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Design Model for Cloud based Waste-Water Management System

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Abstract: Cloud computing is a network of remote servers hosted on the Internet to store, manage, and process large scale data, rather than a local server or a personal computer. Specially, the problems of big volume of spatial data in some of the emergency cases which make the needs for elastic way for storing and analysis and computing all of these resources. The combination of GIS (geographic information system) and cloud computing can provide new prospects for the development of information storage, processing and its application for the GIS. The work presented in this research project highlights the development of a cloud based decision support system for waste water management for the city. The GIS system has been designed to enable local authorities in Municipal Corporation to identify solutions for waste water management.

Keywords: Cloud Computing, Pressure, pH, BOD, CO

I. INTRODUCTION

Climate change, population growth and unreasonable exploitation of water resources have caused environmental deterioration, the unavailability of freshwater and an imbalance between supply and demand to a global extent, thus seriously affecting the sustainable development and utilization of water resources.[4]. In waste water management system, city authorities have the waste water data of all the different areas of the city. They need to manually analyze the data and decide the future usage of the waste water. This task is tedious and time consuming. Our system makes this task autonomous and by deploying this system on cloud, they can get the results on any computer connected to the network.

Cloud Computing gives us access to remote servers hosted on the internet. We can store, manage and process our data on a distributed system. Cloud computing allows consumers to use applications without installation and access their files at any computer with internet access.[1] (Kanday, 2012)

GIS is an incorporated arrangement of PC equipment, programming, and spatial information (topographic, demographic, plain, realistic picture, digitally abridged), which performs manipulative and scientific operations on this information to deliver reports, illustrations and measurements and controls geographic information preparing work processes. Here, Cloud computing gives us very useful GIS spatial decision support tool for MNC authorities to get decision for waste water usage.

The current situation requires new or improved integrated approaches in which the knowledge of diverse disciplines is combined in a unified methodological and operational framework [9], with adequate management and communication of uncertainty and with a persistent involvement of decision makers and stakeholders and consideration of their views [8–7].

MNC water works system need to access waste water source data from all locations for computation. At this time authenticate people manually analyze data and forward water flow to water treatment plant. This cloud based system gives access of distributed location data to any computer, which is connected in network.

Cloud based waste water system gets data of analyzed waste water source and through parallel computation model,

MNC authenticate people will get best match usage for particular analyzed waste water component.

A number of valuable studies have been undertaken to provide a foundation for future studies that are required to develop models that are fit for this purpose.[5]

II. BACKGROUND

In recent years, the management of natural resources has become an increasingly challenging issue for several reasons. First of all, the problems themselves are characterized by intrinsic complexity as a consequence of the complex spatial and temporal features of water and related ecosystems.**[6]**

In Ireland, web based Geographical information system (GIS) spatial decision support tool (Nadeem Qazi, 2013) is intended to empower local authorities to decide ways for the treatment of residential waste water in low porousness subsoil region.[2] It is set up over Amazon cloud computing environment. Here spatial modeling is done through ESRI's ArcMap[2] and announced as a web service on ArcGIS server 10.1. It is using REST (Representational State Transfer) architecture.

Main modeling datasets are topography, soil and subsoil, rivers, urban and rural sewered area, waste water treatment plants, septic tanks etc. These datasets were first loaded as file geo database on ArcGIS server. Then need to find area of low permeability. Inadequate percolation layer was shown in ArcMap, on which locations of rivers, septic tanks, sewered areas were added. It gives map service to ArcGIS server.

This system offers two solutions:

- Forward water flow to a centralized wastewater treatment plant
- Construction of small bore sewerage through clusters of single house.

These all administrations were modeled as geo-processing assignments and hosted on ArcGIS Server. Flex widget technology was used to enable access from client browser. The widgets offer information with one another

through occasions dispatched by base widgets and information supervisor.

In ancient system, there is only one pipe lining for water supply in domestic area and second one pipe lining for drainage system. This drainage pipelining combine all waste water from domestic usage (ex. Washing water, bathing water, drainage water). So this drainage water can forward water flow to water treatment plant only.

But Modern system has two outgoing pipe lining from domestic area. One is for drainage water particularly flushed water and other one is for other used water like car washing, cloth washing, cleaning, bathing etc. So second pipeline can forward water flow to low permeability area for beneficial usage of that water source. Second pipelines water will have reliable pH, Bod, Cod values compared to drainage water pipeline.

Emergency management faces inconvenience in overseeing crisis information in light of the fact that it contains the coordination of different heterogeneous sources, numerous areas claim the important information and process parts of crisis related learning. The emergency WebGIS [3] platform is for the most part for each segment of the government emergency administration, for major unexpected occasions to the investigation of high performance, possibility administration and transfer of spatial data frameworks to support choice making.

A. MNC Leakage Mapping

Here we can see that in current MNC leakage mapping system,(http://www.hgiworld.com/services/leak-detection-2/pipe/) we have very much delay in between complaint and repairing.

If leakage occur at any location. Customers can complaint online or contact via helpline number. Full geographical areas are divided into many zones on the base of locations. All zones reports headquarter daily. And Head quarter reports to community weekly. After discussion with leakage team, they come to repair leakag**e.**

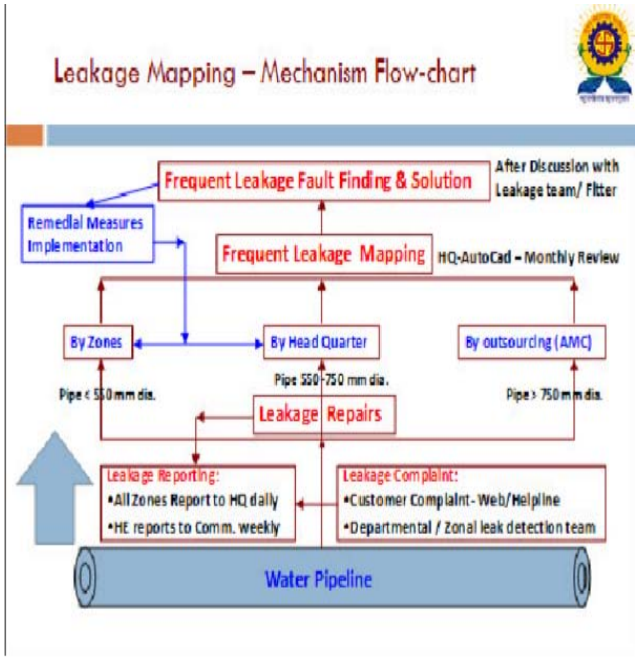

Figure 1. Leakage Mapping

In between complaint done by customers and leakage team overcome the problem, much amount of water being wasted.

Water gets accumulated in certain regions, which can be properly utilized if prior knowledge is available.

B. Proposed System Architecture

To manage the usage of waste water sources deploy the cloud based computational model with GIS to measure the waste water quality. In a proposed system, authorized person from Municipal Corporation, will have registered account in the system. Through it, he/she can manage and examine waste water sources.

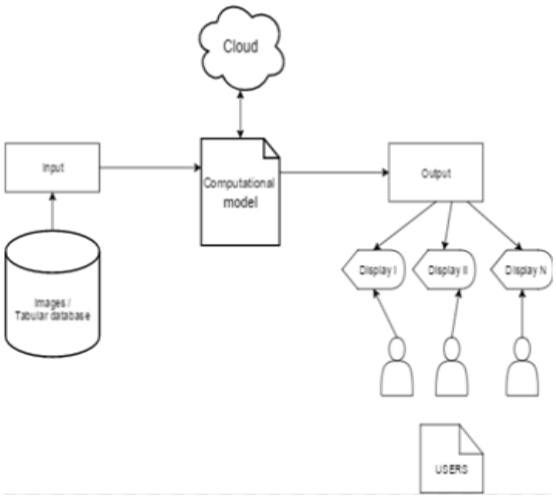

Figure 2. Proposed Architecture

After login successfully by authorized person he/she can give a location on the base of requirement, from where they want to use waste water resources. From the database last some amount of quality parameters details will be fetched, and it will go for computational flow as mentioned below. On the basis of various conditions best usage will be given to the user for requested waste water resources.

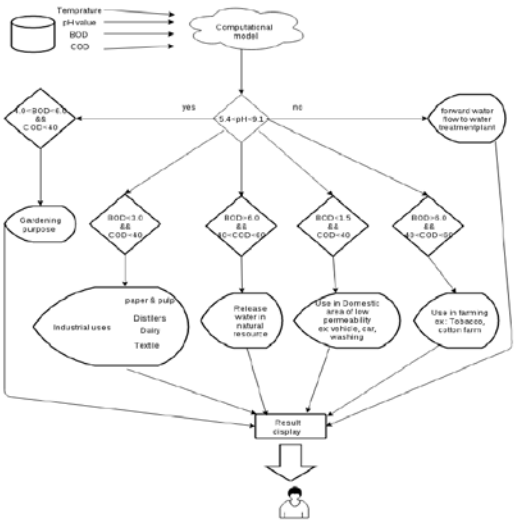

Figure. 3 Architecture of computational model

Computational part of the system will work like mentioned architecture.

III. SYSTEM WORKFLOW

The workflow of the above mentioned architectures as shown in fig.2 and fig.3 is explain below.

Workflow of the system is shown in the fig.3 Also the pseudo code for the same is given in the fig.4

- User should have to register their account into the system.
- Once user has registered, he/she has credentials, through which they can login in to the system and manage functionalities.

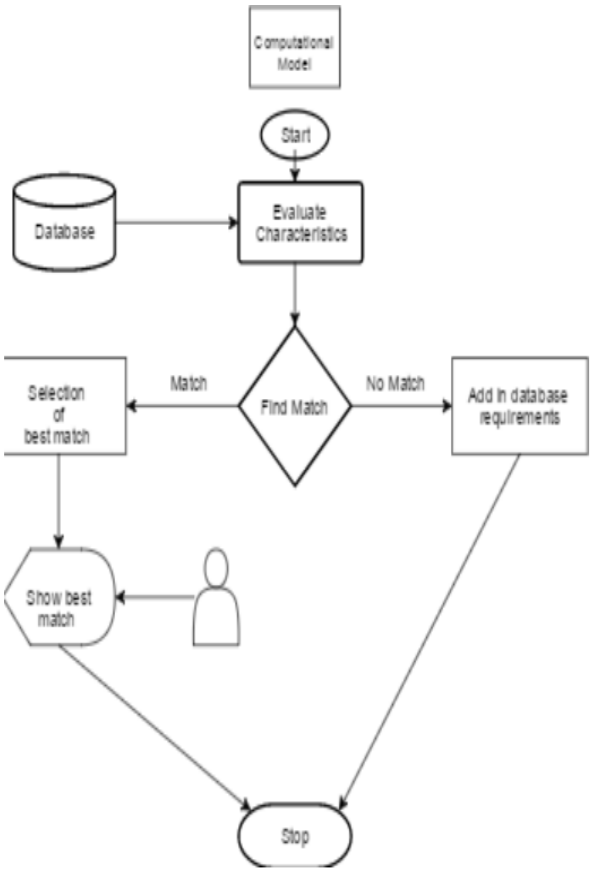

Figure.4Workflow of the system

- After successfully logged in, for getting VM, users will redirected to Open Nebula which generates VM in background.
- Now User can give a location, for which they want to find a best usage of waste water.
- From the database related data for the required location will be fetched, and will be evaluated for the computation.
- After computation, based on the result it will be available beast usage for the requested waste water source.
- Last some amount of quality parameters details and maps related to usage will be shown along with best suitable usage for the requested waste water source to the MNC authorized person.
- If there is not usage available for required particular location, it will be added in database requirement to admin panel.
- When user asks for logout, his/her account will be closed and login page will be shown.

IV. FUTURE WORK AND CONCLUSION

Waste-water management system and its functioning in detail is discussed. We have also proposed the architecture to implement the system to manage the waste water based on parameters like BOD, COD, and temperature and water pressure.

In future work we are going to propose algorithms for various models of this system. After that we are going to implement this system on live cloud test-bed and generate the results.

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