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DEVELOPMENT OF AGRICULTURE DATA CENTER BASED ON CLOUD OBJECT STORAGE

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Abstract. Agriculture plays a major role directly or indirectly in improving the economies of developing countries such as India, China, Brazil, Indonesia etc. In the current liberalization era, every competitive sector including agriculture, so to compete the agricultural sector must also use information technology to achieve maximum benefits. Most rural areas are dependent on agriculture, poor in information and lack of facilities to use the latest technology results. This research implements cloud object storage in agricultural data centers. Cloud object storage is built using swift openstack on a server cluster. Average bandwidth usage in cloud object storage uses swift openstack for large file sizes of 11 MB / s. The advantages of using cloud object storage, including which can be used to handle disaster recovery. In this study the agricultural data center is used to store monitoring data, such as temperature, humidity, rainfall, wind direction and soil fertility. Data stored in the data center is then used to determine the right time to start planting and what crops are in accordance with the existing soil fertility. The evaluation is done by measuring the performance of the agricultural data center.

1. Introduction

Agriculture plays a major role directly or indirectly in improving the economies of developing countries such as India, China, Brazil, Indonesia etc. In the current liberalization era, every competitive sector including agriculture, so to compete the agricultural sector must also use information technology to achieve maximum benefits. Most rural areas are dependent on agriculture, poor in information and lack of facilities to use the latest technology results[1].

Communities in the villages have passed down best practices for centuries in the form of farming knowledge for each subsequent generation. Agriculture is traditionally practiced by families by passing on their knowledge as inheritance from their ancestors. Agricultural productivity is low and unreliable in poor rural areas, which causes food insecurity. Information exchange can play an important role and can help reduce poverty. Therefore, the use of information and communication technology (ICT) can act as a positive force and can promise agricultural growth, poverty reduction, and sustainable use of resources[2].

Agricultural resources are important resources in our daily lives. The need to monitor effectively, the factors that influence agricultural productivity are very important. Soil moisture sensors can help improve crop irrigation in agriculture and can help understand the effects of various plants on various types of soil. Therefore, the assessment of groundwater content has received a proportion of responsive levels. Other basic environmental factors that affect this resource are relative humidity, ambient temperature, dew point, and many others. Platform for monitoring is very important for the agricultural base, because virtualization is the key to analysis[3].

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Wireless Sensor Network (WSN) devices are composed by microcontrollers, memory, sensors, batteries, and radios. The use of the Cloud to store and process data collected by WSNs has resulted in a large scale infrastructure called Sensor Clouds. Cloud Sensor settings using web services, SOAP-XML, REST-JSON, and commercial cloud services tailored for WSN remote management, can be used[4].

This research implements cloud object storage in agricultural data centers. Cloud object storage is built using swift openstack on a server cluster. There are several advantages to using cloud object storage, some of which can be used to handle disaster recovery. In this study the agricultural data center is used to store monitoring data, such as temperature, humidity, rainfall, wind direction and soil fertility[5].

2. Method

The system design consists of block diagrams which are a general description of the system to be built, clustering which is a grouping of nodes into regions and zones, and network topology which is the foundation in building a network system.

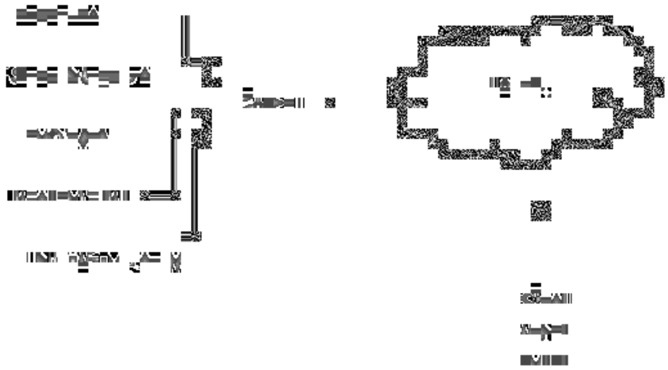

Figure 1. Proposed architecture

The proposed system is shown in Figure 1 which consists of sensor nodes connected to a microcontroller. Data from sensor readings by the microcontroller are sent to cloud object storage via the Internet network. Cloud object storage is built using openstack swict object storage. Cloud object storage is a server computer cluster consisting of several nodes. So that if a fault occurs in one node, then the other node will back up the node. With this method, data availability is guaranteed.

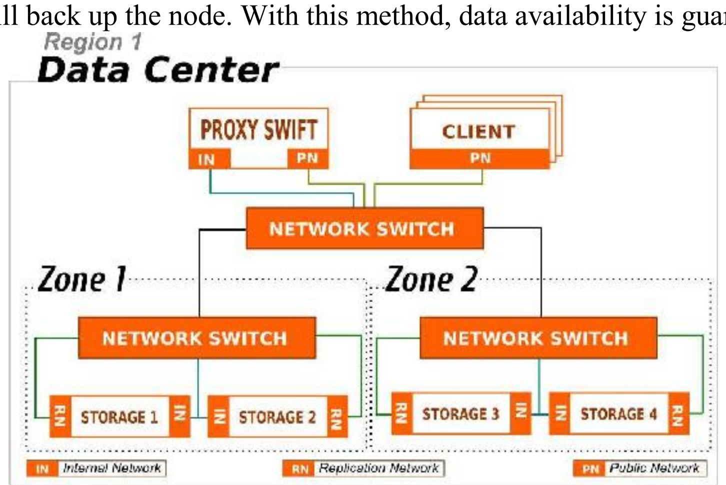

Figure 2. Network topology

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Data center or region has 2 zones or racks, namely rack 1 and rack 2. Each rack contains 2 nodes with 2 NIC Ethernet Cards. The first network interface will be used for public paths to users, while the second path is used for replication paths between nodes. The purpose of separating the replication path from the public path is to reduce the level of data traffic on the network. Each rack has one network switch, this separation is intended to build link redundancy. Rack Switch will be connected to the Root Switch that is outside the scope of the test. Swift proxy has the duty to regulate data traffic both data to / from client and replica data. Swift proxy has 2 interfaces namely internal network that is connected to the internal network to be able to communicate with node storage and public network to be able to accept connections from service users.

3. Result and Discussion

This tool uses 5 sensors namely DS18B20 sensor to read temperature, DHT11 sensor to absorb humidity, Rain Gauge sensor to read rainfall, Anemometer sensor to read wind speed and Soil Moisture sensor to read soil moisture. The voltage source needed by this sensor is 5 volts DC except Soil Moisture uses 3.3 volts DC. Weather Monitoring Series as shown in Figure 3.

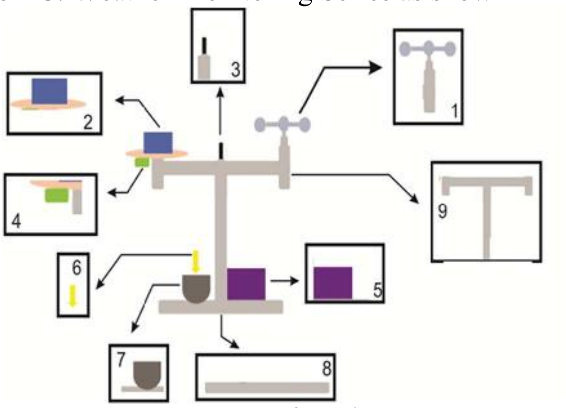

Figure 3. Prototype of Weather Monitoring

The mechanics of the prototype are made from a half-Dm-sized pvp pipe with a design-appropriate size of 75x35x47 Cm. The mechanics consist of a sensor buffer frame, a Rain gauge frame, a frame buffer, and a microcontroller box. Mechanics are made in the form of a single sector that is intended for a limited distance. Prototype Architecture can be found in Figure 4.

Figure 4. mechanics of the prototype

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Website development with nodered, begins with the connection of nodes in a structured way. Nodered website developers must manage each node used. The nodes are configured with settings and some scripts therein. This nodered script uses the javascript programming language. In the planning stage, the website is designed with one web page so that there is a flow in the development of the website with nodered.

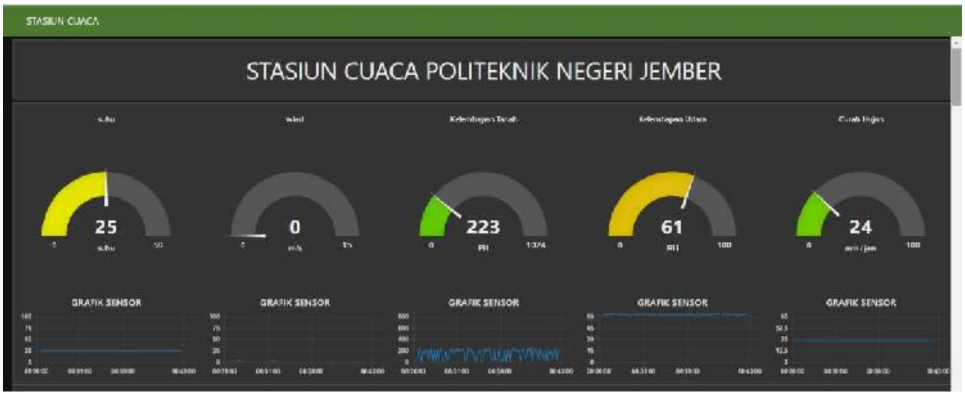

Figure 5. Website interface

Testing the accuracy of sensor readings is done by comparing the value of sensor readings with the values indicated by official data on the Accu Weather website.

Table 1. Accuracy testing

No	Temperature			Wind Speed			Humidity		
	Sensor	Data Accu Weather	% error	Sensor	Data Accu Weather	% error	Sensor	Data Accu Weather	% error
1	28	29	3.4	4.9	10	51.0	56	58	3.4
2	28	29	3.4	5.1	10	49.2	56	58	3.4
3	28	29	3.4	5.8	10	42.0	56	58	3.4
4	28	29	3.4	5.1	10	49.2	56	58	3.4
5	28	29	3.4	1.6	10	83.8	56	58	3.4
6	28	29	3.4	4.7	10	52.8	56	58	3.4
7	28	29	3.4	6.9	10	31.2	56	58	3.4
8	28	29	3.4	6.0	10	40.2	56	58	3.4
9	28	29	3.4	6.2	10	38.4	56	58	3.4
10	28	29	3.4	6.7	10	33.0	56	58	3.4
11	28	29	3.4	7.1	10	29.4	56	58	3.4
12	28	29	3.4	8.0	10	20.4	56	58	3.4
13	28	29	3.4	7.1	10	29.4	56	58	3.4
14	28	29	3.4	8.0	10	20.4	56	58	3.4
15	28	29	3.4	3.8	10	61.8	56	58	3.4
	rata - rata error		3.4	rata - rata error		42.2	rata - rata error		3.4

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4. Conclusion

In this study the agricultural data center is used to store monitoring data, such as temperature, humidity, rainfall, wind direction and soil fertility. Data stored in the data center is then used to determine the right time to start planting and what crops are in accordance with the existing soil fertility.

5. Acknowledgement

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