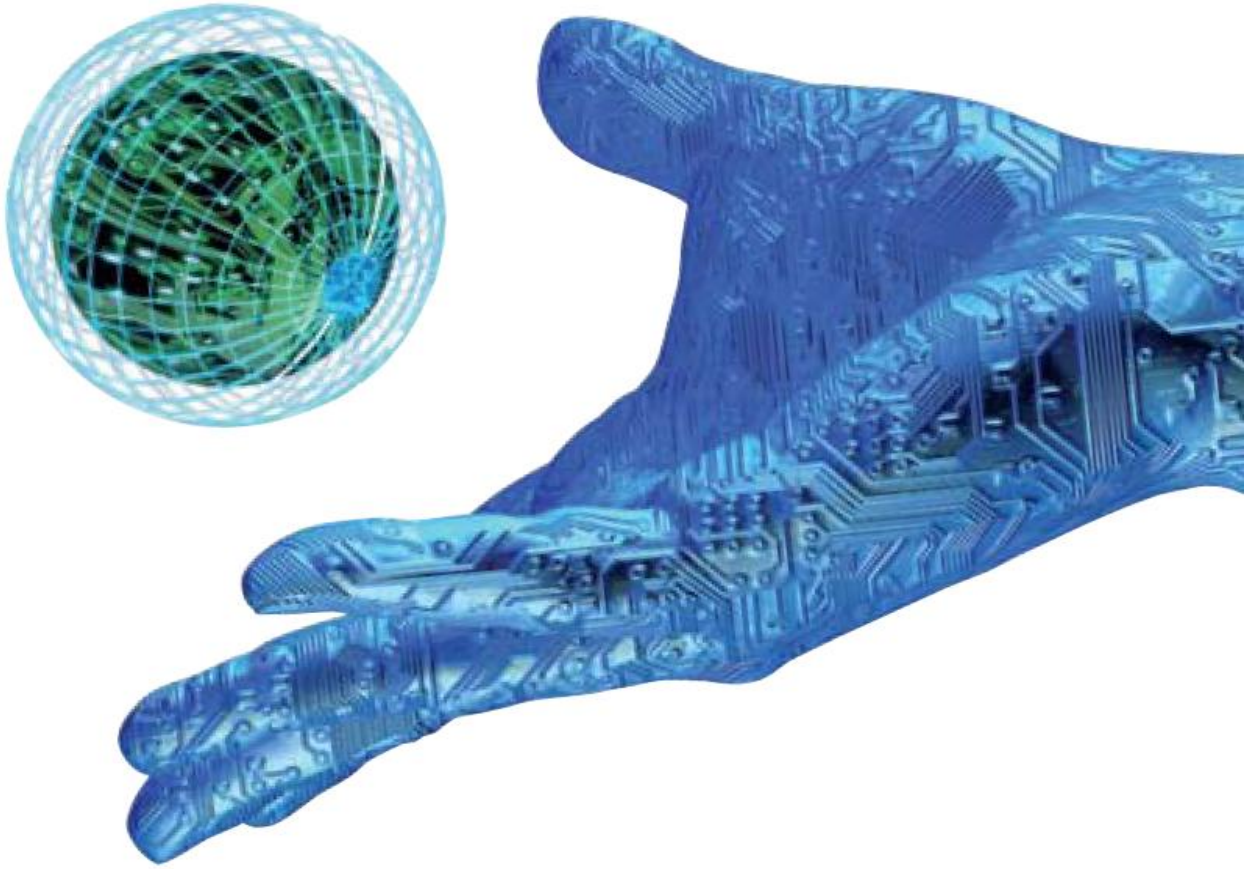
Ubiquitous City in Korea

Services and Enabling Technologies

Ubicom Tekes

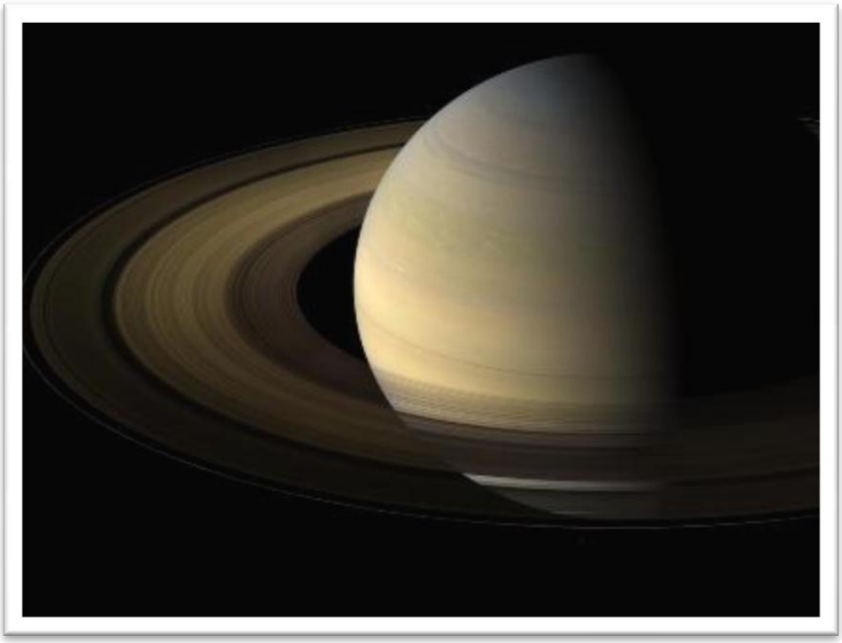


Tekes, the Finnish Funding Agency for Technology and Innovation

Tekes is the main public funding organisation for research and development (R&D) in Finland. Tekes funds industrial projects as well as projects in research organisations, and especially promotes innovative, risk-intensive projects. Tekes offers partners from abroad a gateway to the key technology players in Finland.

Technology programmes – Tekes´ choices for the greatest impact of R&D funding

Tekes uses technology programmes to allocate its financing, networking and expert services to areas that are important for business and society. Programmes are launched in areas of application and technology that are in line with the focus areas in Tekes' strategy. Tekes allocates about half the financing granted to companies, universities and research institutes through technology programmes. Tekes technology programmes have been contributing to changes in the Finnish innovation environment for twenty years.



1/10/2011

Ubiquitous City in Korea

Services and Enabling Technologies

TEKES-Finnode-Finpro

Ubiquitous City in Korea

Services and Enabling Technologies

Table of Contents

Executive Summary

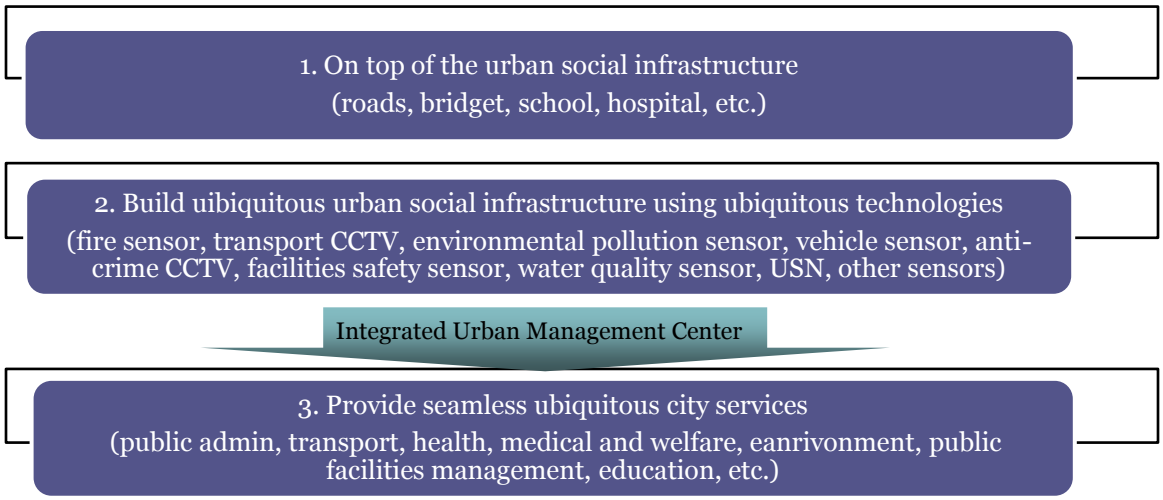
1. Definition

*"**U-City** is a city where ubiquitous services are provided through ubiquitous **city infrastructure** using ubiquitous city technologies"* - Law on Construction of Ubiquitous City

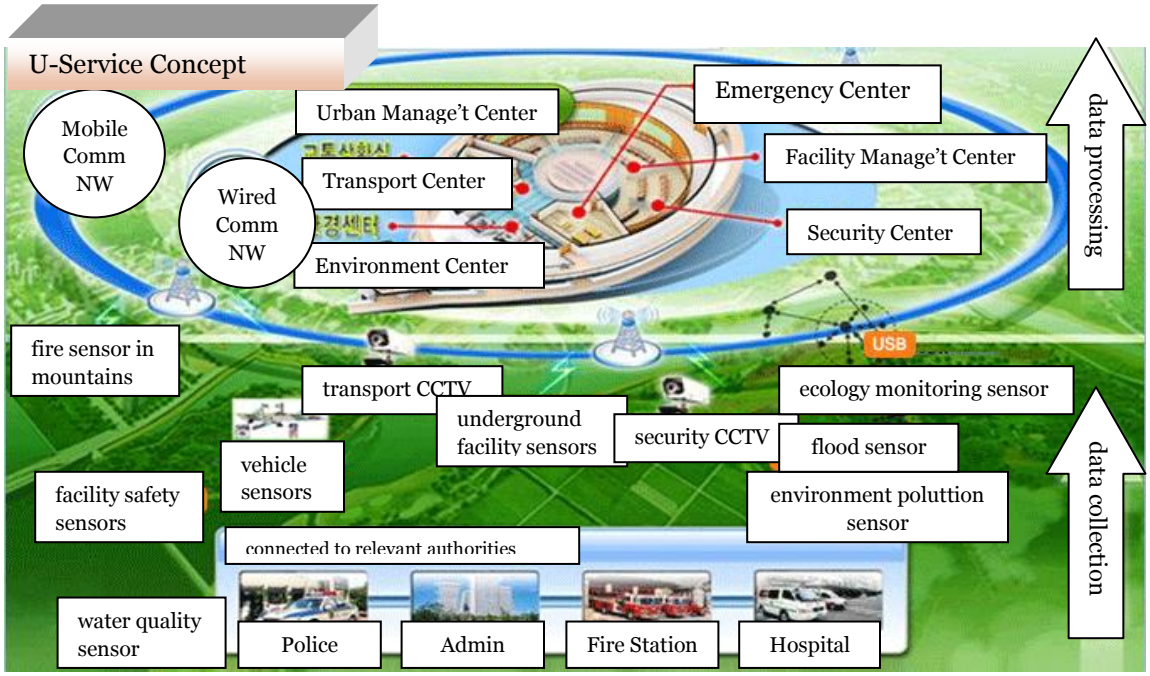
*"**U-City service** is a service that collects and provides data about **public** administration, transport, welfare, environment, and anti-calamities or integrates such data through ubiquitous **city infrastructure.** "* - Law on Construction of Ubiquitous City

"U-City service is an aggregation of intelligent data and contents that are used to maximize the management and efficiency of urban elements (city infrastructure, human, and natural environment) by utilizing ubiquitous technologies (context awareness and data processing) and ICT infrastructure (sensing and tagging), in accordance to the purposes of U-City projects in each city." – NIA (National Information Society Angency –

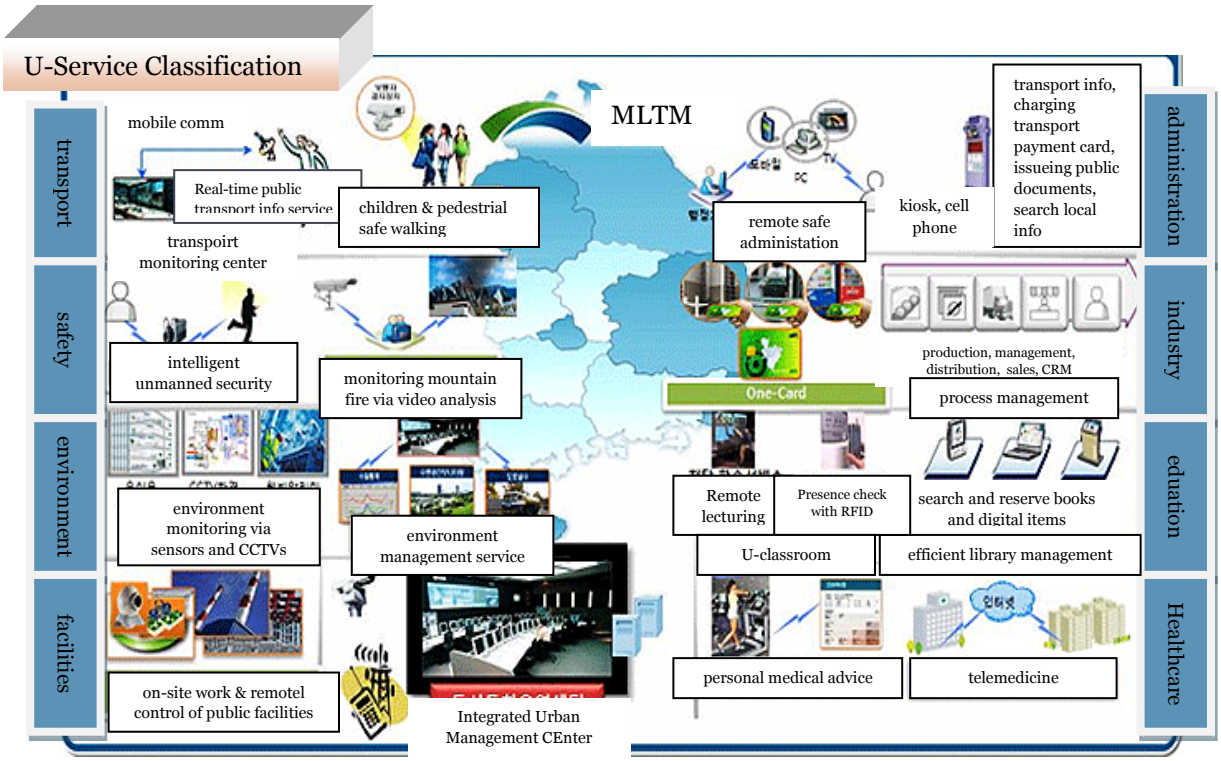
*"**U-City infrastructure** include basic social infrastructure based on the 'Law on Planning and Usage of Land', broadband telecommunication network, BcN, integrated urban operation center, and/or ubiquitous sensor network. "* – Enforcement Ordinance on the Construction of Ubiquitous City



Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009



Source: Korea Ubiquitous City Association



Source: Korea Ubiquitous City Association

According to the MLTM, the primary purpose of Korean U-City is to reduce costs in managing urban facilities by integrating existing individual systems. For example, if 7 public services(swewage leakage, anti-crime, illegal parking, U-placard, vehicle plate number recognition, and environmenal information) are to be provided between 2008 and 2018 in Hwaseong-Dongtan U-City, 37.9 billion KRW worth of cost savings and tax income is expected, according to MLTM source. At a latest U-City conference, an MLTM official said that *'however, it is important to develop business cases and models in order to **sutain** U-City'*.

As said, U-City and U-City service – at least during the 1st 5 year-period of time- in Korea is focusing around the social infrastructure in the public sector rather than services used in every day life by citizens, so called "citizen friendly U-services". As the country has gone through 1 year of the 1st 5- year U-City Master Plan that was made in 2009 based on the above Law, there are more and more recognition in the government that U-City must evolve from the public sector-oriented domain towards **'citizen-friendly U-service'** domain that normal citizen can use and benefit from. Therefore, the latest revision to the Law (as of Nov.2, 2010) defines U-City service as one of the below services or as a service that more then 2 of the below service items are connected ;

1. Administration	2. Transport	3. Health, Medical, Welfare
4. Environment	5. Anti-crime, anti-calamities	6. Facilities management
7. Education	8. Culture, Tourism, Sports	9. Logistics
10. Work, Employment	11. Others	

*"**U-City technologies** are construction-telecommunication convergency technology and ICT technology that are used to provie U-City services based on constructed U-City infrastructure."* – Law on Construction of Ubiquitous City

In order to help U-Cities with improving service interperability among different services and U-Cities as well as with coping with changing technology and user demands, MLTM made a "Guidline for U-City Technologies" in June, 2009. According to the Guideline, U-City technologies consits **of data collection** technology, **data processing** technology, **data application** technology, and other technologies.

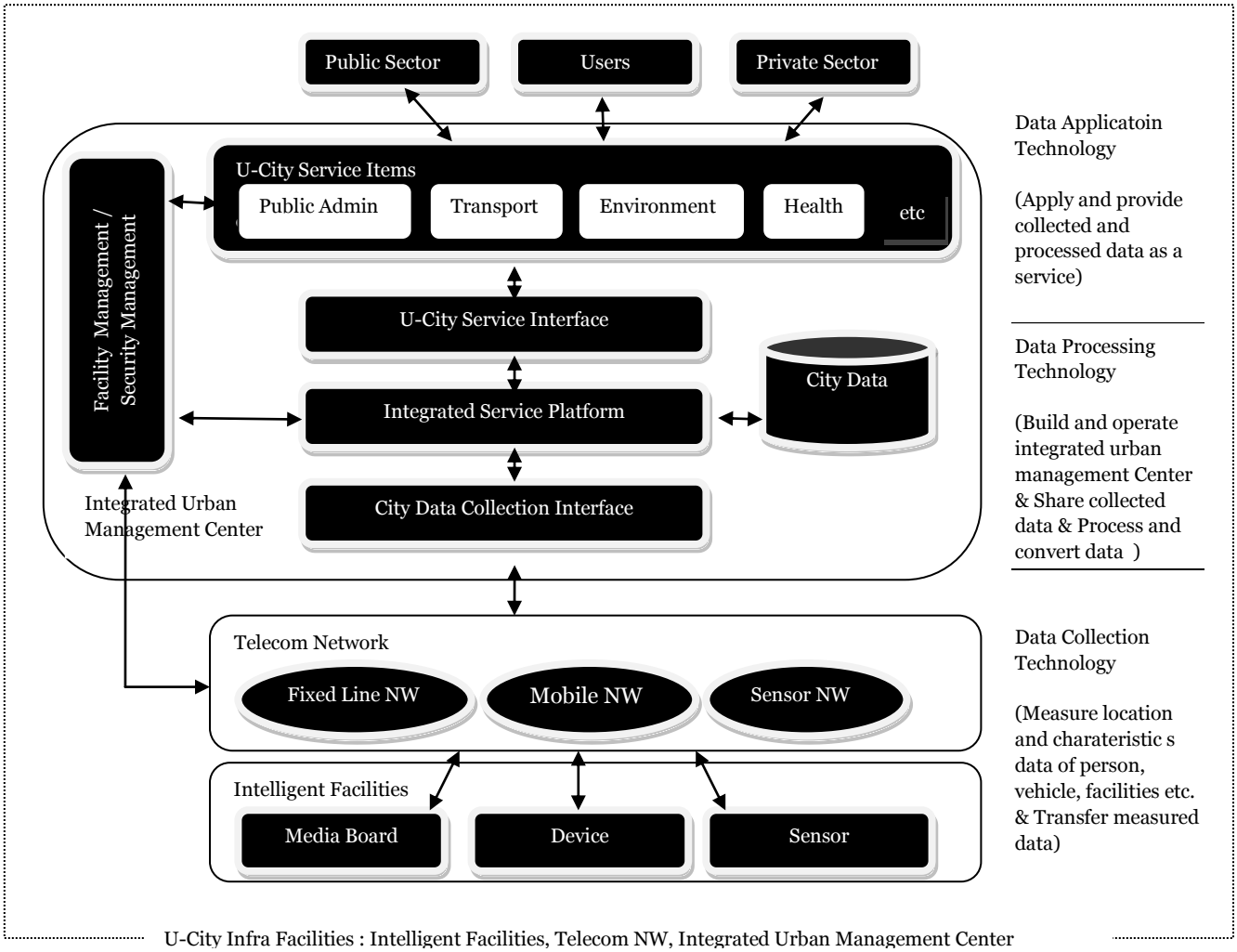
Data collection technology is defined as technology to measure and transfer various city information. Included in the data colletion technology is construction technology that builds intelligence in public facilities and telecommunication networks such as fixed-line NW, wirless NW, sensor NW etc. Data collected through data collection technology is placed in "City Info Data Base" in the Integrated Urban Management Center.

Data processing technology means a technology to process or convert collected data into an optimal form in accordance to the purpose of service. Technologies composing Urban Management Center such as U-City integrated platform are included in the data processing technology.

Data application technology enables citizens, public agencies, and service users to use processed data.

Other technologies are ancillary ones to construct and operate U-City economically, stabily, and continuously. Examples in this category include data security, energy saving, business model development, U-City infra facility management technologies.

U-City Technology Overview



U-City Infra Facilities : Intelligent Facilities, Telecom NW, Integrated Urban Management Center

2. Financial Support to U-City

When designated as "U-City" according to the Law, the owner of the U-City project is entitled to financial support from the government. If the owner of the project is a local government, it can ask for financial support from the State, and if it is a prviate sector, it can seak subsidy from the State and/or from the pertinant local government. The State and a local government can conduct R&D, transfer, and distribute U-City technologies. They can also carry out joint R&D among industry, academia and research institutes as well as international collaborations. They can support training of U-City experts and developing and distributing U-City training programs. The Ministry of Land, Transport, and Maritime Affairs (MLTM)

can designate a pilot U-City where fianancial supports for administration, finance, and technology can be provided.

According to the Master Plan, the central government takes charge in financing R&D of core technologies and training of human resources to build the foundation of U-City industry. For the actual construction and operation of U-City, local governments and private contractors are responsible for financing the project. Pertinent local government who runs a U-City project should, at the time of contruction or approval of such contruction, take into account how the operation cost of U-City will be financed. The Master Plan recommends to secure fiancing through fees and charges levied on the usage of U-City services and public infrastructure.

Budget of the State for U-City Projects

- Total budget : 490 billion KRW (450 million USD)
- Project period : 2009 – 2013 (unit:100 million KRW)

		2009	2010	2011	2012	2013	Total
1. Setting relevant regulation	MLTM	-	-	-	-	-	0
	MOPAS	60	40	95	97	95	387
2. Core technology developments	MLTM	220	200	232	150	-	802
	MKE	23.8	23.3	18.9	-	-	66
	MOPAS	20	5	85	72	2	184
3. Support for fostering U-City industry	MLTM	78	70	404	422	422	1,396
	KCC	-	-	5.5	5.5	5.5	16.5
4. Service creation	MLTM	137	130	132	136	141	676
	NEMA	3.3	-	25	30	35	93.3
	MW	1	1	1	1	1	5
	MCST	233.8	233.5	270	277.5	281.5	1,296.3

Total	MLTM	435	400	768	708	563	2,874
	Other Ministries	341.9	302.8	500.4	483	420	2,048.1
	Total	776.9	702.8	1,268.4	1,191	983	4,922.1

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

*MOPAS:Ministry of Public Administration and Security

*MKE : Ministry of Knowledge and Economy

*KCC : Korea Communications Commission

*NEMA :National Emergence Management Agency (www.nema.go.kr)

*MW : Ministry of Health and Wellfare

*MCST: Ministry of Culture, Sports, and Tourism

3. U-City Master Plan

Ministry of Land, Transport, and Maritime Affairs (MLTM) made a national-level master plan to realize advanced city model of 21 C that converges city construction with ICT technologies, to foster U-City industry as a new growth engine of the nation, and to help exporting of U-City industry. The Master plan which is made in 5-year cycle (Phase 1: 2009-2013) sets U-City vision, directions, national level implementation scheme, progressive implementation strategy, and practical tasks.

Overview of Ubiquitous City Master Plan

Vision	Realize advanced informatized city reinforcing quality of life and citiy's competitiveness			
Goal	1. Optimize city management	2. Foster as a new growth engine		3. Enhance city services
Implementation Strategy	1. Set regulations	2. Develope core technologies	3. Support U-City industy	4. Create citizen-friendly U-Service
Implementation Tasks	(1) Set guidelines for construction and management of efficient U-City	(1) Develop data collection technology	(1) Create successful U-City model	(1) Set intelligent admin system
	(2) Prevent privacy infringement and damage from calamities	(2) Develop data processing technology	(2) Set basis for U-City export	(2) Provide customized transport service
	(3) Set standard and criteria for U-City technologies	(3) Develop data utilization technology	(3) Train U-City human resources	(3) Advance medical service
	(4) Distirubtion and connection of U-City data	(4) Develop other technologies		(4) Provide green service
				(5) Build intelligent preventive and reactive system
				(6) Build intelligent SoC

				(7) Maximize education and knowledge service
				(8) Proivde one-stop culture,tourism service
				(9) Realize global distribution system
				(10) Realize advanced IT-based labor, employt system
				(11) Other services

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

As U-City requires involvements from many players from different segments and Ministries, the Master Plan also divides the roles and responsibilities of players involved in the Ubiquitous City project in Korea.

(1). Among Ministries

Ministry of Land, Transport, and Maritime Affairs			
Manager and Coordinator of the Plan. • Setting regulations • Managing R&D of core technologies • Supporting growth of related industries • Training human resources • Supporting exports			
Ministry of Knowledge and Economy	***Ministry of Public Admin and Security***	***Korea Communications Commission***	***Ministry of Education, Science, and Technology***
• R&D of USN, RFID technologies • R&D of core SW component technologies for integrated platform development	• Informatization of regions • Intelligentize and upgrade of social infrastructure	• Convergence of broadcasting and communications • Vitalization of IPTV	• Informatization of education • R&D of scientific technologies
Ministry of Health and Welfare	***Ministry of Culture, Sports, and Tourism***	***Ministry of Environment***	***Ministry of Agriculture, Fishery, and Foods***
• U-Healthcare • U-Welfare	• U-Sports • U-Knowledge society	• Eco projects	• Advanced agriculture • Building distribution system for agri and livestcok goods

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

(2) Between the Public and the Private by Phase

Phase	Implementation Strategy	R&R
Beginning	• Set regulatory basis	Public
	• Support R&D of U-City core technologies	Collaboration between P and P
	• Train human resources	Public
	• Foster new industry using U-City echnologies	Collaboration between P and P
	• Secure financial basis for building and management of U-City	Public
	• Provide public services	Public
Growth	• Check the status and drive growth	Collaboration between P and P
	• Vitalize regional economy through upgrading U-City technology	Collaboration between P and P
	• Train over 5,000 peopl pool which is 25% of the needed human resource pool for U-City by 2013	Public
	• Lead U-City related technology standardizations and development through international collaboration and hosting World Forum on U-City	Collaboration beween P and P
	• Provide private services for convenience of life	Private
Expansion	• Operate and manage U-City business stably	Collaboration between P and P
	• Provide various private services for convenienc of life	Collaboration between P and P
	• Expand selective service using U-City infra facilities	Private
	• Export to overseas market	Collaboration between P and P

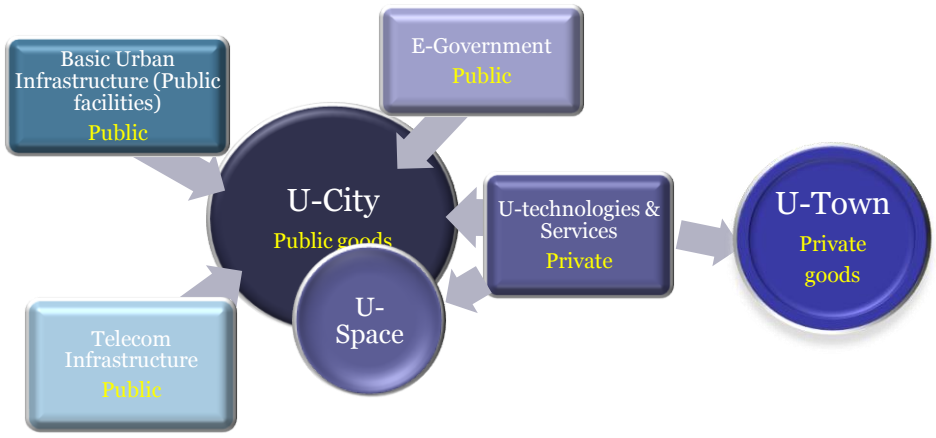
(3) Between Central and Local Governments

Central Gov	Local Gov
Set regulations • Enact construction laws as to U-City • Set and implement U-City Master Plan • Set guidelines for U-City planning, construction, operation of local governments	**Set U-City plan** • Plan according to the characteristics of each region as the owner or approver of U-City construction and management • Supervise the construction
Finance R&D of core technologies • Finance R&D of U-City core component technologies	**Enact local regulations**
Train human resources	**Plan and approve construction**
Support exports • Build brand of Korean U-City and help export	**Management and Operation** • Direct management and operation or consignment

4. Types of U-City Projects

MLTM classifies U-City into 3 different types – Existing City, New City, New Town. Existing City as the word itself says is to build a U-City out of existing city so that U-City services can be provided. New Town is a to build a U-micro-city (town) within an existing city. New City is to build a complete new U-City from scratch. New City type U-City is built on a land size bigger than 1,650,000 m2. For each type of U-City project, the government designated a pilot city where government provides financial supports – Busan for Existing City type, Incheon Songdo for New City type, and Mapo (Seoul) for New Town.

In addition to U-City, "U-Town" and "U-Space" are often used in Korea. While U-City is considered more as public goods in a bigger scale built on land sized over 1.65 million square mters encompassing basic urban infrastructure, telecom infrastructure, and e-government with a bit of private U-services, U-Town is a multi-usage private goods developed and provided completely by a private sector in a smaller scale within an existing city as a means to rejuvenate an aged area. U-Space is a limited space area like street, school-zone, convention center, etc., in the U-City where a certain U-service is provided either by the public or private sectory.



Other notes

ITS is excluded from this study.

1,000 KRS = 1 USD apprx. Change billion KRW to million KRW when reading the monetary figures.

Chapter I . U-Services in Korean U-City

1. Citizen-Friednly U-Services Proposed under U-Eco City

Most of the U-services defined so far in Korea since 2005 were developed from operators' perspectives, rather than relfecting citizens needs. Besides, those U-service concepts so far introduced in Korea were more of listing up service areas like shopping malls without deep understanding of "the space and how citizens interact with the space" in the urban city It is very imprtant to identify and develop services that are needed by citizens in daily life and provie those as killer applications. With this background, the Master Plan of U-City and its Guidelines define the below 11 U-services as 'citizen-friendly services'. Based on these 11 U-services, the U-Eco City project (one of the 17 growth engines designated by the current government in 2009 that are expected to enhance Korea's global competitiveness for the next 10 years. U-City is encompassed in U-Eco City engine category together with ITS, GIS, and Green Home) commissioned a group of players (LG CNS, Dongil Engineering Corp, and Yonsei University) to carry out a research on new service items in each cateroty of U-service domain. The research outcomes proposes 78 service groups and 228 service iterms as below;

Domain	No. of Service Groups	No. of Service Items
1. Admin	5	15
2. Transport	15	42
3. Health, Medical, Welfare	9	28
4. Environment	5	19
5. Anti-crime and Anti-calamities	8	21
6. Facility management	6	14
7. Education	6	17
8. Culture, Tourism, Culture	8	18
9. Logistics	7	20
10. Labor and Employment	4	17
11. Others	5	17
Total	78	228

(1). Admin Domain

Service Groups	Service Items
Onsite admin support	• Surveillance service on illegal waste dumping • Onsite admin support service • U-asset management service
Urban landscape management	• U-Placard service • Streetlights management service • Night lights management service • Onsite structures management service
Remote civil services	• Remote tax billing and payment services • U-Civil service
Convenient life	• Land information service • Portal service for community life • U-Moving service

Civic engagement	• U-Vote service • U-Public hearing service • Civil reporting/declaration/registration/complaint services

(2). Transport Domain

Service groups	Service items
Traffic flow management serivce	• Realtime traffic control • Highway traffic flow control • Inter-city traffic flow control • Traffic control information
Emergency situation management service	• Emergency situation sensing • Emergency sitatuion handling • Emergency vehicle operation management support
Automatic law enforcement service	• Enforcement on speed violation • Enforcement on bus-only lane violation • Enforcement on road lane violation • Enforcement on traffic light violation • Enforcement on illegal parking and stop • Enforcement on overloading • Vehicle tracking management • Enforemcne on license plate rationing violation
Support service for traffic pollution management	• Support for traffic pollution management
Electronic toll payment service	• Electronic toll payment • Electronic congestion charge payment
Electronic fare payment service	• Electronic payment for public transportation fare • Electronic payment for public parking lot
Basic transport information service	• Basic transport information
Transport information management and connection service	• Transport information management and connection
Value-added service for in-vehicle travelers	• Transport information for in-vehicle travellers • Route guidance • Parking information (public parking lots)
Value added service for non-in-vehicle travlers	• Pedestrian route information
Public transportation info service	• Public transportation info
Public transporation management service	• Public transporation management
Safe driving support service	• Automatic warning about traffic accidents • Front-rear car collision prevention • Intersection car collision prevention • Safe railway crossing management • Safety management in deceleration road section • Automatic vehicle safety diagnotics

	• Pedestrian safety support • Driver visibility improvement • Prevention of careless driving
Automatic driving support service	• Vehicle-to-vehicle distance control service • Automatic pilot control • Platoon (swarm) driving service
Taxi call	• Call-taxi service

(3). Health, Medical, and Welfare Domain

Service Groups	Service Items
Health management service	• Home health management • Community health management • Dosage management • U-fitness
U-Hospital service	• Hospital informatization • Smart hospital patient card • Smart bedside service • Hospital asset and patient management • Electronic prescriptions • Hospital environment management
Telemedicine service	• Telemedicine • Remote collaborative medical service • Home-visit medical service • Emergencey medical service
U-Healthcare management service	• Personal health information management • Special medicine and medical equipment management • Food management • Transfusion/Blood management
U-Public healthcare center service	• Integrated public healthcare center infomration • Public healthcare center facility management
Family safety service	• Preventions of missing aged people with Alzheimers' disease • Prevention of missing child • Safe monitoring service for aged people • Mobility assistance service for aged people • U-helper service for aged people
Assistance service for the handicapped	• Walking assistance for the handicapped • Facility guidance for the handicapped
Multi-cultured family assistance service	• Helper service for multi-cultured families
Childbirth and care assistance service	• Childbirth and care assistance

(4). Environment Domain

Service Groups	Service Items

Pollution management service	• Water resource pollution management • Soil pollution management • Air pollution management • General environmental pollution information
Waste management service	• Household garbage management • Food waste management • Harzardous waste management • Recylables management
Environment-friendly service	• Ecological space management • Park and green areas management • Arbor management • Usage of intelligent bicycle
Energy efficiency service	• Energy telemetering • Realtime electricity usage management • Streetlight monitoring and control
Renewable energy service	• Solar power generation • Solar heating service • Geothermal heat and sewage heat cooling and heating service • Wind power generation

(5). Anit-crime & Anti-calamities Domain

Service Groups	Service Items
Rescue/Emergency	• Emergency notice • Emergency resuce
Personal safety	• Safety information for public transportation users • Home anti-crime and calamities service
Public safety	• Safety monitoring for the public areas • Mobile security information • Criminals location tracking • School zone service
Institution safety	• Unmanned security service
Fire management	• U-fire sensing • Fire-fighting support • Mobile inspection on anti-fire structures and items
Natural disasters management	• Stream flooding information service • Snow removal management service • Earthquake information service • Typhoon information service • Tsunami information service
Accidents management service	• Hazardous gas information for the public facilities • Ground condition management • Management of decrepit buildings' conditions
Integrated calamities management	• integrated calamities management service

(6). Facilities Management Domain

Service Groups	Service Items
Roadside facilities management service	• Tranport facilities management • Streetside facilities management • Bridge safety management • Tunnel safety management
Building management service	• Building management
Stream facilities management service	• Stream facilities management
Additional facilities management service	• Retaining wall safety management • Inclining surface management
Underground supply facilities management service	• Common area management • Water supply facility management • Sewage facility management
Facilities data management and information service	• GIS-based urban information • Space visual management • Drawings management

(7). Education Domain

Service Groups	Service Items
U-Kindergarten service	• Integrated kindergarten information
U-Campus service	• Realtime day-care situation checking • Campus information • Locker management • Smart student card • U-School infirmary • U-School bus • U-Dormitory
U-Classroom service	• U-Classroom
Remote education service	• Online education • Cyber school
U-Library service	• Libriaries information • E-libriary • U-Bookshelf • U-Reading room • U-Mobile library
Education assistance service for the handicapped	• Education assistance for the handicapped

(8). Culture, Tourism, Sports Domain

Service Groups	Service Items

Cultural facilities management	• Management of cultural properties preservation • Cultural assest management
Cultureal tourism experience	• U-Showroom • U-Theme Park • U-Convention
Cultural information guides	• Cultural information guide
U-Tour information guide	• U-Tour • City Tour bus information • Realtime video sharing of tourist sites • U-Booking service for visitors • Tourist infomraion guide
U-Park	• Park information guide • Park facilities usage guide
U-Playground	• U-Playground
U-Resort	• U-Resort
U-Sports	• Sports-for-All service • U-Golf service • U-Sky service

(9). Logistics Domain

Service Group	Service Items
Management of manufacturing history tracking	• U-Factory • U-Cattle shed • U-Farm • U-Fish farm
U-Warehouse	• Management of shipping-in and out of warehouse • Intelligent inventory management • Intelligent picking/packing
U-Transport	• Cargo vehicle management • Optimal transport route guide • Customs clearance • Cargo transport tacking
U-Delivery	• Unmanned postal/parcel delivery service
Distribution history tracking inquiry	• History tracking for agricultural, seafood, livestock goods • Product history tracking
U-Store	• Automatic warehousing-shipping management service for retails and wholesales • Intelligement store management service
U-Shopping	• Personalized shopping information service • e-payment • U-e-commerce • U-customer mamangement service

(10). Labor and Employment Domain

Service Groups	Service Items
Employment information service	• Employment trend information • HR market support service • Personal job hunting support • U-License card service • Enterprise recruiting support
U-Work service	• U-Work space • U-Work Center • Remote collaborative work • Remote conferencing • Enterprise integrated card • U-Print pole • U-Office rent
Industry activities support	• Regional industry support • Service for collaboration among regional companies • Service for founding venture start-ups
Industrial safety management	• Safety management service for dangerous work place • Remote support service for dangerous work

(11). Other Areas Domain

Service Groups	Service Items
Home managements service	• Home automation • Video conferencing
Connection service with the outside	• Elevator call service • Service for connecting with parking lots • Home entertainment
Complex management service	• Integrated complex management • Complex safety management • Complex community support • Integrated complex residents card
U-Artifact service	• Digital structures landscape • Digital lighting service for building exteriors • Media board service • Emotion bench service • Music fountain service • Digital stepping stone service
Digital theme street service	• Service for experiencing advanced street technology • Specialized industry street

2. U-City Services by Major Local Governments

U-City projects			No. of service areas
New City	Suwon Gwanggyo Gyonggi Province	• U-Facility management • U-Environment • U-Medical • U-Portal • U-Urban Management	9
		• U-Anti-crime • U-Transport	
		• U-Education • U-Citizen service	
	Seongnam Pangyo, Gyonggi Province	• U-Protal/Education • U-Facility • U-Transport • U-Safety • U-Environment • U-Communication Infra • U-General Info Center	7
	Sejong City, Chungcheong Province	• U-Transport • U-Facility managment • U-Admin	10
		• U-Anti-crime/calamaties • U-Medical/Welfare	
		• U-Environment	
		• U-Education, U-Tourism / Culture / International Cooperation, U-Community, U-Knowledge-based business	
	Hwaseong Dongtan Gyonggi Province	• U-Life safety, U-Weather, U-Transport, U-Education, U-Public admin	7
		• U-Homenetwork, U-Residential safety	
	Eunpyoung New Town, Seoul	• New Town Portal • Intelligent CCTV Network • Intelligent Meter at home • U-Mediaboard • U-Streetlight management system • U-Library • U-GIS Situation Surveillance • U-Public Transport Info	12
		• U-Children playground • U-Green • U-Family safety • Digital Streets	
	Paju Wonjeong	• U-Transport	10

	Gyongi Province	• U-Environment/Water Circulation • U-Safety • U-Health and Welfare • U-Card, U-Portal • U-Residence, U-Education • U-Work, U-Info System	
Existing City	U-Seoul	• U-Care, U-Fun, U-Green • U-Transport, U-Business • U-Governance	6
		• U-New Town, U-Cheonggyecheon, U-Library, U-TOPIS	
	U-Busan	• U-Port, U-Transport • U-Tourism/Convention • U-Health • U-Anti-calamaties • U-Home, U-School • U-Street	8
	U-Incheon	• U-Traffic, U-Air Cargo • U-Container • U-WALLet • U-Biz Support • U-Foreign Admin	12
		• U-Convention • U-Health, U-Home • U-Learning, U-Welfare	
	U-Daejeon	• U-Smart Town • U-R&D Cluster • U-ITS • U-Wellbeing	4
	U-Gyeongbuk	• U-Admin, U-Culture/Tourism • U-Transport • U-Environment • U-Home, U-Industry • U-Agriculture • U-Welfare	8

U-Service Model in Eunpyoung New Town

Service		Major subtance
Intelligent CCTV Network		• Anti-crime function. • Surveiling illegal parking • 109 units of CCTV
Landmarkt Streets with Themes	Water Screen	• 30m x 15m water screen to be installed in the Waterfall Park
	Smart Post	• Announce the news, events, and genegal information of the district office. • Interactive games • Image video contents

	Digtal Stepping Stones	• Install 2 sets of 8 stepping stones with 8 music tones
Intelligent Streetlight Management System		• Integrated Urban Management Center monitors and controls the streetlights
Eunpyoung New Town U-Portal	Web/Mobile Portal	• Fixed-Mobile Convergence ofr Portals services • U-Library to be connected with e-Book viewer for distributioin of e-books
	GIS services	• GIS services based on the design drawings of the new town
Building Public Transport Infomration Service infra		• Processing information for public transport info, administrative notices, weather info
Building U-Communication infra		• Building fiber opetics network in 6 children day care centers
Building Town's own network		• Connecting servers for CCTV, children day care center, Smart Posts, Water Screen, Complex Management with Integrated Management Center
U-Placard		• Multimedia placarcds that replace conventional placards
Integrated Management Center		• Building Control Center, IT Room, UPS Room and Show Room

3. How Users See U-Services

A joint report by LGCNS, Dongil Engineering Co., and Yonsei Univeristy published in 2010 under the MLTM's U-Eco City project surveyed on adaptability of the citizen-friendly U-services in which priotization and willing-to-pay by users are studied. Interviews were done face-to-face with 200 citizens living in Seoul at the age between 20 and 59.

Priotized Citizen-Friendly Services by Citizens

Rank	Service Area	Ranked Service Details		
1.	Education	Children safety and monitoring	U-Home learning	Intelligent library
2.	Anti-Crime	CCTV monitoring	Emergency alarm	Intrusion detection
3.	Health and Welfare	Telemedicine	Safety and monitoring the handicapped and the aged living alone	Assistance for emergency patient
4.	Life	Home automation	Safety management in the residential complex	Parking management in the complex
5.	Transport	Basic transport info provision	Transport info management	Realtime traffic control
6.	Anti-Calamities	Emergency rescue	Reaction to fire/gas casualties	Alarm on calamities
7.	Public Admin	Electronic documents issuance	U-moving	Mobile admin
8.	Culture, Tourism	General tourism info	City information Portal	Guide/convenience provision
9.	Distribution,	Certification/history tracking	Cargo management	Logistics/distribution

	Logistics			management

The same report made another interviews with 83 experts working in various business sectors including public sector, IT, construction, service, police, social welfare etc. The preferred service areas are slightly difference from the result by the citizens.

Priotized Citizen-Friendly Services by Experts

Rank	Service Area	Ranked Service Details (Average monthly fee payable by the surveyed)		
1.	Education	Intelligent education	Intelligent library	Children safety and monitoring
2.	Anti-Crime	CCTV	Intrusion prevention	Emergency alarm
3.	Transport	Realtime traffic control	Basic transport info provision	Transport info management
4.	Life	Home automtation	Safety management of the complex	Telemedicine/billing
5.	Anti-Calamities	Emergency rescue	Alarm on calamities	Reaction to fire/gas casualties
6.	Public Admin	Electronic document issuance	Mobile admin	Regional Portal
7.	Health and Welfare	Telemedicine	Food and pharmaceuticals management	Safety and monitoring the handicapped and the aged living alone
8.	Distribution, Logistics	Certification/history tracking	Distribution/logistics management	U-Market
9.	Culture,Touorism	General tourism info	Guide info on facilities of the urban space	City info Portal

Services deemed Profitable by Citizens and Experts

Rank	Citizen			Expert		
	Service Area	Service Details	Montly amount payable (KRW)	Service Area	Service Details	Monthly amount payable
1.	Education	Children safety/monitoring	9,300	Education	Children safety and monitoring	10,301
2.	Health and Welfare	Health management	14,495	Distribution and Logistics	Logistics and distribution management	NA
3.	Life	Home automation	10,568	Health and Welfare	Telemedicne	10,795

Chapter II. Enabling Technologies for U-Services

1. Data Collection Technology

Data collection technology is to measure and transfer city information that is composed of data measuring technology (building intelligent facilities) and communication infrastructure technology (telecommunication).

Technology trend

Area	Technology	Trend
Data Measurement Technology	Near Field Communication Technology	(Passive RFID) Reader that can read collective tags is the key technology. Intermec Symbol, Samsys, Alien Tech, ETRI
		(Active RFID) Longer distance than passive RFID Savi, e-Logicity, AllSet, Hi-G-Tek
		(Mobile RFID) Allow mobility to RFID reader
	Sensor Technology	(Physical sensor) temperature, pressure, speed, accelerometer, flow, load, radiant energy etc. Applicable to electronic products and vehicles
		(Chemical sensor) gas (Co, Nox, Ion, humidity etc.) sensor . Applicable to atmospheric air measurement, indoor air pollution measurement etc.
		(Bio sensor) blood glucose meter , cholesterol meter etc.
	Location Data Collection Technology	(GPS) Widely used in the mobile phone (Ir-based technology) Use Ir sensor and active badge (Ir generator) to measure location. Although installation cost is low, accuracy is not assured. (WLAN-based technology) Calculate location based on the signal distance detecting RF signal strength received by a device. MicroSoft (RADAR), Intel (Place Lab)
		(Ultra-sonic waves-base technology) Use the gap in transfer speed between RF signal and ultra-sonice wave. Enables 3D location recognition. Low power, low cost system.
		(Video-based technology) EasyLiving. Use 3D camera to detect location. High accuracy, but high cost.
		(Others) Smart Card, CCTV etc.
Communication Infra Technology	Sensor NW	(USN) Realize ubiquitous environment using sensor networks. (ZigBee) 20-250kbps low data transfer speed. Low cost, low electricity consumption. Good for sensors used for long hours. As ZigBee is non-IP-based, integration with internet can be a bottleneck. ZigBee is more economical than Bluetooth. Samsung Electronics, LG Electronics, ETRI etc., participate in ZigBee Alliance. Globally, ZigBee is a leading and most commercially proven technology as of now. (6LoWPAN) Use existing communication and application service infra through IP. Low cost. Need more nodes

		than existing network. Good for IPv6. Samsung Electronics, NIA, Aju University etc., participate in 6LoWPAN alliance. (Binary CDMA) Transfer CDMA modulation signals in the TDMA signal format. Can solve complicated structure, high cost, high power consumption issues. B-CDMA allows hightest transmission speed enabling both near and wider communication distance. (WiBEEM : Wireless Beacon-enabled Energy Efficient Mesh Network): A wireless Mesh communication technoogy using 2.4GHz (ISM Band) band that can be used without license. It provides low power consumption, good scalibility, low cost, good mobility. 250Kbps ~16Mbps bandwidth supporting single hop communication covering upto 30 meters as well as a few 100 meters with Mesh Network. Whole Mesh Network is synchronized with Beacon information that makes it stable and economical. (Bluetooth) etc.
	Wirless Communication NW	(HSDPA) 14.4Mbps. Commercialized in korea since 2007 (LTE) (Ultra Mobile Broadband, UMB) (WiMax) (Wibro) Commercialized in Korea since 2007 (Others) EVDO, CDMA, Ad-HOC NW, Wireless Mesh NW, Wi-Fi, Femto Cell, GSM etc.
	Fixe Line Communicatin NW	Telephony, xDSL, FTTH, HFC etc. MSPP (Multi Service Provisioning Platform) (Others) VoIP, PON, MPLS, ATM etc.

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

Focus of R&D in Korean U-City

- Technology to optimize sensor installation (efficient and economical installation of sensors and operation)
- Put intelligence in public facilities such as road, bridge, pipes etc. (install sensors and integrated with IT technolog)
- Technology to give interoperability among various networks
- Technology to minimize frequency interruption

How to Secure Technology in Korean U-City

- Invest 8.1 billion KRW (8 million US) for Data Measurement Technology between 2008 and 2013 to develop core technology and apply in test bed.
- Invest 15.5 billion KRW (15 million USD) for Communication Infra Technology between 2008 and 2013

2. Data Processing Technology

Data Processing Technology is to convert or process measured data that is composed of Intetrated Urban Management Center and data processing and converting technology.

Technology Trend

Area	Technology	Trend
U-City Integrated Urban Management Center	Domestic Situation (U-City Management System & Integrated Platform)	(Samsung SDS) Focus on U-City Integrated Platform. Built Suwon Gwanggyo U-City. Provide 6 U-City solution areas that is Home, Office, FMS, ITS, GIS, Integrated Management Center. (KT) Focus on U-City Integrated Platform using its IT infra that can connect U-GIS, Road, Transport, Environment Monitoring, Public Facilities, and Security/Anti-Calamities services. Led Busan, Incheon, Paju, Hwaseong Dongtan, Yong-In Heungdeok, Pangyo U-City projects (LG CNS) Focuse on U-City Integrated Platform and USN. Participates in Pangyo, Eunpyoung, Cheongra projects. (SK C&C) Focus on Bus Information System and Bus Management System Composing HW technologies for the Management Center include operation server, control room (where services are monitored and controlled), Internet Data Center, UPS, etc. Composing SW technologies include EKP (Enterprise Knowledge Portal) that integrates and provides various SW, Directory Service, WAS (Web Application Server), CRM, DBMS (DataBase Management System), BPM (Business Process Management), SCM, Search Engine, Authentication Server, Firewall, SOA (Service Oriented Architecture), Web Service, LDAP, Semantic Web etc.
	Overseas	(MicroSoft) Develop 5 core technologies such as sensor, process, communication, interface, security that are needed for ubiquitous computing.
		Cisco, Oracle, HP develop U-City Integrated Platform or middleware solutions based on the core strength area of each company such as network, database, middleware, and server etc.
Data Processing and Converting Technology	U-City Integrated Platform	Provide functions like writing & testing application programs, security, fixed-mobile Portal, DB management, back-up etc.
	U-City Service Middleware	In U-City service, various kinds of City data are used that are collected and transferred in different format, place, and time. Therefore a service middleware that allows

		consistancy among various application programs is needed. Web-based technology is widely used.
	Context Awareness Technology	Various devices around U-services are aware of surrounding information (weather, personal information, transporation etc.) and utilize such information to provide intelligent services. IBM, MS, MIT are key players, but not enough for commercialized services.

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

Focus of R&D in Korean U-City

- Develop technology for building U-City Integrated Urban Management Center and Operation/Maintenance System.
- Standardize open platform
- Develop middleware that can connect u-devices and networks
- Develop context awareness technology

How to Secure Technology in Korean U-City

- Invest 1.2 billion KRW (1 million USD) for Urban Management Center beween 2008 and 2011
- Invest 7.5 billion KRW (7 million USD) for integrated platform between 2008 and 2013 by MLTM.
- Ministry of Public Administration and Security (MOPAS) funds development of integrated platform for public admin services. MKE (Ministry of Knowledge and Economy) funds development of core SW component technologies such as context awareness & processing system and collaborative system among devices etc.

3. Data Application Technology (U-Service Provision Technology)

Data Application Technology (=U-City service provision technology) lets citizens, public officials, and other service users use processed information and is composed of service provision technology, service interface technology, and common technology that is commony used among various service items.

Technology Trend

	Trend
Service Provision Technology	• To provide service items under 11 U-City Service Areas. • Currently, each U-City project by each local government run its own R&D for service provision technology in its own pilot project without nationwide standardization.
U-City Service Interface Technology	• Service interface technology is for optimal data entry and retrieval technology including KIOSK, Wallpad, Smart card etc. • Personal interface technology includes personal devices like PC, smart phone, cell phone etc. However, existing devices do not meet the expected

	user satisfaction of U-City services and security needs. • Media Poles in Gangnam district of Seoul has been introduced as an example of public data entry/retrieval device.
Common Technology	• GIS, LBS, Telematics can be utilized for U-City services.

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

Service Provision Technologies by Each Service Area

11 Service Areas	Main Technologies
U-Public Admin	• Technology to support mobile public admin service • Technology to introduce, manage, and use smart ID card
U-Transport	• Technoogy to optimize ITS • Technology to build realtime transport info DB and provide service • Technology to exchange data between vehicle and facilities & vehicle and vehicle • Technology to build intelligent U-transpor system
U-Health, Medical and Welfare	• Technology to provie public medical service via HER (Electronics Health Record) and inter-organizations information sharing • Technology to remotely detect the physical conditions of the disabled and the aged living alone • Technology to provide customized advanced health, medical, and welfare service
U-Environment	• Environment monitoring technology for realtime monitoring and management • Technology to build system for reduction of pollutants discharge into water resources and management • Technology to build U-IT-based multi-functional ecological green area • Technology to build and manage Eco-city that is energy saving and resource recycling
U-Anti-Crime and Anti-Calamities	• Technology for sensor or CCTV-based location tracking and management • Technology for connecting 119 (firem and emergency) and 112 (crime) • Technology to monitor realtime bridge, tunnel, and cultural properties and to reduce calamities • Technology to build 3D GIS data for efficient calamities prevention • Intelligent technology to prevent and react to calamities by calamity type
U-Facility Management	• Technology to intelligenly manage public facilities • Technology to buld and manage infrastructure facilities to support smart grid • Technology to converge GIS and IT
U-Education	• Technology for intelligent classroom and learning environment such as U-blackboard or U-desk etc. • Technology to utilize U-device for education such as digital text book • Life-long learning system based on IT
U-Culture, Tourism, and Sports	• Technology for fixed-mobile converged electronic cash • Technology to build and share cultural properties DB • Technology to provide one-stop culture, toursim, sports service specialized for each region • Technology to manage ubiquitous cultural space (library, museum, art galleries, exhibition halls etc.)

	• Technology for cultural and toursim guide service and contents services (such as virtual reality, augmented reality etc.) in the next generation internet and mobile environment • Technology for ubiquitous sports (managing competitions, record management, customized exercise management, sports goods etc.) • Technology to build intelligent sports stadium and for augmented sports simulation
U-Distribution and Logistics	• Technology for LBS-based realtime vehicle tracking and remote vehicle management • Technology to manage safety in transporting hardardous items such as explosive or radioactive materials and toxic waste etc. • Technology for RFID/USB-based intelligent integrated distribution management
U-Work and Employment	• Communication technology to enable realtime collaborative work and mobile work • U-Work technology to provide virtual office
U-others	• Technology for unmanned surveilance on military facilities • Technology for integrated management of military assets and transportation and distribution • Technology to manage national security related information such as terrorist info or immigration (exit and entry) info.

Source: "The 1st Ubiquitous City Master Plan (2009-2013)" by Ministry of Land, Transport, and Maritime Affairs, Nov.2, 2009

Service Interface Technology

Technology	Description
KIOSK	Various terminals in the public space such as ATM for banking, other terminals for ticketing, purchasing, registration, information search etc.
Wall-pad	Multi-media control pad attached to wall such as intelligent interphone, control unit for lighting, gas, curtain etc., that access Web and communicate with outer world.
Smart Card or Tag	Tag or Card with micro-processor, security module, memory module, input/outpu module etc.
Information Terminal	Various communication terminals such as mobile phone, smart phone, etc.
Media board/pole	Large digital display that runs various contents such as video, image, intertactive multimedia etc.
Others	LCD, LED, Touch-sensor technology, bio-signal based user interface technology etc.

Common Data Application Technology

Technology	Description
GIS	Geographic Information System combining geographic data and attribute data.
LBS	Location information tracking user's location using GPS or mobile communication technology.
Telematics	Infomration service around vehicle.
Others	Mobile Web, Virtual reality etc.

Focus of R&D in Korean U-City

- Develop standardized service items for economical and efficient service provision that can be interoperable amont regionas and systems.
- Develop personal service internal technology accomodating various near filed communication technologies and outdoor interface technology such as media board and KIOSK.

How to Secure Technology

- Invest 17 billion KRW (17 million USD) between 2008 and 2013

4. Other Technologies

Other technologies include technologies for data security, energy saving, infrastructure management and protection, business model developing etc.

Technology Trend

Technology	Sub-technology		Description
Data Security	Private data protection	Encryption technology	SSL, personal firewall, PKI-based authentication etc.
		Filtering technology	Spam filtering, cooki cutter, spyware killer etc.
		Anonymitzing technology	Anomymity securing mailing system, Onion Routing etc.
	Public dat protection	Network infra protection	IDS (Intrusion Detection System), IPv6 terminal authentication and service protection technology, USN device security technology, etc.
		Digital copy right management	Prevention of piracy of digital contents used in internet broadcasting, mobile device etc.
	Others	Kill tag technique, recording technique, privacy protection for RFID users, bio-authentication technology, Smart card-based user authentication, key management for security sensor node etc.	
Energy Saving	Smart Grid	Efficient usage of electricy power with smart metering etc.	
	Hybrid energy	Simultaneous us of electric power that is supplied by the	

		utilities company and self-generated in the facility in order to reduce amount of supplied energy.
	Others	Geothermal heating, recovery of exhaust heat, energy storage technology etc.
Infra Management and Protection	Real-time monitoring of U-City devices and equipment	Monitoring technology by installing sensors and CCTV etc., to monitor operation and abnormalities of main U-City equipment.
	Remote recovery and control	Remotely check conditions of U-City infrastructure and recover or control via robot technology
	Back of city information	Efficiently store and manage U-City information. Efficiently manage city facilities
	Others	Real-time provision of city information
Business Model Development (business model to secure operational costs after completion of U-City, BOO (Build Own Operate), BTL (Build Transfer Lease)	Revenue from adversiting model	Revenue made out of avertising put on intelligent facilities.
	Revenue from Certified Emission Reduction model	Revenue made out of selling CER
	Public-Private Joint Operation	Joint investment by the public and private sector into buidling and operating city infrasturcture and profite share.
	Others	Commission the operation to the private sector etc.

Source: The Guideline

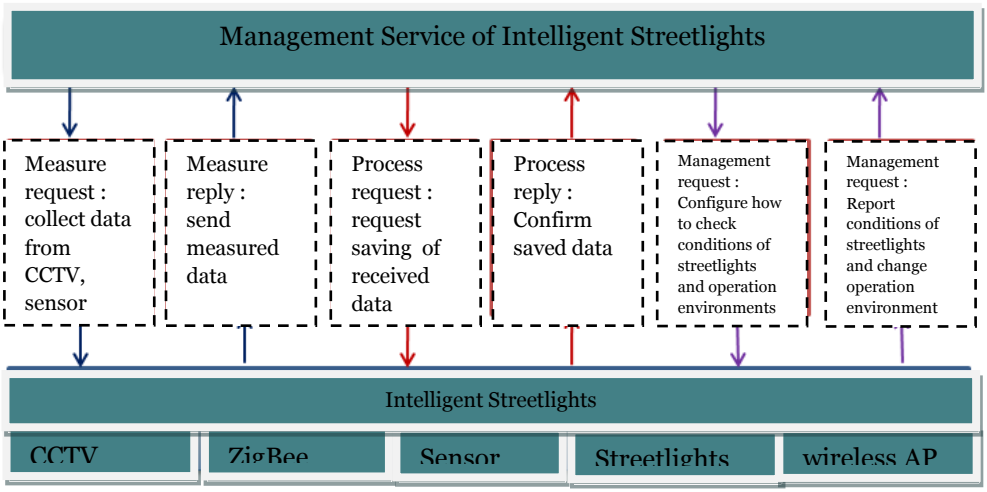
How to Secure Technology

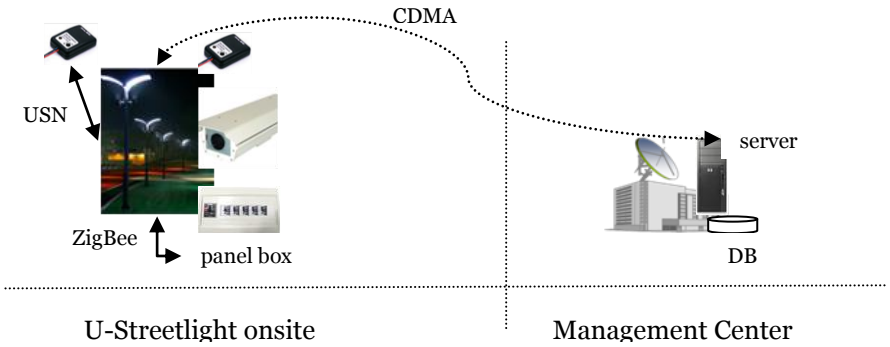
- Invest 7.9 billion KRW (7.9 milion USD) between 2008 and 2013

Chapter III. U-Service Cases

1. U-Streetlight Management Service

Service	Manage intelligent streetlights where CCTV, sensors, and wireless AP are installed.
Service Provider	Local government
Related Sector	Korea Electri Power Corporation (power management), Police (security) Public service
Service user	Facility manager
Main service	• Control lightings of intelligent streetlight
Value-added Requirements	• Provide wireless internet access to pedestrians • How to manage both intelligent streetlights and conventional streetlights at the
Challeges	• Communication methods of streetlights considering installation and operation
Service Flow	





2. Intelligent Video Security Service

- Install and operate surveillance camera in streets, parks, school zone, bridge, playground, forest etc., to monitor onsite situation and take necessary actions

Service Structure

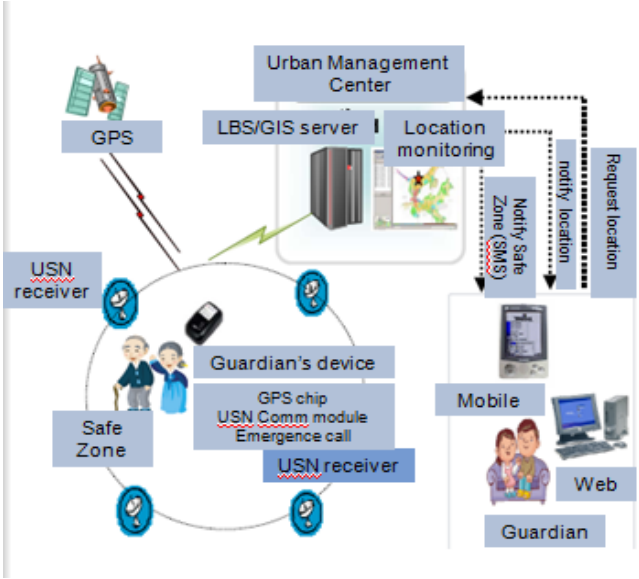
Service	Functions
Street surveillance	-Install CCTV in roads, park, streets, underpass etc. to prevent crimes and help tracking criminals -Install IP-based digital surveillance system using broadband internet infra -Using intelligent surveillance system, faster recognition of dangerous situation and notice
Building surveillance	Using intelligent surveillance system inside building, notice intruder, detect accidents, and monitor entrance etc.
Others surveillance	-Monitor road conditions and illegal parking using CCTV -Monitor fire and damages in mountain and forests -Monitor theft of public goods

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

- Conventional anti-crime services are based on CCTV cameras installed in the school zones or areas where crimes frequently take place, which are monitored by police stations . Lately, CCTVs have been used to monitor safety, transport, cleaning etc.
- Currently, there are 7 disctricts in Seoul that have built Integrated Surveillance Centers – Seongdong District, Gwangjin District, Joongrang Districut, Mapo District, Gangseo District, Seocho District, and Kangnam District. 8 more districts have plans to build integrated Surveillance Centers during 2010 and later. About 10 districts have installed anti-crime centers that monitor anti-crime purpose CCTVs. These CCTVs are mostly operators and managed by police stations.
- Change from analogue-based CCTV using VCR storage to IP-based system using DVR-based compressed video and digital transfer technologies. Lately, changes to integrate IP network based on broadband network and open protocol with intelligent video security solutions based on automatic video analysis and recognition technologies. Intelligent solutions market has been grown 38% annual growth on average since 2006, and the market is expected to be worth 1.4 billion USD in the globe and 175 million USD in Asia alone in 2011.
- Bio technologies such as face, iris, voice, finger print, and vein recognition technologies have expanded in the security market. The security market in 2008 was 4.6 billion USD market in the world and 300 billion KRW (apprx.260 million USD) in Korea in 2008.

3. Location Service

- Using USN and GPS, track location and provide real-time location info service.

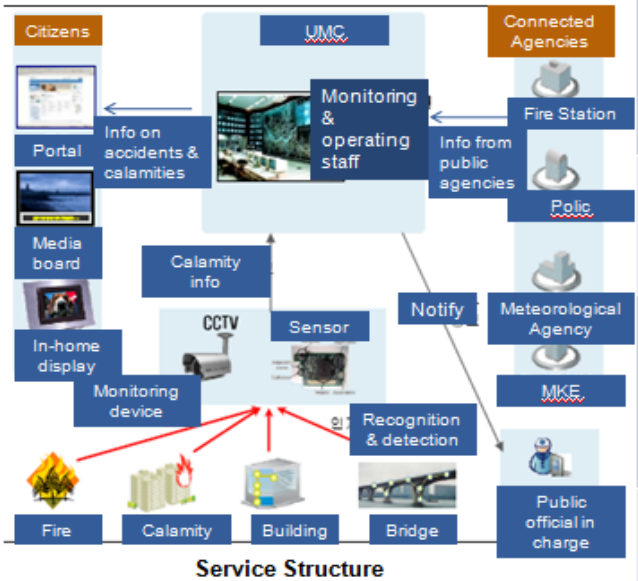


Service	Functions
Guardian service for the disabled, the aged etc.	Track location and provide location information real-time on the requested person among the tenants such as disabled, aged people etc.
Location service	-When a ward gets out of Safe Zone, automatic SMS notice to a guardian -Guardian can check location of a family members any time using mobile phone or Web Portal -GPS+USN technology used

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

4. Anti-Calamities Service

1. Provide citizen and tenants with info on calamities, traffic, weather etc. by connecting with National Emergency Management Agency, Police, National Meteorological Agency etc.



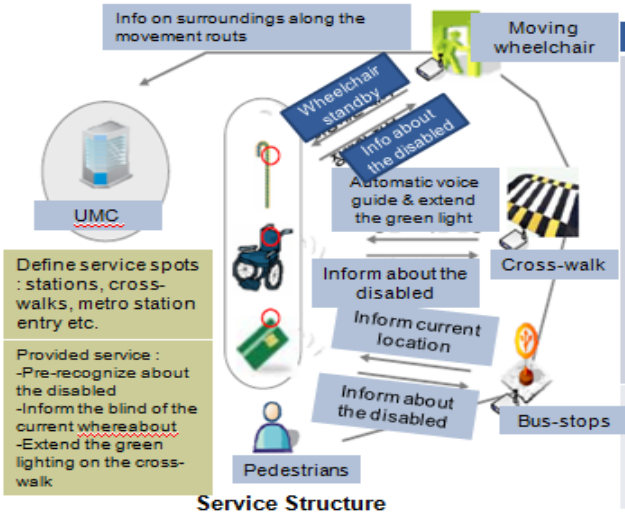
Service Structure

Service	Functions
Calamity information service	-Provide info on fire, calamity etc. -Provide remedial measures by connecting with National Emergency Management Agency
Traffic accident info service	-Provide traffic info on accidents, site situation, recovery etc. -Provide detour info by connecting with ITS
Weather info service	-Provide weather info on typhoon, earthquake, torrential rain, heavy snow etc. -Daily, weekly, monthly weather info -weather info on yellow dust, ultra violet ray etc.
In-Community monitoring service	-Provide sensor monitoring info on air quality, water quality etc.

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

5. Pedestrian Support Service

- Provide support to pedestrians for safe and comfortable street-crossing based on communication with RFID reader and traffic signal controller.



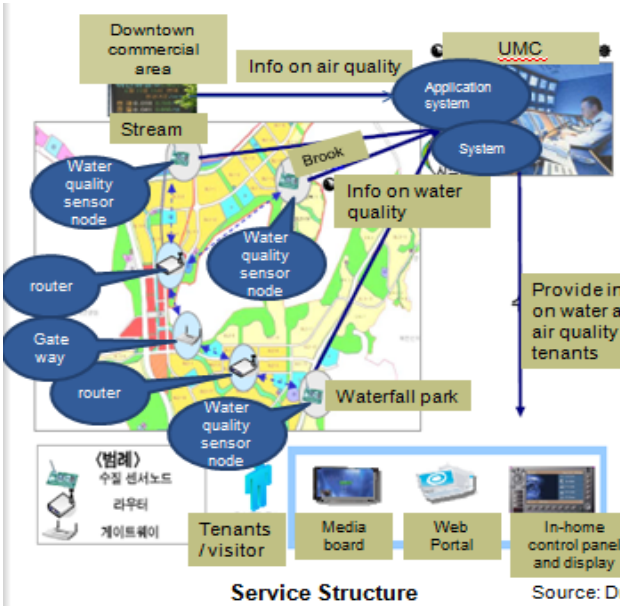
Service Structure

Service	Functions
Service for the disabled, aged, children etc.	-Give out RFID tag to the traffic minority such as disabled, aged, and children etc. (tagged cane, wheelchair, card etc.) -Install RFID reader in stations, cross-walk, and metro station entry etc. -Automatic recognition of the minority's approach -Inform the blind about the current whereabout -Extend the crossing time (green light) on the cross-walk -Call the moving wheelchair
Support service for transport admin	-Prevent cross-walking related accident -Improve work quality by managing cross-walks using advanced system

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

6. Environment-friendly Green Service

- Provide info on water and air quality to the tenants and visitors



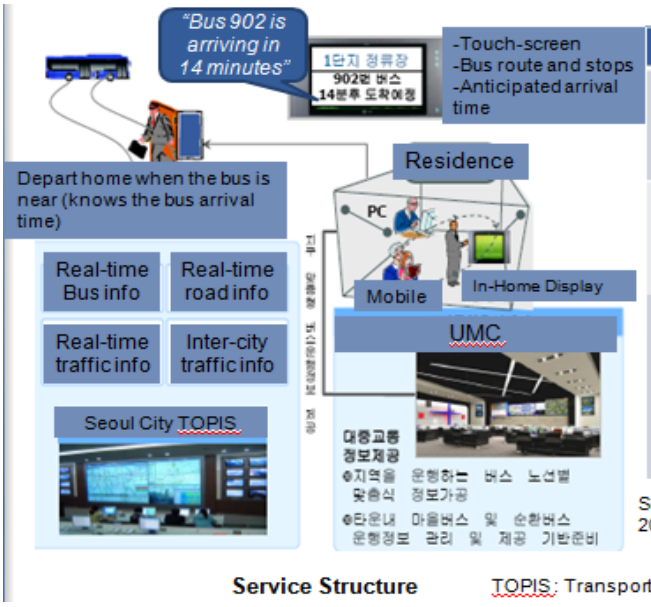
Service	Functions
Info service on air pollution and water quality	-Using sensor and USN etc., collect and connect water quality info -UMC provides environment info real-time to tenants/visitors via Portal/In-home control box and display / media board
Provided environment info	-Water quality :pH, dissolved oxygen/ atmospheric conductivity (water pollution) -Air quality : SO2, CO2, NO2, Ozone, fine-dust etc.
Places where sensors are installed	-Water : streams, brook etc. -Air : downtown commercial area

Service Structure

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

7. Transport Info Service

- Provide public transport information to users such as bus arrival, whereabout, map, surroundings of bus stations, city news etc.



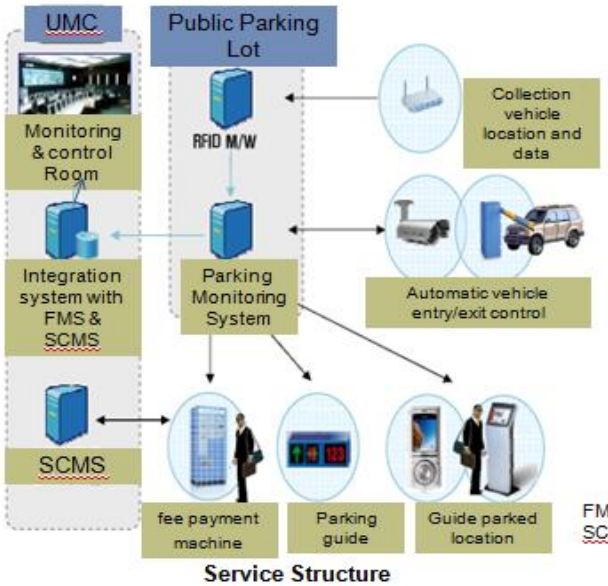
Service	Functions
Service for public transportation user	Inform passenger waiting at bus stop on the exact arrival time
Service for residents	Provide info on bus route, bus operation info, arrival time etc., to the resident inside house via In-home display
Service for city operator	-Increase more usage of public transportation by providing convenient user environment -Improve operation efficiency via real-time management of bus operation information

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

Service Structure TOPIS : Transport Operation and Information Service

8. Public Parking Lot Management Service

- Provide info on parking availability, available spot, and parked location to users



Service	Functions
Service for drivers and facility operator	-Minimize driving around to find a parking space by informing drivers of available parking spot -Increase utilization of parking lot and help planning

Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

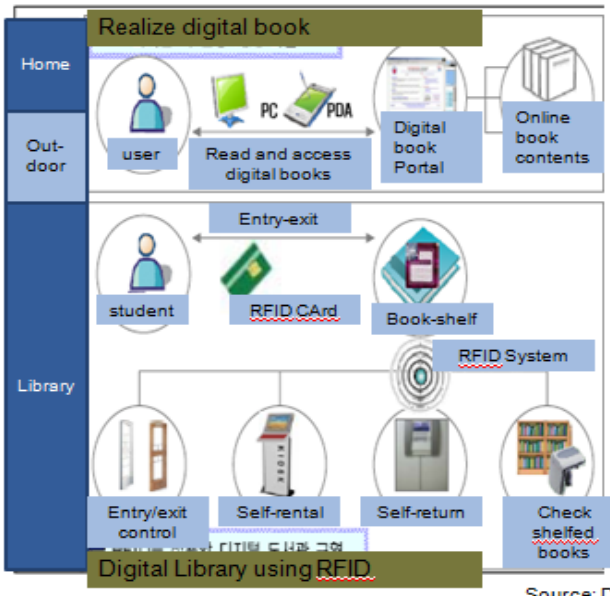
FMS : Facility Management System
SCMS : Smart Car Management System

Service Structure

9. Digital Library Service

- Use digital book outside library. Use RFID student card inside library to enter and exit the place, rent and return RFID tagged-books

- Ministry of Public Administation and Security together with Ministry of Culture, Toursim, and Sports is going to launch a "u-library service' project using RFID tag. The Ministries selected 6 pilot libraries in Seoul and Gwangju where RFID Tag-based library management sytem will be built. Also, smart phone based mobile application service will be provided that enables searching, reserving, and borrowing books and notice for book return via smart phones. 24-hour unmanned book borrowing and return service at major metro stations will be provided as well. Both Ministry jointly invest 800 million KRW of budget for this pilot service. Ministry of Public Administation expects 35% of cost savings by building a nationwide standardized RFID Tag-based library management system.



Service Structure

Service	Functions
Online library using digital book	-Convert various books into digital contents and provide them via PC or Tablet
Digital library using RFID	-RFID tag books in library. Via RFID reader, control entry and exit of users and allow self-rental and return of books - Improve library management based on RFID

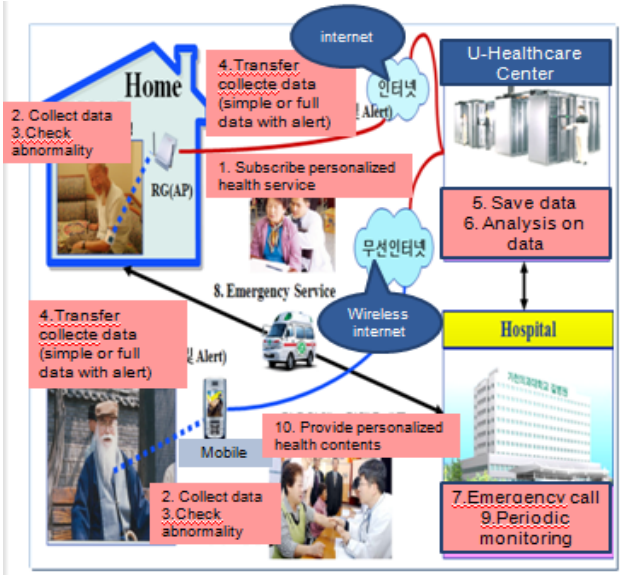
Source: Dr.JS Song, U-Engineering Unit, LG CNS / June 2009

10. U-Health Care Service

- Telemedicine and personalized health management service

- Measuring and transferring personal health data

- Remote monitoring on disabled, aged, etc., and connection with emergency agencies



Service	Functions
Telemedicine	-Health Center with information system for remote medical consulting and services (booking and online presription)
Energency medical service	-Remote monitoring on disabled and aged people and call to emergency agencies or hospitals with location information -expand medical service to social minorities (living in remote areas or under poverty)
Personalized medical service	-personalized medical services using personal measuring sensor and devices -provide health contents service

Source: Mr. Insoo Kim, IFEZ, "IFEZ U-City", Dec., 2010

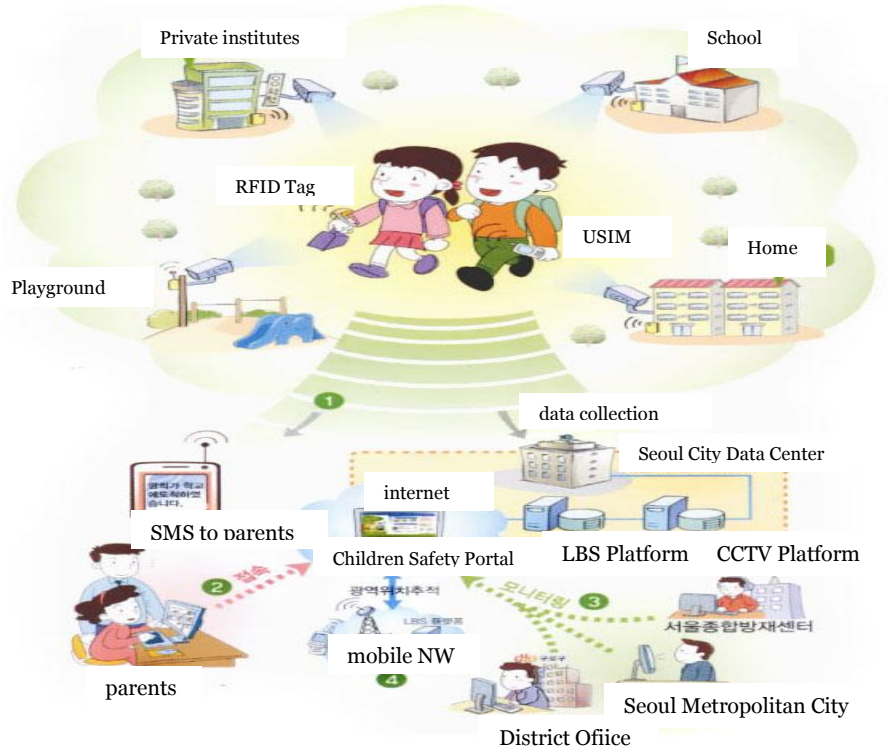
11. U-Port

Incheon Port Authority (www.icpa.or.kr) started U-Port system (so called "I-PUS") Phase 2 project with SK C&C who was the system builder for Phase 1 that provided one-stop logistics service from entry/embarking of cargo ships to cargo shipping. Phase 1 was to build an integrated platform for U-Port. Phase 2 is to build logistics ubiquitous system. Phase 3 will be to build Port Logistics Portal. In Phase 2, SK C&C will build Port Monitering System that is connecte to Ocean Safety Information System and Port Operation Information System of MLTM. Using RFID technology, SK C&C will build Port entry/exit control system and customer service information system that issues online and smartphone-based entry and notification documents. When Phase 2 is completed, Incheon Port Corporation will be able to track location of ships and navigation history based on electronic nautical chart and satellite video. Besides, mobile U-Tower contents using 3D augmented reality technology will be developed that enables virtual simulation of the lock gate of Incheon Port and passing ships, and marine transport control center etc.

12. U-Seoul Safe Zone Service

In 2009, Seoul City made a "U-Seoul Safe Zone" pilot project in Guro District and Dobong District in Seoul in which the technical feasibility was tested. In March 2010, Seoul City decided to build additional 5 U-Seoul Safe Zones by the 1st half of the year in order to prevent crimes against children. Those 5 selected zones are Seogyo Elementary School in Mapo District, Nammyoung Elementry School in Yangcheon District, Daedong Elementary School in Youngdeungpo District, Nokbeon Elementary School in Eunpyoung District, and Myounmok Elementary School in Choongrang District. After a survey on demand from 25 local governments, statistics on crime against children, and on citizens, Seoul City selected those 5 places. U-Seoul Safe Zone service can locate children to the accuracy of 50 meters within the Safe Zone and provide such location information to the parents of the children via mobile phone or internet (Children Safety Portal). This service is realized by USN technology. The service is to prevent

crimes against children or missing childrend. Also, it can help emergency rescue based on the accurate location information and CCTV data. For those children without mobile phone, Seoul City will give away RFID tag. For those children with mobile phone, Seoul Ctiy will give away USIM card with RFID tag function. In case a parent subscribes to Childrend Safety Service of mobile operators, they can use location tracking service of mobile operators that is connected to Seoul City's Childrend Safety Portal, when its chilrend moves out of the U-Seoul Safe Zones. Seoul City plans to expand this service to all the elementary schools in Seoul by 2013. Furthermore, in cooperation with the Ministry of Public Administration and Security, Seoul City plans to expand this service model to the nation.



Source: http://u-safety.seoul.go.kr/

Chapter IV. U-City Projects in Korea

As of October 2010, there are 53 U-city projects either ongoing or under planning by 36 local governments in Korea. U-City projects in Korea are classified in 3 different categories – Existing city type, New town type, and New city type.

(1) New City Type
New city type is limited to a case where the city construction is based on "Laws on Residential Land Development" and "Laws on City Development"

(2) Existing City Type
Existing city type is limited to a case where ubiquitous city basic infra facilities are applied to existing city.

(3) New Town Type
New town type is limited to a case there the development is based on "Laws on City and Residential Environment Improvement" and "Speical Laws for City Improvement Promotion"

In 2009, MLTM designated Busan, Incheon IFEZ (Songdo), and Seoul Mapo District as U-City pilot case and invested 2 billion KRW (2 million USD) respectively for each city.

City	Projects
Busan (Existing city type)	U-Anti Calamaties Infra Building for Intelligent Safe City
Incheon IFEZ (New city type)	Songdo district
Seoul Mapo (New town type)	Ahyeon New Town

Local Governments with U-City Projects

Types		Local governments
Existing City (17)		Gangwon, Gyeongbuk, Gwangju, Daegu, Daejeon, **Busan**, **Seoul**, Ulsan, Gyeongnam, Jeonbuk, Jeju, Gangreung, Suwon, Yangsan, Yeosu, Naju, Pohang
New Town (4)		Sangam DMC, Seoul Eunpyoung, **Seoul Mapo**, Daejeon Future-X
New City	New City (17)	Gwanggyo, Gimpo Yangchon, Gimhae, Namyangju Byeolnae, Daejeon Seo Nambu, Seongnam Pangyo, Sejong City, Asan, Yongin Heungdeok, **Incheon IFEZ**, Paju Unjeong, Hwaseong Dongtan, Goyang Samsong, Yangju Okjeong, Werae Songpa, Hwaseong Hyangnam, Chungnam provincial office relocation city
	Innovation City (10)	Gangwon, Gyeongnam, Gyeongbuk, Gwangju/Jeonnam, Daegu, Busan, Ulsan, Jeonbuk, Jeju, Chungbuk
	Enterprise City (6)	Muan industrial trade type, Muju tour and leisure type, Youngnam-Haenam trou and leisure type, Wonju knowledge basis type, Chungju knowledge basis type, Taean tour leisure type

1. New City Type U-City Project : Songdo Pilot Case

- Total Songdo U-City Project period : 2003-2020
- Total development land : 53 km2
- Total budget : 167.9 billion KRW (167 milion USD) (9.52 billion KRW for designing and 158.38 billion KRW for construction)
- Goal of the development : building an international business district with high technologies
- U-Service provision plan

Phase 1 (2008-2009)	Phase 2 (2010-2014)	Phase 3 (2015-2020)
•4 basic public U-services as a pilot project.	•Various contents •Link tourism and shops •Public-Private Special Purpose Corporation will be established to provide U-service for the private sector.	•Focus on user needs •Various value-added services •Business model

- How the city finances social infrastructure building : The development contractor pays 1% of the total development project costs to the city, which is used to build basic public facilities such as CCTV system, Wi-Fi, Broadband, environment monitoring system etc.

- **U-Service pilot test project** : In 2009, MLTM selected Songdo's 2 and 4 Blocks as one of U-City pilot site. The pilot project period is between May 2009 and Dec.2010, with the budget of 5.6 billion KRW (3.2 billion from the State and 2.4 billion from the City). IFEZ (the project owner of Songdo) contracted KT (the biggest telco in Korea) to build and operate 4 pilot U-Services in Block 2 and 4 (2,640,000 square meters) within Songdo New City that are ;

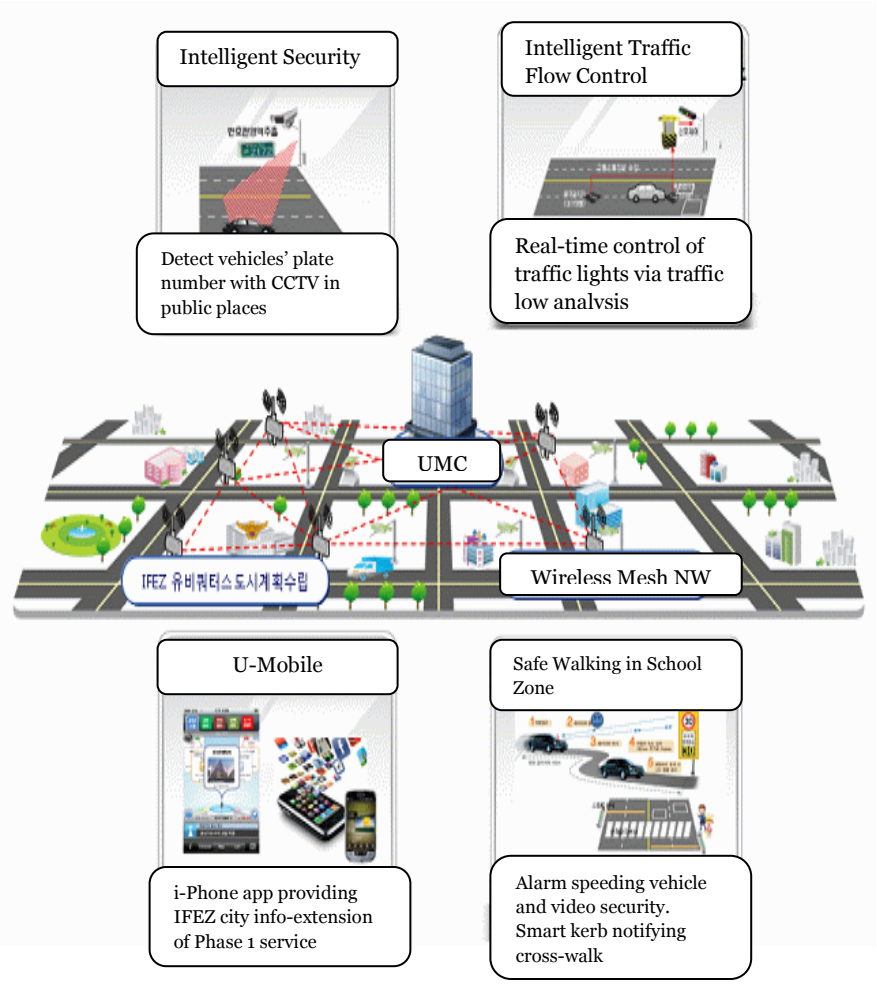
  (1) Wi-Fi Service

  (2) Intelligent Situation Awareness Security Service

  (3) Public Parking Lot Service (inside the new convention center)

  (4) Providing Public Information via Home Network.

  This pilot project will be extended to Phase 2 betweeen Dec.2010 and June 2011, with the budget of 3 billion KRW (1.5 billion KRW from the State and 1.5 billion KRW from the City). During Phase 2, 4 U-services will be developed and provided – (1) Intelligent Situation Awareness Security Service, (2) Intelligent Traffic Flow Control Service, (3)U-Mobile Service, and (4)Safe Walking in School Zone.



- Currently, **only public sector U-services are available** in Songdo such as Anti-crime and calamities, Tranport, Environment, and Facility management that are operated by IFEZ (the city authority where Songdo belongs to). For private sector U-services, IFEZ will establish a public-private Special Purpose Corporation (SPC) in 2011 in which Incheon Development Corporation, Cisco, Portman (a US company), KT, NSIC (New Songdo International Corporation that is a JV between POSCO E&C and Gale International) and Samsung SDS will participate as investors and have the SPC build and operate the private sector U-services.
- **Export** of Songdo U-City project model to China, Malaysia, Indonesia etc., is under discussion.
- Feedback on the current public U-service : The police finds the current anti-crime service very efficient as the intelligent cameras automatically detect and report vehicles entering and exiting Songdo.
- Development of IT system and solutions in Songdo : **Songdo U-Life Corporation**, a joint venture between NSIC (JV between POSCO E&C and Gale International) and LG CNS, is in

charge of designing, building, operating (O&M), and marketing of ICT system and solutions in Songdo.

- **Challengages** : In the beginning, IFEZ had difficulties with conceptualizing the U-City. The City percieves U-City as a public telecom network infrastructure where U-services are built on. However, as the public telecom network (built and owned by the City) only can provide public services that can not be charged to citizen users (because if it is charged to citizens, then it becomes a profit-making private business that is not allowed by the current Korean legal framework), the City alone can't develop or provide charged private U-services over its telecom network. That is why the City started with the 4 basic public sector U-services. Without a business model that can generate revenue from the public infrastructure, the City can't afford operational costs of the U-City. Also, some public services like anti-Crime (that is currently provided only in the public spaces where network, sensors, and CCTVs are installed) must be connected with private sector in private buildings. Therefore, **publi-private collaboration has become the key-word at the moment.**

2. New Town Type U-City Project : Mapo Case

- Project Period : Phase 1 : Nov.2009 – March 2010 / Phase 2 : ongoing
- Nature of the project : Redevelopment of an old county within an existing city (3.5 square kilo meters)
- Goal of the project : (1) Redevelop and refurbish old county (2) Built district's own telecom network and operation center, (3) Develop citizen-friendly and engaging and sustainable services
- Key success factors : (1) Citizen-friendly and engaging services, (2) Reusae of existing infrastructure and integration, (3) Continuous development and improvement of services, (4) Efficiency in operation
- U-Service provision plan

City Information System	U-Safety	U-Community
• Smart Post • Info Booth • UCC Zone	• U-Pole • Safe Driving	• Silver Lounge • U-Learning • U-Healthcare • U-Senile

Smart Post

Touch screen display installed in the town that has functionalities as below ;

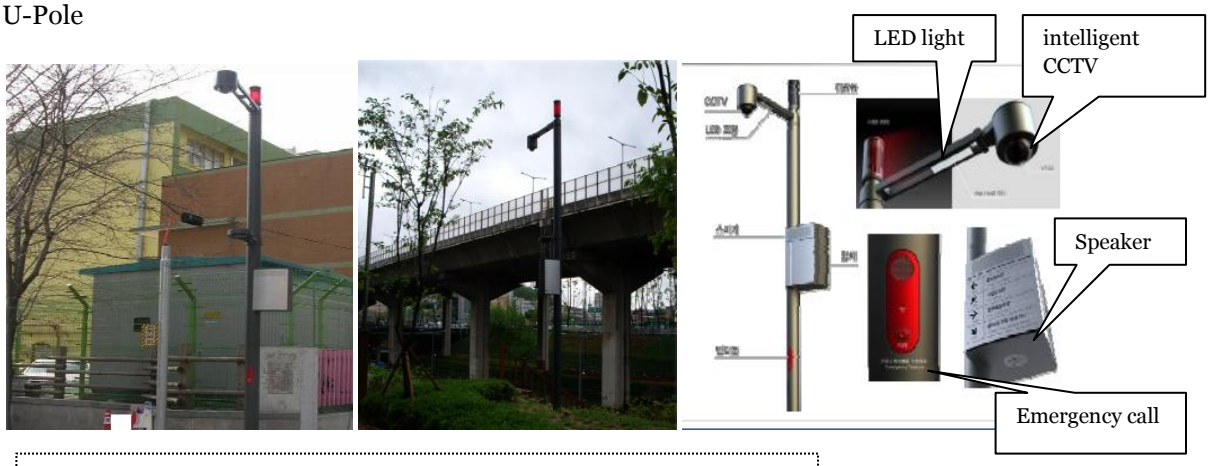
- public transportation information, map and route info
- public telephone using T-Money (mobile payment)
- photo-taking and email
- searh shops and restaurants
- tour and cultural info
- info on banks, public offices, hospitals etc.

Infor Booth

Service that provides various contents through the media booth.

- Route guide
- UCC video contents
- Guide on sports and cultural events
- Announcement of public and district news
- Broadcast district events

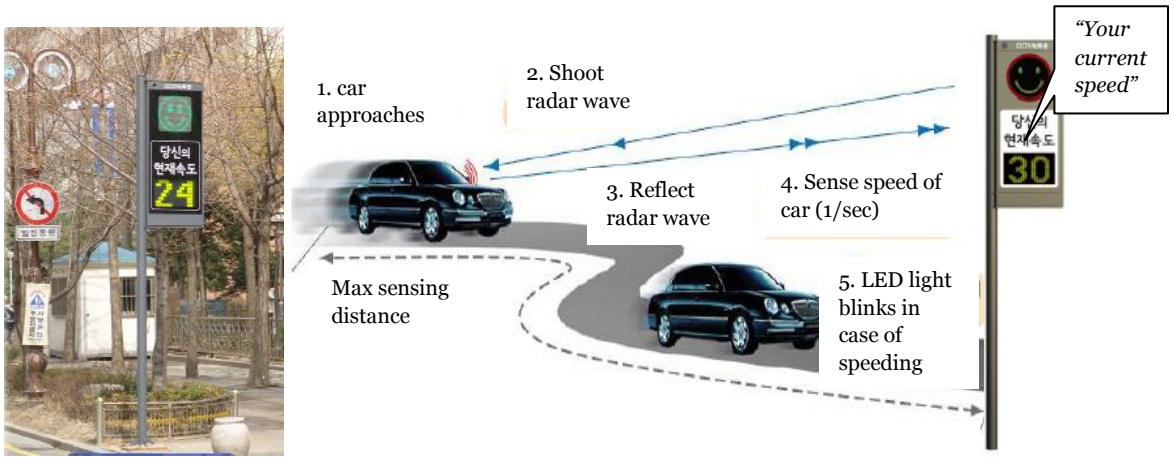
U-Pole



Security and safety service.

- Monitors the vacinity
- When emergency happens, the alarming light and sounds work
- Real-time video data transfer to the operation center
- Call to the operation center in emergency
- Remote control of the Pole
- Link to the police in emergency

Safe Driving



Service that gives a notice to a driver when a vehicle enters the School Zone so that the driver can slow down ;

- The signage blinks when a car approaches School Zone speeding over 30 km/h

3. Existing City Type U-City Project: Busan Case

- Project period :
  Phase 1 : 2006 – 2010 : 5 Service areas including transport, tourism/convention, health, port, and anti-calamities.
  Phase 2 : 2008 – 2012 : Integrated City Management Center, U-School
  Phaser 3 : 2010 – 2012 : Environment, Entertainment
- Project budget : 140 billion KRW
- Progress as of 2010 :

Major Tasks	Progress
Set U-City Master Plan (Nov.2005)	Phase 1 (2006 ~ 2010) : Transport, Tourism, Health, Port, Anti-Calamities Phase 2 (2008 ~ 2012) : u-School, Integrated City Management Cente Phase 3 (2010 ~ 2012) : u-Environment/Entertainment, Host an international IT forum
National U-Port Project (2006 ~ 2009)	• Phase 1 of Port efficiency improvement project using RFID • Built Single-Window(Common system for export/import information service) system • Built SP-IDC(Common shipping and logistice information service) system
U-Infra and Pilot Service (2006)	• MoU with the private sector on invesetment into Super IT Highway • Built u-Convention system • Built u-City tour service system

	• Built U-Health system between sanatorium and healthcare institutions • Built USN monitoring system on Gupo Bridge
Set basic plan for each area (consignment) (2007)	• Basic design of u-Transport system (15 service were designed) was consigned • U-City anti-calamity system was consigned (calamity prediction system etc.)
National pilot project and local service (2007)	• Phase 1 of u-Tourpia project (public and private) : tour info service via handheld device, Fun beach service, free Wi-Fi along Haeundae Beach • Upgrading u-Health project : 16 public health centers and sanatoriums are linked with telemedicine system • U-Emergency medical service piolot project (2007-2009) : a national pilot project • Built USN monitoring system in Mandeok Tunnel
Expand ubiquitous infra (2008)	• Completed Busan Super IT Highway (319 public organizations are equipped with own 1,278 km of broadband network • Built integrated CCTV system (phase 1) • Built 3D City GIS system
Expdn ubiquitous infra, pilot city project (2009)	• Selected as a pilot U-city by MLTM : built U-anti-calamities infra platform • Built 24 Wi-Fi Zones • Built integrated CCTV system (Phase 2)

- Projects and Budget (2006-2009)

Year	Project	Contents	Budget (100 million KRW)			
			Sub-total	State	City	Private
Total			892.1	467.2	366.7	58.2
2006	u-City Tour Service	2 double-deck tour bus, u-tour info service	10.3		10.3	
"	u-exhibition/convention service	BEXCO facility management, U-conference including multi-array etc.	29.4	12	17.4	
"	u-Health phase 1	Health monitoring and telemedicine guidance service among 6 public healthcare centers and 5 sanatoriums	18	4.5	3.5	10
"	Prediction and alarm system for earthquake and tsunami	32 units of coastal alarming system and 14 units of CCTV	20	12	8	
"	USN monitoring system on Gupo Brand Bridge	28 sensors in 5 different types of vitravtion and deformation : enabling remote monitoring	2	2		
"	Improve efficiency in port logistics using RFID	Built 3 port operation and management systems, installed RFID readers in 199 spots, RFID tagged 28,000 units of vehicles	41	41		
"	Single Window	Built common export/import information system	89	89		
"	u-Transport basic design was consigned		7	7		
"	u-School pilot project	Built infra, u-learning system, USN environment in 1 elementary school	10			10
2007	u-Tourpia project	Tour Portal, tour information contents, u-device	14.5	5.5	8	1
"	Fun Beach Haeundae	Tour infor contents about Haeundae Beach, UCC Zone, Wi-Fi Zones	16	7	5	4

“	u-PIFF (international film festival)	During the film festival, RFID-based film information contents and show room	16	4		12
“	Expansion of u-Health phase 1	Health monitoring and telemedicine guidance service among Public healthcare centers (10), sanatorium (10). 1 telemedicine center	7		7	
“	u-119 Emergency medical guidance service	10 units of 119 ambulences , Emergency medical center of 6 hospitals, fire station	22.4	4.7	8	9.7
“	Strategy set-up for u-anti-calamities system was consigned	11 target system, 4 target services, 3 basic infra management	3		3	
“	USN-based Turnnel safety monitoring system	40 sensors in 10 different types of vibration and deformation sensors were installed in Mandeok 2 Turnnel.	6.1	5.1	1	
“	ETCS	Built ETC system in East-West Highway	19.5		19.5	
“	u-School pilot project	Built infra, u-learning system, USN environment in 1 highschool	10			10
	RFID-based port logistics efficiency improvement	Built 3 port operaiton and management systems (phase 2)	17	17		
“	Real-time cargo location tracking service (RTLS)	Built RTLS/USN infra in container terminal	8	8		
2008	Super IT Highway	Payment for BTL (Build-Transfe-Lease)	14.3		14.3	
“	ETCS	Built ETC system in Gwang-An Grand Bridge	18.5		18.5	
“	Storm and flood prediction system	Built meteorological prediction technique, flood and tsunami prediction system	2.5	2	0.5	
“	Integrated CCTV for security and safety	Installed 150 units of anti-crime CCTV, surveillance system, and related SW	17.5		17.5	
“	Realtime cargo location tracking service (RTLS)	Built RTLS/USN infra in container terminal	28	28		
“	SP-IDC	Built common shipping and port logistics information system	15	15		
“	u-Tourpia phase 2	Tour Portal, u-Tour Guide	20		20	
“	u-119 emergency medical guidance service system	10 units of 119 ambulence, telemedicine equipment and device for medical guidance to 28 emergency medical centers	9		9	
“	USN-based turnnel safety monitoring system	Installed sensors for vitration, deformation, CO2, lighting, cracks etc., in Gudoek Turnnel	7.8	4.8	3	
“	WiFi Zones	Built 10 Wi-Fi Zones	8.2		8.2	
2009	u-IT-based city facility safety model	Built USN-based safety management system for highways and underground shopping malls	10.4	5.4	5.0	
“	Children safety system in Haeundae Beach	300 RFID-tagged bracelets to prevent missing children	0.5		0.5	
“	Operation of Super IT Highway	Payment for BTL	37.5		37.5	
“	u-anti-calamity infra platform	Built integrated platform, remote control system in drainage pump facility, u-device	37	20	17	
“	2010 ITS Congress preparation	Service Center for transport information, transport information, support for ITS World Congress, Bike ITS, Airport limousine bus information, etc.	238	135	103	
“	Integrated anti-crime	Builted anti-crime CCTV, surveillance system, and	22	6	16	

	CCTV system (phase 2)	related SW				
“	u-Tour information system	1 unit of DID UCC Tour booth, 10 units of tour guide kiosk	3		3	
“	RFID-based roadside trees and park management system	Installed RFID tags in 90,000 units of roadside trees and built onsite management system	3	3		
“	Realtime cargo location tracking service (RTLS)	Built RTLS/USN infra in container terminal	24	24		
“	Intelligent monitoring system for Nakdong ecological environemnt	Installed water quality sensors. Provide information on sensed quality.	9.7	5.2	3	1.5

Chapter V. R&D Projects for U-City in Korea

The Korean government earmarked 110.8 billion KRW for R&D of core technologies between August 2007 and April 2013 in order to stimulate the U-City industry. Main R&D areas include integrated platform, construction-IT convergence technologies, standard service model etc.

1. U-Space Technology Program by MLTM

"U-Space" is a technology R&D program managed by MLTM to support development of core technologies for U-City. "U-Space" is an advanced future urban space that provides U-services such as public administration, transport, environment, safety and education via converged technologies that enable communications among human, space, and machines. In order to realize such U-Space, the "U-Space" program conducts researches on ;

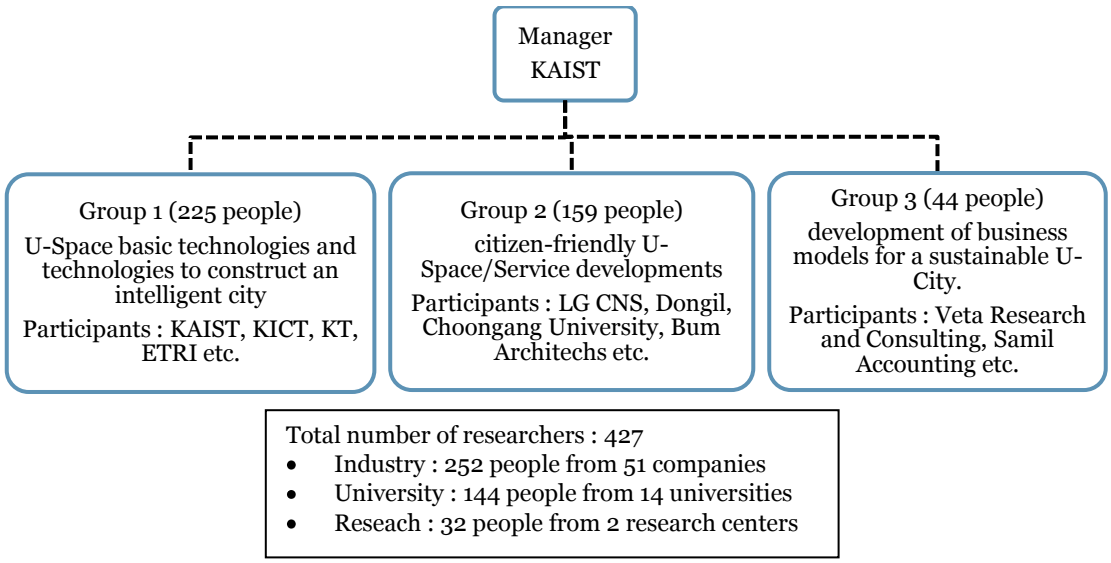
(1) U-Space basic technologies and technologies to construct an intelligent city

(2) citizen-friendly U-Space/Service developments

(3) development of business models for a sustainable U-City.

These researches will help (1) building a systematic foundation for applying ICT technologies to construction, (2) developing construction-ICT convergence basic technologies, (3) giving intelligence to urban infrastructures and operation, and (4) developing and providing services that are used by citizens for every day life.

Organization of U-Space Program



1.1 U-Space IT-Construction Convergency Technology

In case of construction-IT convergence technology, Korea's technological level is only at 60% of the advanced country's while it accounts for only 0.21% of the global market share (US 41.8% and UK 14.5%) . Although construction capability of Korean construction companies are excellent, their engineering and designing capabilities for hightechnology is not top-notch. KAIST's research under the U-Space program summarizes Korea's status as below;

Technology Area	Infrastructure	Status of Korea compared advanced countries				
		behind	slightly behind	equal	better	superior
convergency technology	number of experts	X				
	R&D results	X				
	Standardization	X				
Intelligent construction technology	number of experts		X			
	R&D results		X			
	Standardization		X			
Construction IT infra technology	number of experts		X			
	R&D results		X			
	Standardization	X				
Integration management of infra	number of experts		X			
	R&D results			X		
	Standardization		X			
Construction and new materials	number of experts	X				
	R&D results	X				
	Standardization	X				
Building group management	number of experts		X			
	Built infra				X	

Source: Report by KAIST on U-Eco City Project, April 2010

Detailed technology area	Advanced countries	Majoy players in Korea	Level of development (compared to advanced countries)
convergence tehcnology	USA, EU	Architectural Institute of Korea, Korea Road and Transportation Association	80%
USN	USA	Seoul NationalUniversity, Hanyang University, Korea Electronics Technology Institute (KETI)	80%
GIS	USA	Seoul National University, ICU, ETRI	60%
BIM	USA	Yonsei University, Kyunghee University	60%
NFC	USA, Japan	Seoul National University, Jeonbuk University,	70%

		SoonChunHyang University	
DSRC	Japan	Korea Instute of Construction Technology (KICT), Korea University	70%
Environment monitoring technology	EU, Japan	KICT, Korea Infrastructure Safety and Technology Corporation, ETRI	60%
Building facility/energy monitoring technology	USA, Japan	Samsung SDS, Hanhwa S&C	60%
Building group management	USA, Japan	Samsung Everland Co.	40%

Source: Report by KAIST on U-Eco City Project, April 2010

1.2 Application of IT infra technology to U-Space

The goal of this research is to develop common IT infra technologies needed for intelligent urban facilities and to distribute them in a test-bed. For this, researches on RFID/USN technology, situation awareness technology, video tracking technology, media board technology, and technology for building intelligent space are being conducted.

(1) Goal

Develop common IT infra technologies and various application models of them within U-Space that are needed for realization of intelligent urban facilities and provision of intelligent services.

(2) Implementation Strategy

- Refrain from development of source IT technology
- Solve practical issues such as applying IT technology to physical space and operation of such spaces
- Research how to package (for integration) individual technology

(3) Research contents

Tasks	Contents
Technology for operation of U-Space network	Technology to deploy RFID/USN in U-Space (how to compose mesh network using USN and define architecture) • Research on IP-USN performance • Research on WiBEEM performance • Compare vairous USN engrafting possibilities • Find appropriate mesh network technology • Research various application scenarios by each U-Space • Research applicable USN technologies based on found scenarios • List up requirements for building sensor networks in U-Space • Find appropriate USN technologies in accordance to the requirements

	Technology to operate RFID/USN in U-Space
Multimedia terminal network in U-Space	Technology to integrate dispersed multimdeia terminals • Study on large outdoor displays and their efficiency • Define public services and information type and scope providable on displays • Set interaction design target for media board (use modeling and concept design, service scenarios, and interface sketch work) • Develop 3D-based media board UI and guidance system
Change awareness system in U-Space	Situation awareness engine in space
	Situation awareness platform in space
	Indoor and outdoor location recognition system
	Sensor fusion-based behavior awareness system in space
	Intelligent space component
RFID reader packaging technology and operation technology	Technology to install RFID in concrete and RFID reader packaging technology • Research on methods to install antenna and readers in concrete • Develop RFID operation system and integrate with USN network • Build servers such as SAVANT, PMI, ONS in order to build interface for realtime RFID control and location recognition
SW for user tracking and behavior regonition based on video analysis	• Research on single sensor-based behavior recognition and conversion between different sensors • Research on multi sensor-based behavior recognition and human tracking technology • Sensor fusion-based behavior recognition and location tracking module

(4) Nature of research outcome

- Technology analysis document
- Guidelines for implementation
- Software
- Protype
- Techology package

(5) Major Korean Players

Technology Area	Companies
Mesh Network using USN	Raiopulse, Nuri Telecom (ZigBee), Korea Wireless Network (ZigBee Stack and module) , Octacom, TSC System (ZigBee), Orange Logic (ZigBee), Reitech (WeBEEM)
Multimedia information among different devices	Samsung Electronics, LG Electronics, KT, KAIST, GIST, Korea University, Yonsei University
Space situation awareness engine	N.A
Space situation awareness platform	Korea is behind. ETRI, Seoul National Univeristy, KAIST, ICU, Ubiquitous

	Computing Center (Sungkyoonkwan University)
Seamless user location recognition between indoor and outdoor	WLAN, UWB, Ultrasonic wave, Infra-red, RFID etc., are used for locationing, but there is no service available for indoor location service. ETRI, Point-I, Samsung Electro-Mechanics
Intelligent space composing component technology	Intelligent indoor floor space requires structure, materials, engineering, space characteristics, facility engineering, environment perspectives, and chemical fusion between construction technology and ICT technology. However, it is very hard to find any meaningful R&D in Korea in this area. Some activities include the below ; • Smart Location Tracking System (by KIST): Recognize a user by changing resistance value from the RSF sensors installed in 4 corners of a floor. • Music Player with Smart Floor (by KJIST UVR Lab, IVR Lab) : Music is played by smart floor where on/off switches are installed • Naviwalk (by ID Phone) : Using IDF, RF IC Tag, TTS (Text to Speech) algorithm provides location information to a user.

1.3 R&D projects under U-Space

No.	Researching Org	Name of Projects (Completion of the research)	Description
1	KAIST, KIST, Kyung Hee University	Anti-missing child service in parks (04.2012)	Using RF receivers installed in parks, location of child can be tracked realtime and checked via Web
2		Media board service for in-park information (04.2010)	Kiosk-type media board to provide in-park information
3	KAIST	U-bridge safety management system (10.2012)	Analyse and predict the sturucture via accurate modeling and deformation rate
4		Realtime BOD/colon bacillus sensor system (03.2010)	Sensor system to sequentially measure amount of BOD/colon bacillus in water
5	KT	Pedestrian crossing safe walking service (04.2011)	Change the conventional vehicle stop line in the pedestrian crossing into smart curb and install USN sensor node in the pedestrian light to assist safe crossing
6		Law enforcement service on illegan U-Turn (04.2011)	Through connection with pedestrian light and streetside traffic lights, sense vehicles violating U-Turn sign and transfer the collected data to the Police Station's system
7		Unmanned onsite inspection service (04.2010)	On the Service UI, access the Onsite inspection robot and transfer or store data to urban facilities service system,

			and connect with fire stations or police stations systems
8	LGCNS	U-Anti crime service (Intelligent integrated surveillance service) (04.2013)	Use intelligent video analysis solutions to improve surveillance and reaction efficiency
9		U-Anti crime service (Wireless device-based video data sharing service) (04.2013)	Share video data tranferred from the onsite CCTV with relevant parties located in outside the surveillance center
10	Asiana IDT Kookmin University	Home_Home Network service (04.2011)	Build home network and test-bed to prive U-service by connecting unit residence, community network, and internet network
11		Home_U-Helper IPTV service (04.2011)	Connect existing Wall-pad type in-home indoor environment control and monitoring system with Set-top-Box to provide control service via IPTV
12		Home_Parking connection service (04.2012)	Control on vehicles entering the parking lot of the complex and guide the vehicle into available parking space
13		Home_integrated remote controller service (04.2012)	Remote controller connected with Wallpad to control in-home applicances and equipment
14		Home_Wireless switch service (04.2013)	Control wireless lightings and gas valves
15		Home_Telemetering and realtime display of consumed electricity (04.2011)	Monitor realtime consumed electricity at home through U-device and home network equipment
16		Home_U-Helper Fall-off sensing and emergency call service (04.2012)	Monitor anged people's falling off via biological info sensor and fall-off monitoring sensor and notify the emergency situation to guardian
17		School Zone_Children safe return service (04.2010)	When a school is locate inside the residential complex, track the location of students so that parents can moniotor the location and surroundings via CCTV
18		School Zone_Entry and Exit info service with Student ID Card	Using student ID card, monitor entry and exit of students to and from school and provide information
19		Playground Zone_Digital play apparatus service (04.2012)	Using digital video equiment, provide emtional play service
20		Playground Zone_Safe playground service (04.2013)	Using video recognition technology, identify the residents and control the entry. Enable parents at home and the security center to monitor the children in the playground and its surroundings via CCTV
21	Ubidus System Hongik	Mediaboard service (04.2013)	Provider interactive contents via mediaboard

22	University	USL Trainer service (04.2013)	Based on intelligent street lights installed with digital display and serving as network infra, provide weather info, customized excersie course, and excersie performance information
23		On-site ecological park education service (04.2013)	For ecological park education service, use RFID technology.
24		Integrated usage servic in Parks (04.2013)	Using Samrt Key (active RF Tag), user identification and authentication and charge/post payment functions. Location recognition service.
25	KT	Loaction-based fire alarm and evacuation announcement service (04.2013)	Apply location-recognizing communication module in fire sensor in each household. In case of fire, send the fire signals to relevant organizations. Provide exact fire location via display and tranfer visual evacuation routes to the display.

2. Realtime Bridge Monitoring Web GIS System

- Via Web GIS, conditions of bridges can be monitored realtime.
- DB about 7 bridges in Seoul wer built.
- Web GIS is
- Web GIS is composed of Web GIS client, server software, space DBMS, web server and web browser.
- Information about the conditions of the bridge is provided realtime to users via fixed line and wiress communications networks.

Monitoring service	displacement, acceleration, direction and velocity of wind, temperature
Visualization techniques	Using 2D Map, mapping the information layers of 'road, river, building, bridget' etc.
Monitoring technologies	Web GIS technology, LANDSAT video data, Realtime DB, ArcMap
Result	Realtime monitoring via wireless senwor network Builing and managing data via Web GIS system
Key Participants	KICT (Korea Institute of Construction Technology) Data PCS (www.datapcs.co.kr) Konkuk University

3. Parking Lot Infomration Management System (Songdo IFEZ)

Project concept	Provide parking information via outdoor displays about nearby parking lots

Web Interface	-Via WiBEEM wireless module installed in each parking unit space, data is collected and transferred to GateWate PC. -Build management system interface for parking lot operators
Monitoring service	-Parking info collection service : Parking occupancy info is collected realtime -Process and provide parking info : process occupancy data collected from the data collection system and calculate the available parking space which is provided via outdoor parking guide display
Monitoring info visualizing technique	-Collected parking info is transferred to GateWay PC program by module
Main monitoring technology	-WiBeem Sensor Node (sensing parking occupancy via ultrasonic sound) -Wireless Mesh (data transfer via wirless network) -WiBeem GateWay (process transferred data and tranfer PIS server)

4. U-Health Projects

According to a ETRI report, published in 2006, "Market opportunities and potential of Ubiquitous City", U-Health was surveyd the most willing-to-use service follwed by U-Home Networking, U-Anti-Crime, and U-Car. The government's U-Health goal indicator is to increase U-Health user percentage upto 40% by 2018 from 0.02% in 2008 and to expand the domestic U-Health market size to 2 trillion KRW by 2013 and further to 8 trillion KRW by 2018. By 2013, the government estimates that there will be 12 million people with chronical illnesses. In order to cope with the emerging market, the government will foster development of U-Health related system, sensors, and service platforms, on which commercial service models will be developed around the area of remote monitoring, early diagnotics, and health management.

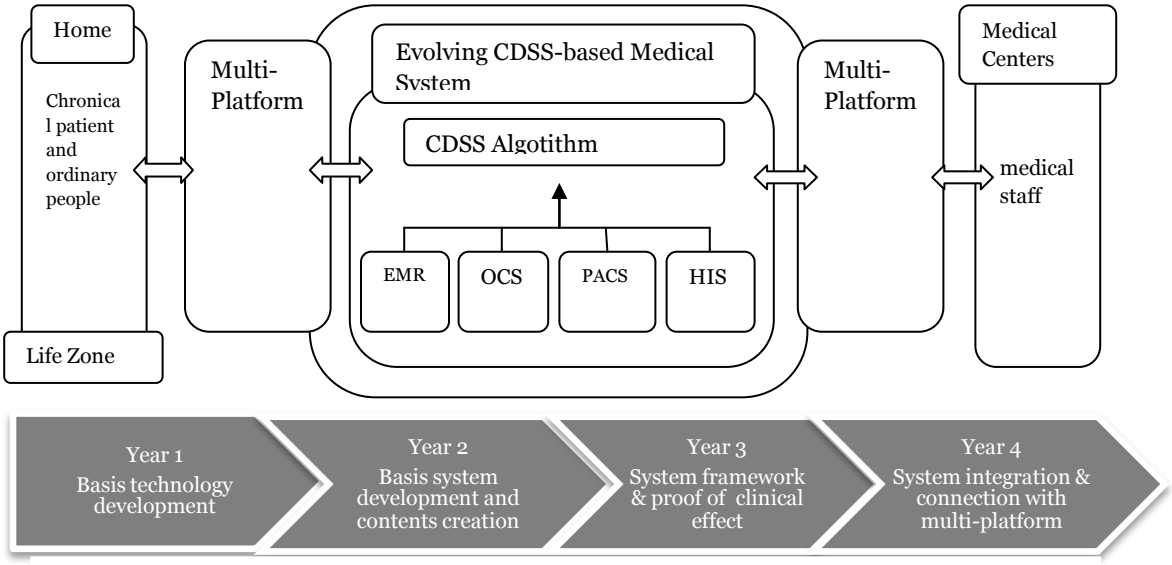
4.1 Smart Care Pilot Project

- Participants : Hospitals (6 general hospitalsincluding SNU Hospital, Severance Hospital, Samsung Medical Center , 100 clinics, 30 sanatorium), SK Telecom, Samsung Electronics, LG Electronics, Infopia, Insung, local governments (Gyeonggi, Chungbuk, Daegu, Jeonnam)
- To help patients with chronical disease such as diabetes, lung disease, caner (survivor), hypertension, to monitor and manage their health conditions via medical service using IT technologies
- 20,000 patients for clinical tests
- March 2010 – Feb.2013
- Investment : Total of 29.7 million USD (Central government 6.7 million USD, local government 8.3 million USD, private 14.5 million USD)
- Composed of U-Home Care and U-Silver service
- Contact person at Ministry of Knowledge and Economy : Mr. Jun-Dong Kim, New Industry Policy

4.2 U-Health Health Management Service in Songdo, Incheon

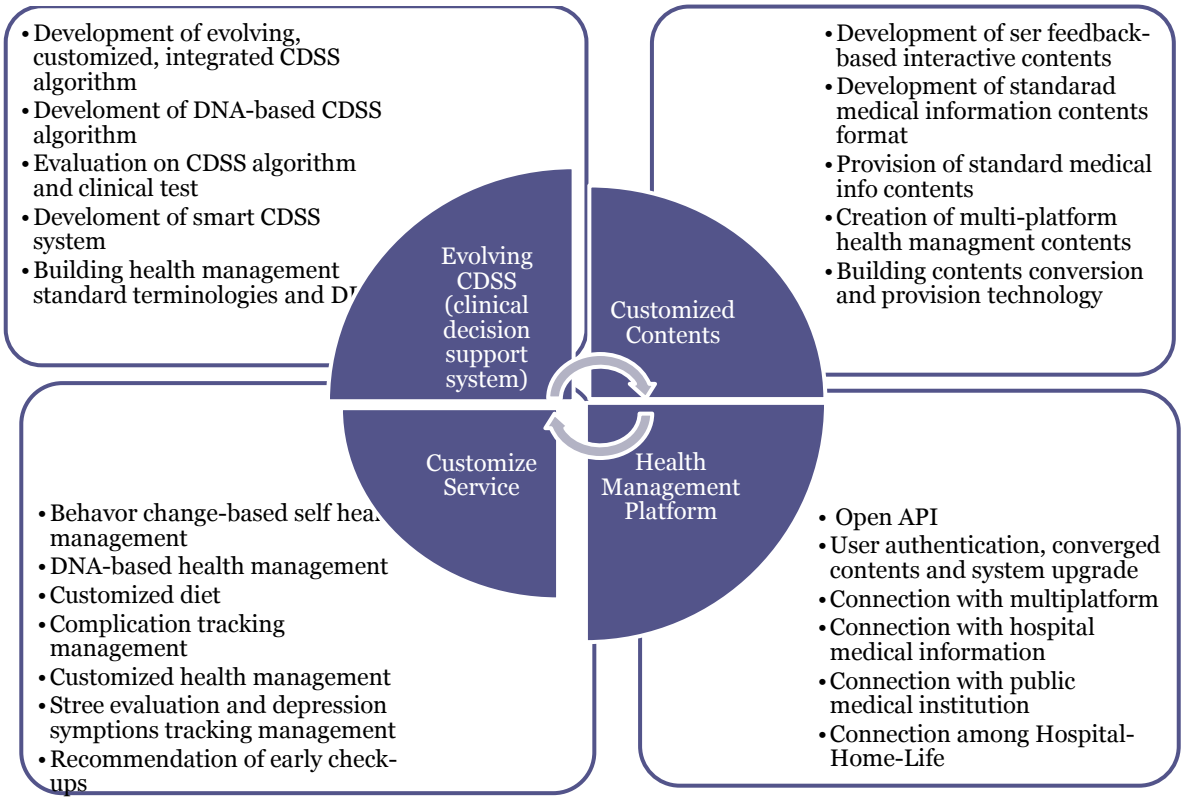
Definition of Health Management Service is a service that provides consultation, education, training and practice program and related value-added services that improves life style and guides optimal health management for the purpose of maintenance and improvement of health and prevention and and anti-deterioration of disease.

Multi-platform-based health management and improvement service technology development for chronical patients (Dr. Dong-Gyoon Park, U-Healthcare Center, Gachon University Gil Hospital)



Picture by Dr. Dong-Gyoon Park, Gachon Univ Gil Hospital, Oct.1, 2010, U-City Conference Incheon 2010

CDSS: Clinical Decision Support System



Picture by Dr. Dong-Gyoon Park, Gachon Univ Gil Hospital, Oct.1, 2010, U-City Conference Incheon 2010

4.3 U-Healthcare System Pilot Project by Seoul Metropolitan City (in 2009)

- Bit Computer Co., Ltd together with GC Healthcare won the project in 2009.
- Bit Computer is to develop and build system while GC Healthcare is to provide health management service using healthcare experts and solutions
- Through medical equipment installed in U-Healthcare Center of Seoul Metropolitan City, bio data such as blood pressure, blood glucose level is measured and sent to health management server over the Web together with diet and excertise diaries. Healthcare experts privides advices through telepresence or home-visit. The pilot will be made available firstly to about 150 people who have chronical disease and senile altzheimer disease with lowest income in 5 slams in Seoul. Based on the result of this pilot, the service will be expanded to other areas and citizens.

4.4 U-Health Lifecare Service in The Classic 500 (Senior Tower) in Star City

- Unmanned health information measuring and collecting system
- Conduct health check-up at the time of moving in

- Measure realtime blood pressure and blood glucose level and send the data to the centralized data system. Measured data is sent to Lifecare system managed by inhouse medical doctor and to Fitness system that manages exercise functions.
- Using the U-Health smart tag given to each resident, the service user can retrieve its own accumulated data from the unmanned health measuring system.
- Bio info mesasured from body weight, blood pressure, blood glucose level is analysed by the inhouse medical doctor, nutritionist, and fitness trainer, after which they provide personalied advices and programs.
- The service is already available for the tenants
- 24 hour available nurse residing in the building
- Fitness center of 2,314 m2 inside the builing
- Home network system with 6 star-hotel level of suite room and service – vallet parking, parcel keeping, one-stop call center, personal concierge, house keeping, front-desk services
- Community services – learning, workshops, dance, yoga, wine tasting, singing, tour, music, movie, sports, photopraphy etc.
- Located in mixed-use complex with cinema, shopping center, big discount mart. Within walking distance from metro station
- Partner : Konkuk University Hospital located 2 minutes from the building
- Contact: Mr. Young-Il Min, Head of Lifecare team / Jee-Hee Koo, New Technology Fusion Department, Konkuk University, koojeehee@gmail.com

4.5 Suwon SK Sky View in Suwon

- ZigBee system.
- Put ZigBee chip on top of USIM card in a mobile smart phone
- Using the smart phone, user can open the gate, call the elevator, track the car in the underground parking lot, call the emergency service etc.
- User can do the urine self-test in the community facility

Chapter VI. Major U-City Project Cases

1. Hwaseong Dongtan

Key substance	-Building public telecom network and public information center -Providing public information services
Major services	Safety service, Transport service, Public admin service, Envrionmental protection service
Project Budget	45 billion KRW (for above subtance)
Project period	May 2006 – September 2008 (30 months)

2. Seongnam Pangyo

Key substance	Based on integrated platform and stable network, provide 15 services and

	integrated surveillance and operation management
Major services	Local Portal, Mobile residents service, Lighting controls, Facilities management service, Enrionment-related information publishing service, anti-crime service
Project Budget	58.4 billion KRW (including 6 billion KRW dedicated to telecom network building)
Project period	Nov.2008-September 2010 (22 months)

3. Busan

Key substance	Building U-Anti-calamities integrated infra for swift reactions against natural disasters and calamities
Major services	Building U-Anti-calamities infra platform Remote management system for drainage pumps U-personal device service Building integrated system among calamities management authorites Building wireless infro for U-Anti-calamities 3D-based flood prediction and reaction system
Project Budget	17.7 billion KRW (of which 3.2 billion KRW is supported by the central gov)
Project period	May 2009 – December 2009 (8 months) June 2010 – December 2010 (7 months)

4. Incheon Songdo (IFEZ)

Key substance	Develop and apply user-centric U-Service model
Major services	Intelligent context-aware anti-crime service Integrated public parking lots usage service Devlope U-city operation model School Zone safe walking service Intelligent urban space information service
Project Budget	164.7 billion (of which 3.5 billion KRW is supported by central gov)
Major Players	• KT : Main contractor of pilot phase I in Bloc 2 and 4 • IBM Korea, Cisco Systems IBM completed building "Smart Space" service that provides various customized services by recognizing the location of users automatically. Smart Space service is based on Mesh network to automatically recognize the location of a smart phone user and provide optimized service. Smart Space is built on IBM's Celladon platform that is based on Mesh network. IBM Korea built public parking service that tells the parking space to the user via smart phone based on its Celldon platform. IBM Korea also built Mesh-based next generation intelligent CCTV system for anit-crime service. • Cisco Systems Cisco's Global R&D for the Smart City Unit, called "Smart + Connected Community Global Center", will be located in Songdo. For the initial operation of the Center with about 120 people, Cisco will invest 30 million USD. Global R&D Center will develop applications and solution for U-city as well as build up eco-partnership. In order to play a pivotal role in the areas of U-City and intelligent building, Cisco plans to be one of the major shareholders of a SPC (Special Purpose Company) together with Incheon

	Metropolitan City and Incheon City Development Corporation. Cisco's role will be (1) R&D of U-City technologies, (2) support venture start-ups, (3) Develop U-City business model and export to overseas markets.
Project period	May 2009 – December 2009 (8 months) June 2010 – December 2010 (7 months)

5. Suwon Gwanggyo

Key substance	
Major services	U-Transport
Project Budget	U-Transport : 17.8 billion KRW Other U-City project : 36.1 billion KRW Total: 53.9 billion KRW.
Major Players	Samsung SDS+KT+Daewoo Information and Communication consortium
Project period	Dec/2009-Sep.2011

6. Suwon Homaeshil

Key substance	3,116,000 m2 (943,000 pyoung)
Major services	• U-Transport (ITS) , Anti-crime, environment, facility management • Integrated Urban Management Center
Project Budget	15 to 20 billion KRW
Major Players	• Project owner: LH Corporation (Mr. Seong-Bok We, Head of Team, U-City Business Department • Min contractor : LG CNS – KT Consortium
Project period	Nov.2009 – Dec. 2011 19,000 households are expected to reside in Homaeshil U-City.

7. Sejong U-City

Key substance	
Major services	
Project Budget	35 billion KRW
Major Players	project owner : LH Corporation
Project period	Phase I. : June 2010 (발주) -

8. U-Town Projects

Unlike U-City project which has more of a nature of public goods, that is to to build telecom infrastructure, intelligent public facilities, and integrated urban management center and to provide mostly public services such as transport, public admin and anti-crime by the public sector, U-Town project is a new development project concept, very much focused on profit model and private services, that is to be designed, constructed and operated from the perspectives of private realestate developers, tenures, and operators where customized u-services are provided.

8.1 "U-Town" Pilot Project – Daejeon "Future-x"

Korea's Ubiquitous City Association designated Future-x block as a "U-Town" pilot project in December 2009

(1) Site: 340,000 pyoung (1,122,000 square meters) in 1, Eunhaeng-dong, Daejon
(2) Project period : 2007-2012
(3) Project type: Pure private development
(4) Project classification : Complete new urban development within an existing city
(5) Players : KT, Samsung SDS, LG Consortium (LG CNS, LG Electronics), Albatros Plus (www.albatrosplus.co.kr)

Company	Roles
Samsung SDS	• Building BcN • ID recognition on person and object • Iintegrated billing and payment system
LGCNS	• Management & Control system server for the whole complex and designing integrated DB • Security such as CCTV, parking control, entry control etc. • Planetarium(Dome ceiling multimedia display system)
KT	• IBS and facility management system • Operating integrated management & control system
LG Electronics	• Home network system for 20,000 household units
Albatros Plus	• Project management
GS Construction Consortium	• Composed of GS Construction, Daelim Construction, Doosan Construction, Kaeryong Construction

(6) Project budget: Apprx. 2 trillion KRW (of which 15 to 20% is IT budget)
(7) Project description : Residential complex of 5 buildings, 60-story landmark commercial building, hotel, shopping mall, and cultural center
(8) Ubiquitous aspects :

- Full BcN (Broadband convergence Network) in the whole complex
- Free communication network environment in the complex
- Personal portable wireless device that can recognize a person, an object, and voice.
- Integrated billing and payment system in the complex
- 30 RFID-based business models in the complex
- All city funtions like public admin, finance, weather, transport, education, healthcare will be in place in the complex
- Hydrogen fuel cell-based UPS energy system

- Planetarium (30m Dome ceiling multimedia display)
- 72-story Display tower buildings with LCD exterior walls
- LCD streets

8.2 Senior U-Town "The Classic 500" in Start City (www.starct.co.kr/) in Seoul

The Classic 500 (www.theclassic500.com/) project focuses on U-Health and senile sanatorium business.

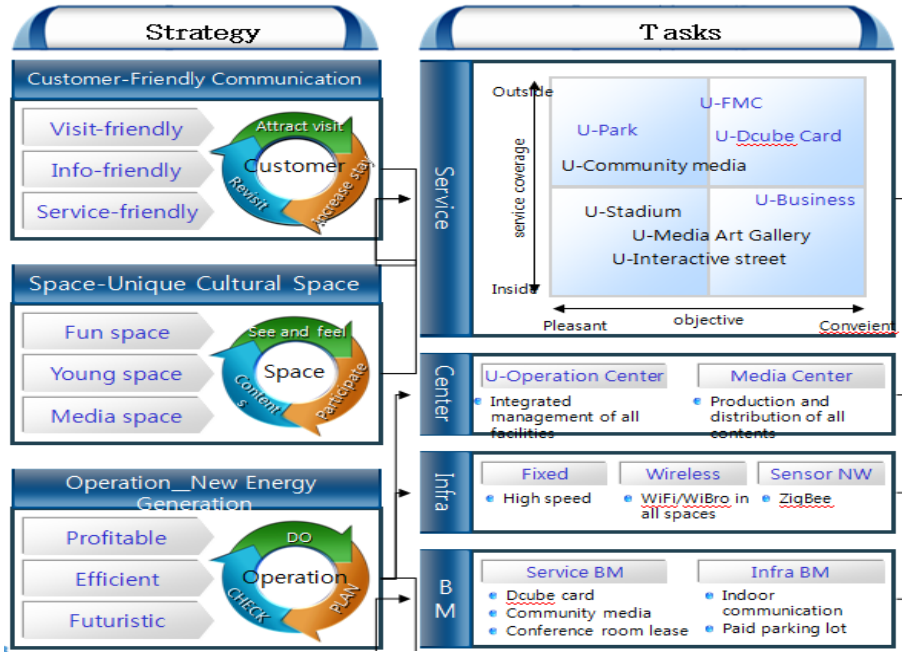
(1) Site : 1,777 household units and an office with 133 units in Jayang-dong, Seoul.
(2) Players : Konkuk University, Samsung SDS
(3) Main services :
    - Medical : Personalized life care, 24-hour family doctor, nurse, and nutritionist, connection with general hospital
    - Community
    - Spar and Fitness : Personalized exercise consulting system connected with medical system
    - Life : Home network, smart tag, motion sensing sensor, emergency call, digital TV through inhouse broadcasting center. Indoor ventilation system based on life rhythm
(4) Main systems :
    - Ventilation and water treatment system
    - Anti-crime and calamities system
    - Facility management system
    - Parking guidance system
    - Structure (earthquake and storm-resistant design and high strength concreting) system

8.3 D-cube City in Shindorim-dong, Seoul

Mega multi-complex with residential building, office buildings, shopping mall & cultural center, hotel, and mini-park. About 10.5% of the total project budget is allocated to IT system and service development.

(1) Site: 100,000 pyung (330,000 square meters) in Shindorim-dong Guro-gu, Seoul
(2) Project period : April 2007 and July 2010
(3) Players : KT, LGCNS, Daeseong Industry Co.
(4) Project budget : Apprx. 150 billion KRW
(5) Ubiquitous aspects :
    - Intelligent Park
    - U-D-cube card
    - U-Office
    - FMC (Fixed-Mobile-Convergence) Portal

- U-Interactive streets
- U-Community media
- U-Stadium
- U-Media art gallery
- RFID-based Building Inventory Management system that manages labors and construction materials inventory on the contruction site.



Source: Dr. Gwang-Ho, Park, Professor at Hanyang University, Jan., 2010

Chapter VII. Conclusion

1. Challenges in U-City Projects

- As a U-City project requires an enormous amount of investments into construction as well as operation and management, it is difficult for a local government to self-finance the project with the city's own budget. For a 100,000 inhabitant-city, it is estimated that construction of a U-City would cost 30 billion KRW (30 mil USD) and operation of it afterwords would cost 3 billion KRW (3 mil USD) per annum. Therefore, unless sufficient service and business models are developed and charged, operational cost of a U-City may be an unbearable burden to both citizens and the local government.
- With ubiquitous technologies and equipments being installed in new apartment buildings and buildings, selling price of those flats has been also increased. Therefore, less people can afford such higher price.
- As the current law does not allow the local government to lease its communication network as a profit-making business (according to the current Laws in Korea), the scope of business models to finance the operational cost of a U-City by the local government is limited. It is very difficult to make sufficient revenue only from advertising and service charges. Therefore, relevent reformation of the current Laws is needed in order to allow the government to develop versatile business modesl to finance the operational and management cost of U-City.
- If a local government can not find financing means to operate and manage a constructed U-City, the city may end up with a moratorium like the Ubari City case in Japan or the Seongnam City case in Korea.
- For a stable and viable operation and development of a U-City, participation and investment from the private sector is critical.
- As there is a legal restriction on the usage of data acquired from the communication networks of U-City under the current legal framework, relevant legal reformation is needed in order to allow a local goverenmtn to develop a new paid service as a means to finance the operational cost of U-City.
- Also, the current law does not allow the local government to make a profit out of digital outdoor advertising. Due to this restriction, commercial advertising and revenue from such business model is not practiced at the moment even after media board, media pole, and digital signages are installed by U-City government. Therefore, relevant law needs to be revised.
- Another legal restriction on the local government in developing and providing new paid U-City service is in the locatoin-based U-service. According to the current Law, a service provider who provides a service using a location information must be registered as a location-based service provider. Therefore, the local government must either register itself as a location-based service provider or establish a special-purposed corporation (SPC) to provide such service.

2. Lessons Learned from Korean U-City

- Basic urban and telecom infrastructure in place to accommodate U-services

- U-service : from public domain services to private domain services so called 'citizen friendly u-service'.
- Private – Public cooperation in building the infra and services
- Business model to finance operation of U-City
- Think Global : export aspect is designed and embedded from the Master Planning stage

3. Opportunities for Finnish Companies

U-City

- *Partner with advanced Korean companies for the global market through joint R&D and business development outside Korea.*

Smart Grid

- *As the development of Korean Smart Grid is taking place in an extensive scope from generation to EV to home-end, there are wide range of technologies in need. In certain fields like* ***network/data security*** *which is quite critical, Korea is not very strong. Also, Korea is a little behind in the* ***sensor technology*** *area which is also quite critical in Smart Grid. Another important part is how to* ***manage and optimize substantially increased amount of data flowing over different networks***

Intelligent Video Surveillance

-Compression technology -Image sensor technology

-Application SW -Face/gender /bio-data recognition technology

-Security solutions -Data and NW optimization technology for processing and transfer

-Connectivity (Wired, wireless, PLC, PoE, etc.)

-Intelligence (motion tracking, fire detection, night vision etc.)

-Storage of video data (requiring big bandwidth)

General

- *Korean companies like to try new technologies and make fast decision-makings if certain technologies are found needed for completion of their final products.*
- ***Key success factors in the Korean market include***

  "Right offering"

  "Early entry"

  "Timely partnership"

  "High-level networking"

Appendix : Major Players in the U-City in Korea

Public Sector

- IFEZ
  Mr. Insoo Kim, Head of U-City Planning Team /Tel : 032 453 7461 / Mob : 010 4327 0827

- Seoul Metropolitan City
  Mr. In-Hwan Kim, U-City Team, Informatization Planning Unit / Email: kimbo@seoul.go.kr
  Mr. Jeong-Hee Song, Head of Informatization Planning Unit
  Mr. Seong-Man Seo, U-City Team

- Land & Housing Research Institute
  Mr. Hyong-Bok Kim, Principal Investigator (Head of Team), U-Eco City Test Bed Center
  Email: hyongkim@lh.or.kr / Tel: 042 866 8480 / Mob: 016 409 8622

- Ministry of Health and Welfare
  Mr. Geum-Ryol Park, Director , Health Industry Policy Department / Tel:02 2023 7590
  Mr. Hyoung-Gi Baik, Assistant Director / Tel: 02 2023 7580

- Ministry of Land, Transport, and Maritime Affairs
  Mr. Jin-Cheol Lee, Assistant Director, City Revitalization Department / Tel: 02-2110-8201 /
  Email: jcwood@hanmail.net

- Ministry of Public Administration and Security
  Mr. Yoomin Kang, Director, Ubiquitous Planning

- Mapo District Office
  Mr. Hyon-Jin Lee, Computation and Information Team/Email: sarang@mapo.go.kr

- Korea Ubiquitous City Assocation (http://www.ucta.or.kr)

- U-Eco City R&D Center under MLTM (http://www.ueco.or.kr/ueco_pro/common/main.php)
  Mr. Hyo-Kyung Gwak, Manager for U-Space Technology program, KAIST /Tel: 042 350 4542

- Korea Institute of Construction and Transportation Technology Evalutation and Planning (KICTEP) (http://www.kictep.re.kr/app/main/main.jsp)

Private Sector

- Songdo U-Life
  Ms. Jeong-Hwa Heo, Director, R&D Center / Mob: 010 5500 5329

- Samsung SDS
  Mr. Byong-Cheol Lee, Head of U-City Business Team
- LG CNS
- SK Telecom
- SK C&C
  Mr. Seok-Won Yoon, SVP
- KT
- POSCO CIT
- Daewoo Information System
- Asiana IDT
  Mr. In-Seob Byon, Senior Manager
- Hanhwa S&C
- SKC&C : Incheon U-Port system
- Lotte I&C
  Mr. Chang-Shin Lee, Head of Hightech Business Team
- Future U-Channel Co. (Future X project)
  Mr. Young-Ho Moon, VP
- Albatros Plus Co. (Future X project)
  Mr. Sang-Ryol Ryoo, EVP
- Cisco Systems
  Mr. Joong-Won Kim, EVP

Research

- KAIST Institute of Urban Space and System