Sanctuary ZigBee Sensor System Reference Manual

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Sanctuary ZigBee Sensor System Reference Manual

1. Summary

This document describes functions and applications of various ZigBee sensors that are connected with iNode, the network gateway node.

(Please refer to iNode Reference Manual for iNode detail.)

2. Remote sensing and system management

The primary purpose of setting sensors around is to grasp the overall situation of target system by means of measuring and analyzing various data obtained through the sensor network. And the ultimate goal of measuring and analyzing data is to keep the target system and environment in good order by responding properly to reported and analyzed data. The scheme to manage this is the feed-back control: collecting/analyzing data and providing adequate control to the system. In other words, the purpose of sensor system is to monitor the system, to detect abnormal status, and to make it possible to provide timely and proper counter measure when troubles are found.

This document focuses how to set up sensor network, and how to establish the functional environment to obtain the sensor data all the time. How to react to the environment status reported by the sensor network depends on the target business application, the operation organization, and other factors.

(1) Human method

This idea is to rely on the sensor network system for monitoring and to rely on human to human network for responding and controlling the situation.

The security monitoring is often included in this category. For example, when some trouble is found, the staff in charge (in some case, yourself) immediately go to the site, and take corrective actions on site. Another example may be the case when you watch power consumption status of your home by power sensors and manage home appliances usage seeing consumption data.

In those cases, the basic and crucial role of the sensor network system is to report the status correctly to the user periodically and/or on demand. Also, the analyzing criteria to judge error status or normal status is quite important. The necessary, sufficient and timely detection of error status is crucial function of those network system.

Careful human system design is important;

When a trouble is reported,

Who should report what to whom?
What are the key information to judge it a trouble?
What are the corrective actions taken on trouble reporting?
What are the roles of each staff involved till the end of the actions?

Operational human contact network structure should be carefully designed.

(2) Human method with remote control

In this idea, the (human) staff perform the corrective actions by operating the remote control equipment set in the target environment when a trouble is reported through the sensor network. The human system judges whether it is an trouble or not, and the feedback actions are all under human control.

It may be applicable to the case, where the room temperature/humidity is reported and a staff turns on/off the air conditioner remotely depending on the situation.

(3) Partially automated method

Setting up control equipment in advance, together with sensors, the application program may execute corrective actions by sending commands to those control equipment when a problem is found. The application program may judge whether the status is a problem or not, if it can collect proper sensor data from the sensor network and analyze them properly. When the application program judges the case is a problem, the program activate the control equipment accordingly.

When intrusion is detected, audible alarm sound may be a good corrective action. When a siren is installed together with an intrusion sensor, the application program can trigger the siren as soon as the intrusion sensor detects the intrusion.

Usually, the automated corrective actions are first-aid purpose and human method is triggered in parallel to automated actions. Human involvement and manipulation is mandatory almost always. Total system design is important to balance human method and automated method.

The sensors are under control & management of VCJ Sanctuary application platform service in the cloud server. Using VCJ Sanctuary API, business application program can easily set parameters of the sensors and collect sensor data.

The following sensors are used in this document for application example description.

(1) ZigBee Temperature and Humidity Sensor: Z711
(2) ZigBee Window Sensor: Z302A

(3) ZigBee Window/Intrusion Sensor with an Extended Contact Sensor: Z302C
(4) ZigBee Infrared Motion Detector: ZB11A
(5) ZigBee Smoke Detector with Heat Sensing: ZA02E
(6) ZigBee Power Meter: Z821
(7) ZigBee Light Sensor: Z302G
(8) ZigBee Occupancy Sensor: ZB01D
(9) ZigBee Power Socket with Power Consumption Monitoring: Z809A
(10) ZigBee Infrared Motion Sensor: ZB01A/B/C
(11) ZigBee Window Sensor: Z311A
(12) ZigBee Air Sensor with Heat Sensing: ZA01A

And the following devices are also used as related devices for ZigBee sensor application description.
(1) ZigBee Power Socket with Power Consumption Monitoring: Z800
(2) ZigBee Siren: Z602A
(3) ZigBee Panic Button: Z302D
(4) ZigBee 4-Key Remote: Z-501A/B/C

3. System configuration and operation

iNode sensor network system consists of the following components;

(1) ZigBee sensor: data collector
(2) iNode gateway: ZigBee sensor controller
(3) Cloud server: VCJ Sanctuary application platform services
(4) User business application: application program, user cloud

ZigBee sensors and iNode are set in-house or on its premises. iNode and ZigBee sensors configure the sensor network that is connected with the internet through to cloud server where VCJ Sanctuary platform services operate and to the cloud server where user application operates. User application controls iNode and ZigBee sensors via Sanctuary API

General guideline and rules in the system configuration and operation are as follows.

3.1. iNode installation

iNode operates on AC power via AC adapter cable. Single iNode can accommodate up to 30 sensors.

iNode has two models. One is LAN interface and the other is Cellular interface. The correct model is to be selected depending on the situation.

(1) When the internet access is available in-house or on the premises;

iNode would be better set in-house due to easy access to power source and connected to LAN (wired Ethernet or wireless USB WiFi). And the LAN is to be connected with the internet

iNode is connected with the cloud server and gets under control of the application program.

(2) When the internet access is unavailable in-house or on the premises,

iNode-3G is recommended because iNode-3G can access the Cellular network, then to the internet.

3.2. iNode System registration

iNode is registered to VCJ Sanctuary Platform at the system generation and gets under its control. The registration, deletion, change, and other procedures about iNode and sensors are conducted by PC via VCJ Sanctuary Platform administration page.

3.3. User Application

The application program is prepared for each target system and installed in the user's cloud server. The application accesses and controls iNode and sensors by executing VCJ Sanctuary Platform Service API. The application sets the parameters and collect data of iNode and sensors using Sanctuary API.

3.4. Client device

Smartphone and PC can access application via the internet and perform various function such as sensor data collection, sensor parameter setting and equipment control.

3.5. Sensor Network

ZigBee sensors share the same common operational rules such as below.

(1) Network connectivity: Network Join/Leave

ZigBee sensors have to be connected with the network that is configured by iNode.

This connection is called "Network Join". And disconnection is called "Network Leave".

Network Join is conducted by ZigBee sensor button operation near iNode. All ZigBee sensors in the particular iNode have to do Network Join operation one by one to configure the ZigBee sensor network.

(2) Sensor registration and parameter setting: Bind/Unbind

Network Join procedure completes configuration of ZigBee network under iNode. And next step is to register the sensors to iNode as a gateway. This procedure is called “Bind”. Deletion of registration is called “Unbind”.

Bind is done by execution of Sanctuary API. One way to do it is PC access to the Sanctuary Web and another way is to develop application that executes Bind procedures via Sanctuary API.

Registration information are the target iNode information (ID, device address) and sensor information (Device address, sensor type, reporting time interval if necessary).

(3) Sensor Access: Sanctuary API

The application executes Sanctuary API to access ZigBee sensors. The application can obtain data from the sensors and set parameters of the sensors.

(4) Power on: Wake up

ZigBee sensor, in many cases, is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor

(5) Reset or Initialization: Restore to Factory Setting

In some case, ZigBee sensor would better be reset to initial condition. In such a case, sensor button operation brings it to the original condition. This initialization procedure is called “Restore to Factory Setting”.

(6) CIE (Control & Indicating Equipment) function of iNode

ZigBee standard specifies that security sensors will notify the central security unit, CIE (Control & Indicating Equipment) device when a problem is found. iNode performs CIE functions and security sensor alert notices are all sent to iNode. Receiving alert report from sensors, iNode reports the situation to application via Sanctuary. Receiving the alert report, application trigger alarm or other necessary actions.

(7) Warning device

Application can execute Sanctuary API to trigger an alarm, the warning device as well as other necessary corrective actions

(8) Low Battery Notice

Some sensors report low battery status to CIE device when the operating voltage is lower than the normal level. The low battery status is notified to the application. Then the application arranges battery change.

4. Application System Configuration Examples

Some application system configured by iNode and ZigBee sensors are shown below.

4.1. Temperature/Humidity Sensor Application Example

(1) System Function

You can check temperature and humidity of your home from a remote location when you are out by your smart phone and PC. If you feel it necessary, you can set the air conditioner switch on/off by your smart phone and PC.

With this system, you can go out whenever you like, leaving your pets behind, keeping the pets in comfortable environment, by checking home temperature/humidity from remote location anytime you want.

(2) System Configuration (Fig. 4.1.)

Enough number of temperature/humidity sensors are installed at proper location in house. Enough number of wireless power switches are also installed to control the air conditioners. Air conditioner power cables are changed to plug in to the wireless power switches.

iNode is installed in house and connected to LAN and to the internet where Sanctuary API is available. iNode now gets under control of the application via Sanctuary.

ZigBee sensors, wireless switches and iNode in house configure the wireless network and communicate with the application via Sanctuary. iNode uploads measured data to the application and executes commands from the application.

Sensor data check and air conditioner switch control is done by smart phone and PC.

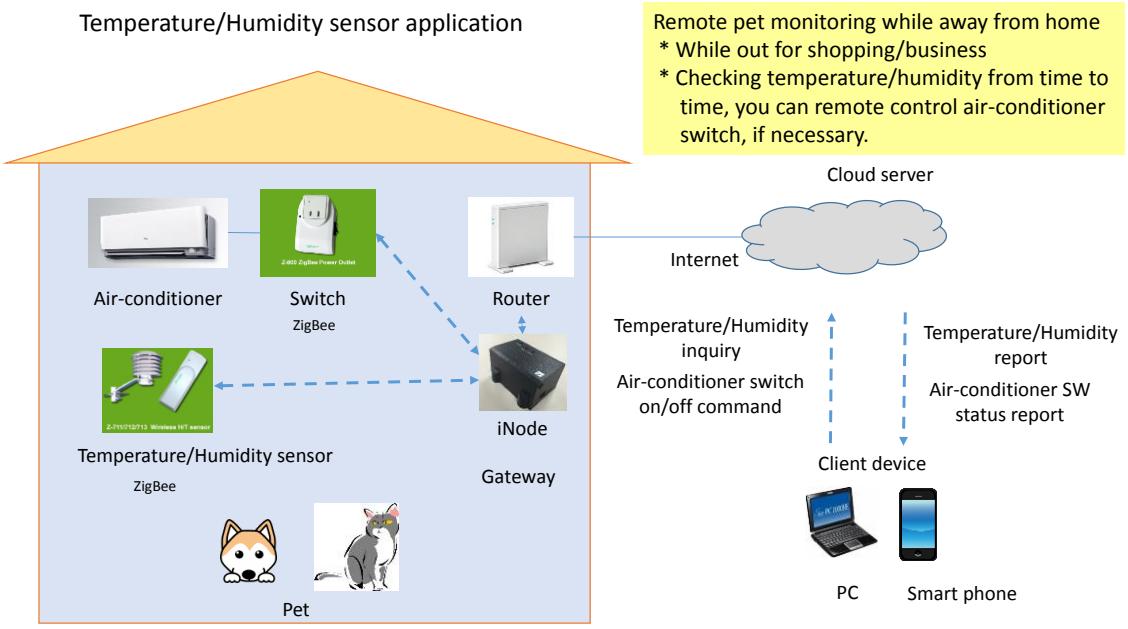

Fig. 4.1. Temperature/Humidity sensor application example

(3) Sensors used in this example

- Z-711/712 Wireless Humidity and Temperature Sensor
- Z800 Power Socket with Power Consumption Monitoring (Wireless switch)

4.2. Security Sensor Application Example-1

(1) System Function

You can check security of your home from a remote location when you are out by your smart phone and PC. If you find out a problem, you can contact proper persons, offices or organization to fix the problem. Or you can go home quickly to cope with it.

The security sensors such as below are used.

- Motion detector
- Smoke detector
- Window sensor
- Alarm siren

With this system, you can go out whenever you like, you can check your home status from remote location anytime you want. You can move quickly when a problem happens because the problem is quickly reported to your smart phone and PC.

(2) System Configuration (Fig. 4.2.)

Enough number of security sensors are installed at proper location in house.

iNode is installed in house and connected to LAN and to the internet where Sanctuary API is available. iNode now gets under control of the application via Sanctuary.

ZigBee sensors and iNode in house configure the wireless network and communicate with the application via Sanctuary. iNode uploads status data to the application and executes commands from the application.

Sensor data check and alert receiving is done by smart phone and PC

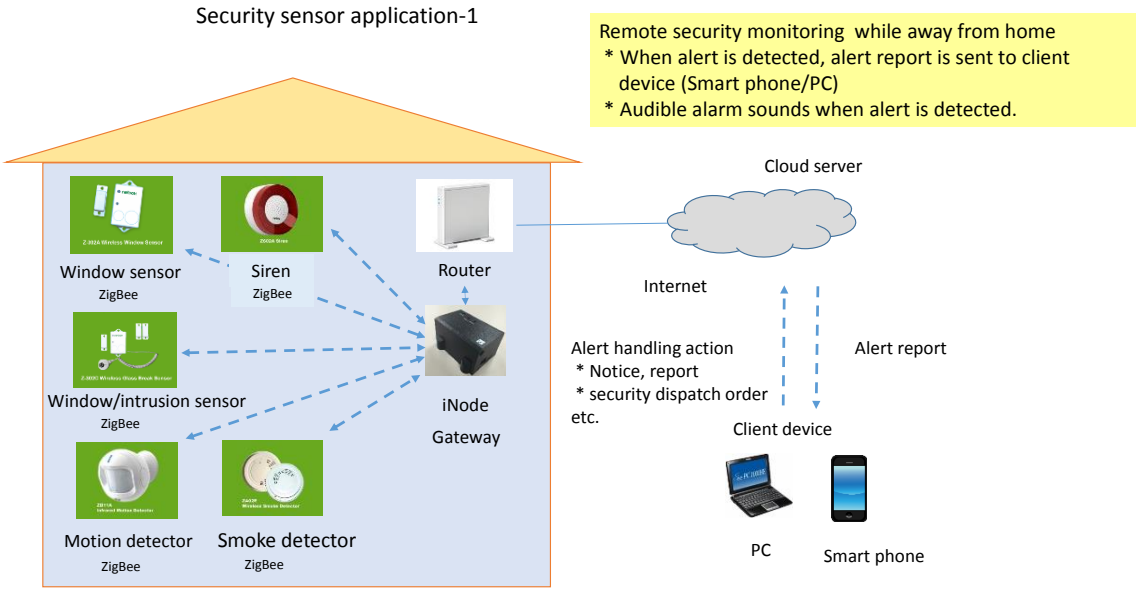

Fig. 4.2. Security sensor application - 1

(3) Sensors used in this example

- Z-302C Window/Intrusion Sensor with an Extended Contact Sensor
- Z-302A Window Sensor
- ZB11A Infrared Motion Detector
- ZA02E Smoke Detector with Heat Sensing
- Z602A Siren

4.3. Security Sensor Application Example-2

(1) System Function

You can check security of vacant houses or condominiums from a remote location by your smart phone and PC. If you find out a problem, you can contact proper persons, offices or organization to fix the problem. Or you can go home quickly to cope with it.

With this system, you can check vacant houses/condominiums status from remote

location anytime you want. You can move quickly when a problem happens because the problem is quickly reported to your smart phone and PC.

(2) System Configuration (Fig. 4.3.)

Enough number of security sensors are installed at proper location in house.

The internet may not always available in this case, due to no resident. In such a case, enough number of iNode-3G are installed in house and connected to the Cellular network and to the internet where Sanctuary API is available. iNode-3G now gets under control of application via Sanctuary.

ZigBee sensors and iNode-3G in house configure the wireless network and communicate with application via Sanctuary. iNode-3G uploads status data to the application and executes commands from the application.

Sensor data check and alert receiving is done by smart phone and PC

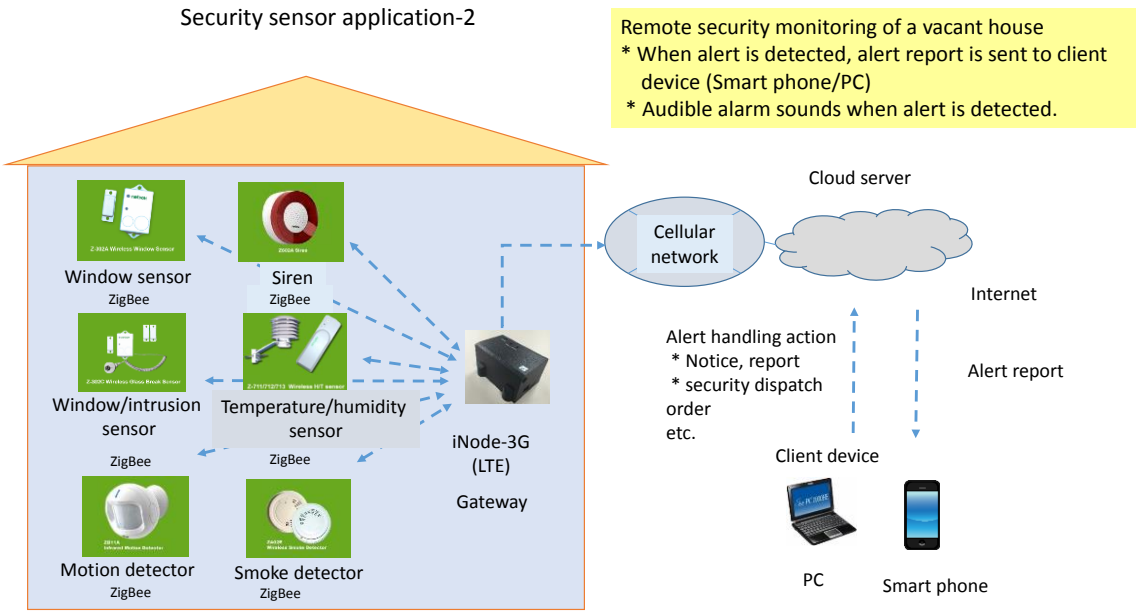

Fig. 4.3. Security Sensor Application - 2

(3) Sensors used in this example

- Z-302A Window Sensor
- Z-302C Window/Intrusion Sensor with an Extended Contact Sensor
- ZB11A Infrared Motion Detector
- ZA02E Smoke Detector with Heat Sensing
- Z602A Siren
- Z711 Wireless Humidity/Temperature Sensor

4.4. Power Sensor Application Example

(1) System Function

You can monitor your home appliances power consumption status by your smart phone and PC at home or away from home. Knowing the power consumption status, you can manage the power usage by refraining from using the appliances

With this system, you can check power consumption status anytime anywhere so that you may optimize your power consumption pattern.

Report may be daily, weekly, monthly, etc. You can optimize your life style.

(2) System Configuration (Fig.4.4.)

Enough number of power sensors are installed at proper location in house. Home appliance power cables are changed to plug in to the power sensors.

iNode is installed in house and connected to LAN and to the internet where Sanctuary API is available. iNode now gets under control of the application via Sanctuary.

ZigBee power sensors and iNode configure the wireless network and communicate with the application via Sanctuary. iNode uploads measured data to the application and executes commands from the application.

You can check the sensor data and control the air conditioner switch by your smart phone and PC

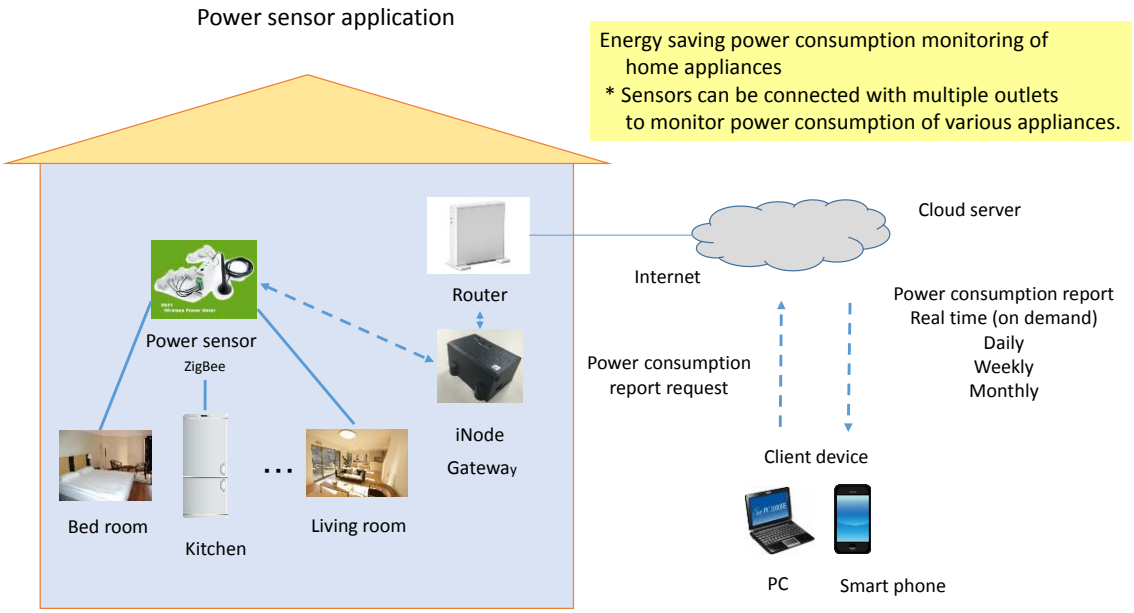

Fig. 4.4. Power Sensor Application

(3) Sensors used in this example

- Z821 Power Meter

4.5. Monitoring Sensor Application Example

(1) System Functions

You can watch security/safety of elderly residents from a remote location by your smart phone and PC. If you find out a problem, you can contact proper persons, offices or organization to fix the problem. Or you can go to the site quickly to handle the situation.

The monitoring sensors such as below are used.

- Motion detector
- Smoke detector
- Window sensor
- Alarm siren
- Temperature/Humidity sensor
- Panic button
- Going-out button (Vacancy button)

With this system, you can check elderly residents' houses/condominiums status from remote location anytime you want. You can move quickly when a problem happens because the problem is quickly reported to your smart phone and PC.

(2) System Configuration (Fig. 4.5.)

Enough number of security sensors are installed at proper location in house.

iNode is installed in house and connected to LAN and to the internet where Sanctuary API is available. iNode now gets under control of the application via Sanctuary.

ZigBee sensors and iNode in house configure the wireless network and communicate with the application via Sanctuary. iNode uploads status data to the application and executes commands from the application.

You can check sensor data and receive an alert message by your smart phone and PC

Problem judgement algorithm depends on resident status at home. When residents are at home, detection report of window opening by window sensor would not be treated as alert, because window most likely was opened by residents. But if motion detector does not detect any motion for a certain period of time, the situation would be treated as alert, because no motion might be due to an accident or sudden illness. And as soon as this situation is reported, the application would take corrective action.

On the other hand, when the motion detector detects motion while residents are away home, it would most likely be suspicious intrusion. Then this situation would be reported

as alert and the application would take corrective actions. The same consideration is taken for window sensor detection report.

Residents are required to push “Going out button” (Vacancy notice) before going out and push the button again when they get back home.

Panic button is prepared for residents to notify the application for emergency help.

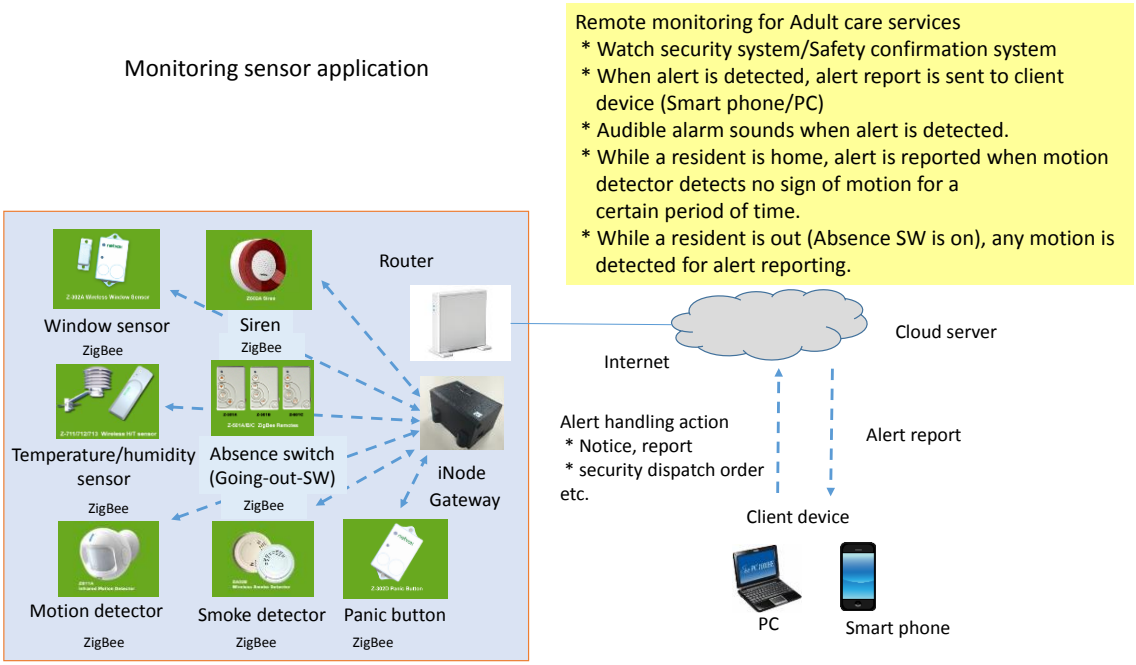

Fig. 4.5. Monitoring Sensor Application - Adult care service

(3) Sensors used in this example

- Z-302A Wireless Window Sensor
- Z-711/712/713 Wireless Humidity/Temperature Sensor
- ZB11A Infrared Motion Detector
- ZA02E Wireless Smoke Detector
- Z602A Siren
- Z302D Panic Button
- Z-501/A/B/C ZigBee Remotes (Going-out Button)

5. Sensors

Function and data of frequently used sensors are described below.

5.1. Z711 Temperature and Humidity Sensor

(1) Function

Z711 Temperature/Humidity sensor detects indoor temperature and humidity. 2 AA batteries are used to power. For outdoor use, Z712 is available with the same functionality. Z713 is also available for outdoor use with solar panel charger.

(2) Data format

Temperature data format is signed 16 bit integer. Humidity data format is unsigned 16 bit integer. Measured data are both value 100 times as big as that of measured value. Thus, formula manipulation below is required.

Transformation formula:	Centigrade:	Measured value x 0.01
Humidity:		Measured value x 0.01

(3) Measurement timing

Immediate measurement and scheduled measurement are feasible. Immediate measurement is to measure value when the application requests. Scheduled measurement is to measure value according to the schedule specified by the sensor parameters. Immediate measurement is possible during scheduled measurement,

(4) Wake up operation

Z711 sensor is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, you have to wake up the sensors by pressing buttons on the sensor

5.2. Z302A Window Sensor

(1) Function

Z302A Window Sensor consists of the main unit and the magnetic contact. Z302A sensor sends an alarm message to CIE device when the window is opened. When the window is closed, the change is also sent to CIE device. One button battery can power the sensor for up to 2 years.

(2) Data format

Sensor data is 8-bit bitmap.

A. Closed: 0
B. Opened: 1

(3) Report timing

Report timing are;

A. Opened: 1 second after the change

B. Closed: 120 second after the change

(4) Sleeping mode

Z302A sensor is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor

Z302A sensor goes to sleeping mode every 5 minutes. When 5minutes pass, Z302A checks the network connectivity and if the network connectivity is active, it goes to sleeping mode. When the network connectivity is not found (for example, in case of removal), Z302A checks the network connectivity every 15 minutes and keep checking as long as power runs. Therefore, when Z302A is not used for long time, and when Z302A is removed from the network, the battery of Z302A would better be removed from the sensor.

(5) Low Battery Notice

Z302A sensor reports low battery status to CIE device when the operating voltage is lower than the normal level. The low battery status is notified to the application. Then the Application arranges battery change.

5.3. Z302C Window/Intrusion Sensor with an Extended Contact Sensor

(1) Function

Z302C Window/Intrusion sensor with an Extended Contact Senor detects illegal break-in and multiple window glass break. When Z302C sensor detects break-in, Z302C sends alarm message to CIE device. One CR2450 button battery is used to power Z302C

(2) Data format

Sensor data is 8-bit bitmap;

A. Closed: 0

B. Broken: 1

(3) Report timing

Report timing are;

A. Broken: 1 second after the change

(4) Sleeping mode

Z302C sensor is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor

Z302C sensor goes to sleeping mode every 5 minutes. When 5minutes pass, Z302C checks the network connectivity and if the network connectivity is active, it goes to sleeping mode. When the network connectivity is not found (for example, in case of removal), Z302C checks the network connectivity every 15 minutes and keep checking as power runs. Therefore, when Z302C is not used for long time, and when Z302C is removed from the network, the battery of Z302C would better be removed from the sensor.

(5) Low Battery Notice

Z302C sensor reports low battery status to CIE device when the operating voltage is lower than the normal level. The low battery status is notified to the application. Then the application arranges battery change.

5.4. ZB11A Infrared Motion Detector

(1) Function

ZB11A Infrared Motion Detector sensor detects movement in front of the sensor. 2 AAA batteries power the sensor. When ZB11A detects movement, ZB11A sends the report to the CIE device. The indicator flashes red once. Then ZB11A goes into “Occupied Status”. ZB11A then tries to detect further movement every 84 seconds. When no additional movement is detected any more during 120 seconds, ZB11A goes into “Unoccupied Status” and report it to the CIE device.

The sensor sensitivity adjuster is provided for a user to change detecting sensitivity.

(2) Data format

The sensor data is 8-bit bitmap.

A. Unoccupied: 0
B. Occupied: 1

(3) Report timing

The report timing is

A. Change from unoccupied to occupied: 1 second after the change
B. Change from occupied to unoccupied: 120 second after the change

(4) Sleeping mode

ZB11A sensor is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor

ZB11A goes to sleeping mode every 5 minutes. When 5minutes pass, ZB11A checks the network connectivity and if the network connectivity is active, it goes to sleeping mode. When the network connectivity is not found (for example, in case of removal), ZB11A checks the network connectivity every 15 minutes and keep checking as power runs. Therefore, when ZB11A is not used for long time, and when ZB11A is removed from the network, the battery of ZB11A would better be removed from the sensor.

(5) Tamper alarm

When the cover is opened, ZB11A sensor notifies the CIE device.

5.5. ZA02E Smoke Detector with Heat Sensing

(1) Function

ZA02E Smoke Detector with Heat Sensing sensor detects smoke near the sensor and the alert message to the CIE device. ZA02E sensor is powered by AC 100 – 240V. ZA02E sensor uses GP1604 6F22 9V back up battery.

When ZA02E sensor detects smoke, it reports the incident to the CIE device. And alarm sounding continues till the smoke vanishes.

ZA02E sends heat alarm to the CIE device when the temperature exceeds the pre-set value (60 degree Celsius)

(2) Data format

The sensor data is 8-bit bitmap.

A. Smoke not detected: 0
B. Smoke detected: 1

5.6. Z821 Power Meter

(1) Function

Z821 Power Meter sensor measures up to 7 single phase AC outlets. Z821 is CT type power meter. As single Z821 can measures multiple AC outlets, Z821 is a very good sensor to know the whole power consumption status of the office or the building.

(2) Data format

Data format is as follows.

A. Current: unsigned 16 bit integer. mA.
B. Voltage: unsigned 16 bit integer. V.
C. Power: unsigned 16 bit integer. Wh
D. Energy: unsigned 16 bit integer. KWh

(3) Measurement timing

Immediate measurement and scheduled measurement are feasible. Immediate measurement is to measure value when the application requests. Scheduled measurement is to measure value according to the schedule specified by the sensor parameters. Immediate measurement is possible during scheduled measurement,

(4) Wake up

Z821 sensor does not go to sleeping mode. Wake up procedure is not required.

5.7. Z302G Light Sensor

(1) Function

Z302-G Loght sensor measures illumination intensity near the sensor. Measurement range is from 1 Lux till 3446.5 Lux. Z302-G is powered by 3V CR2450 button battery.

(2) Data format

The data format is unsigned 16 bit integer. Data conversion is required based on the formula below.

Formula: Measured value (16 bit integer) = 10,000 x illuminance (Lux) + 1

(3) Measurement timing

Immediate measurement and scheduled measurement are feasible. Immediate measurement is to measure value when the application requests. Scheduled measurement is to measure value according to the schedule specified by the sensor parameters. Immediate measurement is possible during scheduled measurement,

(4) Sleeping mode

Z302-G sensor is designed to go to sleeping mode for power saving except during immediate measuring and scheduled measuring. When users would like to setup or change parameters of the sensor which is in sleeping mode, you have to wake up the sensors by pressing buttons on the sensor

5.8. ZB01D Infrared Occupancy Sensor

(1) Function

ZB01D sensor detects motion in front of the sensor. ZB01D is powered by 2 CR123A button batteries.

(2) Data format

The sensor data is 8-bit bitmap.

C. Unoccupied: 0

D. Occupied: 1

(3) Report timing

The report timing is

C. Change from unoccupied to occupied: 1 second after the change

D. Change from occupied to unoccupied: 30 second after the change

(4) Sleeping mode

ZB01D sensor is designed to go to sleeping mode for power saving except during data transmission. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor

5.9. Z809A Power Socket with Power Consumption Monitoring

(1) Function

Z809A Power Socket with Power Consumption Monitoring sensor measures current, voltage, and power of the appliances connected with the socket. Z809A can be paired with remote devices that have on/off control switch function. The manual switch can also be used.

(2) Data format

Data format is as follows.

A. Current: unsigned 16 bit integer. mA.

B. Voltage: unsigned 16 bit integer. V.

C. Power: unsigned 16 bit integer. Wh

(3) Switch on/off control by Sanctuary API

The application can control Z809A on/off switch by executing Sanctuary API. The application can check the current switch status by using Sanctuary API.

(4) Measurement timing

Immediate measurement and scheduled measurement are feasible. Immediate measurement is to measure value when the application requests. Scheduled measurement is to measure value according to the schedule specified by the sensor parameters. Immediate measurement is possible during scheduled measurement,

(5) Wake up

Z809A does not go to sleeping mode. Wake up procedure is not required.

5.10. ZB01A/B/C Infrared Motion Sensor

(1) Function

ZB01 Infrared Motion Sensor series sensor detects motion in front of the sensor. Three models are available.

A. ZB01A: intrusion alarm sensor
B. ZB01B: lighting on/off switch
C. ZB01C: temperature sensor plus function of ZB01A & ZB01B

When ZB01 sensor detects motion, it send a message to the CIE device. The application can trigger the audible alarm or trigger other corrective actions instead of audible alarm.

ZB01B often is used for the staircase and entrance door lighting control configured with ZB01A. ZB01C reports the temperature at the same time of motion detection for example to show on the display device.

ZB01 sensor is powered by 2 CR123A lithium batteries.

When ZB01 detects movement, ZB01 sends the report to the CIE device. Then ZB01 goes into “Occupied Status”. ZB11A then tries to detect further movement every 84 seconds. When no additional movement is detected any more during 120 seconds, ZB11A goes into “Unoccupied Status” and report it to CIE device.

The sensor sensitivity adjuster is provided for a user to change detecting sensitivity.

(2) Data format

The sensor data is 8-bit bitmap.

E. Unoccupied: 0
F. Occupied: 1

(3) Report timing

The report timing is

E. Change from unoccupied to occupied: 1 second after the change
F. Change from occupied to unoccupied: 120 second after the change

(4) Sleeping mode

ZB01 sensor is designed to go to sleeping mode for power saving in some case. When users would like to setup or change parameters of the sensor which is in sleeping mode, you have to wake up the sensors by pressing buttons on the sensor

(5) Tamper alarm

When the cover is opened, ZB01 sensor notifies the CIE device.

(6) Low Battery Notice

ZB01 sensor reports low battery status to CIE device when the operating voltage is lower than the normal level. The low battery status is notified to the application. Then the Application arranges battery change.

5.11 Z311A Window Sensor

(1) Function

Z311A Window Sensor detects open/close status of a window or a door. When Z311A detects the change, Z311A sends a message to CIE device. Two CR2450 button batteries are used to power Z311A.

(2) Data format

Sensor data is 8-bit bitmap;

A. Closed: 0
B. Open: 1

(3) Report timing

Report timing are;

A. Open: 1 second after the change
B. Closed: 120 second after the change

(4) Sleeping mode

Z311A sensor is designed to go to sleeping mode for power saving except during data transmission. When users would like to setup or change parameters of the sensor which is in sleeping mode, we have to wake up the sensors by pressing buttons on the sensor.

Z311A goes to sleeping mode every 5 minutes. When 5minutes pass, Z311A checks the network connectivity and if the network connectivity is active, it goes to sleeping mode. When the network connectivity is not found (for example, in case of removal), Z311A checks the network connectivity every 15 minutes and keep checking as power runs. Therefore, when Z311A is not used for long time, and when Z311A is removed from the network, the battery of Z311A would better be removed from the sensor.

(5) Low Battery Notice

Z311A sensor reports low battery status to CIE device when the operating voltage is lower than the normal level. The low battery status is notified to the application. Then the Application arranges battery change.

5.12. ZA01A Air Sensor with Heat Sensing

(1) Function

ZA01A Air Senor with Heat Sensing detects NH3, No2, Ethanol, SO2, and smoke. When ZA01A detects pollution, ZA01A reports it to the CIE device. ZA01A is powered by AC 100 – 240V 50/60Hz. ZA01A generates the audible sound to alert.

(2) Data format

The sensor data is 8-bit bitmap.

A. No pollution: 0
B. Pollution: 1

6. Sensor related device Examples

The application can control various devices based on the information obtained from the sensor network. The below are examples.

6.1. Z800 Power Socket with Power Consumption Monitoring

Z800 can monitor the load current, voltage, power, and KWh of the appliances and send measured data to iNode. Z800 can control the switch on/off receiving the commands form iNode. The manual switch is also provided.

6.2. Z602A Siren (Audible Alarm)

Z602A siren is for emergency use. Once Z602 receives the alarm message from the CIE device, it generates both the alert sound and the visible LED indicator. There are 4 different sound pattern; fire alert, emergency alert, burglar alert, and doorbell sounds.

Z602A Siren is mainly powered by DC 12V and has backup power supply from 3xAAA Ni-MH rechargeable batteries.

6.3. Z302D Panic Button

Z302D Panic Button is for emergency use. When the button is pushed, Z302D send the alarm message to the CIE device. The button is easy to use for both children and the elderly. Z302D is powered by 3V CR2450 button batteries.

6.4. Z501/A/B/C 4-Key Remotes (Going-out Button)

Z501 contains programmable 4-key switches and it controls the devices bound with itself. User can develop program for each switch so that the application can execute function required for the system.

Using this feature, Z501 can be used as "Going out button" (Vacancy Button). When a resident pushes this button just before going out home, Z501 notifies the incident to iNode. iNode notifies the application. The application thus capture the timing of going out/coming home. Z501 itself in not limited to this particular usage and achieve various functions when programmed.

Z501 has three models. Each model has 4 buttons, whose functions are programmable.

A. Z501A: up key, down key, on/off, emergency, arm/disarm
B. Z501B: 2 pairs of on/off switches
C. Z501C: Dimmer switch and 2 toggle buttons

end