

## Decommissioning support system, using RFID and USN

W. H. Cho, S. K. Park, Y. D. Choi, K. I. Lee, J. K. Moon  
Korea Atomic Energy Research Institute, Daedeok-Daero 989-111, Yuseong-gu, Daejeon  
whcho@kaeri.re.kr

### 1. Introduction

RFID and USN are key technology in the ubiquitous computing systems. Actual physical environmental information can be used to remote control systems and management using various sensor technology and wireless network. These are used to managing physical distribution systems, complex monitoring environments such as fire detecting and various environments in the field of u-healthcare. Recently, decontamination and dismantling for nuclear plant have increasing interest after Fucushima nuclear accident. In this paper, a decommissioning support system is suggested for an effective management and control of work efficiency and of worker's status. This system makes effective real-time monitoring worker's location, work status and radiation exposure and effective response for worker's safety and emergency situation.

### 2. Methods and Results

In this section, RFID and USN are defined and configured and applied to the worker's equipments which are discussed how it can be used in the actual decommissioning works.

#### 2.1 RFID System

RFID, radio frequency identification, which contains tag built-in IC chip and antenna, is a key technology to the next generation of the ubiquitous era. RFID system is a technology using RFID tag that is identified goods or objects. As shown in Figure 1, RFID systems is composed of a TAG that included identifiable information, READER that read and interpret the tag information and HOST COMPUTER for process reading data[1][2].

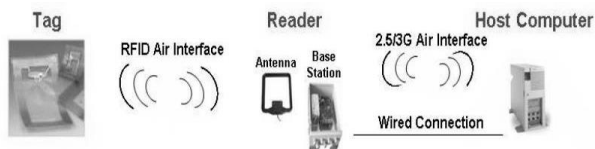


Fig. 1. RFID System

#### 2.2 USN(Ubiquitous Sensor Network)

USN is a management technology that very small independent wireless sensor nodes have placed in

physical space which likes buildings, roads, costumes, sensed information such as light, temperature, magnetic field, and movement. Wireless sensor nodes were built in sensor, sensor controller, PC, wireless network module, antenna, power and they are communicate other sensor nodes by AD-hoc[3].

#### 2.3 Equipment

The propose USN sensor node is based on Uremon[4] sensor node and u-FIPI[4] infra in KAERI. Mobile sensor nodes used in Uremon that mounting accelerometer and tilt sensors that focused on the physical protection of nuclear material. It seize workers location, work time, radiation exposure with detecting mobility of insoluble material the loss or placing function by this application. For this purpose input RFID tag to mobile sensor node and mounting radiation sensor, send data to control system and manager's portable devices periodically. Equipment parts figured Table 1.

Table 1. System Equipments

	Sensor	Func(user)	Network
AMT-302 (Mobile)	Acceleration Incline Radioactivity RFID Tag	Sensing, Information (Worker)	Zigbee Wireless
ASN-202 (Fixed)	Humidity Temperature Illumination	Sensing (Building)	Zigbee Cable
AGW-300 (Gateway)	X	Collect data (Manager)	TCP/IP Cable
AGM-200 (Gateway Master)	X	Manage gateways (Manager)	TCP/IP Cable

AMT-302 is a mobile sensor node which contains acceleration, inclination, measure radioactivity sensor and RFID tag which contain worker's information. ASN-202 is a fixed sensor node which contains temperature, smoke, flame sensor what are watching fire and collecting data from AMT-302. AGW-300 is a coordinator between sensor nodes that are using Zigbee net and server that are using TCP/IP net for data conversion from each protocol, also responsible for a floor which consist of multiple ASN-202. Finally, AGM-200 controls several of AGW-300, tune the traffic, and send data to server from overall AGW-300. In general, buildings are responsible for an AGW-300

can be connected directly to the server because AGM-200 shall apply to the optional. Sensors are shown in Figure 2.



Fig. 2. Flow sensor nodes

#### 2.4 Applying decommissioning works

In this paper, normal decommissioning works which is simple works to protect radiation except remote works are included. According to research nuclear reactor decommissioning project, most decommissioning site will be simple work because contamination is relatively low except some area. For example, radiation-qualified concrete removal, decontamination, etc. are working. Figure 3 is shown workers location and monitoring feature at exposure area. The system communication range of ZigBee sensor network is considered. Divide each building and place by RFID reader and send workers information, location, work type, work status and radiation status from sensor node that the worker has, when workers accessing.

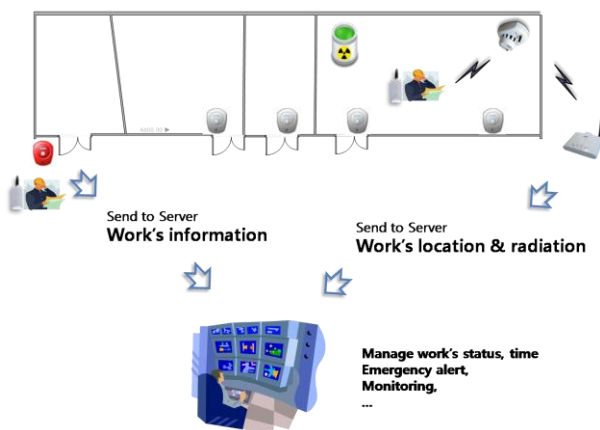


Fig. 3. System functions

### 3. Conclusions

The decommissioning support system was suggested which is increased management and monitoring

efficiency during performing decommissioning works using RFID and USN sensor node. This system based on Uremon and u-FIPI, which are in operation in KAERI, is proposed for efficient decommissioning work with workers information, location, work time, work status, and radiation status when they are working at exposure area. This system currently is developing and using at emergency events or after life time passed for nuclear power plants or facilities.

### REFERENCES

- [1] Finkenzeller K. RFID handbook: fundamentals and applications in contactless smart card identification. 2nd ed. Giesecke & Devrient GmbH. munich, Germany:John wiley & Sons Ltd; 2003.
- [2] Want R. "Enabling ubiquitous sensing with RFID." IEEE computer 2004. 04.: pp.84-86. 2004.
- [3] David. B. Jhonson, "Routing in adhoc networks of mobile hosts", IEEE Workshop on Mobile Computing Systems and Applications, 1994.12.
- [4] D. S. Hwang, Y. D. Choi, H. K. Choi, K. I. Lee, W. S. Jung "Insoluble Nuclear material storage management", KRS 2010, pp.53-54, 2010.