MONITORING APPARATUS AND SYSTEM

The present invention relates to error and incident reporting apparatus and systems and, more particularly, to a system adapted to monitoring and acting upon status signals emanating from widely diverse and geographically separated installations.

BACKGROUND

The efficient functioning of modern societies relies on innumerable discrete items of infrastructure. In many cases, particularly where such items are located in remote or difficult to reach or monitor locations, a malfunction or adverse incident may remain undetected for considerable lengths of time causing inconvenience, economic loss or even potentially hazardous situations.

Regular inspection of many such items of infrastructure in remote areas, for example irrigation sluices, gates, stock watering troughs etc is usually impractical. Similar impracticality or prohibitive expense is associated with the monitoring for example of such items as tool sheds at building sites, tool boxes on trucks, and equipment and plant remaining on construction sites etc.

The need for monitoring is of course not restricted to remote areas. Security and status of equipment, buildings and vehicles and the like is important everywhere. However, setting up a monitoring system is frequently a complicated procedure, often involving complex wiring of hardware installations, site visits by professional personnel.

It is an object of the present invention to address or at least ameliorate some of the above disadvantages.

Note

1. The term "comprising" (and grammatical variations thereof) is used in this specification in the inclusive sense of "having" or "including", and not in the exclusive sense of "consisting only of".
2. The terms "owner", "user", "registered user" are used interchangeably in this specification for any person authorised to predefine the steps to be executed in response to a signal from an individual signal unit (ISU).

BRIEF DESCRIPTION OF INVENTION

Accordingly, in one broad form of the invention, there is provided an infrastructure monitoring system; said apparatus including a plurality of geographically disparate individual signal units in communication with a central control facility via at least one communication satellite; said individual signal units adapted to change from a first stand-by state to a second powered up state on the

occurrence of a change of status of an item of said infrastructure; each device of said individual signal units transmitting a signal to said central control facility during said powered up state; said signal triggering a programmed predefined sequence of responses; each said device returning to said stand-by state after transmission of a said signal.

Preferably, each of said individual signal units is provided with a unique signal unit identification code; said unique identification code comprising said signal transmitted to said central control facility.

Preferably, each of said individual signal units is provided with a signal transceiver module.

Preferably, each of said individual signal units is provided with a rechargeable power supply.

Preferably, said rechargeable power supply is recharged by a solar cell array.

Preferably, each said individual signal units is provided with at least one external event sensor.

Preferably, said at least one external event sensor is adapted to respond to a change in status of a said item of infrastructure.

Preferably, a said individual signal unit receives an input signal from said at least one external event sensor at said change of status.

Preferably, each said at least one external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code; said unique sequence of repeat transmissions comprising said signal transmitted to said central control facility.

Preferably, each of said individual signal units is provided with an external event sensor interface adapted to monitor signals from at least one remote external event sensor.

Preferably, each of said individual signal units is provided with tamper monitoring means; said tamper monitoring means associated with one said unique sequence of repeat transmissions of said unique identification code.

Preferably, said central control facility includes a transceiver module in communication with said at least one satellite.

Preferably, said transceiver module is linked to server and data storage devices; said server and data storage devices adapted to process signals received from any one of said individual signal units.

Preferably, said server and data storage devices are adapted to initiate any of a plurality of pre-programmed outputs; said outputs dependent on said unique identification code and said unique sequence of repeat transmissions of said unique identification code comprising a received said signal.

Preferably, said server and data storage devices are adapted to initiate coded data for transmission to said individual signal units.

Preferably, said coded data transmitted to a said individual signal unit includes instructions for programmed responses by a said individual signal unit to inputs received from said one or more external event sensors.

Preferably, a said individual signal unit is provided with at least one output relay; said at least one output relay adapted to control an external device.

Preferably, said server and data storage devices are adapted to initiate predetermined communications to at least one nominated recipient; said communications dependent on signals received from a said individual signal unit.

Preferably, said at least one nominated recipient is a registered user of said monitoring system.

Preferably, said at least one nominated recipient is a service provider to said monitoring system.

Preferably, a said registered user of said monitoring system is enabled to register a said individual signal unit with said central control facility over the Internet.

Preferably, registration of said individual signal unit includes provision of data relevant to responses to external sensor events by said individual signal unit and by said central control facility.

In a further broad form of the invention there is provided a method for monitoring the status of at least one aspect of geographically disparate items of infrastructure; said method including the steps of:

(a) installing an individual signal unit at each of said items of infrastructure,

(b) providing said individual signal unit with at least one external event sensor and a signal transceiver,

(c) linking said individual signal unit with a central control facility via a satellite link,

(d) providing said central control facility with server and data storage devices; said devices adapted to execute pre-programmed responses to a signal received from a said individual signalling device.

Preferably, each said individual signal unit includes;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one external event sensor.

Preferably, said method includes the further steps of:

(a) providing each said individual signal unit with a unique individual signal unit identification code,

(b) associating a unique sequence of repeat transmission of said identification code for each said external event sensor,

(c) programming said individual signal unit to transmit a signal comprising said unique sequence of repeat transmission identification code of said individual signal unit to said central control facility on the occurrence of a change of said status of a said item of infrastructure,

(d) executing said pre-programmed responses to a signal received from a said individual signalling device.

Accordingly, in a first broad form of the invention, there is provided an apparatus and monitoring system for response to incidents sensed by at least one sensor of an individual signal unit; said response comprising in a first instance, transmission to a central control facility by a said individual signal unit, of at least a unique identifying code for that individual signal unit, over a communication network; said response comprising in a second instance,

transmission of data from said central control facility to one or more recipients nominated by a registered owner of said individual signal unit; and wherein registration of a said individual signal unit and configuration of sensing and of said response is via a web-based interface.
Preferably, said response in said first instance includes digital or analogue data input to said individual signal unit.

Preferably, said digital or analogue data is transmitted to said central control facility in real time.

Preferably, said digital or analogue data is stored, prior transmission, on a data storage device of said individual signal unit.

Preferably, said at least one sensor is incorporated within said individual signal unit.

Preferably, said at least one sensor is an external sensor connected to an input port of said individual signal unit.

Preferably, said individual signal unit further includes a rechargeable power supply.

Preferably, said rechargeable power supply is recharged by a solar cell array.

Preferably, said web-based interface includes at least one web page; said web page provided with at least one data entry field.

Preferably, each of said individual signal units is provided with a unique individual signal unit identification code; said unique identification code comprising said signal transmitted to said central control facility.

Preferably, each said at least one external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code; said unique sequence of repeat transmissions comprising said signal transmitted to said central control facility.

Preferably, of each said individual signal units is provided with at least one external event sensor.

Preferably, said at least one external event sensor is adapted to respond to a change in stimulus of said sensor.

Preferably, said at least one external event sensor is adapted to respond to a predefined stimulus.

Preferably, a said individual signal unit receives an input signal from said at least one external event sensor at said change in stimulus.

Preferably, said central control facility includes a transceiver module in communication with said communication network.

Preferably, said transceiver module is linked to server and data storage devices; said server and data storage devices adapted to process signals received from any one of said individual signal units.

Preferably, said server and data storage devices are adapted to initiate at least one pre-programmed output~~s~~; said output or outputs dependent on said unique identification code

Preferably, a said individual signal unit is provided with at least one input; said at least one input adapted to communicate with one said sensor.

Preferably, a said individual signal unit is provided with at least one output; said at least one output adapted to control an external device.

Preferably, said server and data storage devices are adapted to initiate predetermined communications to at least one nominated recipient; said communications dependent on a signal received from a said individual signal unit.

Preferably, said at least one nominated recipient is an owner of a said individual signal unit registered with said monitoring system.

Preferably, said at least one nominated recipient is a service provider nominated by said owner of a said individual signal unit.

In a further broad form of the invention, there is provided an individual signal unit; each said individual signal unit including;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one external event sensor,

and wherein a signal from a said individual signal unit to a central control facility causes said central control facility to execute a number of predefined steps; said predefined steps configured by an owner of said individual signal unit.

In another broad form of the invention, there is provided a monitoring system; said apparatus comprising an individual signal unit and at least one owner selectable sensor connected to said individual signal unit; said individual signal unit and said at least one sensor registered by said user with a central control facility; wherein said individual signal unit is programmed to transmit a unique device identification code to said central control facility when said at least one sensor detects an incident; said central control facility responding to a transmitted said unique device identification code according to protocols established at registration of said unit by said owner.

In yet a further broad form of the invention, there is provided a monitoring system enabled by the internet and a communication system; said system including a number of individual signal units; each of said devices connected to at least one owner selectable sensor; each of said individual signal units and said at least one sensor registered with a central control facility by said owner over said internet; said central control facility responding to an incident sensed by a said sensor according to protocols established at registration by a said owner.

In yet a further broad form of the invention, there is provided a method of monitoring the status of an item of interest; said method including the steps of:

(a) purchase by an owner of an individual signal unit and at least one user selectable sensor for connection to said device,

(b) registering said individual signal unit and said at least one sensor with a central control facility,

(c) configuring a response executable by said central control facility on receipt by said facility of a signal transmitted by said individual signal unit.

Preferably, said signal comprises a unique identifying code of said individual signal unit.
Preferably, said registering of a said individual signal unit includes the steps of:

(d) accessing a web site maintained by said central control facility,
(e) establishing a user name and password with said central control facility,
(f) entering into said web site a registration code of said individual signal unit,
(g) entering a user selected identifier name for said individual signal unit,
(h) entering details of one or more sensors to be connected to said individual signal unit,
(i) entering details of said response executable by said central control facility.

In another broad form of the invention, there is provided a method for monitoring the status of at least one aspect of geographically disparate items of infrastructure; said method including the steps of:

(a) installing an individual signal unit at each of said items of infrastructure,

(b) providing said individual signal unit with at least one external event sensor and a signal transceiver,

(c) linking said individual signal unit with a central control facility via a communication network,

(d) providing said central control facility with server and data storage devices; said devices adapted to execute pre-programmed responses to a signal received from a said individual signalling device.

In still another broad form of the invention, there is provided apparatus of an infrastructure monitoring system; said apparatus including a plurality of geographically disparate individual signalling devices in communication with a central control facility via at least one communication satellite; said individual signalling devices adapted to change from a first stand-by state to a second powered up state on the occurrence of a change of status of an item of said infrastructure; each device of said individual signalling devices transmitting a signal to said central control facility during said powered up state; said signal triggering a programmed predefined sequence of responses; each said device returning to said stand-by state after transmission of a said signal.

Preferably, each of said individual signalling devices is provided with a unique signalling device identification

code; said unique identification code comprising said signal transmitted to said central control facility.

Preferably, each of said individual signalling devices is provided with a signal transceiver module.

Preferably, each of said individual signalling devices is provided with a rechargeable power supply.

Preferably, said rechargeable power supply is recharged by a solar cell array.

Preferably, each said individual signalling devices is provided with at least one external event sensor.

Preferably, said at least one external event sensor is adapted to respond to a change in status of a said item of infrastructure.

Preferably, a said individual signalling device receives an input signal from said at least one external event sensor at said change of status.

Preferably, each said at least one external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code; said unique sequence of repeat transmissions comprising said signal transmitted to said central control facility.

Preferably, each of said individual signalling devices is provided with an external event sensor interface adapted to monitor signals from at least one remote external event sensor.

Preferably, each of said individual signalling devices is provided with tamper monitoring means; said tamper monitoring means associated with one said unique sequence of repeat transmissions of said unique identification code.

Preferably, said central control facility includes a transceiver module in communication with said at least one satellite.

Preferably, said transceiver module is linked to server and data storage devices; said server and data storage devices adapted to process signals received from any one of said individual signalling devices.

Preferably, said server and data storage devices are adapted to initiate any of a plurality of pre-programmed outputs; said outputs dependent on said unique identification code and said unique sequence of repeat

transmissions of said unique identification code comprising a received said signal.

Preferably, said server and data storage devices are adapted to initiate coded data for transmission to said individual signalling devices.

Preferably, said coded data transmitted to a said individual signalling device includes instructions for programmed responses by a said individual signalling device to inputs received from said one or more external event sensors.

Preferably, a said individual signalling device is provided with at least one output relay; said at least one output relay adapted to control an external device.

Preferably, said server and data storage devices are adapted to initiate predetermined communications to at least one nominated recipient; said communications dependent on signals received from a said individual signalling device.

Preferably, said at least one nominated recipient is a registered user of said monitoring system.

Preferably, said at least one nominated recipient is a service provider to said monitoring system.

Preferably, a said registered user of said monitoring system is enabled to register a said individual signalling device with said central control facility over the Internet.

Preferably, registration of said individual signalling device includes provision of data relevant to responses to external sensor events by said individual signalling device and by said central control facility.

In a further broad form of the invention there is provided a method for monitoring the status of at least one aspect of geographically disparate items of infrastructure; said method including the steps of:

(e) installing an individual signalling device at each of said items of infrastructure,

(f) providing said individual signalling device with at least one external event sensor and a signal transceiver,

(g) linking said individual signalling device with a central control facility via a satellite link,

(h) providing said central control facility with server and data storage devices; said devices adapted to execute pre-programmed responses to a signal received from a said individual signalling device.

Preferably, each said individual signalling device includes;

(e) a transceiver module,

(f) a rechargeable power supply and power control module,

(g) a logic circuit,

(h) at least one external event sensor.

Preferably, said method includes the further steps of:

(a) providing each said individual signalling device with a unique signalling device identification code,

(b) associating a unique sequence of repeat transmission of said identification code for each said external event sensor,

(c) programming said individual signalling device to transmit a signal comprising said unique sequence of repeat transmission identification code of said signalling device to said central control facility on the occurrence of a change of said status of a said item of infrastructure,

(d) executing said pre-programmed responses to a signal received from a said individual signalling device.

In still another broad form of the invention, there is provided, an individual signal unit; each said individual signal unit including;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one of a number of selectable external event sensors,

and wherein a signal from a said individual signal unit to a central control facility causes said central control facility to execute a number of predefined steps; said predefined steps configured by an owner of said individual signal unit.

In still another broad form of the invention, there is provided a monitoring system including an individual signal unit; said individual signal unit communicating with a central control facility when an event sensor activates said individual signal unit; said central control facility executing a number of predefined steps on receipt of a communication from said individual signal unit; said predefined steps configured by an owner or registered user of said individual signal unit.

Preferably, a communication between said individual signal unit and said central control facility is not limited by distance.

Preferably, said individual signal unit may be located at any location relative said central control facility.

Preferably, said individual signal unit is mobility independent of said central control facility.

Preferably, said communication between said individual signal unit and said central control facility is by means of any communication network.

Preferably, said predefined steps include a communication between said central control facility and a said owner or registered user of said individual signal unit.

Preferably, said communication between said central control facility and said owner or registered user is by means of any communication network.

Preferably, said predefined steps may include a first layer and a secondary layer of said predefined steps.

Preferably, selected ones of said secondary layer of predefined steps may be executed by said central control facility in accordance with a reply to a said communication between said central control facility and a said owner or registered user.

Preferably, said individual signal unit is programmable.

Preferably, said individual signal unit includes a graphic display.

Preferably, said individual signal unit is configurable to accept signal input from any external sensing device.

Preferably, said individual signal unit is configurable to allow output signals to any said communication network.

Preferably, said individual signal unit is adapted for integration into products as an original equipment manufacture (OEM) module.

Preferably, said central control facility includes a database and a server; said central control facility maintaining an Internet web site on said server.

Preferably, said system provides a means of asset monitoring; said asset monitoring alerting a said owner or registered user to an incident affecting a said asset.

Preferably, said predefined steps include activation of an output device connected to a said individual signal unit.

In another broad form of the invention, there is provided a method of deriving revenue from a monitoring system; said monitoring system including a remotely located individual signal unit in communication with a central control facility; said method including:

(a) selling said individual signal units

(b) renting said individual signal units

(c) charging periodic registration fees

(d) charging for network services

(e) charging for development, programming and design

(f) charging licence fees for custom or retrofitted applications

(g) collecting industry co-operation commissions

(h) charging licence fees for monitoring agents and service providers.

BRIEF DESCRIPTION OF DRAWINGS

Embodiments of the present invention will now be described with reference to the accompanying drawings wherein:

Figure 1, is a representation of a preferred arrangement of communication between apparatus and users of a monitoring system according to the invention,

Figure 2, is a schematic of a preferred embodiment of an individual signal unit (ISU) of the arrangement of Figure 1,

Figure 3 is a perspective view of a preferred enclosure for an individual signal unit according to the invention,

Figure 4 is an exploded perspective view of the enclosure of Figure 3 showing principle internal components of one embodiment of an individual signal unit,

Figure 5 is a circuit diagram of an embodiment of an individual signal unit,

Figures 6 to 12 are pages of a possible web site for registering an individual signal unit with a central control facility,

Figures 13 to 16 are further pages of the web site of Figures 6 to 12, for configuring of an individual signal unit,

Figures 17 to 19 are further pages of the web site adapted to allow an owner or authorized person to access data collected by an individual signal unit,

Figure 20 is a diagram indicating examples of the interconnectivity of an individual signal unit (ISU) with a variety of communication systems, input devices, the web site of a central control facility and of that facility's outputs,

Figures 21 to 23 show a variety of applications and functions of an ISU installed in a vehicle, including the interfacing of the ISU with the onboard computer of the vehicle,

Figures 24 and 25 show two pages of a possible web site for registering aspects of a vehicle's performance monitoring and servicing arrangements,

Figure 26 shows the interactions facilitated by means of an in-vehicle ISU for arranging servicing of the vehicle,

Figure 27 shows a web page provided by a central control facility for registration of vehicle service providers who are willing to provide services to vehicles equipped with an ISU,

Figure 28 shows an example of revenue streams which may be derived from vehicle service providers who register with the central control facility,

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

First Preferred Embodiment

Figure 1 is a diagrammatic representation of the apparatus and connections included in a monitoring system 10 according to a preferred embodiment of the invention. A central control facility 12 includes a data processing server 14 and data storage 16, linked to a transceiver 18. Central control facility 12 is in radio communication with a communication network such as a mobile phone network, or for example as shown in Figure 1, with at least one communication satellite 20, by means of transceiver 18.

In the example of a communication satellite 20, it in turn, is in telecommunication contact with a number of individual signal units 22, for example via the Global System for Mobile Communications (GSM), the General Packet Radio Service (GPRS) or a similar communication network 21. Individual signal units 22 belong to registered users of the system and may be located anywhere within the signal footprint of a communication satellite (or satellites) 20, or of some other communication network.

Individual signal units 22 each are assigned a unique identifying code, and may take a number of physical configurations depending on the environment in which they are to be located. Figure 3 shows one preferred form of an individual signal unit, comprising enclosure 50 with various input and output devices. In some preferred forms at least, they will comprise a rugged, moisture and tamper-proof outer casing with internal power supply and a selection of bracketry and other attachment means for affixing the devices to a variety of structures and surfaces. In other preferred forms the device may be incorporated in an item of equipment at manufacture, for example in the lantern structure of street lights.

With reference to Figure 4 which shows an exploded view of one preferred form of an individual signal unit 22, enclosure 50 comprises a base portion 52 and cover portion 54. Housed within enclosure 50 are a communication module 56, for example using the General Packet Radio Service (GPRS) standard for communication with a communication network, and antenna jack 58. Also contained within enclosure 50 is a rechargeable battery module 60, and various input and output connections, including power input/outputs 62, sensor inputs 64, device relay connections 66 and a universal serial bus (USB port) 68. Individual signal unit 22 may also be provided with status indicating light emitting diodes (LEDs) 70. Enclosure 50 is provided with a space, for example space 72 on cover 54, for display of a code used in the registration of the unit with the central control facility.

Each individual signal unit 22 is adapted to monitor the status of some aspect of an item of infrastructure,

such as for example illustrated in Figure 1, a gate 22, irrigation control sluice 24 or tool shed 26.

As shown in the schematic of Figure 2, individual signal units 22 include at least a transceiver module 40, a rechargeable power supply and power control module 42, at least one external event sensor 44 and a logic circuit 46. For some applications, an individual signal unit may be provided with, or connected to, a magnetic card reader, enabling inspecting personnel to simply swipe an authorising card as confirmation that the individual signal unit is in its proper position and functioning, or that some predefined task has been accomplished.

Preferably, the power supply 42 is rechargeable by means of a solar panel 48, but may also comprise batteries rechargeable from a mains power source, or replaceable battery packs. Where an individual signal unit has been incorporated in some item of infrastructure already provided with a power supply, such as in the street light example, power to the unit may be provided from that external supply.

An individual signal unit 22 may be provided with at least one external event sensor 44 incorporated within the device itself, but individual signal units 22 are more preferably provided with a sensor interface allowing the unit to accept signals from a number of external event sensors connected to the interface. Thus for example, an individual signal unit 22 may monitor a number of aspects of a remotely located facility, such as the doors and windows of a building or various items of equipment located on a service vehicle.

With reference to Figure 5, the ISU may include the following components.

- GSM Engine 74.

This is the central core of the device. It includes a GSM transceiver allowing the module to connect to and communicate over the GSM network. The transceiver also makes use of the GPRS capability of the GSM network to connect to a server of the central control facility using IP sockets. The GSM engine also includes a basic Python script interpreter to run application scripts (software) and a battery charger 75 to allowing the charging of a LiIon battery pack (connected via J5 on the circuit diagram of Figure 5).

The application scripts (software) loaded into the GSM engine 74 allow the module to monitor the external sensors and devices connected to the ISU device and generate messages over the GPRS network to the central control facility server whenever there is a change in the status of these external sensors or devices. The typical operation will be for the GSM engine to connect to a known IP socket on a server at a known IP address. The message passed to

the server via this connection will include the identification of the ISU device (typically the 'phone number associated with the SIM card) and the details of the input status change.

The GSM engine has a push button switch (S1 on the circuit diagram of Figure 5) which allows the GSM engine to be turned on and off.

- Network Status Indicator (D1 on circuit diagram)

An LED (light emitting diode) is provided to give an indication of the status of the ISU device. When the LED is permanently off, the device is powered down. When the LED is blinking quickly (approximately 1 second period), the GSM engine is searching for the GSM network and attempting to register itself with the network. When the LED is blinking slowly (approximately 3 second period), the GSM engine has registered itself with the GSM network and is in a state that will allow it to make a connection with a server should one of the inputs change state. When the LED is permanently on, there is an active call being made by the device.

- Battery Status Indicator (D6 on the circuit diagram)

A visible indication of the charge status of the battery is provided using an LED (light emitting diode).

- USB Connection (J3 on the circuit diagram)

The ISU device has a USB connection to allow the module to be connected to a Personal Computer. This connection allows the application scripts (software) to be updated in the GSM Engine. Power is also drawn from the Personal Computer to recharge the LiIon battery. The power for the USB interface device (U6 on the circuit diagram) is taken from the USB connector. This minimises the current drawn from the LiIon battery to extend the operational time between charges. Interface components (U4 and U5 on the circuit diagram) isolate the connections between the USB device and the GSM engine when either the USB port is disconnected (USB device powered down) or the GSM engine has been turned off.

A protection device (U7 on the circuit diagram) has been included on the USB port to protect the USB device from electrostatic discharge onto the pins of the USB connector.

- External Sensor Inputs (IN1-4 signals on the circuit diagram)

The prototype ISU device implements 4 external sensor inputs. These connections are available on a dedicated input connector (J2 on the circuit diagram) and on the special attachment connector (J4 on the circuit diagram). These inputs have been configured to allow external sensors to simply connect these input signals to a 0Volt return signal (available on both connectors) using a relay contact closure. This is the typical output from a wide range of

sensors.

An interface component (U3 on the circuit diagram) is provided to isolate the input signals from the GSM engine when the GSM engine has been turned off. There are also some protection devices (D2-5 on the circuit diagram) to protect the inputs of the interface component from electrostatic discharge onto the pins of the connectors.

- Controlled Outputs (OUT1 and OUT2 signals on the circuit diagram)

The prototype ISU device implements 2 controlled outputs. These outputs allow external devices to be switched by the ISU device. These outputs are implemented using transistors Q1 and Q2. The connections to external devices can be made either by the dedicated output connector (J1 on the circuit diagram) or the special attachment connector (J4 on the circuit diagram).

- Special Attachment Connector (J4 on the circuit diagram)

A special attachment connector has been provided on the ISU device to allow it to be plugged into purpose built sensors. These sensors will be engineered to accommodate the ISU device and all of the required connections between the two devices are made through the single attachment connector. This connector supports attachments that are self-powered and are capable of providing current to recharge the battery in the ISU, as well as attachments that do not have their own power supply and require current from the ISU device's battery to operate.

The apparatus of a monitoring system may include a number of standard sensor devices available for purchase along with, or in addition to the individual signal unit 22. Each sensor device is adapted to respond to a predefined stimulus, and may include sensors for power status, smoke detection, motion detection, door or window opening, button press, fluid level, tampering, location via the GPS system and video camera, for example. These standard sensor devices are provided as a simple plug-in to the individual signal unit 22, via one of the input connection 64 or USB port shown in Figure 4, or other standard interface ports provided on the device.

An individual signal unit 22 may further be provided with internal error monitoring facilities, such as a power supply failure. Preferably also, individual signal units 22 are equipped with interference sensors to alert the central control facility 12 of tampering by unauthorised persons, or disturbance by animals for example.

Individual signal units 22 in at least one preferred embodiment, are provided with output relays to activate one or more external devices according to pre-programmed responses to sensor monitored events. Examples may include

the activation of audio and/or visual alarms, the switching on of security lighting, closure of fire doors and so forth.

The power supply and control module 42 is adapted to maintain individual signal unit 22 in a passive, standby state until receiving a signal from an external event sensor. Such a signal initiates a powering up of the device, enabling it to transmit its unique encrypted identifying code to the central control facility. After transmission of this signal the individual signal unit powers down and returns to its passive standby state.

An individual signal unit 20 may also be brought into a powered up state on command from the central control facility 12. This powering up may be for the purpose of re-programming the individual signal unit 22 to install a new response procedure, for example after the installation of a new, or an additional external event sensor, relocation of the unit, or to modify an existing procedure.

Where an individual signal unit 22 is provided with data entry and display facilities, such programming or re-programming of the unit may be performed at the device itself. At the conclusion of such local data input, the new or modified data is transmitted to the central control facility to update its responses to any signals received from the individual signal unit as required.

Referring again to Figure 1, during a powered up state, as well as following any pre-programmed procedure for the activation of any local connected devices, individual signal unit 22 will transmit a signal via the network 21 and a satellite 20, reporting the event to the central control facility 12.

In a first simplest preferred form of the invention, a signal sent by an individual signal unit 22 consists solely of its unique encrypted identifying code. No data is sent with this code. The information as to what a receipt of this code by the central control facility means, is stored in the central processing computers of the facility. This information, which is supplied by and under the control of the registered owner of the individual signal unit, may include instructions as to what actions are to be taken in response to the signal.

Although in this preferred form of the invention, the individual signal unit 22 is only enabled to transmit a single encrypted identifying code, it may do so in various ways to indicate various events. Each external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code. For example if an external sensor device is activated, the code may be transmitted a predetermined number of times for that particular sensor at short intervals. However should an error condition develop in the device itself, such as for

example a low battery situation, the code may be transmitted singly. The manner of transmission of this single encrypted code is then the determinant of the status of the device and of what action should be taken by the central control facility.

According to its pre-programmed instructions, an individual signal unit 22 may continue to transmit its signal at intervals for a pre-defined period as an aid in location of the device by service personnel alerted by the central control facility 12 as described below.

Again with reference to Figure 1, a received signal is acted upon by the central control facility 12, notifying any of a number of nominated recipients 30 according to a pre-established protocol negotiated between the registered user of the individual signal unit 22 and the control facility. Notification of details of a monitored event could be made in the form of an email via the Internet 29 as shown in Figure 1, by facsimile transmission or over the distributed network 21 to any personal communication device.

Typically, one nominated recipient 30 will be the registered user or owner of the individual signal unit from which the alerting signal was received. However nominated recipients may also include service providers, who are automatically notified of the occurrence and the nature of the event, the location of the individual signal unit and any other pre-defined details. Service providers may include police, fire and ambulance services, or equipment servicing personnel for example. At registration of an individual signal unit, the owner of the unit may elect that third parties be contacted only on receipt by the central control facility of authorisation from the owner.

An applicant user or owner will be required to supply all relevant details of the individual signal unit, its external event sensing faculties, intended location and the procedures to be implemented on receipt of a signal from the device. The central control facility then issues the unique identification code for the individual signal unit. Alternatively, an individual signal unit may be pre-programmed at manufacture with its unique identifying code. As well, the applicant user or owner nominates a service provider of the GSM, GPRS or other communication system, for billing purposes, or alternatively, the central control facility makes this arrangement, with billing for such service included in the overall charge for use of the system.

The information thus received is used by the central control facility to program the procedure to be followed by the facility in response to signals received from the individual signal unit. The facility may also transmit data to the individual signal unit prior to its commissioning

but subsequent to its installation at the infrastructure item, to set the parameters of signal transmission, such as frequency and interval of repeat transmissions for example.

Second Preferred Embodiment

In a second preferred embodiment, the individual signal unit of the present invention again includes at least a transceiver module 40, a rechargeable power supply and power control module 42, and at least one external event sensor 44 and a logic circuit 46 as shown in Figure 1. In this embodiment however, the unit may further be provided with a data storage device able to record analogue or digital input from a device connected to the individual signal unit.

In this embodiment also, the unit is not restricted in its transmission to the central control facility of it unique identifying code but is enabled to transmit the input analogue or digital data, either in real time, or retrieved from its data storage device at predetermined times or on command form the central control facility.

Thus in this form, the individual signalling unit may have attached as an input device such equipment as a video camera, sound recording equipment or a Global Positioning System (GPS) module for example. The connection of a GPS module allows the individual signal unit to report its location, either continuously, at predetermined intervals or on command from the central control facility. Similarly, a video camera may send images on a continuous basis, at predetermined intervals or as commanded. Alternatively, data from a camera, GPS module etc may be stored in the data storage device (if so provided) of the individual signal unit for later interrogation and download to the central control facility.

In either of the above described preferred embodiments, an individual signal unit may be provided with an on/of facility adapted for local activation. That is a facility whereby a registered user or other authorised person can switch the unit between power off and standby for monitoring. This facility may be a Radio Frequency (RF) responder unit, either incorporated in the individual signal unit itself, or as a connected input device.

Connectivity

The flexibility of the individual signal unit (ISU) in the many ways it can be interfaced with other devices is illustrated in Figures 20A to 20D. In its simplest form as illustrated in Figure 20A, some sensing device, for example a motion detector 140 is connected to an ISU 142 via a standard input/output (I/O) connector 144 provided on the ISU. In this instance the ISU 142 has been configured to send a signal, when activated by input from the motion sensor, via a GSM network 146 to the central control

facility (represented in these figures by its web site 148). The web site 148 of the central control facility acts on the received signal according to pre-configured instructions received from the user of the ISU 142. In this example, an SMS message 150 is sent to the user's mobile phone 152.

As shown in the sequence illustrated by Figures 20B, the web site 148 of the central control facility may communicate with the user 154 of the ISU 142 over any one or combination of current or future communication systems 156.

Likewise, as shown in Figure 20C, the ISU 142 and central control facility may be configured to send and receive a signal from a sensed event via any form of signal transmission, and as further illustrated in Figure 20E, messages to a user or registered owner of an ISU 142 may be transmitted to any type of communication device.

These may include SMS messaging, Internet, voice, facsimile transmissions, use of the GPRS system, telephone, pagers and satellite. Thus the central control facility may communicate the occurrence of an incident to the user's mobile phone, computer, land-line telephone, and facsimile machine. As well, the control facility may where appropriate communicate with another ISU, programmable logic controller (PLC) or transfer data to a designated database. Thus, by connecting an output device, for example a PLC, actuator, or motor and the like, to an ISU, the predefined steps or actions to be executed could include the initiation of processes at the remote location at which the ISU is situated.

Also as shown in Figures 20D and 20E, the ISU may be configured with a number of standard input/output connectors 160, including but not limited to, USB and RF ports, Infra Red, Wi/Fi, Bluetooth and Fire Wire receivers for example. Sensors 162 communicating with any one or more of these connectors may include, motion detectors, switches, telephone, measuring devices, data sources, programmable logic controllers and other attachments.

Depending on its configurations, the ISU 142 may communicate with the web site 148 of the central control facility by any of a number of distributed communication systems 158. These may include, as shown on Figure 20E, the GSM or other mobile phone networks, satellite based systems, the Internet, wireless broadband, the copper telephone network and voice.

In addition to these communication systems being used to send messages or other forms of communication to the user or registered owner of the ISU, the central control facility may use the same systems for communication with other service providers 162 as shown in Figure 20F. Using tracking systems available via the GSM network, an ISU's

signal can be used to determine its location as indicated schematically in Figure 20G.

Figure 20H shows still a further example of how the connectivity of the ISU with sensing equipment may be utilized. Sensors 162 associated with an advertising board may monitor for temperature, crowd sizes or other parameters associated with advertising effectiveness. Based on these measurements and in accordance with the ISU user's configured instructions, the ISU may provide the most appropriate advertising information, thereby enabling premium charges.

Some further features of the monitoring system according to the invention include:

- the ISU and server are programmable and can support a wide range of inputs.
- The ISU is not restricted to the above described inputs and outputs. Additional or alternative inputs and outputs can be readily added to the design.
- The ISU can support a variety of transport mechanisms including CDMA, 3G and satellite depending on what distributed communication system is available.
- The message sever of the central control facility is based on scalable architecture allowing it to be duplicated or upgraded to support increased traffic in the future.
- The ISU can support a simple LCD or other graphic display unit, to provide a user with status information.
- The ISU can be integrated into products as an OEM (Original Equipment Manufacturer) module. This may be a user upgradeable or factory fitted option.

The monitoring system of the present invention lends itself to commercial exploitation in a number of ways. Some of these may be summarized as:

- Licensing of complete systems developed by others as ISU certified
- Retail of ISUs for ad hoc users
- Inviting existing products and services to join user configurable web-based systems
- Additional programming and systems service charges
- Building custom-designed measurement and control applications
- Asset monitoring, for example
  - Vehicle care
  - Security

- Innovative equipment hire options
- Triangulation
- Wildlife and stock tracking
- Scheduling
- Environmental monitoring

- Asset control, for example
  - Environmental control - local government, national parks, defence
  - Plant control - factories, farms, local government
  - Access control - remote door opening

Revenue may be derived from a number of activities associated with the ISU based monitoring system, for example:

- Unit sales - ISUs and attachments
- Unit rentals
- Monthly registration fees - ISU network, optional services
- Network services charges (e.g. SMS, GPRS etc)
- Development - programming, design
- Annul license fees for custom or retrofitted applications
- Access to ISU network fees for other service providers
- Industry co-operation commissions (e.g. Insurance rebates
- License fees from monitoring agents (e.g. Callout providers)

With reference now to Figure 24, with an ISU fitted to a vehicle and interfaced with the vehicle's onboard computer, the vehicle becomes another device for which the registered owner of the ISU can configure various actions associated with aspects of the vehicle. One category of configuration as shown in Figure 24 is a listing of preferred or potential servicing facilities for the vehicle from which quotation may be solicited for servicing or repair. Performance and satisfaction ratings may be assigned to these facilities garnered from data collected by third party assessors and supplied to the central control facility.

A further configurable option shown in Figure 25, is for the owner or manager of the vehicle to receive data of performance parameters of the vehicle.

Figure 26 shows a possible result of a vehicle management configuration using the ISU in a vehicle to arrange for servicing of the vehicle at a predefined service interval. The ISU, monitoring the vehicle's onboard computer, signals the central control facility that the

vehicle has reached the given odometer reading. This activates the central control facility to obtain quotations for service and possible dates at which the service may be accommodated from the three service nominated by the vehicle's owner at registration.

To provide the above service to purchasers of an ISU for an in-vehicle application, the central control facility may establish a database of service providers willing to offer services and provide quotations to registered users of the ISU monitoring system. Figure 27 shows a web based page service providers may use to register, including the provision of details of any specialised services they may wish to nominate.

This aspect of the application of the monitoring system of the invention provides for a further revenue stream for the central control facility. An example of a pricing structure for vehicle service providers who wish to promote their services to owners of vehicle based ISUs is shown in Figure 28.

Componentry

As set out in more detail above, the principle components of the ISU are:

- Network module
  - Processor
  - memory
- Connectors
- Power source

Within these broad component modules, the ISU may be configured in various models with varying attributes:

- Network - interchangeable
- Connectors - versatility and adaptability focused
- Capacity - storage, transmission quantity of data
- Durability - weather proofing, water proofing, shock proofing
- Power - mains, battery, solar. Achieving long standby periods of 5 years
- Compact size

As an example of one possible configuration, an ISU could comprise, a GPRS Module GM862; I/O Connector (J4) 2214R-16SG-85; Light Pipe C435815; LED (alarm and network) 0805KRCT; Switch (On/Off) ELTSA-63; USB Connector 5075BMR05SM; 4 Pin Edge Connectors S4B-PH-K-S (output); 8 Pin Edge Connectors S8B-PH-K-S (input); Battery Sanyo UF55344F; Arial Coax 22-SMA-50-0-53.

Attachments

The ISU may be adapted to accept input from virtually any signal producing device. Some currently known examples

include: motion detectors, Bluetooth accessories, alarms, detectors and responders.

Other attachable devices include programmable logic controllers, (which may for example be programmed to act on vending machines, dispensers and robots), message boards, remote monitoring devices, RF networks and remote control units.

In Use

Individual signal units 22 are added to the monitoring system 10 by registration with the central control facility 12. Such registration may be accomplished by an applicant user or owner over an Internet web site maintained by the central control facility. Data monitored by an individual signal unit can only be accessed by the registered owner or by third parties authorised by the owner, through use of a user name and password established when a unit is first registered.

The Public User

A new private user of the system may purchase an individual signal unit 22 at any authorised outlet, such as for example a mobile phone retailer. As well he or she may select from a range of standard sensor units compatible with the individual signal unit also available at the authorised outlet or obtainable from an accredited supplier. Preferably, the individual signal unit is adapted to accept as input up to four individual sensor devices via input connector 64. Thus for example, an individual signal unit may have connected a motion sensor, a video camera, a microphone as well as a smoke alarm (not shown).

Preferably also, the individual signal unit 22 is provided with at least two output relays via output connectors 66, to which may be connected external devices such as security lights or audio alarm for example.

To make use of the equipment, a new owner must register with the central control facility, preferably over an internet web site maintained by the facility, or by telephone. With reference to Figures 6 to 12, the process of registration over the facility web site includes the following steps;

1. After logging onto the web site and selecting the option of registering 100 as shown in Figure 6, the owner enters personal details 102 and selects a user name 104 and password 106 for future interaction with the facility, as shown in Figure 7.
2. At this point also the owner is required to establish an account with the facility for billing purposes.
3. Next, as shown in Figure 8, the owner is invited to enter the identification code number 110 of the purchased individual signal unit. This may be provided on the packaging in which the device was purchased or, preferably

printed on a removable sticker attached to the device itself, (for example in the space 72 on cover portion 54 as shown in Figure 4).

4. If the device is provided with a display module, a Confirmation Code is displayed when power is provided to the unit, that is when it is first switched on. This number 112 is then also entered as shown in Figure 9.

5. For ease of identification, the owner may nominate a brief description 114, typically associated with the function or location of the signalling unit and its connected sensor/s, as shown in Figure 10. For a fixed device, that is one that is not expected to, or which should not move from its installed location, the geographic location may be specified at registration, by means of recording the coordinates from a GPS unit.

6. The owner is then invited to nominate which sensor unit or units are to be connected to the individual signal unit, either by clicking on an icon 116 as shown in Figure 11, or from a drop-down menu 120 as shown in Figure 12.

7. When registration formalities have been completed, the owner is given the opportunity to configure the individual signal unit; that is to establish the protocols to be followed by the central control facility in response to a signal transmitted by the device.

8. As shown in Figure 13, monitoring of the unit may be within specified times 122 or be continuous. Clearly, where for example a device is installed in commercial premises, monitoring for security purposes may only be desired outside working hours.

9. The inputs of the web site page shown in Figure 14 allow the owner to specify some parameters as to the conditions 124 which must obtain for an alert situation to be reported.

10. As shown in Figure 15, the owner may then nominate a message 126 which is to be sent to the owner in the case an alert situation arises.

11. The input web site page of Figure 16 allows the owner to nominate one or more ways 128 in which an alert message is to be sent by the facility. It also allows the owner to nominate a service supplier, for example a security agency which may be instructed to inspect the site of installation of the individual signal unit. In addition, commands can be specified to activate any external device/s which may be connected to the individual signal unit outputs, such as the switching on of a security light.

This sequence of steps completes the registration and configuration of the individual signal unit, the attached sensor and any output device/s and the response steps to be taken by the central control facility if a signal from the registered individual signal unit is received.

In addition to registration and configuration, the central control facility web site may be accessed at any time by the owner (or other authorised person) of a registered individual signal unit, by entering security user name and password, for example. Several options 130 are then presented to the owner of the individual signal unit as shown in Figure 17.

One of the available options is the facility of locating an individual signal unit. When this option is selected, but the individual signal unit is not fitted with a GPS module, the central control facility can command the individual signal unit to transmit its unique identifying code for a sufficient length of time to enable triangulation of its location from three or more stations of the distributed communication network. This location is then superposed on a map 132 and the map and marked detected location relayed to the owner of the individual signal unit as shown in Figure 18.

Another option available to a registered owner is the ability to reconfigure the registered individual signal unit. This may be desirable if the device is to be moved to another location, used for a different application, or sensors added or removed from the device for example.

A third option available to the registered owner, is that of checking the current status of the device and its event history. As shown in Figure 19, this information may be displayed to the owner in tabular form. In the example shown, this owner has four devices 134 registered with the central control facility, and can see at a glance the current status as well as a record of detected incidents reported by each sensing device.

For example "Toolbox 1", may be a toolbox fitted with an individual signal unit, located on an item of earth moving plant left unattended at a work site. The tabulated history shows it has been interfered with at the time and on the date shown 136. Depending on the pre-programmed procedure associated with the individual signal unit, the owner or personnel responsible for the equipment may be alerted within minutes. Alerting messages may be transmitted via any preferred or multiple media, for example by telephone, mobile phone text messages, facsimile or by email.

"Grandma" may be an individual signal unit incorporated in a personal security module in which the sensor is a push button, providing an elderly (or incapacitated) person with a means of alerting someone to a distress situation.

The Commercial User

The individual signal unit of the present invention may be incorporated at manufacture (or be retro-fitted) to

an item of infrastructure or instrumentation. Individual signal units so incorporated are registered with the central control facility in a similar way to that described for the public user above. In the example given earlier of streetlight fittings, streetlights under the control of a local authority are fitted, preferably at manufacture, with a sensor and individual signal unit. The individual signal unit for each streetlight is assigned a unique encrypted code which is associated with data maintained in the central control facility's computers. This data may include the type of bulb fitted and the location of the particular streetlight. The data may further include an instruction set as to what action to take when an encrypted code signal is received by the control facility. This could include a message to the maintenance department and even a requisition on a supplier of the required bulb so that a check of bulb stock and possible resupply will automatically follow.

Similarly, smoke alarms may incorporate an individual signal unit, with the smoke detector circuit providing an input to the signalling unit when smoke is detected. In this example power for the signalling unit may be provided in common with the smoke detector power supply.

In another example, individual signal units may be incorporated in parking meters, with sensing for example of coin full, out of paper or tampering conditions.

In a further example, as alluded to above, individual signal units provided with magnetic card readers as input attachments may be incorporated or attached at a number of locations within or on the outside of various buildings. Security personnel or cleaners may then swipe an appropriate card through the reader to trigger a signal to the central control facility, which then forwards notification to an appropriate nominated recipient that the building is secure or has been cleaned.

An individual signal unit may be installed in plant and commercial vehicles, monitoring for example power up and power down of an engine so as to track duty cycles, servicing intervals and improper use for example. In this example, the owner of the plant or vehicle can access the central control facility and obtain a record of the times the plant was in operation and log the hours of service.

In yet a further example, individual signal units with appropriate sensors may be located along rivers and streams to give early warning of changes in water levels.

Other areas of use include the monitoring of vending machines as to status of stock and tampering for example. Items of utility infrastructure, such as water and gas supply equipment also may be conveniently monitored for usage and error conditions.

In at least one embodiment of the invention, the action taken by the control facility may be predicated on a secondary layer of instructions received from the owner of the individual signal unit and the sensor or sensors attached to it. For example, the registration of the unit may include a number of optional actions for the control facility to implement after a first notification to the owner (or an authorized recipient designated by the registered owner) of an event.

For example, where the individual signal unit is monitoring the security of a site office or container at a building site, the possible actions to be taken by the central control facility may include:

1. to ignore
2. to call a contracted security firm
3. to call the site foreman
4. to call a neighbour
5. to call the police

The primary instructions on record at the control facility to be followed on receipt of a signal from the individual signal unit installed at the building site, is to send an SMS message to the owner or authorized recipient. He or she may respond for example with "34". The control facility will then carry out actions 3 and 4 of the possible actions of the secondary layer of instructions by notifying the site foreman (3) and the neighbour (4) of the event.

In a further example of use, as summarised in Figures 21 to 23, the ISU may be interfaced with the management computer of a private or commercial vehicle. This allows the management of many aspects of the vehicle, its running costs, performance as will as the scheduling of servicing and even the acquisition of service availability and quotations for service.

This application of the ISU is of particular use for operators of hire cars for example with an ISU as described above to provide any of the data transferable from a car's onboard computer. These may include the status of the vehicle's door locks at any given time, for example to indicate if it has been left unlocked while not in use.

In the case of loss of keys of any vehicle, the ISU could be instructed to lock and keep locked the doors of the vehicle until this command was reversed.

An in-vehicle ISU could be used to augment the entertainment system of the vehicle by accessing the internet via wireless broadband for downloading music and videos, accessing a remote computer and using the internet for surfing.

Still with reference to Figure 22, the addition of suitable devices to the ISU could allow the remote immobilisation of a stolen vehicle, and activate various

alarm and indicators that a the vehicle is being interfered with.

Information extracted from the vehicle's onboard computer, if relayed to a designated repair centre when the vehicle suffers malfunction at some remote location, could be used by the repair centre to issue instructions for repairs.

Figure 23 provides an overview of potential uses of an ISU installed in a vehicle and the actions which may follow on from the monitoring of the status, or measurement of various parameters associated with the vehicle's use and its equipment.

It will be appreciated that the individual signal unit and monitoring system described above provides an extremely flexible and effective way of disseminating an alert of an alarm generated by any of a range of events at widely dispersed locations to owners of the device and/or those service providers best able to deal effectively with the cause of the alarm, and allows a unit owner to specify the circumstances under which the owner is to be contacted actions taken.

The system provides:

- Global machine to machine communication
- Distance independence
- Location independence
- Mobility independence
- 5 minute DIY installation
- An extraordinary number of marketable products.

The individual signal unit (ISU) system of the present invention provides a missing link people products and services.

- With unlimited scope and versatility the ISU platform can receive information via any network and initiate a user-configured chain of events, anywhere in the world to any one.
- It is capable of bringing world-wide products and services to a centralised system for multiple uses and applications.
- The small compact ISU (similar in size and appearance of a small MP3 player may be adapted to access advanced programming and resources with little or no setup.

The above describes only some embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope and spirit of the present invention.

CLAIMS

1. A monitoring system for response to incidents sensed by at least one sensor of an individual signal unit; said response comprising in a first instance, transmission to a central control facility by a said individual signal unit, of at least a unique identifying code for that individual signal unit, over a communication network; said response comprising in a second instance, transmission of data from said central control facility to one or more recipients nominated by a registered owner of said individual signal unit; and wherein registration of a said individual signal unit and configuration of sensing and of said response is via a web-based interface.

2. The monitoring system of claim 1 wherein said response in said first instance includes digital or analogue data input to said individual signal unit.

3. The monitoring system of claim 2 wherein said digital or analogue data is transmitted to said central control facility in real time.

4. The monitoring system of claim 2 wherein said digital or analogue data is stored, prior transmission, on a data storage device of said individual signal unit.

5. The monitoring system of any one of claims 1 to 4 wherein said at least one sensor is incorporated within said individual signal unit.

6. The monitoring system of any one of claims 1 to 4 wherein said at least one sensor is an external sensor connected to an input port of said individual signal unit.

7. The monitoring system of any one of claims 1 to 6 wherein said individual signal unit further includes a rechargeable power supply.

8. The monitoring system of claim 7 wherein said rechargeable power supply is recharged by a solar cell array.

9. The monitoring system of any one of claims 1 to 8 wherein said web-based interface includes at least one web page; said web page provided with at least one data entry field.

10. The monitoring system of any one of claims 1 to 9 wherein each of said individual signal units is provided with a unique individual signal unit

identification code; said unique identification code comprising said signal transmitted to said central control facility.

11. The monitoring system of any one of claims 10 wherein each said at least one external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code; said unique sequence of repeat transmissions comprising said signal transmitted to said central control facility.

12. The monitoring system of any one of claims 1 to 11 wherein of each said individual signal units is provided with at least one external event sensor.

13. The monitoring system of claim 12 wherein said at least one external event sensor is adapted to respond to a change in stimulus of said sensor.

14. The monitoring system of claim 12 or 13 wherein said at least one external event sensor is adapted to respond to a predefined stimulus.

15. The monitoring system of claim 13 or 14 wherein a said individual signal unit receives an input signal from said at least one external event sensor at said change in stimulus.

16. The monitoring system of any one of claims 1 to 15 wherein said central control facility includes a transceiver module in communication with said communication network.

17. The monitoring system of claim 16 wherein said transceiver module is linked to server and data storage devices; said server and data storage devices adapted to process signals received from any one of said individual signal units.

18. The monitoring system of claim 17 wherein said server and data storage devices are adapted to initiate at least one pre-programmed output~~s~~; said output or outputs dependent on said unique identification code

19. The monitoring system of any one of claims 1 to 18 wherein a said individual signal unit is provided with at least one input; said at least one input adapted to communicate with one said sensor.

20. The monitoring system of any one of claims 1 to 19 wherein a said individual signal unit is provided with

at least one output; said at least one output adapted to control an external device.

21. The monitoring system of any one of claims 17 to 20 wherein said server and data storage devices are adapted to initiate predetermined communications to at least one nominated recipient; said communications dependent on a signal received from a said individual signal unit.

22. The monitoring system of claim 21 wherein said at least one nominated recipient is an owner of a said individual signal unit registered with said monitoring system.

23. The monitoring system of claim 21 wherein said at least one nominated recipient is a service provider nominated by said owner of a said individual signal unit.

24. An individual signal unit; each said individual signal unit including;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one external event sensor,

and wherein a signal from a said individual signal unit to a central control facility causes said central control facility to execute a number of predefined steps; said predefined steps configured by an owner of said individual signal unit.

25. Apparatus for a monitoring system; said apparatus comprising an individual signal unit and at least one owner selectable sensor connected to said individual signal unit; said individual signal unit and said at least one sensor registered by said user with a central control facility; wherein said individual signal unit is programmed to transmit a unique device identification code to said central control facility when said at least one sensor detects an incident; said central control facility responding to a transmitted said unique device identification code according to protocols established at registration of said unit by said owner.

26. A monitoring system enabled by the internet and a communication system; said system including a number of individual signal units; each of said devices connected to at least one owner selectable sensor; each of said individual signal units and said at least one sensor registered with a central control facility by said owner over said internet; said central control facility responding to an incident sensed by a said sensor according to protocols established at registration by a said owner.

27. A method of monitoring the status of an item of interest; said method including the steps of:

    (a) purchase by an owner of an individual signal unit and at least one user selectable sensor for connection to said device,

    (b) registering said individual signal unit and said at least one sensor with a central control facility,

    (c) configuring a response executable by said central control facility on receipt by said facility of a signal transmitted by said individual signal unit.

28. The method of claim 27 wherein said signal comprises a unique identifying code of said individual signal unit.

29. The method of claim 27 or 28 wherein said registering of a said individual signal unit includes the steps of:
    (a) accessing a web site maintained by said central control facility,
    (b) establishing a user name and password with said central control facility,
    (c) entering into said web site a registration code of said individual signal unit,
    (d) entering a user selected identifier name for said individual signal unit,
    (e) entering details of one or more sensors to be connected to said individual signal unit,
    (f) entering details of said response executable by said central control facility.

30. A method for monitoring the status of at least one aspect of geographically disparate items of infrastructure; said method including the steps of:

    (a) installing an individual signal unit at each of said items of infrastructure,

(b) providing said individual signal unit with at least one external event sensor and a signal transceiver,

(c) linking said individual signal unit with a central control facility via a communication network,

(d) providing said central control facility with server and data storage devices; said devices adapted to execute pre-programmed responses to a signal received from a said individual signalling device.

31. Apparatus of an infrastructure monitoring system; said apparatus including a plurality of geographically disparate individual signalling devices in communication with a central control facility via at least one communication satellite; said individual signalling devices adapted to change from a first stand-by state to a second powered up state on the occurrence of a change of status of an item of said infrastructure; each device of said individual signalling devices transmitting a signal to said central control facility during said powered up state; said signal triggering a programmed predefined sequence of responses; each said device returning to said stand-by state after transmission of a said signal.

32. The apparatus of claim 1 wherein each of said individual signalling devices is provided with a unique signalling device identification code; said unique identification code comprising said signal transmitted to said central control facility.

33. The apparatus of claim 1 or 2 wherein each of said individual signalling devices is provided with a signal transceiver module.

34. The apparatus of any one of claims 1 to 3 wherein each of said individual signalling devices is provided with a rechargeable power supply.

35. The apparatus of claim 4 wherein said rechargeable power supply is recharged by a solar cell array.

36. The apparatus of any one of claims 1 to 5 wherein of each said individual signalling devices is provided with at least one external event sensor.

37. The apparatus of claim 6 wherein said at least one external event sensor is adapted to respond to a change in status of a said item of infrastructure.

38. The apparatus of claim 6 or 7 wherein a said individual signalling device receives an input signal from said at least one external event sensor at said change of status.

39. The apparatus of any one of claims 6 to 8 wherein each said at least one external event sensor is associated with a unique sequence of repeat transmissions of said unique identification code; said unique sequence of repeat transmissions comprising said signal transmitted to said central control facility.

40. The apparatus of any one of claims 6 to 9 wherein each of said individual signalling devices is provided with an external event sensor interface adapted to monitor signals from at least one remote external event sensor.

41. The apparatus of any one of claims 9 to 10, wherein each of said individual signalling devices is provided with tamper monitoring means; said tamper monitoring means associated with one said unique sequence of repeat transmissions of said unique identification code.

42. The apparatus of any one of claims 1 to 11 wherein said central control facility includes a transceiver module in communication with said at least one satellite.

43. The apparatus of claim 12 wherein said transceiver module is linked to server and data storage devices; said server and data storage devices adapted to process signals received from any one of said individual signalling devices.

44. The apparatus of claim 13 wherein said server and data storage devices are adapted to initiate any of a plurality of pre-programmed outputs; said outputs dependent on said unique identification code and said unique sequence of repeat transmissions of said unique identification code comprising a received said signal.

45. The apparatus of claim 13 or 14 wherein said server and data storage devices are adapted to initiate coded data for transmission to said individual signalling devices.

46. The apparatus of claim 15 wherein said coded data transmitted to a said individual signalling device includes instructions for programmed responses by a said individual signalling device to inputs received from said one or more external event sensors.

47. The apparatus of any one of claims 1 to 16 wherein a said individual signalling device is provided with at least one output relay; said at least one output relay adapted to control an external device.

48. The apparatus of any one of claims 13 to 17 wherein said server and data storage devices are adapted to initiate predetermined communications to at least one nominated recipient; said communications dependent on signals received from a said individual signalling device.

49. The apparatus of claim 18 wherein said at least one nominated recipient is a registered user of said monitoring system.

50. The apparatus of claim 18 wherein said at least one nominated recipient is a service provider to said monitoring system.

51. The apparatus of claim 19 wherein a said registered user of said monitoring system is enabled to register a said individual signalling device with said central control facility over the Internet.

52. The apparatus of claim 21 wherein registration of said individual signalling device includes provision of data relevant to responses to external sensor events by said individual signalling device and by said central control facility.

53. A method for monitoring the status of at least one aspect of geographically disparate items of infrastructure; said method including the steps of:

(a) installing an individual signalling device at each of said items of infrastructure,

(b) providing said individual signalling device with at least one external event sensor and a signal transceiver,

(c) linking said individual signalling device with a central control facility via a satellite link,

(d) providing said central control facility with server and data storage devices; said devices adapted to execute pre-programmed responses to a signal received from a said individual signalling device.

54. The method of claim 23 wherein each said individual signalling device includes;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one external event sensor.

55. The method of claim 23 or 24 wherein said method includes the further steps of:

(a) providing each said individual signalling device with a unique signalling device identification code,

(b) associating a unique sequence of repeat transmission of said identification code for each said external event sensor,

(c) programming said individual signalling device to transmit a signal comprising said unique sequence of repeat transmission identification code of said signalling device to said central control facility on the occurrence of a change of said status of a said item of infrastructure,

56. executing said pre-programmed responses to a signal received from a said individual signalling device.

57. Apparatus of a monitoring system for changes in status of geographically disparate items of infrastructure as herein described and with reference to the accompanying drawings.

58. An individual signal unit; each said individual signal unit including;

(a) a transceiver module,

(b) a rechargeable power supply and power control module,

(c) a logic circuit,

(d) at least one of a number of selectable external event sensors,

and wherein a signal from a said individual signal unit to a central control facility causes said central control facility to execute a number of predefined steps; said predefined steps configured by an owner of said individual signal unit.

59. A monitoring system including an individual signal unit; said individual signal unit communicating with a central control facility when an event sensor activates said individual signal unit; said central control facility executing a number of predefined steps on receipt of a communication from said individual signal unit; said predefined steps configured by an owner or registered user of said individual signal unit.

60. The system of claim 59 wherein a communication between said individual signal unit and said central control facility is not limited by distance.

61. The system of claim 59 or 60 wherein said individual signal unit may be located at any location relative said central control facility.

62. The system of any one of claims 59 to 61 wherein said individual signal unit is mobility independent of said central control facility.

63. The system of any one of claims 60 to 62 wherein said communication between said individual signal unit and said central control facility is by means of any communication network.

64. The system of any one of claims 59 to 63 wherein said predefined steps include a communication between said central control facility and a said owner or registered user of said individual signal unit.

65. The system of any one of claims 60 to 64 wherein said communication between said central control facility and said owner or registered user is by means of any communication network.

66. The system of any one of claims 59 to 66 wherein said predefined steps may include a first layer and a secondary layer of said predefined steps.

67. The system of claim 66 wherein selected ones of said secondary layer of predefined steps may be executed by

said central control facility in accordance with a reply to a said communication between said central control facility and a said owner or registered user.

68. The system of any one of claims 59 to 67 wherein said individual signal unit is programmable.

69. The system of any one of claims 59 to 68 wherein said individual signal unit includes a graphic display.

70. The system of any one of claims 59 to 69 wherein said individual signal unit is configurable to accept signal input from any external sensing device.

71. The system of any one of claims 59 to 70 wherein said individual signal unit is configurable to allow output signals to any said communication network.

72. The system of any one of claims 59 to 71 wherein said individual signal unit is adapted for integration into products as an original equipment manufacture (OEM) module.

73. The system of any one of claims 59 to 72 wherein said central control facility includes a database and a server; said central control facility maintaining an Internet web site on said server.

74. The system of any one of claims 59 to 73 wherein said system provides a means of asset monitoring; said asset monitoring alerting a said owner or registered user to an incident affecting a said asset.

75. The system of any one of claims 59 to 74 wherein said predefined steps include activation of an output device connected to a said individual signal unit.

76. A method of deriving revenue from a monitoring system; said monitoring system including a remotely located individual signal unit in communication with a central control facility; said method including:

(a) selling said individual signal units

(b) renting said individual signal units

(c) charging periodic registration fees

(d) charging for network services

(e) charging for development, programming and design

(f) charging licence fees for custom or retrofitted applications

(g) collecting industry co-operation commissions

(h) charging licence fees for monitoring agents and service providers.