The Concept Design of Cloud Server for Integrated Environmental Radiation Management Systems

Jinhyung Lee*, Eun Han Kim, Sang-Do Choi, Seon-Ha Kim, Jong-Myoung Lim, and Wanno Lee
Korea Atomic Energy Research Institute (KAERI), 111, Daedeok-daero 989 beon-gil, Yuseong-gu, Daejeon, 34057, Republic of Korea
**Corresponding author: jinhyung1@kaeri.re.kr*

1. Introduction

KAERI have been carried out the measurement and assessment of environmental radiation of its surrounding owing to the operation of HANARO as shown in Figure 1 and 2.

Fig. 1. Environmental Radiation Monitor deployed on site

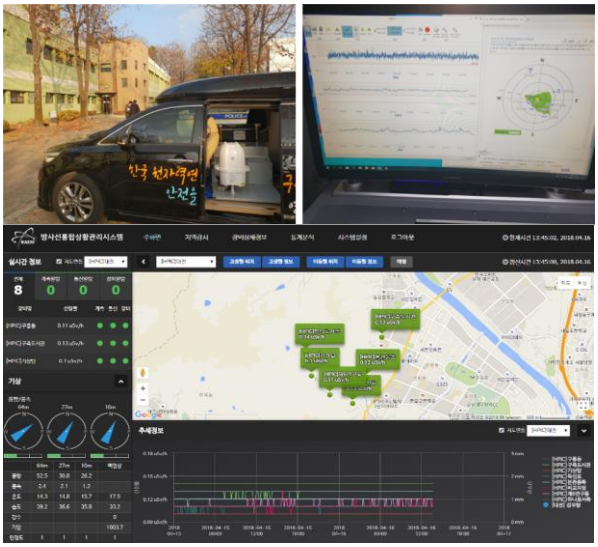

Fig. 2. Mobile Radiation Monitoring System for Environmental Radiation Monitor on accidental site

The radiation generated by HANARO has been measured by environmental radiation monitoring (ERM) and published annually by NSSC and KINS. However, the information in the report is hard to understand for Daejeon citizens who are not knowledgeable about the radiation and the radioactivity. The continuous real-time ERM data is very important to detect the abnormal radiation level immediately.

One of methods to obtain ERM data every hour indicating the spatial gamma dose rate is the high pressurized ion chambers (HPIC) [1-3]. The ERM data are continuously obtained and presented on the KAERI website in real time. The current internal and external network separation system by the KAERI security regulation has been making it difficult to upload the real-time ERM data on the KAERI website. In this study, the novel design for the system synchronizing the ERM data with real-time data on the KAERI website has been demonstrated by installing an external cloud server.

2. Methods and Results

To build a server system, it basically builds a database that can save the ERM data and an operating program installed system that can store real-time data through a cloud server. In addition, to communicate wirelessly without delay in real time the measurement data generated by more than a dozen ERMs are intended to be deployed using the 4G LTE network [4]. Figure 3 shows a basic server deployed concept and operational schematic diagram that minimizes measurement data disclosure.

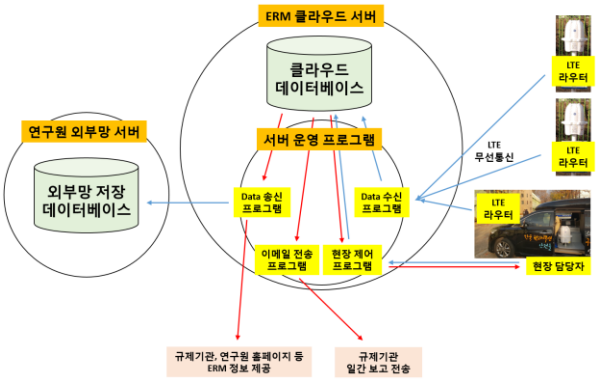

Fig. 3. The diagram of ERM cloud server and its procedures.

2.1 4G LTE Wireless Telecommunication

Data generated by the HPIC radiation detector can be wirelessly communicated via the 4G LTE router (IML-C3010) using TCP/IP as shown in Figure 4. For reasons such as removal of repeaters in site and termination of 2G mobile telecommunication service, 4G LTE wireless network with wide coverage among the site was selected. The HPIC installed on each site and the router send the measured ERM data from multiple equipment to the cloud server, which receives the data through the data receiving program.

Fig. 4. KT 4G Wireless LTE Router (IML-C3010)

2.2 Cloud Server

There are two types of operating system (OS) installed inside the cloud server. It consists of a database that stores measurement data and the operating system on which the operating program is installed. The operating system is deployed separately to ensure the stability of the database. The operating program consists of a data communication program, an E-mail sending program, and an external control program that can only be controlled by an authorized person on the site as shown in Figure 5.

Fig. 5. Control the ERM Cloud Server on Site.

2.3 Results

In this study, the concept design of cloud server deployment and operation programs led to the formation of a synchronization method of the results of HPIC radiation monitoring measurements located at each site. Through this study, we will implement server deployment and operation as soon as possible through actual system deployment and technical application of equipment.

3. Conclusions

Building cloud servers can help respond more quickly to environmental radiation information required by regulators. In addition, the rate of accidents such as data reception not being received due to power failure or communication failure of the laboratory can be significantly reduced. Finally, because security protocols are also operational on cloud servers and measurement data is public data, there are no issues with threats such as cyber security.

As a result, the cloud server enables the establishment of an integrated environmental radiation management system around the graphical user interface (GUI) based web infrastructure that allows real-time weather, dose assessment, radiation protection, mobile vehicle measurement data, and radioactivity analysis results as well as HPIC measurement data. This will allow citizens to easily watch the information on environmental radiation and contribute to securing public acceptance of radiation safety.

Acknowledgements

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