

# DEVELOPMENT OF COLLECTIVE MANAGEMENT SYSTEM FOR INTEGRATED OPERATION OF U-SPACE

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**ABSTRACT:** U-City related researches and development have been actively conducted in Korea since 2002. According to the Act on Ubiquitous City Construction, "U-City" is defined as "the city to provide ubiquitous service anytime anywhere through the existing ubiquitous backbone systems and ubiquitous technologies, ultimately for the purpose of improving urban competitiveness and quality of life. This research explains the plan to develop collective management technology for integrated operation of U-Space which makes up U-City. Specifically, this report is intended to suggest basic approach of identifying collective management elements of each U-Space type, developing integrated management system and creating interface module to link the system with urban integrated operation center.

*Keywords: U-City, U-Space, Collective Management System for Integrated Operation*

## 1. Introduction

### 1.1 Background and Objective

U-City(ubiquitous city) is an intelligent space harmonized with IT technologies. U-City has been considered as one of the national growth drivers while being actively studied as a means to strengthen urban competitive advantage.

Development of U-City technology allows citizens to enjoy safe and fresh living condition and pursue for rich and comfortable urban lives. Moreover, an advanced system to operate U-City systematically and reasonably is absolutely required by applying collective management system for integrated operation to each space. For the collective management system, technology must be in harmony with environment in U-Space of U-City. [1]

Although researches on development of U-City are actively conducted in Korea, standardization of U-City must be immediately made. In particular, connection regarding management system as well as methodology for drawing management elements for integrated management system must be suggested as soon as possible. [2]

Therefore, as part of research on standardization of development of collective management system for integrated operation in

relation to U-Space in U-City, this research is intended to draw management techniques of integrated operation system for collective management in U-City, analyze operational methods and suggest methodology to draw management elements in order to deploy an advanced collective management system for integrated operation. In addition, this research aims to be utilized as fundamental data in developing the optimized integrated management system for collective management in U-City.

### 1.2 Method and Scope

This report is intended to describe management elements for collective management by U-Space of U-City and suggest effective methods of deploying the optimized collective management system for integrated operation. To this end,

First of all, concept of U-City and U-Space, and the existing management elements must be correctly defined. Technologies for integrated operation system must be also analyzed and compensated, ultimately finding out management elements of each space and facility in developing the best integrated collective management system. Furthermore, best technologies required to deploy the optimized system must be

suggested through connection and integration with management elements. This research mainly focuses on qualitative analysis such as expected effects and usage.

## 2. U-Space Concept and Analysis of Previous Researches

### 2.1 Review about U-City and U-Space

U-City can be referred to as Informationized U-City, Place-Oriented U-City, Multi-layered U-City and others depending on national/regional/industrial characteristics. However, generally, U-City is defined as an intelligent city including Ubiquitous to improve city's unique functions and management efficiency. That is, U-City is future-oriented advanced city to improve urban living condition and strengthen urban competitive edge by managing cities, spaces and facilities in link with IT industry, ultimately ensuring convenience and safety.

In particular, Korea has defined U-City differently through previous researches such as NIA(National Information Society Agency), KRIHS(Korea Research Institute for Human Settlements) and KLC(Korea Land Corporation). [3]

**Table 1. Concept of U-City Defined in Previous Research**

Source	Definition
NIA	Innovates the existing information infrastructure to make urban functions and management effective and applies Ubiquitous technology to backbone systems to deal with all urban affairs in real-time and provide advanced IT service. Ultimately, this new concept of city aims to provide urban residents convenient, comfortable and safe living condition.
KRIHS	Integrated online/offline group controlled by the same governing organization while retaining urban space for ubiquitous
KLC	The city to provide comprehensive service through connection between domestic IT industry and construction industry
MKE (Ministry of Knowledge Economy, Korea) (2006)	Future-oriented advanced city applying IT infrastructure technology and service to various urban components

MLTM (Ministry of Land, Transportation, and Maritime Affairs, Korea) (2007)	The city to provide U-Service anytime anywhere by implementing U-Technology in city to improve urban life condition and competitiveness
Act on Ubiquitous City Construction	The city to provide ubiquitous service anytime anywhere through the existing ubiquitous backbone systems and ubiquitous technologies, ultimately for the purpose of improving urban competitiveness and quality of life

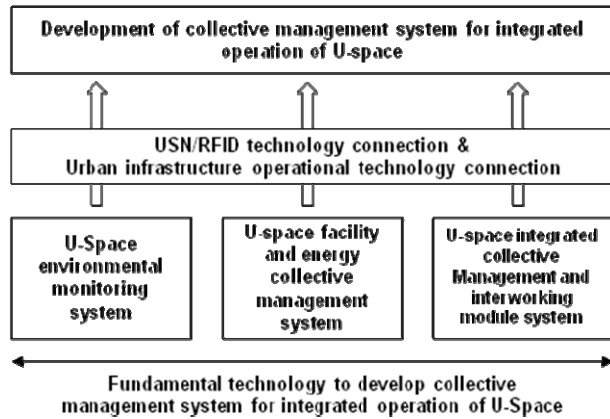
In addition, in order to manage U-City in more systematic and reasonable manner, research and development regarding utilization of collective management technology for U-Space integrated operation are actively underway. For example, for the same type of U-Space such as spaces and facilities in U-City, each management factor has been selected and operating systems have been developed, and ultimately they have been integrated for management.

In order to develop the optimized system, monitoring technology, facility/energy management technology and collective management/interoperation technology must be essentially supported in advance.

Meanwhile, the existing U-Space has limitation of having different characteristics from other simple physical spaces. In order to solve this problem and improve differentiation, different operating system and methodology depending on each U-Space must be additionally studied. Especially, standard type classification system must be introduced to maximize the same type of U-Space function. Moreover, sub-platform which can be connected with integrated operating system of U-City, and collective management sub-platform optimized for service network such as environment information, energy and disaster essential for city must be studied.

Although interests in developing collective management system are very high across the nation, high-level technical development considering operation and optimization of the overall system is still poor. Except for measurement of environmental data, collection of disaster-related data, and systems related to energy and facilities, Korea mainly depends on overseas technologies. Therefore, in order to develop and spread Korea's own technologies along with development and methodology of collective management system, each management factor such as fundamental technology, core technology and detailed technology must be systematically defined to

deploy the optimized U-Space system as shown in Figure 1. Besides, U-Space type and system must be standardized by developing reasonable and optimized collective management system for integrated operation.



**Figure 1.** Fundamental technology to deploy collective management system for integrated operation of U-Space

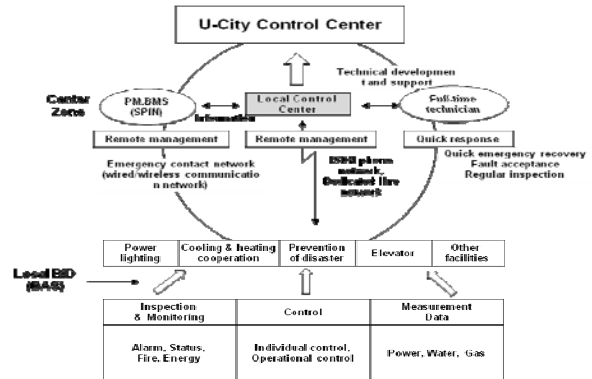
**2.2 Analysis of National-International Previous Researches**

Core technologies of U-City including HA, OA/BA System in Responsive Spaces, Plug & Play System Integration and Adaptive/Preference Based Control are actively studied around the world, but it will take a long time to practice research results. In particular, Japan has systematic monitoring system of urban environment and disaster monitoring system, providing stable urban environment service. Let's take YBP(Yokokama Business Park) Project an example: a total of 12 purpose-built buildings including office building, computer building, residential building, service center and local energy supply facility were constructed in a region and different building management methods (full-time or unmanned intensive management group, night-time management group, individual intensive combined management group) are performed.

The U.S. has invested heavily on technical development including effective design, management and operation of energy & facility systems and provided safe urban environment service systematically in link with national safety network such as urban monitoring system. DOE, NIST and ASHRAE play leading roles in these efforts.

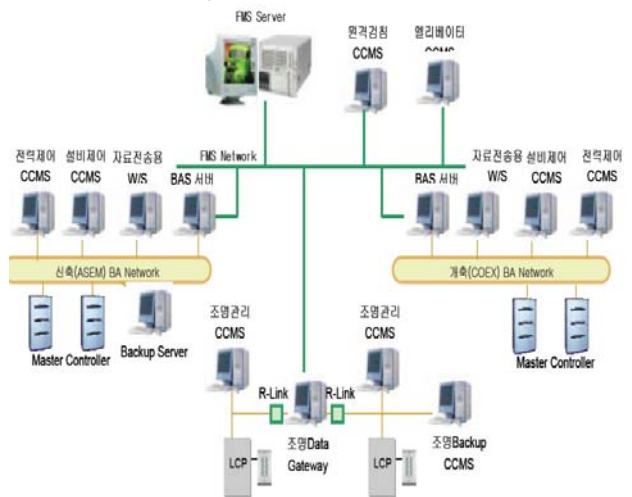
Now, let's look at domestic examples of collective management system for integrated

operation of U-Space. For example, Samsung Everland's collective management system applies the same type of control system to 26 buildings as shown in the Figure 2. Monitoring and controlling each building and facility are connected to local control centers through dedicated line and used for quick response such as remote management and maintenance. [4]



**Figure 2.** Concept diagram of Samsung Everland collective management

COEX and ASEM shown in the Figure 3 are Korea's largest complex and auto control system. Continuum system of the U.S. Andover Controls is utilized as the integrated system for each space, facility and building of COEX and ASEM. [5]



**Figure 3.** Network diagram of BAS and FMS of COEX/ASEM

Unfortunately, however, domestic integrated management system for collective management is currently limited to only monitoring and supervision of many types of systems through BAS. Management system is applied to some spaces and facilities, but collective management system for integrated operation including urban environment, facilities and resources in relation to

metropolitan network is not widely introduced. Therefore, definition and suggestion of management elements and methodology to deploy integrated operating system for collective management of U-Space can contribute to optimization of the overall U-City system and system standardization of the same U-Space.

### 3. Collective Management System for Integrated Operation of U-Space

As mentioned in the above, currently Korea's operating system technology for collective management is not advanced enough to systemize and optimize the overall city. Furthermore, Korea heavily depends on other countries' advanced technologies.

Accordingly, in order to ensure systematic urban management and effective urban resource operation, various U-Space and management elements of U-City must be standardized and ultimately, plans and methods to develop reasonable collective management system for integrated operation must be suggested. This research provides system standardization and suggestions as follows:

#### 3.1 Core Technology and Detailed Technology Development

Before establishing integrated operational management system, objectives of the U-City to be developed must be defined spaces and facilities of U-Space must be systematically classified. In addition, the final system to control and monitor each space and facility must be deployed and related systems must be developed in advance.

More than anything else, environment system to build fresh urban environment, facility to reduce energy resources and energy collective management technology must be developed. Road map for core technologies such as interoperability system of developed technologies must be planned to link and integrate detailed technologies effectively.

The following Figure 4 shows the flow chart of core and detailed technologies to develop collective management system for integrated operation.

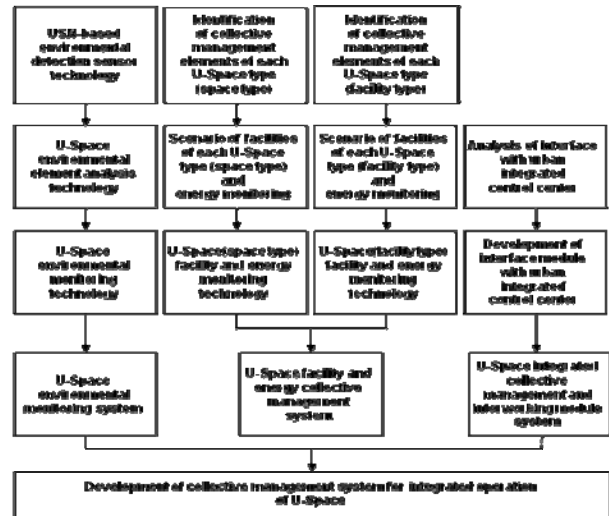


Figure 4. Technical development flow chart to deploy collective management system for integrated operation of U-Space

As core and detailed technologies have been developed, the same type of U-Spaces can be integrated for management, ensuring improved efficiency and intelligence across city in managing each type of U-Space through U-Space environment monitoring technology, facility & energy collective management technology, integrated operating platform and collective management system, and interface module among urban integrated control centers.

#### 3.2 Interoperation of detailed technologies and final evaluation

Detailed plan to develop collective management system for integrated operation is classified into development of core technology and development of interworking technology.

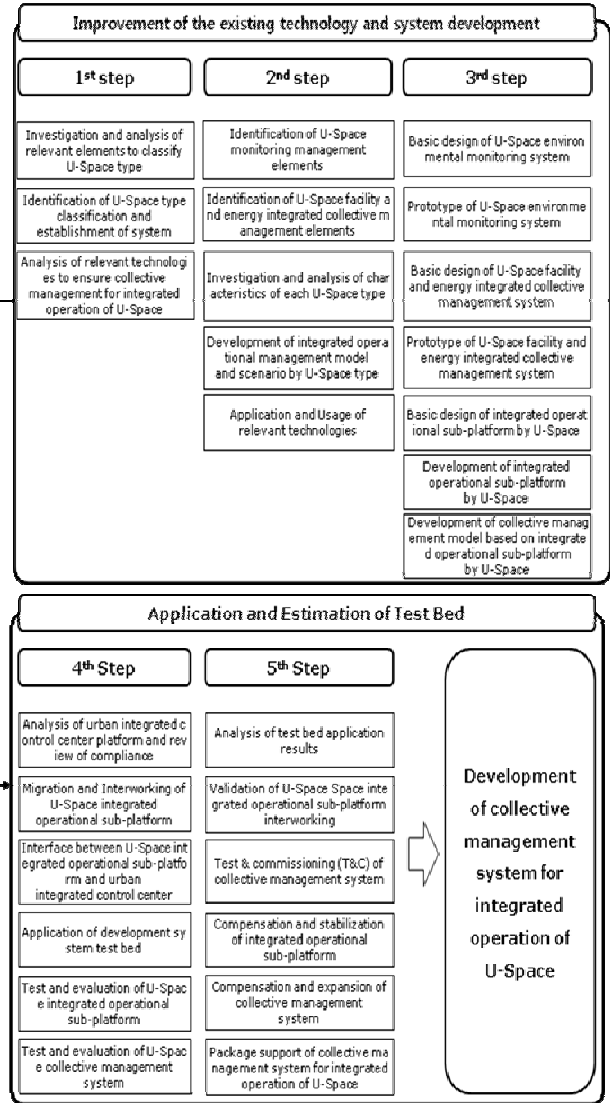
Core technology develops monitoring system, facility & energy control technology, sub-platform and interface module through identification and classification of management elements and development of monitoring techniques and interface with integrated control center after developing scenario of collective management. In addition, sensor technology for RFID/USN, intelligent monitoring technology for facilities and network technology must be based to develop monitoring systems and detection sensors and predict demand of energy and facility. The two types of technologies must be interoperated to deploy collective management system for integrated operation of U-Space.

Table 2 and Figure 5 show connection between detailed technology for each core technology and

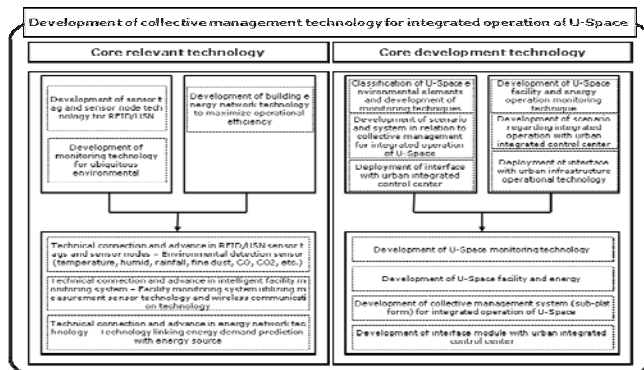
collective management system for integrated operation.

**Table 2.** Core technology and detailed technology to deploy collective management system for integrated operation

Core Technology	Detailed technical development
U-Space monitoring technology	Establishment of U-Space environmental monitoring system and development of service scenario
U-Space facility and energy collective management technology	Establishment of U-Space standard type classification system(space type, facility type) and examination of characteristics of each type Establishment of U-Space facility and energy monitoring collective management system and development of relevant scenario
U-Space integrated collective management and interworking technology	Development of integrated operating platform(sub-platform) for U-Space operational management Development of U-Space collective management model Development of interface module between sub-platform for U-Space integrated operation and urban control center for integrated operation



**Figure 6.** Step-by-step technical development plan to deploy collective management system for integrated operation of U-Space



**Figure 5.** Roadmap of detailed connection and core technology

Figure 6 illustrates step-by-step technical development and system connection method through system deployment scenario.

### 3.3 Usage and Expected Effects

Development of collective management system for integrated operation of U-Space based on scenario and plan for technical development plays an important role in operating city reasonably and effectively in terms of U-City environment, disaster and energy management and improving international competitive edge and advanced urbanization.

### 4. Conclusion

This study aims to identify management elements for collective management of each U-Space and suggest effective methods to deploy collective management for integrated operation. To this end, in this research, concept of U-City

and U-Space and the existing management elements were identified and technologies for integrated operating system were analyzed and compensated. Ultimately, management elements of each space and facility were identified to develop the optimized collective management system for integrated operation. Moreover, connection and integration with management elements suggested optimized technology and usage and expected effects were also analyzed. In short, the following results can be achieved:

(1) Korea's integrated management system for collective management does not fully integrate urban environment, facilities and resources of metropolitan network. Therefore, management elements and effective methods for integrated operation are absolutely required.

(2) In order to deploy collective management system for integrated operation of U-Space, the followings are required: U-Space environmental monitoring system through development of U-Space environmental element analysis technology and monitoring technology; U-Space facility and energy collective management system through identification of space/facility type of collective management elements and development of facility/energy monitoring scenario; and U-Space integrated collective management and interworking module system through analysis of interface with urban integrated operation center and development of modules.

(3) Sensor technology for RFID/USN, intelligent monitoring technology for facilities and network technology must be based to develop monitoring systems and detection sensors and predict demand of energy and facility. The two types of technologies must be interoperated to deploy

collective management system for integrated operation of U-Space.

Development of collective management system for integrated operation of U-Space based on scenario and plan for technical development is expected to ensure reasonable and effective urban operation in terms of U-City environment, disaster and management and improve international competitiveness and advanced urbanization.

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