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Development of Integrated Message alert system for Weather Informatics

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Abstract: This paper introduces a prototype on integrated weather informatics. Weather information delivery has been a major concern in India. This prototype can solve this problem as it uses two widely used communication systems i.e. TEXT SMS and Email. The prototype has been divided into modules and explained individually. Customizing and reimplementation can be done to suite any requirement specification by the reader.

Keywords: Web Server, Trigger, SMS Gateway.

I. INTRODUCTION

Weather refers to the condition of the air on earth at a given place and time. Informatics is the science of information. As an academic field it involves the practice of information processing, and the engineering of information system. It studies the structure, algorithms, behaviour, and interactions of natural and artificial systems which store, process, access, and communicate information. The field considers the interaction between humans and information systems alongside the construction of computer interfaces. Weather Informatics deals with all the science of processing weather data for storage and retrieval. Predicting weather information was a complex task before. Advancement in the technology has brought us to a position in which we can foresee weather information. Some of the needs for weather forecasting can be,

- Farmers need to know if it will rain when deciding whether or not to irrigate.
- Fishermen need to know if it will be safe to go out to sea.
- Air traffic controllers need to direct pilots around storms.
- Storm warnings tell people if and when they need to evacuate.

As sophisticated equipments are available to do this job, the prime concern now is timely delivery of accurate information to the right destination. In this paper we are going to discuss about a prototype which deals with delivery of weather information in multiple ways.

II. PROTOTYPE

I. THE PROTOTYPE

The prototype can be broken down to 4 modules and components are shown in Fig. 1

A. Fetch_Mail

B. Trigger_Module

C. Logic_Module

D. Data_Delivery

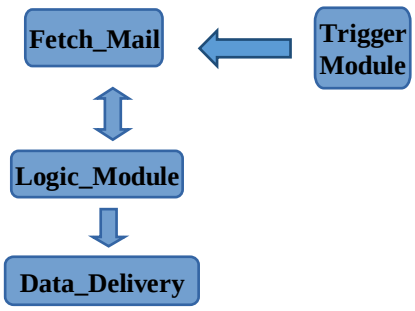

Fig1. Basic component view of the prototype

A. Fetch_Mail

The basic function of this module is to extract the weather information from the mail M_1 sent by the source S_1, which is received at a predefined email_ID E_1 and then delivers it to the Logic Module.

The sending source S_1 can either be a human or a computer program. An email format F_1 has to be decided prior and the sending source S_1 will be sending his weather information in this format F_1 to the email_ID E_1. A semantic analysis is performed on the body of mail M_1, and the required weather data is extracted.

1) The technical explanation is as follows: The script is hosted in web server W which is triggered at particular interval of time from the Trigger_Module. The Login credentials of the email_ID E_1 are defined in the script. The script opens a TCP connection using the IMAP protocol and connects to the email_ID E_1 by the credentials defined earlier. Then by using an algorithm the script extract the mail M_1 sent by the source S_1. After processing the mail M_1, it extracts the required weather information and hands it over to the Logic_Module.

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2) Hosting the script in a web server: The script containing the source code is hosted in a web server. The web server can be a simple WAMP (Windows Apache MySQL PHP) or LAMP (Linux Apache MySQL PHP) and the script is placed in the root. The trigger module has to be configured to call this script by providing it the path of the script file in the web server W.

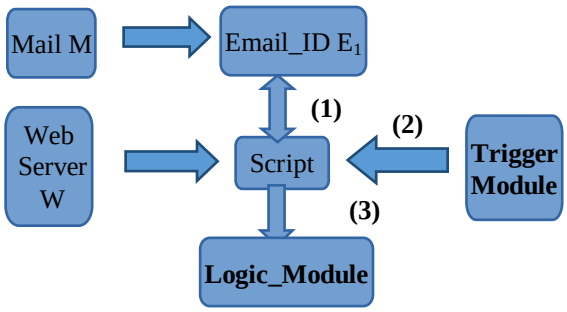

Fig2. Component view of Fetch_Mail Module

(1) Fetching the mail M_1 using an algorithm associated with IMAP.
(2) Invoking the Script with a configurable interval.
(3) Extracting weather information from the mail M_1 and handing it over.

B. Trigger_Module:
The Trigger_Module deals with invocation of the script in the Fetch_Mail Module.
A trigger is a simple & powerful tool to do all timing and scheduling tasks. A trigger website takes the script URL, Time Slice and Repeat interval as parameters. In our context we provide the URL of the script hosted in the Web Server W to the trigger website. The trigger website invokes the URL based on the Time Slice and predefined Repeat Interval.

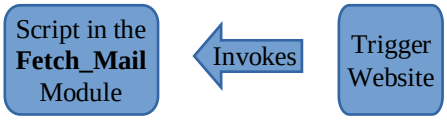

Fig3. Component view of Trigger_Module

C. Logic_Module:
The functionality of this module is defined to manipulate the received weather data from the Fetch_Mail module using a programmed logic; the outcome of this logic determines the input to the Data_Delivery Module.
An Online Database D is connected to this module. The recipients are divided into groups based on a criteria (Criteria can be: Casual users, Government officials, Prioritized Authorities) and all their information's are stored in this Database D. The groups of recipients for which the weather information message is to be delivered are determined. The weather data from the mail M_1 is obtained from the Fetch_Mail module. Logical operations and calculations are performed on this data. The result is formatted to a final format F_2. The succeeding Data_Delivery Module receives two parameters from the Logic_Module i.e. the recipient groups and the Weather Information Message as the input.

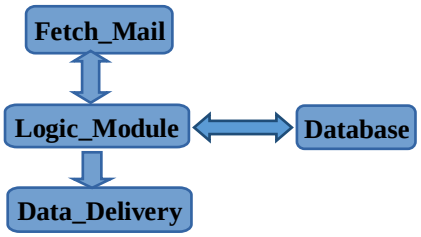

Fig4. Component view of Logic_Module

D. Data_Delivery_Module:
This module is responsible for the delivery of the weather information message to the recipients. The message is delivered as
1) Text SMS (Short Message Service): The Text SMS handler sub-module is responsible for the delivery of the weather information message as text message. An SMS Gateway takes recipient lists and the message as parameters. An SMS Gateway allows a computer to send or receive SMS transmissions to or from a telecommunications network. Most messages are eventually routed into the mobile phones networks. Following the rules and regulations set by TRAI (Telecom Regulatory Authority of India), Transactional SMS channel has to be used to deliver these bulk SMSs.

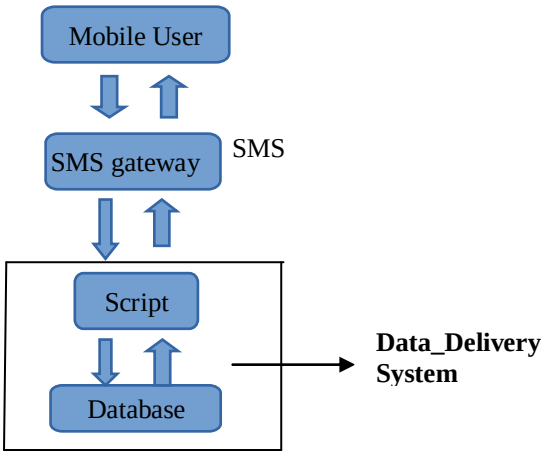

Fig5. TEXT SMS Delivery by SMS Gateway

2) Email: The Email handler sub-module is responsible for the delivery of the weather information message as emails.

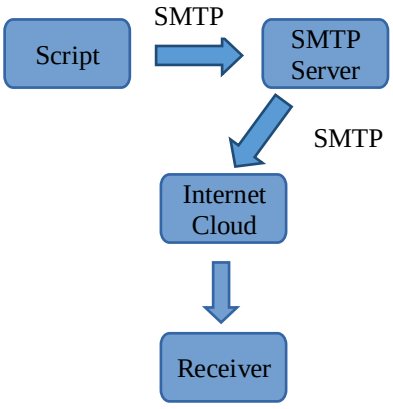

Fig6. Email Delivery through SMTP

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The email handler section of the script opens a TCP connection using the SMTP using the credentials defined earlier. The format of the Email is set to predefined format F_3. Finally the email containing the weather information message is sent to the recipients' group received from the Logic_Module.

The email handler and the Text SMS handler are connected to the Database D. The delivery reports and the transaction logs are maintained.

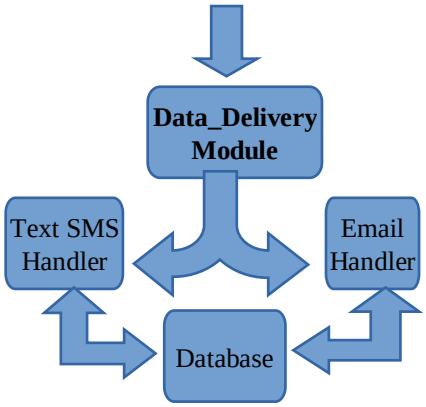

Fig7. Interaction of Data_Delivery Module with the Database

3) Hybrid module: It is said to be the combination of two of the above given model i.e. (Email Handler & SMS handler). Both the handlers is integrated to form a Hybrid module. The log records are stored in the database, which can be further referred as required.

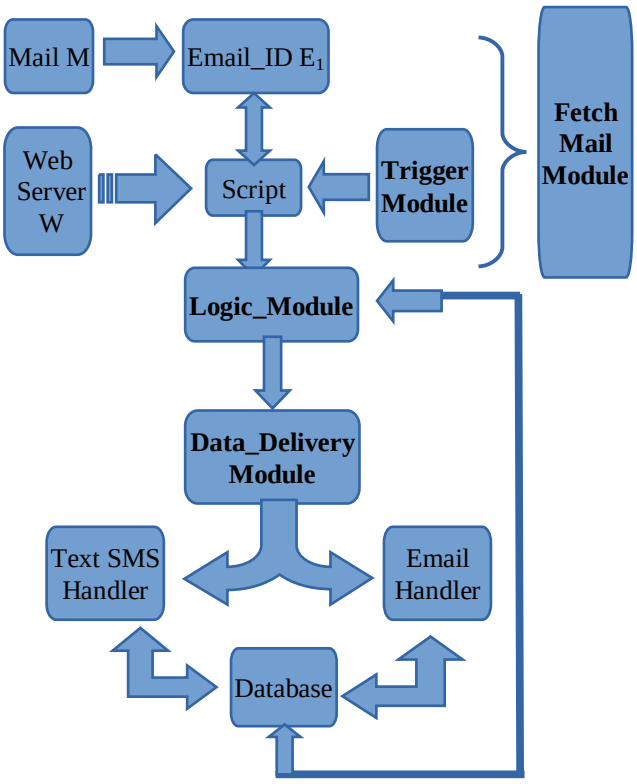

Fig8. Component view of Hybrid Module

This module can be used to deliver the weather information message in both the modules simultaneously, thereby enhancing the productivity and performance of the system.

III.PAGE STYLE

Over the past 150 years, the world's industrialized nations have changed the balance of the carbon cycle by burning huge amounts of fossil fuels. Industrialized nations have also breeding vast numbers poisonous gases into the atmosphere. Depletion of our natural resources is imminent. Irreversible damage has been done to the planet. These changes directly or indirectly affect the world climates. Climate change and agriculture are interrelated processes, both of which take place on a global scale. Climate change affects agriculture in a number of ways, including through changes in average temperatures, rainfall, and climate extremes (e.g., heat waves); changes in pests and diseases; changes in atmospheric carbon dioxide and ground-level ozone concentrations; changes in the nutritional quality of some foods; and changes in sea level.

Climate change is already affecting agriculture, with effects unevenly distributed across the world. Future climate change will likely negatively affect crop production. If a system like the one discussed here is put into existence can minimize these losses to some extent. If a farmer gets to know current weather information before planning out his daily routines, he can take up precautionary measures thereby minimizing losses of his resources. Due to technological advancement in India and several government initiatives, the text message implementation can be the solution for this problem as farmers now own cell phones. Schools and educational institutions and various authority heads can make use of the email implementation for receiving the weather information updates. Hybrid implementation is the most efficient in delivering the weather information simultaneously in both email and TEXT SMS.

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