

SYSTEM AND METHOD FOR REMOTE MANAGEMENT OF A HETEROGENEOUS SENSORY NETWORK USING A UNIFIED MESSAGING FRAMEWORK FOR A MOBILE DEVICE

Field of the Invention

5 This invention relates to monitoring data from sensors remotely via a mobile device. More particularly, this invention relates to providing receiving data from sensors in different formats and providing the information to a mobile device in a known manner. Still more particularly, this invention relates to a system that allows a mobile device to be used to change monitoring criteria in the system to receive alerts when a reading from the sensor
10 output meets a criterion regarding a particular threshold.

Summary of the Prior Art

 In today's society, there are many systems that use remote sensors to monitor the status of various components and/or subjects. For example, a processing plant may include remote sensors that monitor environmental conditions, such as temperature and
15 barometric pressure, as well as the status of a component, such as the flow rate of material through a conduit. A second example is a health care monitoring system that has sensors that measure the blood pressure, pulse rate, and temperature of a patient. As technology has advanced, the systems monitoring the sensors have also evolved to allow the systems to send status messages to a user through a connected device.

20 One problem with current monitoring systems is the integration of new sensors into the system. In particular, sensors from different providers often transmit sensor output data in different formats making it difficult to use in a single control system to monitor all of the sensors. Furthermore, the nature of the sensor output data provided may make it very difficult to generate a uniform data transmission format for sensors that provide data for
25 different parameters. Thus, those skilled in the art are constantly striving to provide a single monitoring system that can monitor sensors even though the received sensor output data are in differing transmission formats.

 A second problem is that although users can receive updates and/or alerts over mobile device, the users typically have no way to change the monitoring systems using the
30 mobile device. For example, a health care provider may want to change the threshold for alerting the provider about a patient's temperature based upon an examination. In the current system, the threshold would have to be changed by an administrator using direct interface with the system. This may cause an unacceptable delay in changing the

threshold parameter. Thus, those skilled in the art would like to provide a way for parameters of the monitoring to be changed using a mobile device, such as a mobile telephone or laptop.

Summary of the Invention

5 The above and other problems are solved and an advance in the art is made by a system and method for remote management of a heterogeneous sensory network using a unified messaging framework for a mobile device in accordance with this invention. A first advantage of a system and method in accordance with this invention is that sensors having different data transmission formats may be monitored by the system. A second advantage
10 of a system and method in accordance with this invention is that only the sensor output of interest is transmitted to a mobile device. A third advantage of a system and method in accordance with this invention is that a mobile device may be used to issue commands regarding the monitoring to the system using conventional messaging systems.

 In accordance with embodiments of this invention, the system monitors sensors in
15 the following manner. Data transmitted from a sensor is received by the system. The system then extracts a particular sensor output from the received data. The sensor output is then compared to an output threshold. The system then determines whether the sensor output meets a criterion in relation to the output threshold. If the criterion is met by the sensor output, the system generates an alert message and transmits the alert message to
20 a mobile device. In accordance with some of these embodiments, the system may also generate a recovery signal and transmit the recovery signal to an associated system such as production plant monitor that is monitored by sensors. In response to the recovery signal, the associated system may deactivate high risk machineries or alter operations to account for the hazardous condition(s). The recovery signal may also be transmitted to
25 one or more of sensors to reset the sensors.

 In accordance with some embodiments of this invention, the system extracts the sensor output in the following manner. The system determines the type of sensor that transmitted the data. A format of data transmissions for the type of sensor is then determined. The position of the sensor output in the format of data transmission is then
30 determined and the sensor output is read from the received data. The system then extracts the sensor output. Furthermore, the length of the data may be determined and the determined length of data is read from the determined position to extract the sensor output. In accordance with some embodiments, this process is repeated for each sensor output provided by a sensor.

In accordance with some embodiments of this invention, the alert message generated is a Short Message Service (SMS) message. In accordance with other embodiments, the alert message generated is an e-mail message.

In accordance with some embodiments of this invention, the system determines a mobile device to receive the alert message by reading an identifier associated with the mobile device from a list of mobile devices to receive an alert when the criteria is met by the sensor output that is stored in a memory. In accordance with some embodiments, the identifier is an e-mail address associated with the mobile device. In accordance with other embodiments, the identifier is a telephone number associated with the mobile device.

In accordance with some embodiments of this invention, the system transmits an alert message to more than one mobile device. In accordance with some of these embodiments, the mobile devices that receive an alert message are determined by reading a list of mobile devices associated with the sensor output that is stored in memory.

In accordance with some embodiments of this invention, the system determines each associated system to receive a recovery signal by reading identifiers of each associated with the monitored system from a list of systems to receive a recovery signal when the criteria is met by the sensor output that is stored in a memory assessable by the system. The system generates and transmits a recovery signal to one or more systems associated to the monitored system. In accordance with some of these embodiments, the systems that receive a recovery signal then perform a recovery process, such as disabling certain system components.

In accordance with some embodiments of this invention, the system receives and stores information about the sensor during configuration of the system. In accordance with some of these embodiments, a new sensor may be added in the following manner. The system receives a request to add a new sensor to the system. The information about the sensor is read from the request and is stored by the system. In particular embodiments, the information about the sensor includes a sensor type, and a list of sensor outputs provided by said sensor.

In accordance with some embodiments, the system may allow new types of sensors to be added in the following manner. A request to add a new type of sensor is received by the system. System then reads the information regarding the new type of sensor from the request and stores the information in memory. In accordance with particular embodiments, the information regarding the new type of sensor includes a sensor type identifier, a list of sensors outputs, a start position for each sensor output in the

data transmission format of the new type of sensor, and a length of data for each of the sensor outputs.

In accordance with some embodiments of this invention, the system may receive a message from a mobile device that includes a command. The system reads the command
5 from the message and then performs the command. In accordance with some embodiments of this invention, the system must determine the type of message received. The system reads a format for commands in the determined type of message, and parses the message based on the format. The system may then read a command identifier, sensor identifier, a sensor output, and a new threshold from the message. The system
10 then stores the new threshold for the sensor output of the identified sensor in memory.

Brief Description of the Drawings

The above and other features and advantages of the present invention are described in the following Detailed Description and are shown in the following drawings:

15 Figure 1 illustrating a network that includes a system in accordance with an embodiment of this invention;

Figure 2 illustrating a block diagram of components of a processing system that performs the processes in accordance with this invention;

20 Figure 3 illustrating a flow diagram of a process for monitoring sensors in accordance with an embodiment of this invention;

Figure 4 illustrating a flow diagram of a process for receiving data from sensors in the network in accordance with an embodiment of this invention;

Figure 5 illustrating a flow diagram of a process for transmitting alert messages to mobile devices in accordance with an embodiment of this invention;

25 Figure 6 illustrating a flow diagram of a process for adding a new sensor to the network in accordance with an embodiment of this invention;

Figure 7 illustrating a method for receiving a command to modify the system from a mobile device in accordance with an embodiment of this invention;

30 Figure 8 illustrating a flow diagram of a process for receiving information about a new sensor type in accordance with an embodiment of this invention; and

Figure 9 illustrates a flow diagram of a process for transmitting recovery signals to one or more monitored systems in accordance with an embodiment of this invention.

Detailed Description

This invention relates to monitoring data from sensors remotely via a mobile device.

5 More particularly, this invention relates to receiving data from sensors in different formats and providing the information to a mobile device in a known manner. Still more particularly, this invention relates to a system that allows a mobile device to be used to change monitoring criteria in the system to receive alerts when a reading from the sensor output meets a criterion regarding a particular threshold.

10 Figure 1 illustrates network 100 that monitors sensors 150 and alerts mobile device 140 in accordance with this invention. Network 100 includes server 105, administrator computer system 115, wireless router 120, Public Switched Telephonic Network (PSTN) 130, wireless base station 135, mobile device 140, transceiver 145, and sensors 150. Server 105 is a conventional server that performs the functions of receiving data from
15 sensors 150, monitoring the sensors outputs and alerting mobile device 140 in accordance with this embodiment of the invention. Server 105 is connected to Internet 110 and/or an equivalent network for communication with other digital processing systems.

Administrator computer system 115 is a conventional computer system that executes instructions to provide an administrator interface to allow an administrator to
20 interact with the system performed by server 105 in accordance with embodiments of this invention. Administrator computer system 115 is connected to Internet 110 and/or equivalent networks to communicate with other digital processing devices including server 105.

PSTN 130 is a conventional network of switches and other routing devices for
25 handling calls and other data transmission between mobile devices. PSTN 130 is connected to Internet 110 via one or more gateways (Not shown) to allow for devices connected to Internet 110 to communicate with devices connected to PSTN 130 to communicate with devices connected to Internet 110. PSTN 130 also includes at least one wireless base station 135 that transmits and receives Radio Frequency (RF) and/or other
30 types of signals 137 to communicate with mobile device 140. One skilled in the art will recognize that only those components of PSTN 130 and wireless base station 135 needed to understand the invention are discussed and a complete discussion of these components is omitted for brevity.

Wireless router 120 or another equivalent device is a device connected to the Internet 110 to allow mobile devices to connect to Internet 110 via RF and/or equivalent signals 125. A complete understanding of the operation of wireless router 120 is not needed to provide a system in accordance with this invention. Therefore, a complete description of wireless router 120 is omitted for brevity.

Mobile device 140 is a mobile hand phone, Personal Digital Assistant (PDA), Laptop computer or other device that may be connected to and/or communicate with PSTN 130 and Internet 110 by transmitting and receiving signals with wireless base station 135 and/or wireless router 120. A complete description of mobile device 140 is omitted for brevity and only those processes that are performed in accordance with this invention are described.

Sensors 150 are sensors that monitor a status of one or more properties of a monitored system. Some example of sensors 150 may include, but are not limited to, health monitoring sensors, such as temperature, pulse, and blood pressures monitors; and production plant monitors, such as flow, temperature, pressure, water level monitors. Sensors 150 are configured to wirelessly transmit data via RF or equivalent signals 155 to transceiver 145. Each sensor 150 may transmit the data in a format that is particular to the type of sensor used. For example, a pulse monitor may transmit data in a first format including a sensor name of a certain length in a first position and pulse data of a certain length in a second position; and a blood pressure monitor may transmit data in a second format including a sensor name of a certain length in the first position, a first blood pressure measurement of certain length in a second position and second blood measurement of a second length in a third position. One skilled in the art will recognize that although sensors 150 are shown to communicate with transceiver 145 in this embodiments, other embodiments may allow sensors 150 to communicate with server 105 directly via wireless internet or telephonic connections without departing from this invention.

Transceiver 145 is a conventional wireless transceiver for communicating with remote devices via RF or equivalent signals 155. In network 100, transceiver 145 receives data from sensors 150 and transmits the data to connected server 105. As transceiver 145 is a conventional transceiver, a complete description is omitted for brevity.

Figure 2 illustrates a block diagram of the components of the processing systems that execute instructions stored in memory to provide processes in accordance with this invention. One skilled in the art will recognize that Figure 2 is for illustrative purposes only and the exact configuration of the components in the processing system may vary without

departing from this invention. Processing system 200 includes Central Processing Unit (CPU) 205. CPU 205 is a processor, microprocessor, or any combination of processors and microprocessors that execute instructions to perform the processes in accordance with the present invention. CPU 205 connects to memory bus 210 and Input/Output (I/O) bus 215. Memory bus 210 connects CPU 205 to memories 220 and 225 to transmit and/or receive data and instructions between the memories and CPU 205. I/O bus 215 connects CPU 205 to peripheral devices to transmit data between CPU 205 and the peripheral devices. One skilled in the art will recognize that I/O bus 215 and memory bus 210 may be combined into one bus or subdivided into many other busses and the exact configuration is left to those skilled in the art.

A non-volatile memory 220, such as a Read Only Memory (ROM), is connected to memory bus 210. Non-volatile memory 220 stores instructions and data needed to operate various sub-systems of processing system 200 and to boot the system at start-up. One skilled in the art will recognize that any number of types of memory may be used to perform this function.

A volatile memory 225, such as Random Access Memory (RAM), is also connected to memory bus 210. Volatile memory 225 stores the instructions and data needed by CPU 205 to perform software instructions for processes such as the processes for providing a system in accordance with this invention. One skilled in the art will recognize that any number of types of memory may be used to provide volatile memory and the exact type used is left as a design choice to those skilled in the art.

I/O device 230, keyboard 235, display 240, memory 245, network device 250 and any number of other peripheral devices connect to I/O bus 215 to exchange data with CPU 205 for use in applications being executed by CPU 205. I/O device 230 is any device that transmits and/or receives data from CPU 205. Keyboard 235 is a specific type of I/O that receives user input and transmits the input to CPU 205. Display 240 receives display data from CPU 205 and display images on a screen for a user to see. Memory 245 is a device that transmits and receives data to and from CPU 205 for storing data to a media. Network device 250 connects CPU 205 to a network for transmission of data to and from other processing systems.

In accordance with an embodiment of this invention, the system is provided by processes executed by a server, such as server 105, that receives sensor outputs from remote sensors 150 and may communicate with a mobile device 140 via a network and/or telephonic connection. Figures 3-7 illustrate embodiments of the processes performed by server 105. One skilled in the art will recognize that the processes may be performed from

instructions stored in memory or implemented via circuitry without departing from this invention.

Figure 3 illustrates a process 300 for monitoring sensor outputs and generating alerts in accordance with an embodiment of this invention. Process 300 begins in step 305 by configuring the system. To configure the system, the server must receive and store information regarding each type of sensors in the system, information regarding each sensor in the system including a format of data transmission from each sensor, threshold information for each sensor output provided by each sensor, and information about the mobile devices to receive an alert when threshold criteria is met. For purposes of this description, a sensor output is data regarding an attribute being measured by a sensor. Examples of attributes include, but are not limited, environmental temperature, pressure, fluid levels, pulse rate of subject, blood pressure of a subject, and body temperature. The information regarding the system and constituent components stored during configuration is provided below with regards to the following description of the processes provided by a system in accordance with this invention.

In step 310, data is received from the sensors 150. The data may be received at certain time intervals, or by the server interrogating the sensors to receive the data transmissions from the sensors. The exact method of receiving the data is unimportant to this invention and is left as a design choice for those skilled in the art.

After the data is received from the sensor, the sensor outputs from each sensor are extracted from the data in step 315. A process in accordance with an embodiment of this invention for extracting the sensor outputs from the data received from the sensors is described below with reference to Figure 4. Each extracted sensor output is then compared to a threshold associated with the output in step 320. The outputs are compared to the threshold to determine whether the output meets a certain criteria. The criteria may be that the output is within or outside a certain range; greater than or equal to the threshold; or less than or equal to the threshold. In step 325, the process determines whether alert should be generated because the sensor output meets the criteria.

If the process determines that an alert must be generated because one or more sensor output meets a criteria for the attribute measured, process 300 generates an alert message and/or recovery signal in step 330. The message is a message that may be transmitted to a mobile device may be an e-mail, a Multimedia Messaging Service (MMS) message, a Short Message Service (SMS) message, or any other type of message that may be transmitted to the mobile device via network and/or telephonic means. The recovery signal is a signal that may be transmitted to the sensors and/or the associated

systems such as production plant monitor, that are monitored by sensors such as flow, temperature, pressure, water level monitors. The recovery signal is transmitted to the associated system to deactivate high risk machineries operating under hazardous conditions. A recovery signal may also be transmitted to the sensors to cause the sensors
5 reset. In step 335, the generated alert message is then transmitted to one or more mobile devices, and the recovery signal is transmitted to the associated systems to deactivate and/or reset the associated systems that are monitored by the sensors. A description of a process for transmitting an alert message to mobile devices in accordance with an embodiment of this invention is described below with respect to Figure 5. A description of
10 a process for transmitting a recovery signal to monitored systems in accordance with an embodiment of this invention is described below with respect to Figure 9.

If the process determines that no alert needs to be generated in step 325 or after the alert is transmitted in 335, the process determines if a request to modify the system has been received in step 340. If no request to modify the system has been received, process
15 300 repeats from said 310. If a request to modify the system has been received, system is modified in step 345 and process 300 is repeated from step 310. Depending on the embodiments, requests to modify the system may be received from an administrator computer system connected to the server either directly or via a network connection; from another connected processing device using a web interface; and/or a mobile device. A
20 process for adding a new sensor to the system is described below with regards to Figures 6 and 8, and a method for modifying the system using the mobile device is described below with respect to Figure 7.

Figure 4 illustrates process 400 that is a process for extracting sensor output from data received from sensors in accordance with an embodiment of this invention. In
25 accordance with this embodiment, process 400 is performed by a server, such as server 105 that receives data from the sensors and is communicatively connected to mobile device via network and/or telephonic connections. Process 400 begins in step 405 by determining the type of sensor that transmitted a specific data to the server. In step 410, the process determines the format of data transmissions based on the type of sensor
30 determined in step 405. In accordance with this embodiment, the data is read according to a format stored in a record for the data type stored in memory that includes information pertaining to each particular type of sensor supported by the system.

In step 415, the process determines a sensor output to be provided by the sensor and determines the position of the sensor output in the data transmission from the format
35 of data transmission for the type of sensor that is providing the output. The length of the

data for the sensor output in the format of the data transmission is then determined in step 420. In step 425, the process then reads the determined length of the data for the sensor output from the determined position in the received data to extract the sensor output.

In some cases, a particular sensor may provide more than one sensor output. For example, a sensor monitoring blood pressure of a subject may give at least two readings or an environmental sensor may provide temperature and barometric pressure of the environment. In this case, process 400 determines if a subsequent sensor output must be extracted from the data in step 430. If so, process 400 repeats from step 415. After all of the sensor outputs needed are extracted from the data from a sensor, process 400 determines if data has been received from another sensor. If so, process 400 repeats from step 405 for a subsequent sensor until all of the monitored sensor outputs from all of the monitored sensors are extracted. Process 400 ends after all of the sensors outputs have been extracted from data received from each of the sensors.

Figure 5 illustrates process 500 that is a process for transmitting alerts to one or more mobile devices in accordance with an embodiment of this invention when one or more sensor outputs meet a criterion with respect to a threshold. In accordance with this embodiment, process 500 is performed by a server, such as server 105 that receives data from the sensors and is communicatively connected to mobile device via network and/or telephonic connections. Process 500 begins in step 505 by retrieving a list of mobile devices to receive an alert when a particular sensor output meets the criteria. Preferably, a separate list is maintained from each sensor output of each sensor and/or for each sensor as not all users of the system may need to be alerted for each particular sensor output and/or sensor.

In step 510, a mobile device associated with a user to receive an alert is read from the list. The process may then read the type of message to send in step 515. For example, some users may desire an SMS be transmitted to mobile device such as a mobile telephone while others may prefer and/or require an e-mail message be sent to a laptop or other mobile device. The message is then formatted into the proper type message.

In step 520, an identifier associated with the mobile device is read. For example, a telephone number of the mobile device may be read if an SMS message is to be sent; or an e-mail address associated with the device may be read. The identifier is then used to transmit the alert message to mobile device in step 525. After the message is transmitted to the device read from the list, process 500 determines whether there are other devices

remaining in the list and process 500 is repeated from step 510 for each device in the list until the list is completed.

Figure 6 illustrates a flow diagram of a process 600 that is a process for modifying the system by adding a new sensor to the system in accordance with some embodiments of this invention. In accordance with this embodiment, process 600 is performed by a server, such as server 105 that receives data from the sensors and is communicatively connected to mobile device via network and/or telephonic connections. Process 600 begins in step 605 by receiving a request to add a new sensor to the system. The request may be received as a message from a mobile device, inputs via a Graphic User Interface (GUI) over a web portal or interaction with a GUI interface provided by an administrative computer system without departing from this invention. If the request is a message from a mobile device, the message must be in a format that can be parsed by the system in order to extract the required information required in the subsequent steps.

In step 610, a sensor identification is read from the message. The identifier is a unique code for identifying the sensor and data subsequently transmitted by the sensor to the server. A record for storing information about the sensor that includes the sensor identification is then created and stored in memory in step 615.

The sensor type identifier for the sensor is then read from the request in step 620. In step 625, the process determines whether the sensor type read from the request is a sensor type supported by the system from the sensor type identifier. If the sensor type is a new type of sensor not currently supported by the system, process 600 requests information for the new type of sensor to be provided. The information for the new type of sensor is received and stored in memory in step 650. A process for receiving and storing information for a new type of sensor is provided below in regards to Figure 8. If the sensor type read from the request is currently supported by the system or after the information for the new type of sensor is received, process 600 proceeds to step 630.

The process stores the sensor type identifier in the record for the new sensor in step 630. A sensor output provided by the sensor that is to be monitored is read from the request in step 635 and stored in the record for the new sensor in step 640. Step 645 then determines if other sensor outputs of the sensor are included in the request. If so, process 600 repeats from step 635 until all of the desired outputs are stored in the record for the new sensor. Process 600 then ends.

Figure 7 illustrates a process 700 that is a process for modifying the configuration of the system based upon a message received from a mobile device in accordance with an

embodiment of this invention. Process 700 begins in step 705 by receiving a message from a mobile device. In step 710, the content of the message is parsed. The parsing is used to read the information for modifying the configuration of the system. As current messaging systems are used, the messages to modify the system must be in a particular format for the system to read and use the information. Thus, the message must be parsed so that the information required to modify the system can be extracted from the message.

After the message is parsed, the process determines whether the message is a modification request message in step 715. This may be done by determining whether a specific string of characters identifying a modification request are read from a specific portion or position in the content. Furthermore, this step may include reading user authentication information such as a user name and/or password to determine that the user has authorization to modify the system. If the message is not modification request, process 700 ends.

If the message is determined to be a modification request, a modification command is read from the message in step 720. The command is a string of characters that identify a specific command in a portion of the content reserved for a command. The process then determines the modification request based on the command. In this particular embodiment, the process determines whether the command is a change threshold command in step 725. If not, other commands are checked and the resulting modifications are performed in step 730. Other modifications may include, but are not limited to, adding a new sensor that is described above and illustrated by figure 6, and changing the sensor outputs to be extracted from the data provided by a sensor. If the command is to change a threshold, a sensor and sensor output associated with the threshold are read from the message in steps 735 and 740. A sensor identifier and the output identifier are read from specific portions of the message in accordance with this embodiment. The new threshold is then read from a specific portion of the message in step 745. The existing threshold for the identified output from the identified sensor is changed to the new threshold in memory in step 750 and process 700 ends. One skilled in the art will recognize that specific portions may be determined by a specific string with the specific portion being a predetermined length of data after the specific string. However, the determination of how to format the message to allow modification is a design choice left to those skilled in the art.

Figure 8 illustrates a flow diagram of a process for receiving information about a new sensor type in accordance with an embodiment of this invention. One skilled in the art will note that process 800 may be performed during system configuration to add new

sensors types to the system or during step 650 of process 600 when adding a new sensor to the system.

Process 800 begins in step 810 by receiving information for the new type of sensor. One skilled in the art will note that exact format of the type information will depend on the format used to transmit the information as described above with respect to the new sensor information. In step 815, a type identifier for the new sensor type is read from the received information. A new sensor type record including sensor type identifier is created and stored in memory in step 820.

A sensor output available from the new sensor is read from the information in step 825 and stored in the record for the new type in memory in step 830. The start position of the data for the sensor output in the data format of a transmission from the new type of sensor is then read from the information in step 835 and stored in the record with sensor output in step 840. The length of the data for the sensor output in the data transmission format of the new type of sensor is then read from the information in step 845 and stored in the record with sensor output in step 850. Process 800 then determines if the new sensor type also provides a subsequent sensor output in step 855. If so, process 800 is repeated from the step 825 for each additional sensor output until information for all of the sensor outputs is stored in memory. Otherwise, process 800 ends.

Figure 9 illustrates process 900 that is a process for transmitting alerts to one or more monitored systems in accordance with an embodiment of this invention when one or more sensor outputs meet a criterion with respect to a threshold. In accordance with this embodiment, process 900 is performed by a server, such as server 105 that receives data from the sensors and is communicatively connected to mobile device via network and/or telephonic connections. Process 900 begins in step 905 by retrieving a list of associated systems to receive a recovery signal when a particular sensor output meets the criteria. Preferably, a separate list is maintained from each sensor output of each sensor and/or for each sensor as not all system and/or sensors need to be recovered for each particular sensor output and/or sensor.

In step 910, a system associated with sensor that monitors the system to receive a recovery signal is read from the list. The process may then read the type of recovery signal to transmit in step 915. For example, some systems may desire the recovery signal to be transmitted to the system via network and/or telephonic connections.

In step 920, an identifier associated with the system is read. For example, a telephone number of a mobile device connected to the system may be read if the recovery

signal is to be sent via telephonic means; or an Internet Protocol address associated with the system may be read if the recovery signal is to be sent via a network. The identifier is then used to transmit the recovery signal to the system in step 925. As there may be other systems that need to be recovered, the system may transmit the recovery signal to more than one system. Hence, after the recovery signal is transmitted to the system read from the list, process 900 determines whether there are other systems remaining in the list and process 900 is repeated from step 910 for each system in the list until the list is completed.

The above is a description of embodiments of a system in accordance with this invention. It is expected that those skilled in the art will design alternatives that infringe upon this invention as set forth in the following claims.

What is claimed is:

1. A system for remotely monitoring sensors comprising:
instructions for directing a processing unit to:

receive data from a first of a plurality of sensors,

5 extract a sensor output from said data received from said first of said
plurality of sensors, wherein said instructions to extract said sensor output
comprises:

determine said first of said plurality of sensors is a particular type of
sensor,

10 determine a format of a data transmission for said first of said
plurality of sensors based on said determined type of sensor wherein said
format of said data transmission of each of said plurality of sensors is
different,

15 determine a position of said sensor output in said determined format
of said data transmission for said first of said plurality of sensors,

read data from said position in said data received from said first of
said plurality of sensors to retrieve said sensor output;

compare said sensor output to an output threshold,

20 determine that said sensor output meets a criterion in relation to said output
threshold,

generate an alert message in response to a determination that said sensor
output meets said criteria, and

transmit said alert message to a mobile device; and
a media readable by said processing unit that stores said instructions.

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2. The system of claim 1 wherein said instructions to extract said sensor output further
comprise:

instructions for directing said processing unit to:

30 determine a length of said sensor output in said format, and

read said data for said length beginning at said position to retrieve said
sensor output.

3. The system of claim 1 wherein said data includes a plurality of sensor outputs, said
35 instructions further comprise:

instructions for directing said processing unit to:

extract data from each of said plurality of sensor outputs from said data received from said plurality of sensors,

compare said data extracted from each of said plurality of sensor outputs to a corresponding output threshold,

5 determine if one of said plurality of sensor outputs meets a criteria related to said corresponding output threshold,

generate said alert in response to one of said plurality of sensor outputs meeting said criteria, and

transmit said alert to said mobile device.

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4. The system of claim 1 wherein said instructions to generate said alert message comprise:

instructions for directing said processing unit to:

generate a Short Message Service message.

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5. The system of claim 1 wherein said instructions to generate said alert message comprise:

instructions for directing said processing unit to:

generate an e-mail message.

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6. The system of claim 1 wherein said instructions to transmit said message to said mobile device comprise:

instructions for directing said processing unit to:

determine a mobile device to receive said alert message.

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7. The system of claim 6 wherein said instructions to determine said mobile device to receive said alert message comprise:

instructions for directing said processing unit to:

read an identifier associated with said mobile device from a list of mobile

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devices to receive an alert when said criteria is met by said sensor output that is stored in a memory readable by said processing unit.

8. The system of claim 7 wherein said identifier is an e-mail address associated with said mobile device.

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9. The system of claim 7 wherein said identifier is a telephone number associated with said mobile device.

10. The system of claim 1 wherein said instructions to transmit said alert message to
5 said mobile device comprise:

instructions for directing said processing unit to:
transmit said alert message to a plurality of mobile devices.

11. The system of claim 10 wherein said instructions to transmit said alert message to a
10 plurality of mobile devices comprises:

instructions for directing said processing unit to:
determine said plurality of mobile devices to receive said alert message.

12. The system of claim 1 wherein said instructions to determine said plurality of
15 devices comprises:

instructions for directing said processing unit to:
read a plurality of identifiers from a list of mobile devices to receive an alert
when said sensor output meets said criteria stored in a memory readable by said
processing unit wherein each said plurality identifiers is associated to one of said
20 plurality of devices.

13. The system of claim 1 wherein said instructions further comprise:

instructions for directing said processing unit to:
generate a recovery signal in response to a determination that said sensor
25 output meets said criteria.

14. The system of claim 13 wherein said instructions further comprise:

instructions for directing said processing unit to:
transmit said recovery signal to said first of said plurality of sensors.
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15. The system of claim 14 wherein said instructions further comprise:

instructions for directing said processing unit to:
transmit said recovery signal to a plurality of sensors including said first of
said plurality of sensors.
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16. The system of claim 13 wherein said instructions to transmit said alert to said device comprise:

instructions for directing said processing unit to:

determine an associated system to receive said recovery signal.

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17. The system of claim 16 wherein said instructions to determine said monitored system to receive said recovery signal comprise:

instructions for directing said processing unit to:

read an identifier associated with said associated system from a list of

10 systems to receive an alert when said criteria is met by said sensor output that is stored in a memory readable by said processing unit.

18. The system of claim 17 wherein said identifier is an Internet Protocol address associated with said monitored system.

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19. The system of claim 17 wherein said identifier is a telephone number associated with said monitored system.

20. The system of claim 16 wherein said instructions to transmit said alert to said system comprise:

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instructions for directing said processing unit to:

transmit said recovery signal to a plurality of associated systems including said associated system.

21. The system of claim 20 wherein said instructions to transmit said recovery signal to a plurality of associated systems comprises:

25

instructions for directing said processing unit to:

determine each of said plurality of monitored system to receive said recovery signal.

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22. The system of claim 21 wherein said instructions to determine said plurality of associated systems comprises:

instructions for directing said processing unit to:

read a plurality of identifiers from a list of monitored system to receive said recovery

35 signal when said sensor output meets said criteria stored in a memory readable by said

processing unit wherein each said plurality identifiers is associated with one of said plurality of monitored systems.

23. The system of claim 1 wherein said instructions further comprise:

5 instructions for directing said processing unit to:

receive information for each of said plurality of sensors, and

store said information for each of said plurality of sensors in a memory readable by said processing unit.

10 24. The system of 1 wherein said instructions further comprise:

instructions for directing said processing unit to:

receive a message from said mobile device,

read a command from said message received from said mobile device, and perform said command.

15 25. The system of claim 24 wherein said instructions to read said command comprise: instructions for directing said processing unit to:

determine a type of message;

20 read a format for a message including a command in said message from memory;

parse said message in accordance with said format to determine said command.

25 26. The system of claim 25 wherein said message includes a command to change said threshold and said instructions to read said command comprise:

instructions for directing said processing unit to:

read an identifier of said command from a specified position in said format,

read an identifier of said first of said plurality of sensors from a second specified position in said format,

30 read an identifier of said sensor output of said first of said plurality of sensors from a third specified position in said format,

read a new threshold value for said sensor output of said sensor from a fourth specified position in said format, and

35 store said new threshold value in said memory readable by said processing unit.

27. The system of claim 1 wherein said instructions comprise:
instructions for directing said processing unit to:

receive a request to add a new sensor to said system,
read information associated from said request, and
store said information for said new sensor in said memory.

28. The system of claim 27 wherein said information for said new sensor includes a
sensor type, and a list of sensor outputs provided by said new sensor.

29. The system of claim 28 wherein said instructions further comprise:
instructions to directing said processing unit to:

receive a request to add a new type of sensor to said system,
read sensor type information from said request, and
store said sensor type information in said memory.

30. The system of claim 29 wherein said sensor information includes a sensor type
identifier, a list of sensors outputs, and a start position in a data transmission format of
each said sensor output in said list of sensor outputs, and length of data in said data
transmission format of each said sensor output in said list of sensor outputs.

31. A method for monitoring sensor outputs with a mobile device comprising:
receiving data from a first of a plurality sensors in a server;
extracting a sensor output from said data received from said first of said plurality of
sensors in said server, wherein said step of extracting said sensor output comprises:

determining said first of said plurality of sensors is a particular type of
sensor in said server;

determining a format of a data transmission for said first of said plurality of
sensors based in said determined type of sensor wherein said format of said data
transmission of each of said plurality of sensors is different;

determining a position of said sensor output in said determined format of
said data transmission for said first of said plurality of sensors; and

reading data from said position in said data to retrieve said sensor output;
comparing said sensor output to an output threshold in said server;

determining that said sensor output meets a criterion in relation to said output
threshold in said server;

generating an alert message in said server in response to a determination that said sensor output meets said criteria; and
transmitting said alert message from said server to a mobile device.

5 32. The method of claim 31 wherein said step of extracting said sensor output further comprises:

 determining a length of said sensor output in said format, and
 reading said data for said length beginning at said position to retrieve said sensor output in said server.

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33. The method of claim 31 wherein said data includes a plurality of sensor outputs, said method further comprises:

 extracting data from each of said plurality of sensor outputs from said data in said server;

15 comparing said data extracted from each of said plurality of sensor outputs to a corresponding output threshold in said server;

 determining if one of said plurality of sensor outputs meets a criteria related to said corresponding output threshold in said server;

 generating said alert in response to one of said plurality of sensor outputs meeting
20 said criteria in said server; and
 transmitting said alert from said server to said mobile device.

34. The method of claim 31 wherein step of generating said message comprises:
 generating a Short Message Service message.

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35. The method of claim 31 wherein said step of generating said message comprises:
 generating an e-mail message.

36. The method of claim 31 wherein said step of transmitting said message to said
30 mobile device comprises:
 determining a mobile device to receive said alert message.

37. The method of claim 36 wherein said step of determining said mobile device to receive said alert message comprise:

reading an identifier associated with said mobile device from a list of mobile devices to receive an alert when said criteria is met by said sensor output that is stored in a memory readable by said server.

5 38. The method of claim 37 wherein said identifier is an e-mail address associated with said mobile device.

39. The method of claim 37 wherein said identifier is a telephone number associated with said mobile device.

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40. The method of claim 31 wherein said step of transmitting said message to said mobile device comprises:

transmitting said alert message to a plurality of mobile devices.

15 41. The method of claim 40 wherein said step of transmitting said alert message to a plurality of mobile devices comprises:

determining said plurality of mobile devices to receive said alert message.

20 42. The method of claim 41 wherein said step of determining said plurality of devices comprises:

reading a plurality of identifiers from a list of mobile devices to receive an alert when said sensor output meets said criteria stored in a memory readable by said processing unit wherein each said plurality identifiers is associated to one of said plurality of devices.

25 43. The method of claim 31 further comprises:

generating a recovery signal in response to a determination that said sensor output meets said criteria.

44. The method of claim 43 further comprises:

30 transmitting said recovery signal to said first of said plurality of sensors.

45. The method of claim 44 further comprises:

transmitting said recovery signal to a plurality of sensors including said first of said plurality of sensors.

35

46. The method of claim 43 wherein said step of transmitting said alert to said device comprise:

determining an associated system to receive said recovery signal.

5 47. The method of claim 46 wherein said step of determining said monitored system to receive said recovery signal comprise:

reading an identifier associated with said associated system from a list of systems to receive an alert when said criteria is met by said sensor output that is stored in a memory.

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48. The method of claim 47 wherein said identifier is an Internet Protocol address associated with said monitored system.

49. The method of claim 47 wherein said identifier is a telephone number associated
15 with said monitored system.

50. The method of claim 46 wherein said step of transmitting said alert to said system comprise:

20 transmitting said recovery signal to a plurality of associated systems including said associated system.

51. The method of claim 50 wherein said step of transmitting said recovery signal to a plurality of associated systems comprises:

25 determining each of said plurality of monitored system to receive said recovery signal.

52. The method of claim 51 wherein said step of determining said plurality of associated systems comprises:

30 reading a plurality of identifiers from a list of monitored system to receive said recovery signal when said sensor output meets said criteria stored in a memory wherein each said plurality identifiers is associated with one of said plurality of monitored systems.

53. The method of claim 31 further comprising:

35 receiving information for each of said plurality of sensors; and
storing said information for each of said plurality of sensors in a memory readable by said server.

54. The method of claim 31 further comprising:
receiving a message from said mobile device in said server;
reading a command from said message in said server; and
5 performing said command in said server.
55. The method of claim 54 wherein said step of reading said command comprises:
determining a type of message;
reading a format for a message including a command in said message from
10 memory readable by said server; and
parsing said message in accordance with said format to determine said command.
56. The method of claim 55 wherein said message includes a command to change said
threshold and said step of reading said command comprises:
15 reading an identifier of said command from a specified position in said format;
reading an identifier of said first of said plurality of sensors from a second specified
position in said format;
reading an identifier of said sensor output of said first of said plurality of sensors
from a third specified position in said format,
20 reading a new threshold value for said sensor output of said sensor from a fourth
specified position in said format, and
storing said new threshold value for said sensor output of said sensor in said
memory readable by said server.
- 25 57. The method of claim 31 further comprising:
receiving a request to add a new sensor to said system in said server;
reading information associated from said request in said server; and
storing said information for said new sensor in said memory.
- 30 58. The method of claim 57 wherein said information for said new sensor includes a
sensor type, and a list of sensor outputs provided by said new sensor.
59. The method of claim 58 further comprising:
receiving a request to add a new type of sensor to said system in said server;
35 reading sensor type information from said request in said server; and
storing said sensor type information in said memory readable by said server.

60. The method of claim 59 wherein said sensor information includes a sensor type identifier, a list of sensors outputs, a start position in a data transmission format of each said sensor output in said list of sensor outputs, and length of data in said data transmission format of each said sensor output in said list of sensor outputs.

61. A server for remotely monitoring sensors comprising:
circuitry configured to receive data from a first of a plurality sensors;
circuitry configured to extract a sensor output from said data received from said first of said plurality of sensors, wherein said circuitry configured to extract said sensor output comprises:
circuitry configured to determine said first of said plurality of sensors is a particular type of sensor;
circuitry configured to determine a format of a data transmission for said first of said plurality of sensors based on said determined type of sensor wherein said format of said data transmission of each of said plurality of sensors is different;
circuitry configured to determine a position of said sensor output in said determined format of said data transmission for said first of said plurality of sensors; and
circuitry configured to read data from said position in said received from said first of said plurality of sensors to retrieve said sensor output;
circuitry configured to compare said sensor output to an output threshold;
circuitry configured to determine that said sensor output meets a criterion in relation to said output threshold;
circuitry configured to generate an alert message in response to a determination that said sensor output meets said criteria; and
circuitry configured to transmit said alert message to a mobile device.

62. The server of claim 61 wherein said circuitry configured to extract said sensor output further comprises:
circuitry configured to determine a length of said sensor output in said format, and
circuitry configured to read said data for said length beginning at said position to retrieve said sensor output.

63. The server of claim 61 wherein said data includes a plurality of sensor outputs, said server further comprises:

circuitry configured to extract each of said plurality of sensor outputs from said data;
circuitry configured to compare said data extracted from each of said plurality of
sensor outputs to a corresponding output threshold;
circuitry configured to determine if one of said plurality of sensor outputs meets a
5 criteria related to said corresponding output threshold;
circuitry configured to generate said alert in response to one of said plurality of
sensor outputs meeting said criteria; and
circuitry configured to transmit said alert to said mobile device.

10 64. The server of claim 61 wherein said circuitry configured to generate said message
comprises:

circuitry configured to generate a Short Message Service message.

15 65. The server of claim 61 wherein said circuitry configured to generate said message
comprises:

circuitry configured to generate an e-mail message.

66. The server of claim 61 wherein said circuitry configured to transmit said message to
said mobile device comprises:

20 circuitry configured to determine said mobile device to receive said alert message.

67. The server of claim 66 wherein said circuitry configured to determine said mobile
device to receive said alert message comprises:

25 circuitry configured to read an identifier associated with said mobile device from a
list of mobile devices to receive an alert when said criteria is met by said sensor output that
is stored in a memory readable by said processing unit.

68. The server of claim 67 wherein said identifier is an e-mail address associated with
said mobile device.

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69. The server of claim 67 wherein said identifier is a telephone number associated
with said mobile device.

35 70. The server of claim 61 wherein said circuitry configured to transmit said message to
said mobile device comprise:

circuitry configured to transmit said alert message to a plurality of mobile devices.

71. The server of claim 70 wherein said circuitry configured to transmit said alert message to a plurality of mobile devices comprises:

5 circuitry configured to determine said plurality of mobile devices to receive said alert message.

72. The server of claim 61 wherein said circuitry configured to determine said plurality of devices further comprising:

10 circuitry configured to read a plurality of identifiers from a list of mobile devices to receive an alert when said sensor output meets said criteria stored in a memory readable by said processing unit wherein each said plurality identifiers is associated one of said plurality of devices.

73. The server of claim 61 further comprises:

15 circuitry configured to generate a recovery signal in response to a determination that said sensor output meets said criteria.

74. The server of claim 73 further comprises:

20 circuitry configured to transmit said recovery signal to said first of said plurality of sensors.

75. The server of claim 74 further comprises:

25 circuitry configured to transmit said recovery signal to a plurality of sensors including said first of said plurality of sensors.

76. The server of claim 73 wherein said circuitry configured to transmit said alert to said device comprise:

30 circuitry configured to determine an associated system to receive said recovery signal.

77. The server of claim 76 wherein said circuitry configured to determine said monitored system to receive said recovery signal comprise:

35 circuitry configured to read an identifier associated with said associated system from a list of systems to receive an alert when said criteria is met by said sensor output that is stored in a memory in said server.

78. The server of claim 77 wherein said identifier is an Internet Protocol address associated with said monitored system.

5 79. The server of claim 77 wherein said identifier is a telephone number associated with said monitored system.

80. The server of claim 76 wherein said circuitry configured to transmit said alert to said system comprise:

10 circuitry configured to transmit said recovery signal to a plurality of associated systems including said associated system.

81. The server of claim 80 wherein said circuitry configured to transmit said recovery signal to a plurality of associated systems comprises:

15 circuitry configured to determine each of said plurality of monitored system to receive said recovery signal.

82. The server of claim 81 wherein said circuitry configured to determine said plurality of associated systems comprises:

20 circuitry configured to read a plurality of identifiers from a list of monitored system to receive said recovery signal when said sensor output meets said criteria stored in a memory in said server wherein each said plurality identifiers is associated with one of said plurality of monitored systems.

83. The server of claim 61 further comprising:

25 circuitry configured to receive information for each of said plurality of sensors; and circuitry configured to store said information for each of said plurality of sensors in a memory readable by said processing unit.

84. The server of claim 61 further comprising:

30 circuitry configured to receive a message from said mobile device; circuitry configured to read a command from message received from said mobile device; and circuitry configured to perform said command.

35 85. The server of claim 84 wherein said circuitry configured to read said command comprises:

circuitry configured to determine a type of message;
circuitry configured to read a format for a message including a command in said message from memory; and
circuitry configured to parse said message in accordance with said format to
5 determine said command.

86. The server of claim 85 wherein said message includes a command to change said threshold and said circuitry configured to read said command comprises:

circuitry configured to read an identifier of said command from a specified position
10 in said format;
circuitry configured to read an identifier of said first of said plurality of sensors from a second specified position in said format;
circuitry configured to read an identifier of said sensor output of said first of said plurality of sensors from a third specified position in said format,
15 read a new threshold value for said sensor output of said sensor from a fourth specified position in said format, and
circuitry configured to store said new threshold value in a memory.

87. The server of claim 61 further comprising:

20 circuitry configured to receive a request to add a new sensor to said system,
circuitry configured to read information associated from said request, and
circuitry configured to store said information for said new sensor in a memory.

88. The server of claim 87 wherein said information for said new sensor includes a
25 sensor type, and a list of sensor outputs provided by said new sensor.

89. The server of claim 88 further comprising:

circuitry configured to receive a request to add a new type of sensor to said system;
circuitry configured to read sensor type information from said request; and
30 circuitry configured to store said sensor type information in said memory.