

Real Time Solutions Pvt. Ltd.

58 Samarpan Marg, Tripureshwar

P.O. Box No. 25090

Kathmandu, Nepal

Phone: +977 (1) 4253717

Fax: +977 (1) 4229709

[www.rts.com.np](http://www.rts.com.np)

Email: info@rts.com.np

# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

Case Study

# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

## Table of Contents

Project Description .....	3
Features of the project .....	5
Hardware .....	6
CDMA Scheme .....	8
Conclusion.....	9



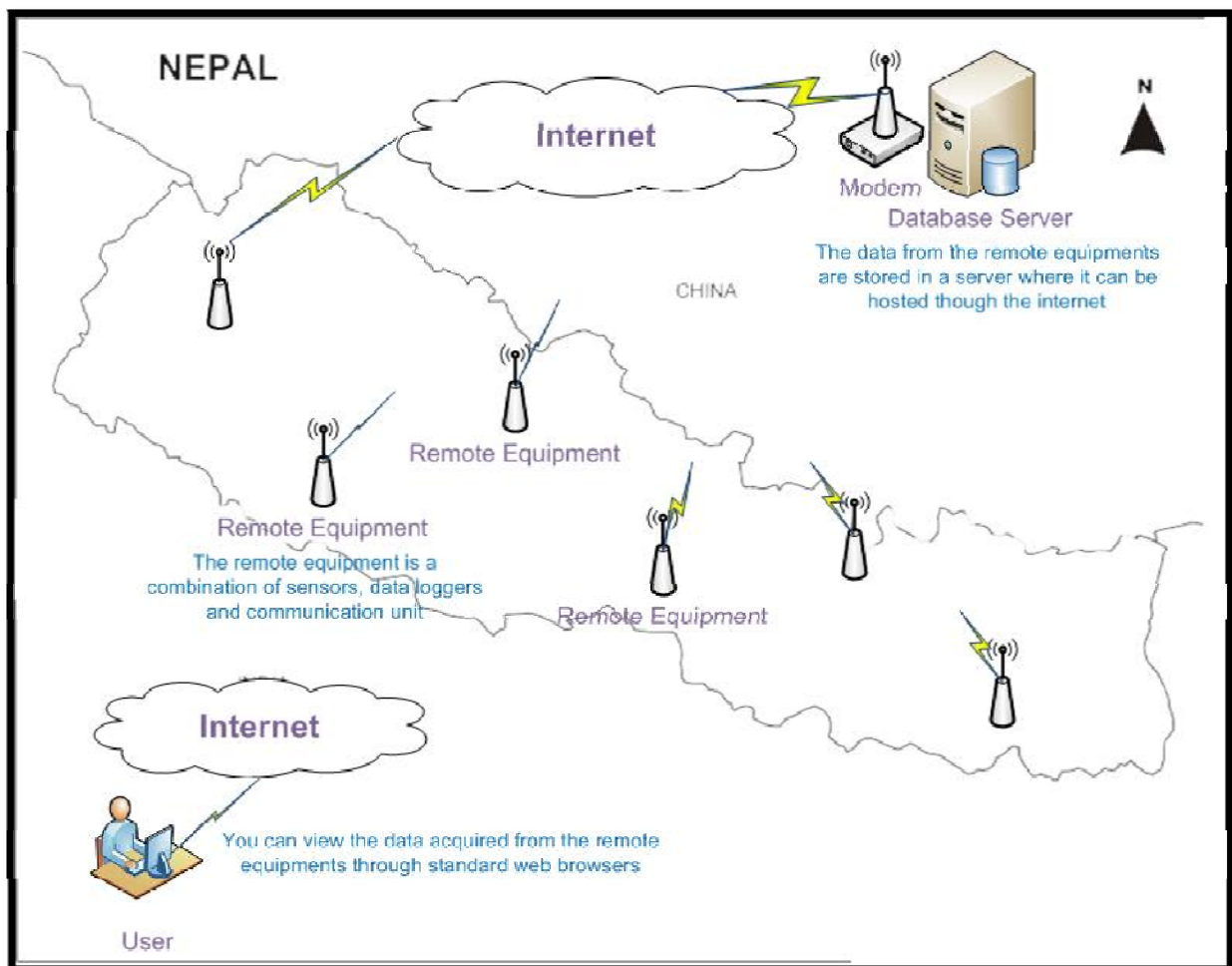
# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

## Project Description

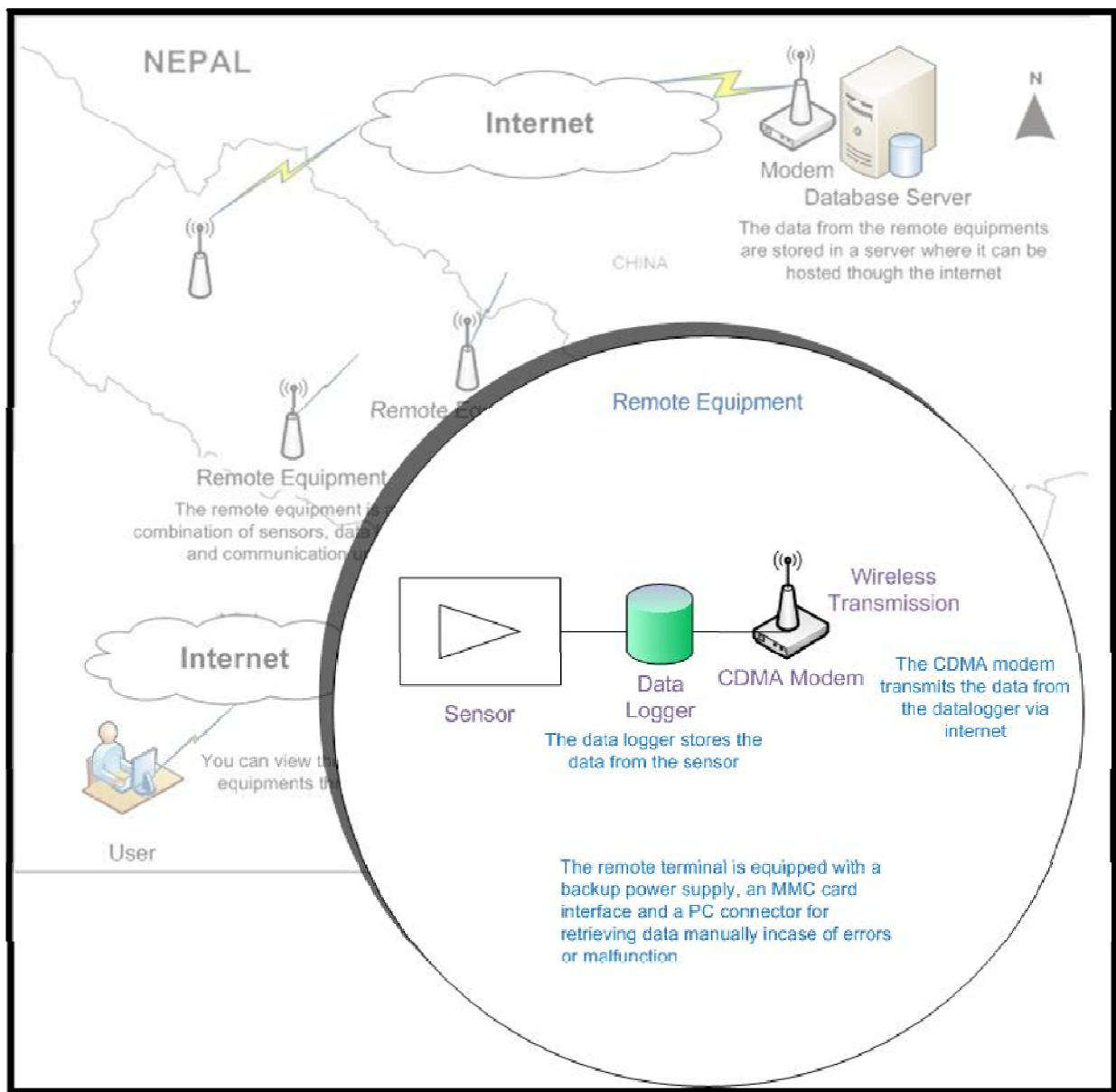
The Real Time Data Acquisition System for forecasting flood implements state of the art technology. The remote monitoring and controlling of a system using internet based technology makes it easier to get data from remote and unreachable places and makes it easier for presentation using standard web browsers.

The system uses various sensors for detecting rainfall intensity and sensing the water level of the river. These data is first stored in a data logger, which supports CDMA transmission. The data is stored and transmitted at a pre defined interval.

The data is transmitted through wireless medium over the internet to a database server where it can be analyzed and hosted in the website for general information.



# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin



# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

## Features of the project

This project is intended for collecting the data for the rainfall and the water level for the areas covered by Narayani Basin. The data collected from the mapped sites are to be posted through CDMA over the internet to a database server. The real time data so collected can then be analyzed to get the general information for forecasting flood. Following statements holds the requirements for the area coverage and data collection.

- All equipments used in this system incorporates state of the art technology (e.g. microcontroller, processors etc) and provide capability for unattended operation for at least one year at remote places using a 12V single sealed maintenance-free battery.
- Ten Rain gauge sites and one water level sensor is interfaced along with the necessary sensors and data logger that supports CDMA transmission.
- Standard transmission protocol has been implemented.
- Solar power supply has been arranged for that area where the electricity is inaccessible.
- All equipment has been able to withstand the hostile environment and well secured against power surge, electrostatic discharge etc.
- The system has an inbuilt memory that is able to store data for at least one year.
- In case of failure in transmission through the CDMA module, the system is capable to store necessary backup and will also be possible to retrieve data directly from the site.
- Error detection and reporting facilities has also been incorporated within the system.

# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

## Hardware

The Real Time Data Acquisition System is a combination of hardware and software. The basic hardware used are:

1) **Sensors:** The sensors along with the accessories and facilities for the Flood Forecasting System are basically Tipping Bucket Rain Gauge, Water Level Detecting Sensor

a) **Water Level Sensor:** the water level sensor being used is the Steven's A/F Encoder Model AF-1. The specifications for the sensors are in accordance to the mentioned specification in the previous reports.

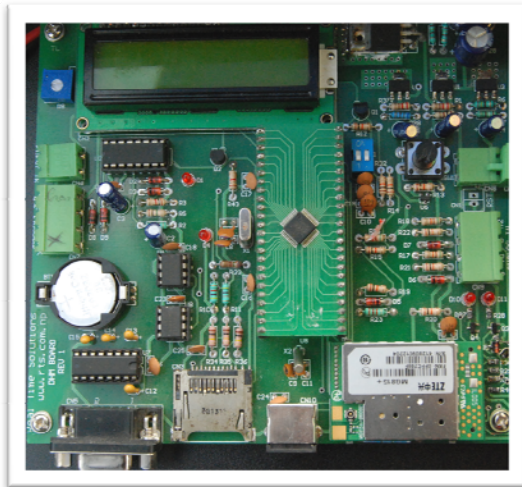


b) **Rain Gauge:** Tipping Bucket Rain Gauge



2) **Data logger and Communication unit:**

all hardware and firmware for the data logger unit are designed by R&D division. The designs have been revised and tested and are ready for implementation.



## General Function

The system automatically collects the observations from attached sensors, process the same and store them into its memory as per the pre-programmed procedure at every minute and data shall be transmitted over the internet to a database server.

- a) The numbers of analog/digital/SDI channels in the data logger are compatible to the sensors being supplied.
- b) Polling rate can be customized by user.
- c) Stand alone System ( independent of the PC/Laptop)

# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

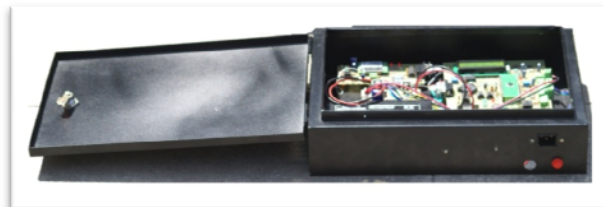
---

- d) Stores observed data along with time for all the parameters in the memory. Capacity of memory is capable to retain at least one year's data. Data is available even if the power supply to the system has failed for one year.
- e) The stored data is transmitted through CDMA transmission. In case of failure of the CDMA module, the stored data can be retrieved via serial port/USB/Ethernet to a PC/Laptop or from the storage card.
- f) A LCD display for displaying current Date/Time by default and incase of errors show the latest error for one minute
- g) A warning system is provided along with the error log including the date and time of failure and also invalid data type. The error log format should be given as stated below.
- h) The number of analog/digital/ SDI channels in the data logger is compatible to the sensors being supplied.
- i) Incorporates a watch dog timer. Manages fault of Software.

## Specifications for keeping log

The log kept in the data logger holds the following information for complete analysis of the metrological parameters for flood forecasting (data log) and also the internal working of the devices used in the system. Every log will have time and date stamp except invalid date and time log. The data logger will log following information.

- i) System Reset Information
- ii) Invalid Date and Time
- iii) Watch Dog Timeout
- iv) Data from the sensor
- v) Timeout
  - (1) Invalid range
  - (2) Log for the communication unit
- vi) Modem not responding
  - (1) Modem PPP open command not successful
  - (2) If modem connection not successful
  - (3) Valid response from the server
  - (4) Invalid response from the server
  - (5) If connection close not successful



The Main Panel containing the data logger, communication unit and the backup power supply

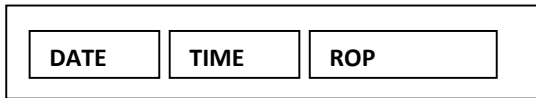
# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

## CDMA Scheme

The system implements CDMA transmission module following the given protocol

- DNS protocol is implemented to resolve the domain name.
- Data is sent using secured HTTP protocol
- GET or POST method will be used for sending/setting the data in the device
- Latest encryption technology is used for transmitting data
- Each unit of information is separated by a unique character
- Data packet format to be used for sending information from the Server to the Device

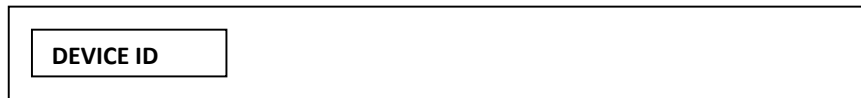


Can be 1 or more frames

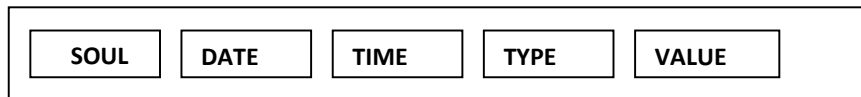
ROP: Rate of Polling to Server

- Data packet format to be used for sending information from Device to Server

- Station Information



- Data From Sensor



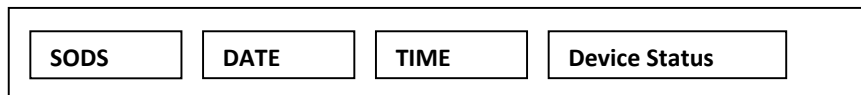
Can be 1 or more frames

SOUL: Start of unit Log

TYPE: Kind of Sensor

VALUE: Measurement from the Sensor

- Device Status



Can be 1 or more frames

SODS: Start of Device Status Info

# Real Time Data Acquisition System for Flood Forecasting in Narayani Basin

---

## o Error Log

SOE	DATE	TIME	ERROR TYPE
-----	------	------	------------

Can be 1 or more frames

SOE: Start of Error Log

## Posting the data over the Internet

### Features of Database Server

- Relational database with at least 1 GB of data storage capacity
- 99.99% up time guarantee
- Redundant database server

### Conclusion:

The Real Time Data Acquisition System is a major breakthrough in communication technology. To implement such system for forecasting flood can lead to saving many lives. There are many areas where these systems can be implemented giving a cost effective and an efficient solution for collecting and analyzing data.