GDCP5(v1.2) May 20,2011

GPRS based Data Collection and Processing embedded system

1. Introduction

GDCP stands for GPRS based Data Collection and Processing System) which is a wireless data collection and processing embedded system. It can be embedded in any vehicle to diagnose the parameters and the status of the components, the modules and the equipments in the vehicle. GDCP also can be embedded in other self-contained devices that operate in the field that requires periodic polling of the device's status and state. The typical applications are in the trains, the high speed trains, the cars, the trucks, the electric bicycles and so on. It can be used in the un-manned monitoring stations which are located remote area where the wired networks can not be reached.

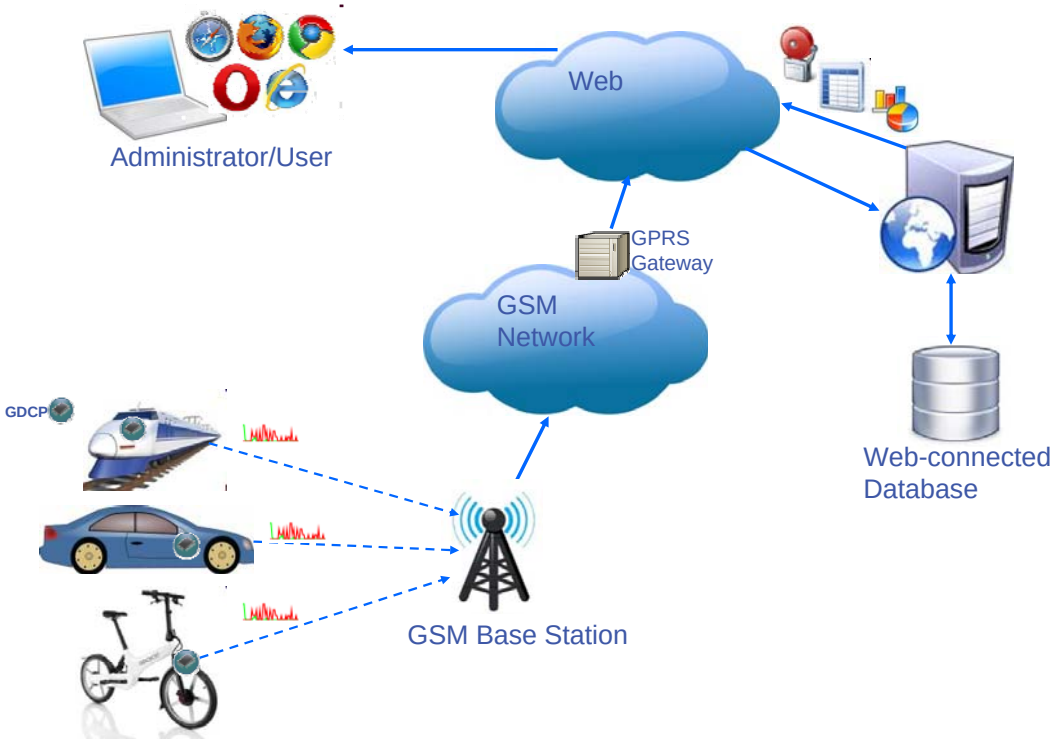

Fig. 1

2. System Structure

The system consists of four units:

(1) The microcontroller with various interfaces to the sensors

(2) The GPRS/GSM module Quad-band support (compatible with all four GSM

frequencies)
(3) The web-connected database
(4) The web-based user interface for both administrators and users
The microcontroller and the GPRS module are usually installed on the moving vehicle while the database is usually hosted on a web site. The users/administrators can access the database information via a web browser on any computer with an Internet connection.

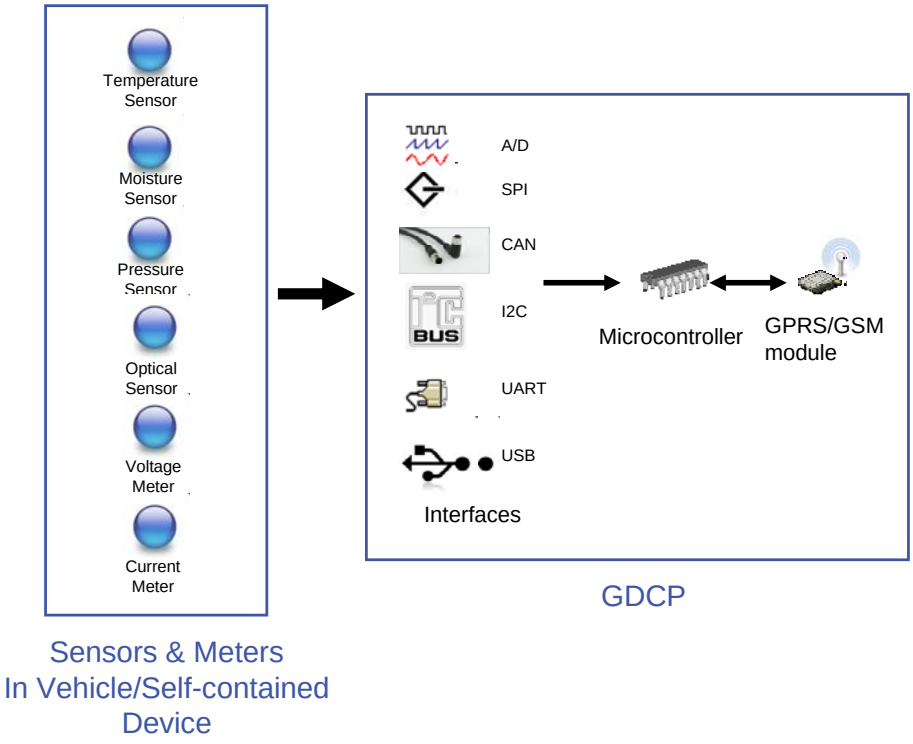

Fig. 2

2. Interface ports to sensors

(1) Digital interface ports: I2C, SPI, USB, UART, CAN, I2S, GPIO and etc.
(2) Analog interfaces: 8 channel 12 bit ADC, 10 bit DAC

3. GPRS radio communication frequencies:

850MHz, 900MHz, 1800MHz and 1900MHz

4. Wireless Baud rate

(1) Up link maximum: 85.6 kbps
(2) Down link maximum: 14.1 kbps

5. Operation modes

(1) Normal mode: the microcontroller sends the data acquitted and processed to the web-connected database at the pre set time-intervals, for example: every one hour. As of this time, the protocol used between the GPRS module and the web-connected database is based on HTTP.

(2) Polling mode: the microcontroller receives the polling command from a central server through the GPRS module, the microcontroller acquires and processes the data from the sensor, then sends the data to the web-connected database.

(3) Alarm mode: when the microcontroller detects any parameter, reported by the sensors, exceeds the preset alarm threshold, the microcontroller will send alarm signals which will result in alarm sounds and/or flashing light alarms at the administrator's web interface. In addition, the microcontroller will also send the alarm signal to the web-connected database through the GPRS module so the alarm is recorded. The warning signal contains the parameter whose value has crossed the threshold, the name of the entry in the database, the value of the parameter, the level of the alarm, the time of the alarm detection and so on.

6. Alarm levels

Usually two levels of alarm are set: alarm and severe alarm. More alarm levels can be defined according to the client request.

7. Type and size of the web-connected database.

They depend on the server hosting the database and the client requirements

8. Web-based User interface

This is a user interface for multi purposes, containing the multi-types of data and graphics. Fig. 3 is an example for railway train safety monitor.

(1) The interface has two basic sections: the latest data and the previous data.
(2) After every data update, the latest data become the previous data. The update interval length can be configured.
(3) The left most column is the identifier, it is the train code in Fig. 3
(4) Staring from the second column, the parameters are listed column by column such as the rail temperature, the wheel temperature….. A LED is located in the corresponding cell for each column: the green LED indicates "normal, the yellow LED indicates "alarm", the red LED indicates "severe alarm"
(5) The most right columns is labeled "Detail". When it is clicked, the detail

parameter information is displayed, for example the starting station, the arriving station of the train.

(6) Many “filter” buttons are set in the interface by which the user can find the specific information more easily.

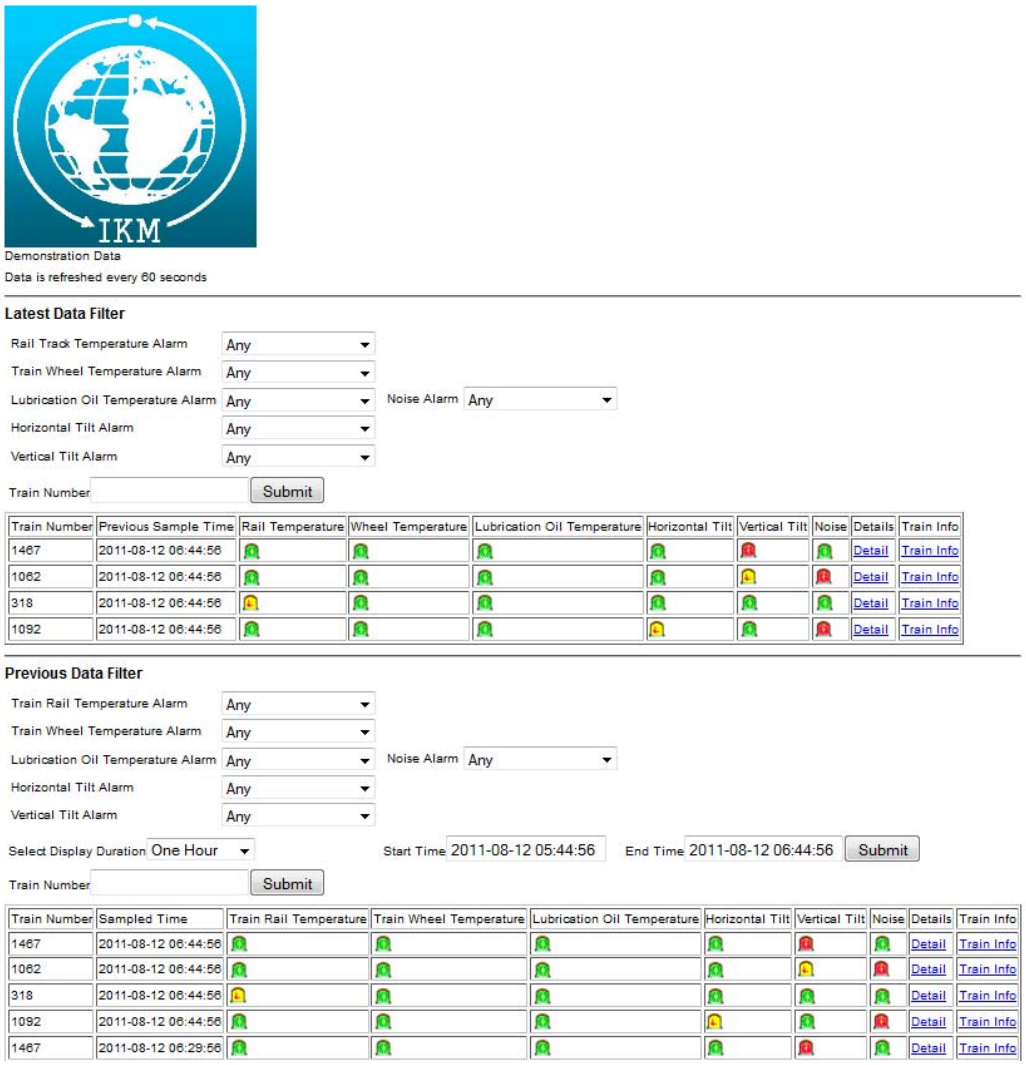

Fig. 3