALIS collects the information through the different agricultural data centers which uploads lot of requests for agricultural logistics needs. Cloud provider distributes these requests to multiple data centers located at different regions and access information of different components of agricultural logistics.

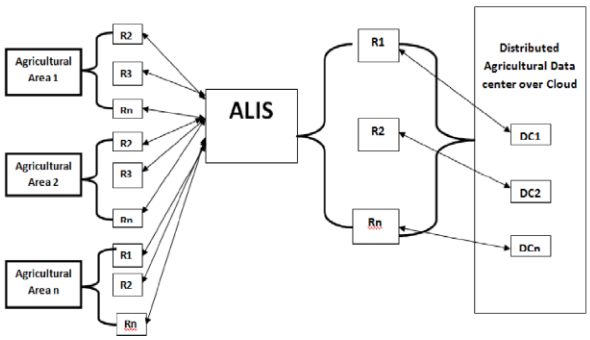

Figure.2: Distributed Agricultural Data Center over Cloud

IV. METHODOLOGY

This paper examines the logistics of agricultural commodities in different markets where all suppliers of those markets are located in different locations. The suppliers have analyzed the farmer demands for agricultural logistics from different locations and also can track all the information environment provides the effective performance, information at all the levels and services details which contribute the success of agricultural logistics implementation with cloud collaboration.al logistics. Below in explanation:

a) Performance: The use cloud in agricultural systems provides in terms of services increases at the feasibility level of agricultural logistics information systems which improves efficiency in agricultural business.

b) Information: The agricultural logistics information systems tracks the information regarding the information generated updated and routed at all the level of suppliers and farmers.

c) Economics: Cloud economically provides services as per demand for suppliers and farmers by which suppliers and farmers will be connected to each other without limit of time and virtual space via internet.

d) Efficiency: Cloud provides minimum latency and minimum data transfer cost which provides effective performance of agricultural logistics information systems.

V. CLOUD ANALYST

Cloud Analyst is an open source tool which supports to evaluate and simulate the cloud based services [4]. The simulation result presents improvement of quality of service by using cloud Sim on the top level of it [5].

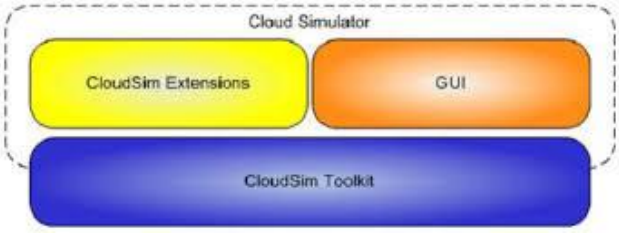

Figure.3: Cloud Analyst Architecture

There are some following operations provided by Cloud Sim kit:

1. Application users: This operation acts as a traffic generator based on configurable behavior.
2. Internet: this operation is used for data transfer across Internet with network delays and bandwidth restrictions.
3. Service Broker: It presents multiple data centers in virtual environment and routing traffic to appropriate data centers. In cloud analyst, there are multiple data centers and routing traffic very suitable accessed in VM management. There are two type of task in service broker policy; Data Center Controller and Cloud App Service Broker.
4. GUI: At GUI, user can simulate results with simulation experiment in repeatable manner it also presents result in pdf format for future use. The main components of GUI are divided in to six regions in the world. The other entities are userbase and data centers in these regions [6].
    a) User Base: In this unit, thousand users are configured in single unit and it generates the traffic for simulation.
    b) Internet: It presents real world internet scenario which defines characteristics of internet execution on the cloud analyst simulator like latency, bandwidth among the regions, current traffic level and performance of data centers.
    c) Internet Cloudlet: It represents the grouping of user's requests. The numbers of requests are generated into a single Internet Cloudlet. It have information like size of requests, number of requests, size of input and output files, application id for routing the request over the internet.
    d) Data Center Controller: It controls the activities of data center like creation of VM and destruction and routing of user request by the user bases over the internet.
    e) VM Load Balancer : This load balancer determines that which virtual machine has to be assigned the next request for executing.

There are three major load balancing policies are included in cloud analyst:

1. Round Robin Load balancing policy: This policy uses a round robin manner to allocate virtual machine.
2. Active Monitoring Load balancing policy: This policy attempts to manage equal balancing of workload on the virtual machines at the data center.
3. Throttled Load balancing policy: This policy ensures only predefined number of internet cloudlets are

generated into a single virtual machine. If more requests are generated on the available virtual machines at the data center.

VI. POPOSED DISTRIBUTED LOAD BALANCING POLICY

This policy presents distributed data center where each regions has its own data center and calculates the response time which will be reduced by using data center selection policy approach to execute user base (agricultural data center) requests on the nearest data center (agricultural commodity). So the nearest data center (agricultural commodity) which has higher position in the proximity list will they respond to the user base (agricultural data center). Distributed load balancing policy uses scheduling approach which focuses that more than one data centers (agricultural commodity) exist in the same region, the job request will be executed on the closest data center (agricultural commodity), the job request will be also executed on data center (relief organization) which have lowest cost of total cost (virtual machine cost + data transfer cost).

There are following steps of distributed load balancing policy:

1. Select the region
2. Calculate the number of relief data center in selected region
3. Select the nearest relief data center with minimum latency and minimum bandwidth cost
4. Find out the current request and pass to nearest relief organization data center
5. Analyze the result.

VII. SIMULATION & RESULT ANALYSIS

Cloud Sim and Cloud Analyst is used for implementation of proposed agricultural logistics information systems architecture and proposed distributed load balancing policy. Cloud Sim and Cloud Analyst simulator helps developers with insights simulation that how to distribute applications among cloud infrastructures and value added services such as optimization of applications performance [7]. We configure simulator by using distributed data center where each region has its own data center and focuses on that how the response time will reduce by executing requests of agricultural data center on closest agricultural commodity. Here is agricultural data center located in different region with their respective region id and different agricultural commodity which are located in different regions. Here is user base (agricultural data center) configuration where each user base located in different regions with their respective region id. On basis of below table we find out the following average response time of all user bases (agricultural data center).

Table.1: User base (Agricultural Data Center Configuration)

Agricultural Data Centers	Region	Data Center Id	Virtual Machine Memory	User base (Relief Data Center)	Requests (Agricultural Data Center)	Available Bandwidth	Number of Processor	Processor Speed
Chandigarh	0	DC 1	512 Mb	5	100	1000	3	1000
Ludhiyana	1	DC 2	512 Mb	5	100	1000	3	1000
Panipat	2	DC 3	512 Mb	5	100	1000	3	1000
Amritsar	3	DC 4	512 Mb	5	100	1000	3	1000
Sonipat	4	DC 5	512 Mb	5	100	1000	3	1000
Ambala	5	DC 6	512 Mb	5	100	1000	3	1000

On basis of an above table we find out the following average response time of all user bases (relief data center) by using our proposed DSBP algorithm.

Table.2: Performance of average response time

Data Center	Region	Virtual Machine in Data Center	Virtual Machine Bandwidth	User Base (Agricultural Data Center)	Requests	Average response time
Proposed Distributed Agricultural Data Center	5	5	1000	30	600	40.2

Now when the number of user base (agricultural data center) requests for logistics demand increases the response time of decreases rapidly. In distributed data center architecture the local agricultural data center takes request from its own region and will not face overloading on its server because each local agricultural data center execute the emergency requirements and gives effective response time. The proposed Distributed load balancing policy uses scheduling job to reduce the total cost of data transfer cost and virtual machine cost in comparison to exist service broker policy. The following graph is presenting the number of virtual machine (VM) and number of cloudlet and cost of different data centers using different approach.

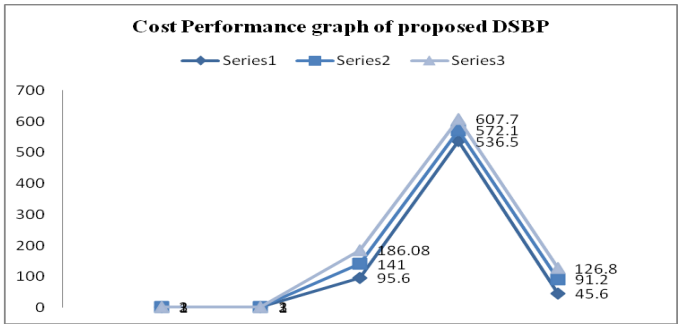

Figure.3: Graphical result for cost performance

According to the average response table and cost performance graph we can analyze that proposed Distributed load balancing policy will improve the service broker policy approach to minimize the latency for response time and cost of selection of data transfer in series 3 in comparison to other policies defined in series 1 and series 2 for information transmission by agricultural data centers to agricultural commodities.

VI. CONCLUSION

A country solving the issues of agricultural commodities by using cloud based agricultural logistics information system with distributed data center which supports distribution of information about agricultural logistics at right time, right location with effective cost and efficient time. Distributed data center concentrates on information flow for agricultural logistics decisions like, coordination of agricultural data centers, funding agencies, need assessment, communication, agricultural commodities and goverment within supply chain. By implementing distributed data center over cloud for agricultural logistics information system, one can get recovered from emergency needs and logistics processes in agricultural issues, so by implementing distributed data center in agricultural sector, any village can overcome their agricultural issue. This paper identifies that distributed agricultural data center can help for recovery of agricultural issues to give better performance for agricultural logistics information system to different agricultural commodities from agricultural data centers.

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