AVISTA REALTIME SYSTEMS

Proposal for GPRs Telemetry System Solution

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Remote monitoring for fuel tank parameters

Solution Proposal

GPRS Telemetry System Solution

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1. Synopsis

This proposal is developed based on the following inquiry:

Hi,
We require a solution for monitoring the fuel level in tanks remotely. It should be done via GPRS. We require a fuel tank level sensor,an impurity sensor, a temperature sensor and need to hook up two binary sensors to the solution.

We require the following capabilities

-Analog signals from multiple sensors (fuel tank level , temperature,2 other binary alarms)
-A2D converter
-GSM Module
-Storage around 2 GB (if possible)
-Scheduled transmission of results to a web server via GPRS(every 5 minutes)
-Triggered transmission of results to a web server via GPRS
-Updates can be triggered via SMS from the web-server. Updates will be done via GPRS.
-Periodic NTP synchronization with the web server. (results of the sensors will be transmitted with time stamp)
-Software to an external micro-controller continuous communication. If there is no heartbeat from the GSM Module's Software to the external micro-controller, micro-controller should be able to RESET the GSM Module.

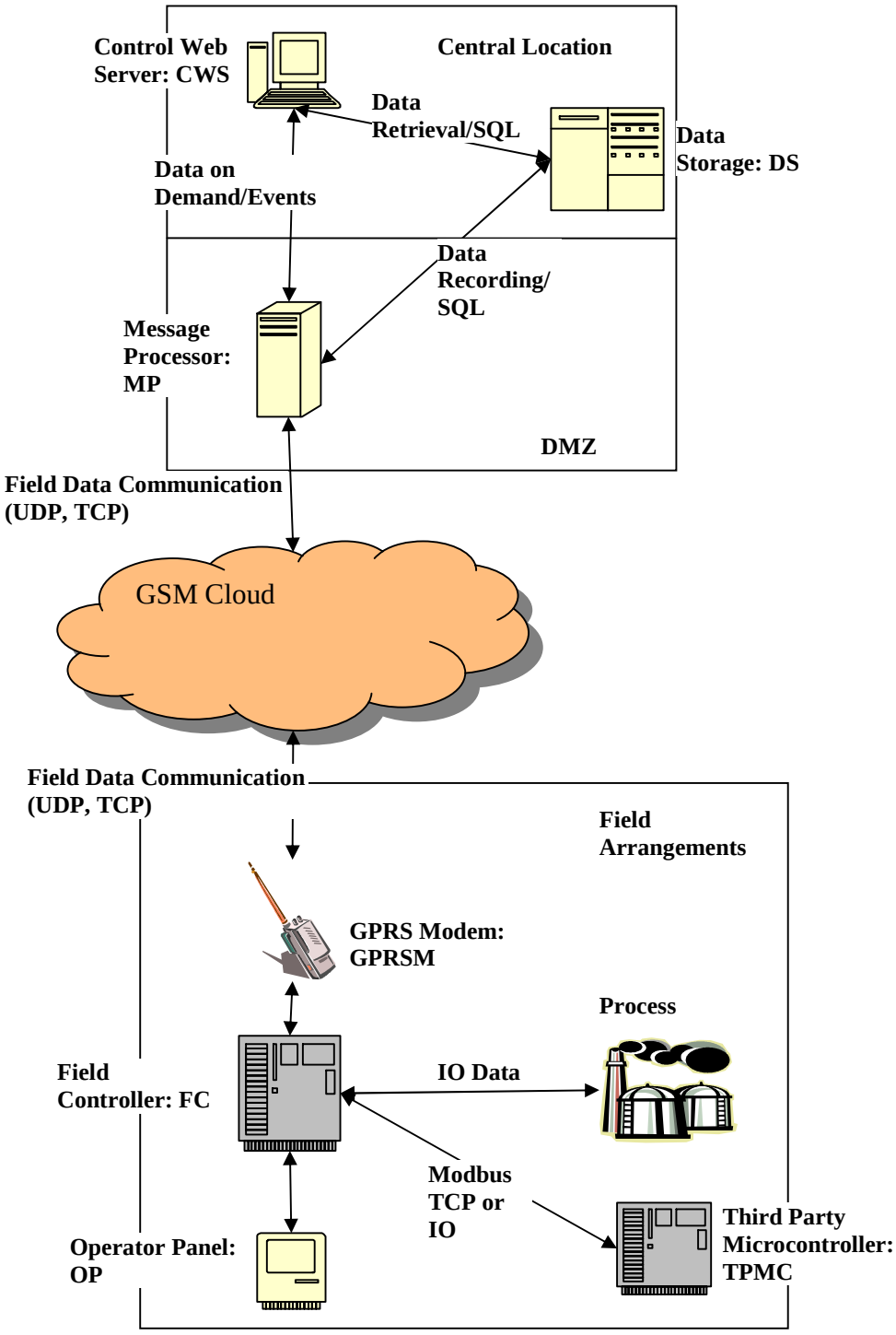
-A webserver is required that can consolidate the date from more than 500 sites and generate reports.

Kindly propose a solution and the unit price for sample.

-Regards,

2. Solution

Following diagram demonstrates a schematic drawing of the proposed solution:



CWS, DS and MP are all located in the central control facility. However, MP is located in DMZ whereas CWS and DS are located in the secure side of the facility. MP is listening/sending messages from/to the field via a public IP address. The demarcation created in DMZ is intended to isolate the control system from possible malicious attacks on the public IP network. MP writes the received information into the DS database. CWS queries DS for field data information and presents them to the user through its local or web user interfaces. DS architecture will include trigger mechanisms to populate auxiliary tables to increase the speed of CWS queries. Also, there would be a link between MP and CWS to support on demand request from CWS to MP as well as events from MP to CWS. The pipe is implemented in Web Services and can be called by the web server using standard technologies such as ASP.Net. MP configuration database is stateless. Once the remote reports to MP with its identity, the remote will be created in the MP dynamic database. Communication between MP and FC is through UDP/TCP messages carried over the GSM system. FC is capable of creating a PPP link to GPRSM to allow for IP communication. The GPRSM does not need to have a static IP address as the commands are polled by the remote with appropriate message timeout. The communication between MP and FC will support on-demand polls from MP, triggers to MP, periodic reports to MP, and time synch commands from MP. FC is equipped with a text LCD display with arrow keys to enable the local operators to view the field information. In addition, FC supports Modbus TCP Server (slave) communication to the local TPMC that will be used for resetting the link. In addition, FC reads the process information through its I/O connections.

3. Included

Here is the list of the components covered by the proposal:

- MP software
- DS software
- FC, OP and GPRSM software

4. Not Included

Here is the list of the components that are not covered by the proposal:

- CWS software/hardware
- Networking equipments in the central location
- MP hardware
- DS hardware
- TPMC
- Field cabling and connections to the process I/O and TPMC
- Field instruments
- Any 3rd party software license such as SQL Server for DS and Windows OD for DS and MP

5. FC Specifications

Ethernet Port	10Base-T, RJ-45
Flash	256K
SRAM	128K
Backup Battery	Socketed 3-V lithium coin-type, 265 mA.h, supports RTC and SRAM
Digital Inputs	24: protected to ± 36 V DC
Digital Outputs	16: source/sink 200 mA each, 36 V DC max.
Analog Inputs	11 at 1 MΩ, 12-bit resolution, ±10 V DC, up to 4,100 samples/sec.
Analog Outputs	Four 12-bit resolution, 0-10 V DC, update rate 12 kHz
Serial Ports	4 total: two 3-wire (or one 5-wire) RS-232, 1 RS-485, and one 5 V CMOS-compatible (programming)
Connectors	Screw terminals support max. 14 AWG/1.5 mm^2 (standard)
Real-Time Clock	Yes
Watchdog/Supervisor	Yes
Power	9-36 V DC, 1.5 W max. (without display), 3 W max. (with display)
Operating Temp.	-40°C to +70°C
Humidity	5-95%, non-condensing

6. OP Specifications

LCD Panel	122 × 32 graphic LCD, keypad with 7-key/7-LED interface
LEDs	7 user-programmable: 1 red, 4 green, 2 yellow
Operating Temp.	0°C - 50°C
Enclosure Size	5.60" x 4.875" x 1.5" (142 mm x 124 mm x 38 mm)

7. XML Messages

There are three types of data messages communicated between FC(s) and MP as follows:

MP to FC

- Poll
- Time synch

FC to MP

Events (triggered and periodic)

8. XML Message Structure

Each XML message has the following elements:

Element	Notation	Description
Sequence No	S	Each message has a unique sequence number that allows the sender to keep track of the message. FC-MP numbers are between 0 to 499 and MP-FC numbers are from 500 to 999
Sources	O	Source name or address
Destination	D	Destination name or address

Element	Notation	Description
Direction	R	This field determines the direction of the message that is a request or response. 0: Request, 1: Response
Fragment	F	This is designed to overcome the problem of small packet size in some networks. C|N, where C is the current packet number and N is the total number of packets. Example: 2|5: The 2nd packet of 5.
Message Type	M	Current message types are Poll, Time Synch and Event. Poll: P, Time Synch: T and Event: E
Status	U	This filed represents the status of the FC or MP. The current defined statuses are Message Error, Poll needed and Time needed. Message Error: E, Poll Needed: P, Time Needed: T
Body	B	Body embeds the message information, which is different from message to message.

9. Message Body Format

Depending on different message types, message body has different structure.

Poll

The message body is empty

Poll Response

Message body includes the point values with the following format:

Element	Notation	Description
Name	N	This field shows the name (index) of the point.

Element	Notation	Description
Value	V	This field shows the value of the point.
Quality	Q	This field shows the quality of the point. Bad: B, Good: G; Example: if the sensor wire is detected to be disconnected, quality becomes bad.
Timestamp	T	This field shows the timestamp of the last sampling.

Each point is embedded in a <P>…</P> element.

Event

Message body includes the point events with the following format:

Element	Notation	Description
Name	N	This field shows the name (index) of the point.
Value	V	This field shows the value of the point.
Quality	Q	This field shows the quality of the point. Bad: B, Good: G; Example: if the sensor wire is detected to be disconnected, quality becomes bad.
Timestamp	T	This field shows the timestamp of the last sampling.
Change of State	C	This field shows if the message was generated based on a change of status (trigger).

Each point is embedded in a <P>…</P> element.

Event Response

The message body is empty

Time Synch

Message body includes the time with the following format:

Element	Notation	Description
Time	T	This field shows the server time.

Time Synch Response

The message body is empty

10. Examples

Poll

MP polls FC102:

<S>522</S>

<O>MP</O>

<D>FC102</D>

<D>0</D>

<F>1|1</F>

<M>P</M>

<U></U>

<B></B>

Poll Response

FC102 responds to the previous poll:

<S>522</S>

<O>FC102</O>

<D>MP</D>

<D>1</D>

<F>1|1</F>

<M>P</M>

<U></U>

<B>

<P>

<N>P1</N>

<V>1234</V>

<Q>G</Q>

<T>020309201432123</T>

</P>

<P>

<N>P2</N>

<V>4321.123</V>

<Q>G</Q>

<T>020309201435333</T>

</P>

</B>

Event

FC102 reports to MP a change of value for P1:

<S>022</S>

<O>FC102</O>

<D>MP</D>

<D>0</D>

<F>1|1</F>

<M>E</M>

<U></U>

<B>

<P>

<N>P1</N>

<V>1234</V>

<Q>G</Q>

<T>020309201432123</T>

<C>1</C>

</P>

</B>

Event Response

MP responds to the previous event from FC102:

<S>022</S>

<O>MP</O>

<D>FC102</D>

<D>1</D>

<F>1|1</F>

<M>E</M>

<U></U>

<B></B>

Time Synch

MP sends a time synch command to FC102:

<S>523</S>

<O>MP</O>

<D>FC102</D>

<D>0</D>

<F>1|1</F>

<M>T</M>

<U></U>

<B>020309211412005</B>

Time Synch Response

FC102 responds to the previous command from MP:

<S>523</S>

<O>FC102</O>

<D>MP</D>

<D>1</D>

<F>1|1</F>

<M>T</M>

<U></U>

<B></B>