SC SOLUTION GLOBAL

Intellectual Leak Detection SOLUTION

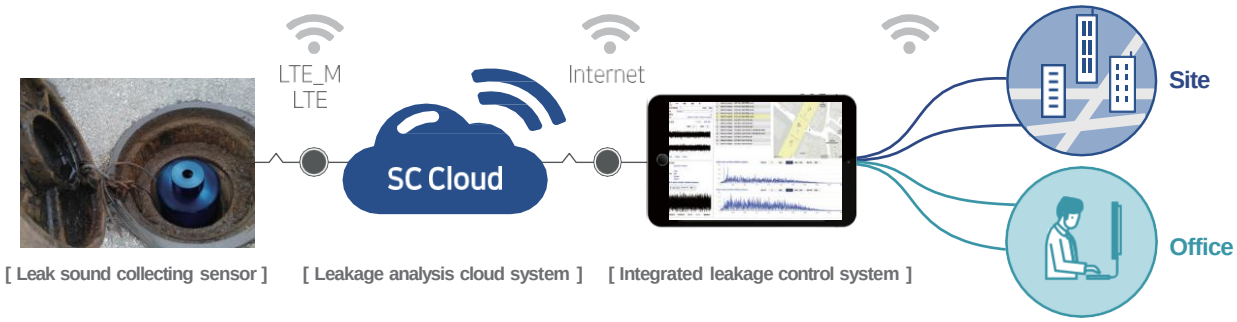
Leakage Diagnosis Through Machine Learning
Leakage Prediction by Deep Learning
Leakage Point Calculation Using Time Synching

www.scsol.co.kr

Innovative solution for leak detection and water loss prevention

Collects leak sound from sensors, analyze it in the cloud, then represent the results on the a web or mobile application

System Diagram



- World's first leakage detection and prediction system using AI technology
- Selected as an innovative product by Government Procurement Office Gr
- and prize from Patent Awards, 12 patent technologies registered
- GS grade 1 certificate
- Approved data collection from national infrastructure
- Selected as an innovative startup by K-water
- Over 50% of installation cost reduced by using domestic ICT convergence technology

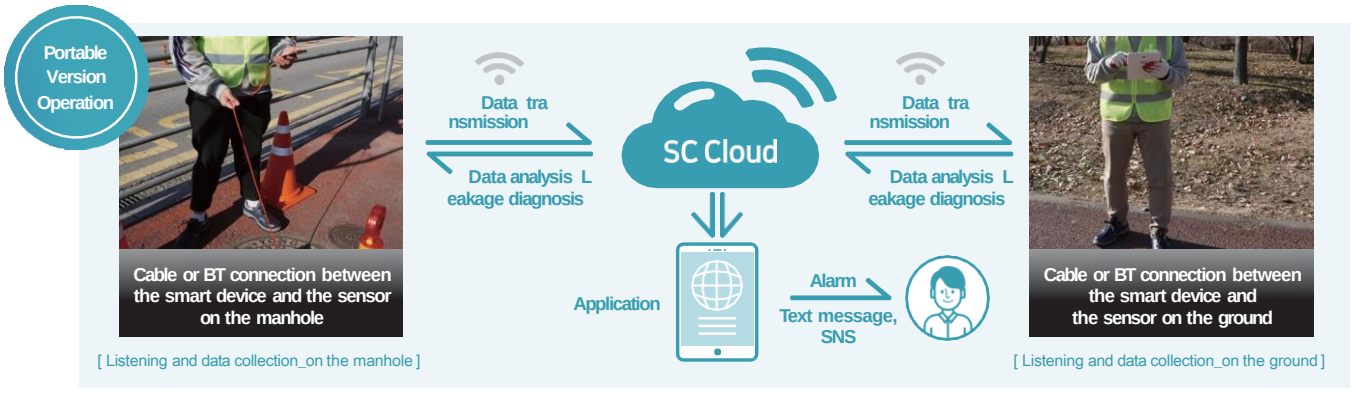
Functions and Performances

- IoT-based, remote leakage monitoring and diagnosis solution
- **Onsite portable type** – onsite leak sound collection and real-time leakage diagnosis using smartphones
- **Manhole attaching type** – Leak point calculation and continuous leak detection using time synchronization
- **AI leakage diagnosis/prediction** – No leakage, weak sign of leakage, strong sign of leakage, on-going leakage
- Leak status diagnosis and monitoring by each block
- Link to flow and fluid pressure data and related data analysis
- Information sharing through text messages, SNS, and alarms

Features

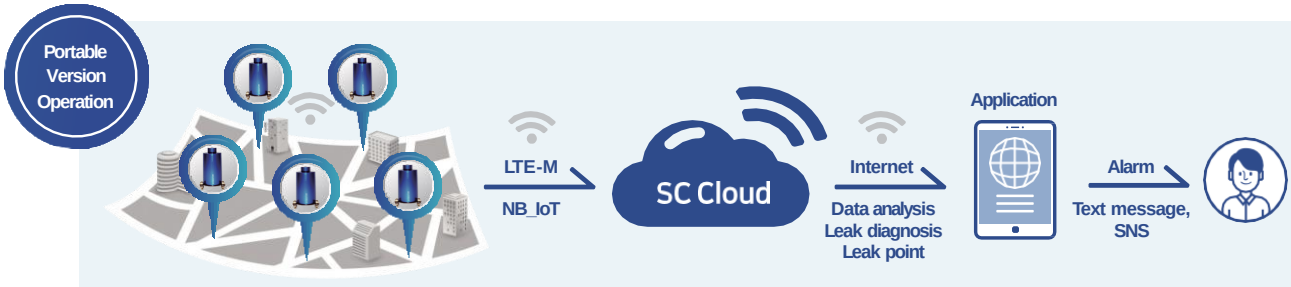
- Small leakage detection using signal amplification and filtering technologies
- AI-based, 4-stage leakage diagnosis and prediction function Simultaneo
- usly supports both static/portable types
- 100% domestic solution and over 50% cost reduction compared to the imported products
- 12 patents about IoT and leak detection technology registered
- Water network's GIS information is linked to Naver Map Prev
- ents outflow of national infrastructure data to overseas Able t
- o install internal cloud inside the business
- Battery efficiency maximized by power management technology

LeakMaster Operation



[Listening and data collection_on the manhole]

[Listening and data collection_on the ground]



[Leak signal collection using static sensors]

Leak sound collecting sensor

Major functions

- **Portable** - Leak sound is collected on the ground and transmitted to the cloud server
- **Static** - installed on manhole and collects leak sound continuously
- Power management using low power communication protocol
- Collects small leak sound data A
- mplification and filtering function
- Supports BT, LTE-M, NB-IoT

Leak sound collecting sensor		
Item	Portable	Stationary
Communication Method	BT, Cable	LTE-M, NB-IoT
Installation Location	Manholes, Hydrants, ground	Manholes, Hydrants
Battery	Rechargeable (72 hours of battery life)	Over 5 years
Frequency	1-2000Hz	
Waterproof	IP68	
Operating Temperature	-20 ~ 85°C	

Characteristics

- 100% localized product, over 50% cheaper than the imported products
- Installation cost reduced by using both portable/static versions
- Easy to install and use
- Waterproof/ anti-vibration design (IP68)
- High performance data collection (static, over 500m of distance between the sensors)

When connected by LTE-M, NB-IoT

When connected by BT

When connected by cable

LeakMaster Android App

Onsite real-time data collection and AI leak diagnosis

Major functions

- Real-time leak detection results according to AI diagnosis Le
- ak sound listening and collecting at the water network site T
- ransmission of collected leak sound data to the cloud
- Leak sound data storage and management by operations/projects
- Project history storage and management Tr
- ansmission of onsite pictures to the cloud

Characteristics

- Wired or wireless connections to the sensors
- Detect location searching using GPS
- Data collection and history management by business/location/project
- GS grade 1 certification product
- Software filter/amplification/signal change

[Leak master Android App Screen]

LeakMaster Cloud System

Major functions

- Real-time leak diagnosis using machine learning algorithm
- Leakage prediction using deep learning algorithm
- Leak point calculation using time synching method
- Systematic water network information management by project/location/block
- AR Rendering engine for AR-based service! Linka
- ge to flow and fluid pressure data and related data analysis

Characteristics

- Data collection approved for national infrastructure
- No outflow of GIS data by using domestic Map
- Diagnosis accuracy increased by using AI leakage diagnose system
- Water network management efficiency increased by AI leakage prediction
- Management cost and time saved by leakage point calculation function S
- mall leakage detection function by using differential amplification L
- eakage status monitoring by project/location/block

[Cloud Screen]

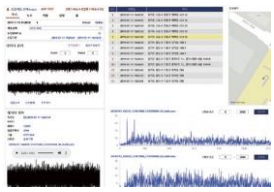
Cloud Model Name/Standards	
SaaS-based Business Model	Servers can be installed at each business
Remote control/monitoring	Continuous status check
MAP Interface	Naver
GIS Interface	National Geographic Information System
Leak sensor regis tration/certification	Location-based registration to prevent loss and theft
Water network and material information link	Geographic information, pipe network diagram, material information link
Leak detection calculation	Automatic Adaptive Filtering / Leak Intensity Estimation
Leak point calculation	Time Sync and Delay / Weighted Cross Correlation
Leak prediction	Automatic Interface Filtering / Statistical analysis and trending / Big Data Analysis / Learning based prediction Analysis

Web-based application

Major functions

- (Portable) Represents the locations of the collected data and provides onsite leak sound
- (Stationary) Represents the locations of the installed sensors and provides remote leak sound
- Water network's GIS information is linked to Naver Map
- Leak status monitoring by block – leakages, leak points
- Provides various additional services through water data linkage and analysis

[Details screen for each pipe]
(Date of laying/material/
diameter/length/depth)



[Data analysis screen for collected data]

Characteristics

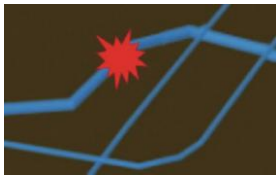
- Re-listening of leak sound and analysis result checking
- Provides various information of water pipe with leakage information by linking with GIS
- Provides data to the person in charge to make early response for leakage

Provides

- Remote control over the sensors
- SaaS service
- Operation instruction generation and system linkage
- External interface for leak sound data
- Leak sound data analysis function for the users

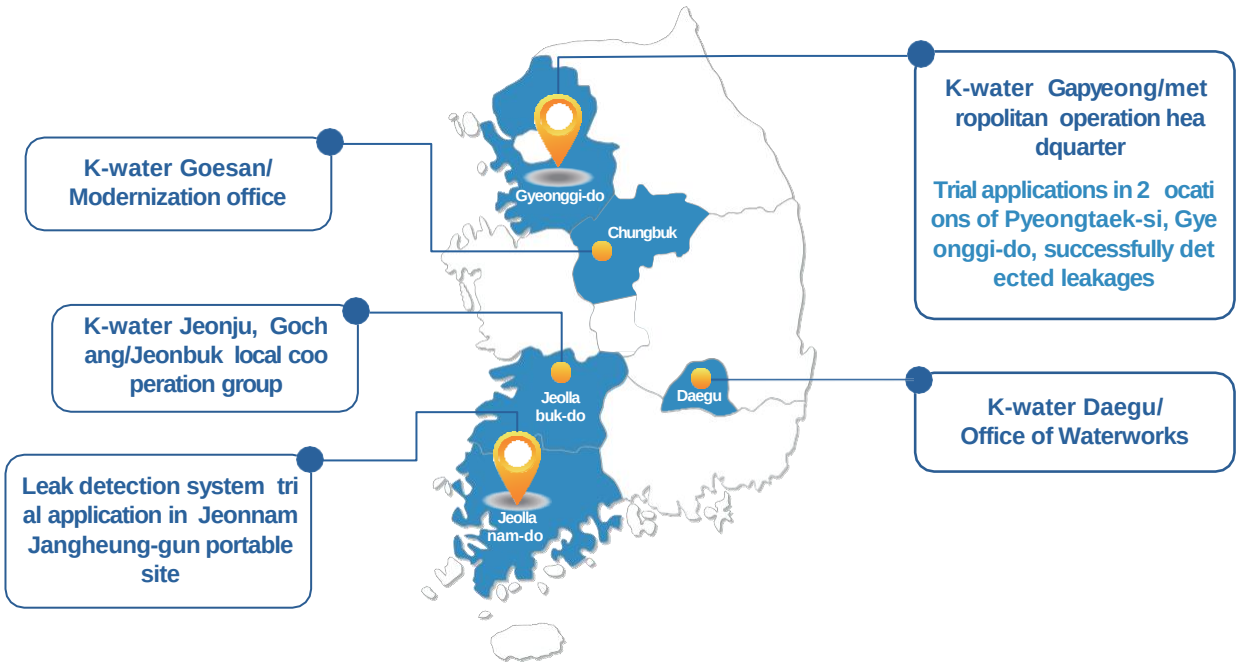
[Satellite screen GIS Water network]

[GIS관망 화면]



[Leak point screen using AR/VR]

Application Cases



Product images

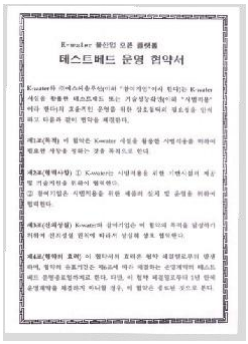
Certifications and Awards

LeakMaster 2.0.0 GS certificate, received grade 1

2019 excellent invention priority purchase selection

Innovative prototype selection

Hankook ilbo's excellent patent award grand prize in the first half of 2019



Selected as water industry cooperation startup and test bed enterprise by K-water

Awards

- Selected as enterprise for K-water test bed application in 2019
- Selected as innovative startup by K-water in 2019 Korea Excellent Patent Award grand prize in 2019
- Selected as a priority purchase enterprise for excellent invention by Korea Intellectual Property Office in 2019
- Received GS grade 1 certification from Telecommunication Technology Association (TTA) in 2019
- Registered to Venture Nara in 2019 Selected as K-global business in 2019 Received venture capital investment in 2019
- Selected for NIPA ICT convergence business support program in 2019
- Selected as an innovative product by the Procurement Office

Patents

Leakage detecting device	Korean Patent/10-1956160
Augmented reality system where users can recognize leakage detection through users' mobile devices	Korean Patent/10-1876956
Communication device and its control method	Korean Patent/10-1699281
Device communication system and its communication method	Korean Patent/10-1740660
Network device simulation method	Korean Patent/10-1784796
Digital sensing device with automatic power on/off control based on critical values	Korean Patent/10-1723854
Remote control system	Korean Patent/10-2012518
Active sensor control system and its sensor control method	Korean Patent/10-2012519
Underground pipe position recognizing device and the position recognizing method using such a device	Korean Patent/10-2036610
Leakage sensing system which synchronizes leak signal using radio signal and leak point detection method using such a system	Korean Patent/10-2036631
Leakage management system and leakage information provision method using such a system	Korean Patent/10-2036642
Leakage management system and leakage point prediction method using such a system	Korean Patent/10-2036649

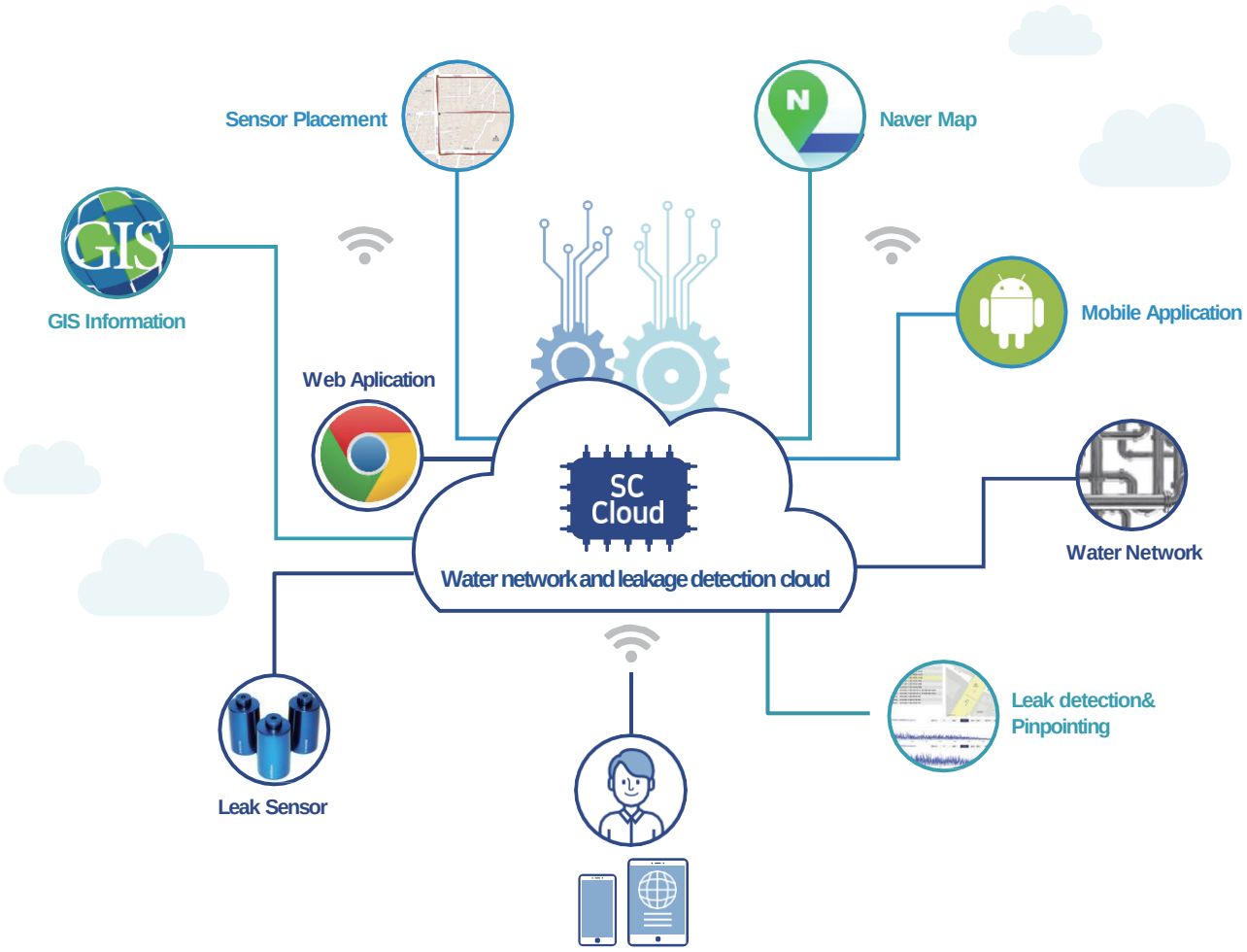
Investments

- **NTELS Corp. Listed in KOSDAQ**
- **BA Partners Series A 2 billion won investment**

Major Partners

K water · (주)한국빅텍 HANGUK BIG-TECHNOLOGY CO.,LTD · SAMSUNG SDS · ABB · GS파워 · KOREA WATER CLUSTER 국가물산업클러스터 · DAEGU 대구광역시 DAEGU METROPOLITAN CITY · 대구환경공단 · 차세대융합기술연구원 ADVANCED INSTITUTE OF CONVERGENCE TECHNOLOGY

System Diagram



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