

Remote Confined Space Monitoring System —— product presentation

2024年10月



1 **Product Overview**

2 **Product Architecture**

3 **Product Showcase**

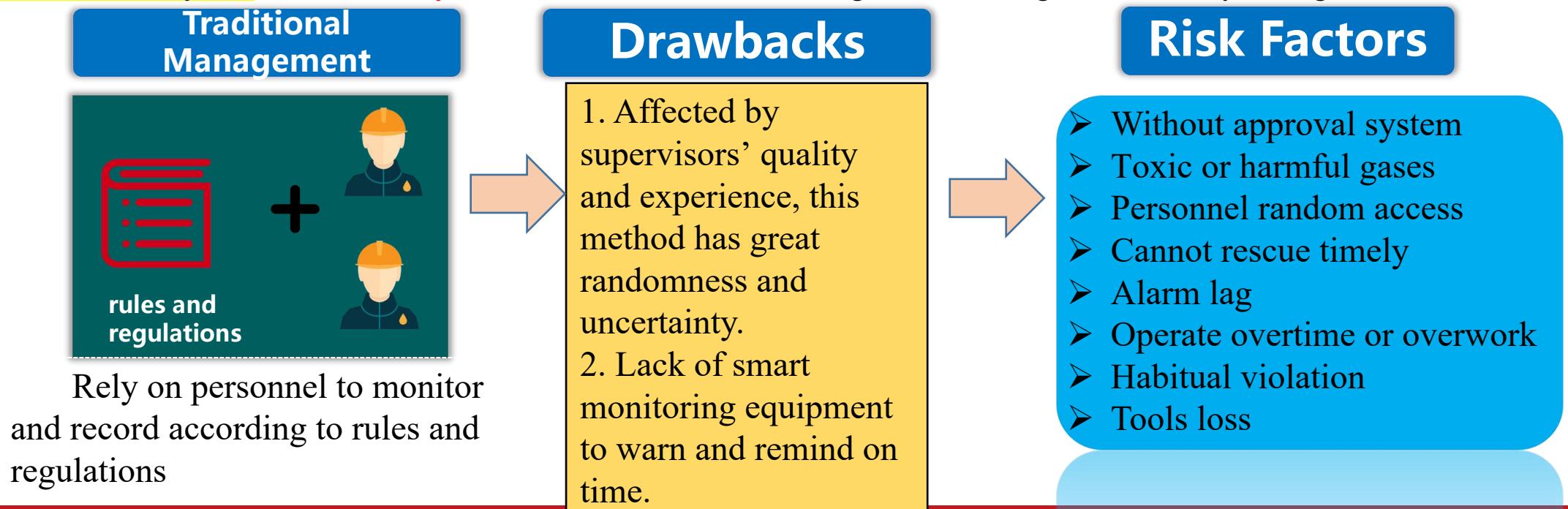
4 **Benefit Analysis**

R&D Background

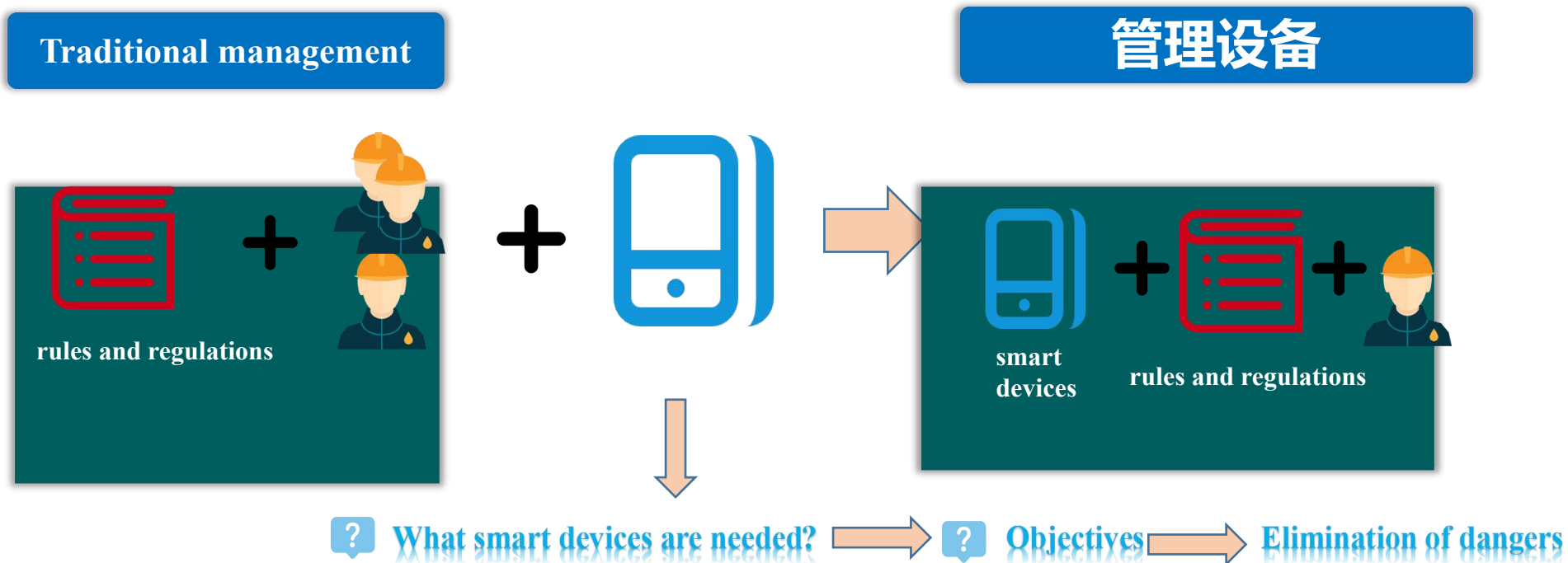
As a production facility intensive enterprise, the production site of **industrial and mining enterprise** is intricate and complex.

The safety management is critical, and the management of **confined space operations** is more important and more difficult. Any negligence will lead to serious consequences such as **equipment damage or personal injury accidents**. With the rapid development of industrial and mining enterprises in recent years, the related **outsourcing team** has no relative improvement and ability to meet the needs of the market after the explosive growth of installed capacity, **resulting in the overall quality of the current outsourcing team**

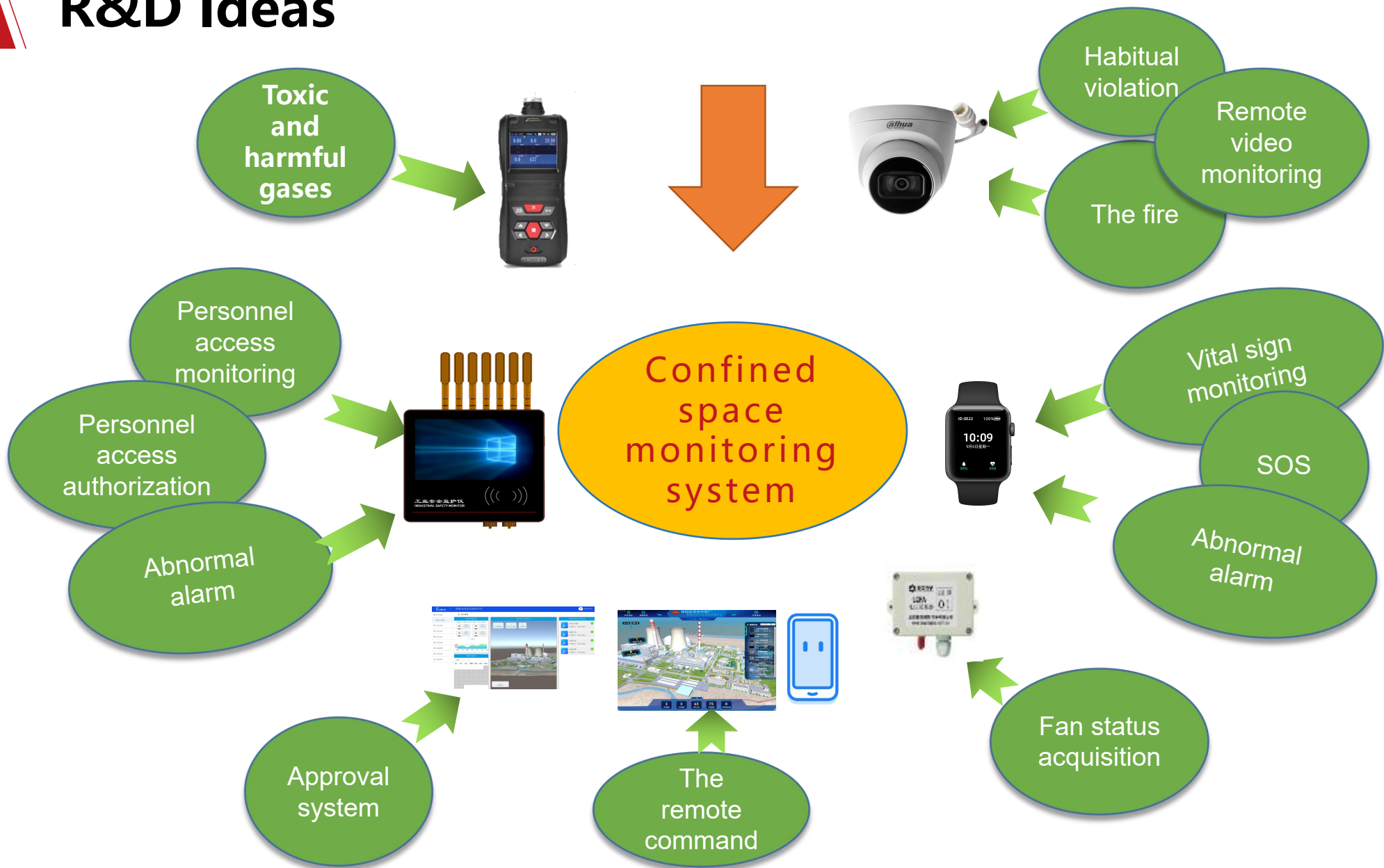
personnel is relatively low, and **the safety awareness is weak**, which brings new challenges to the safety management of confined space.



This product combines the relevant system of confined space management of the state and the industry and the management experience and methods accumulated by enterprises in confined space for many years, and uses scientific and technological means to integrate various technologies such as face recognition, violation judgement, UWB precision ranging technology, LoRa wireless communication, video surveillance and RFID. To realize the abnormal alarm reminder for operators, supervisors, managers, effectively achieves the safety supervision of confined space operations, reduces operational risks.



R&D Ideas



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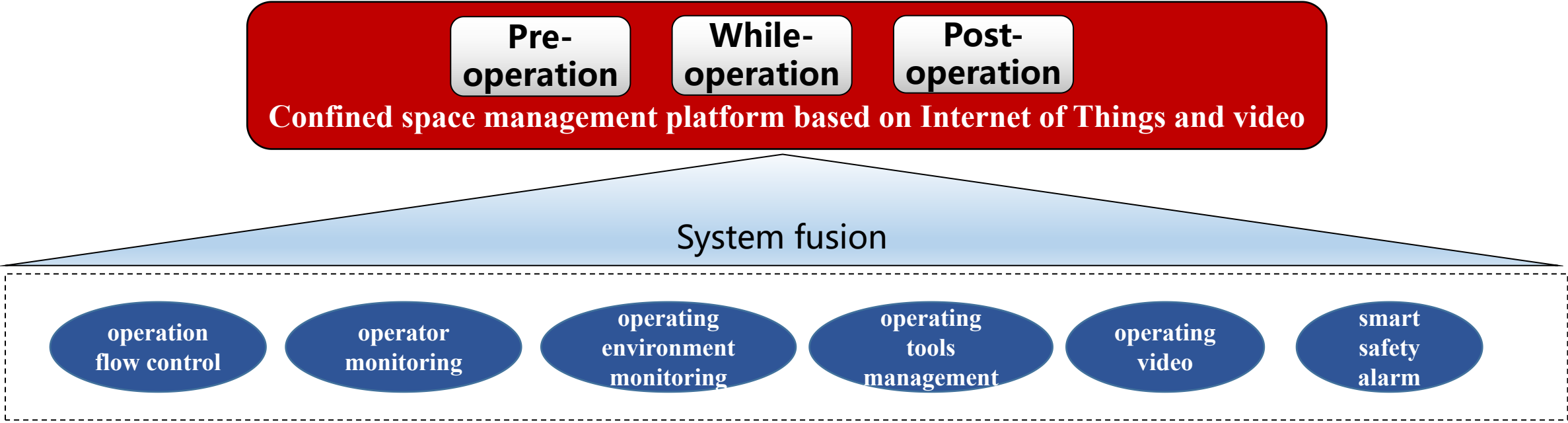
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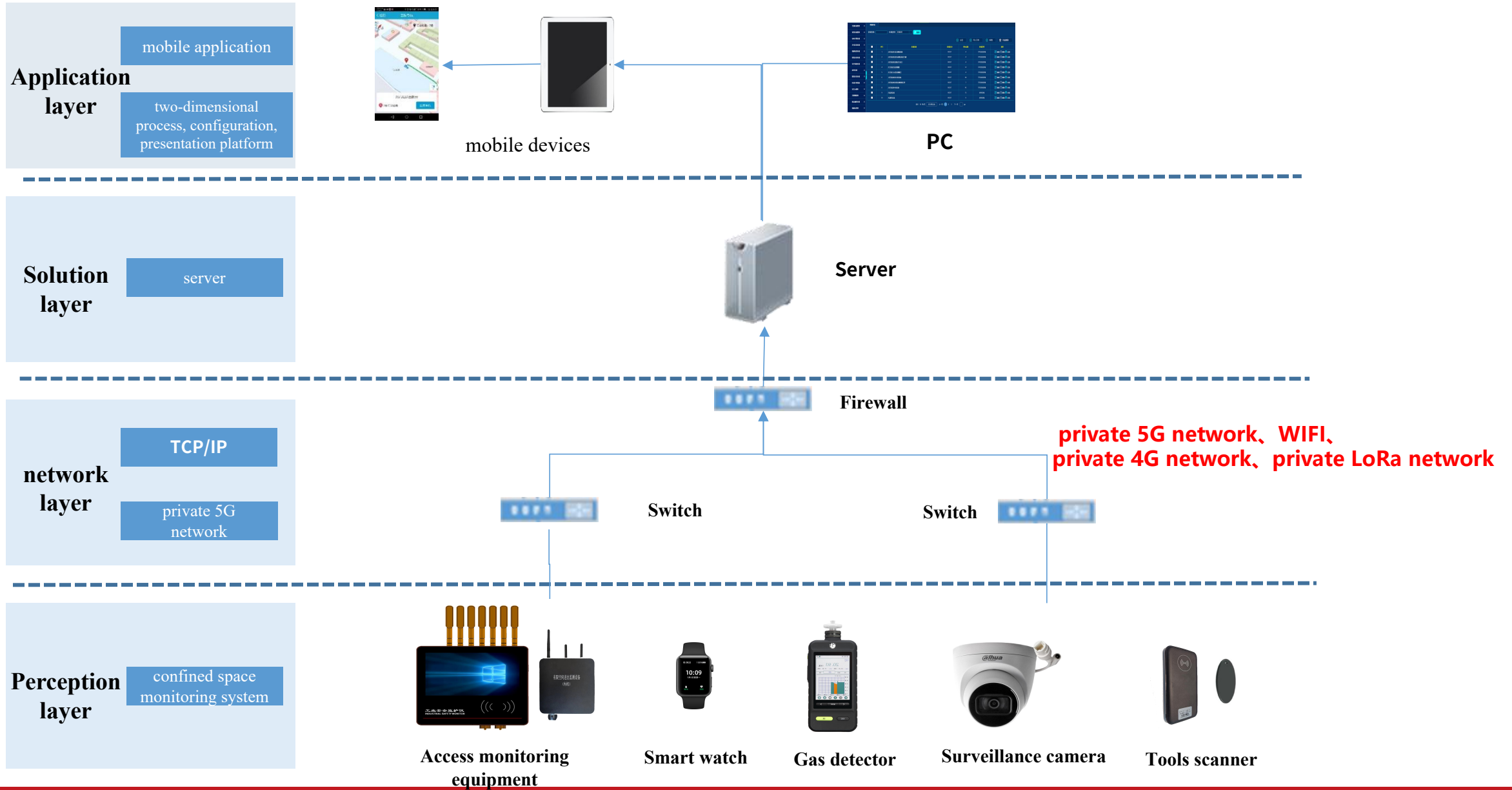
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Brief Introduction of Functions

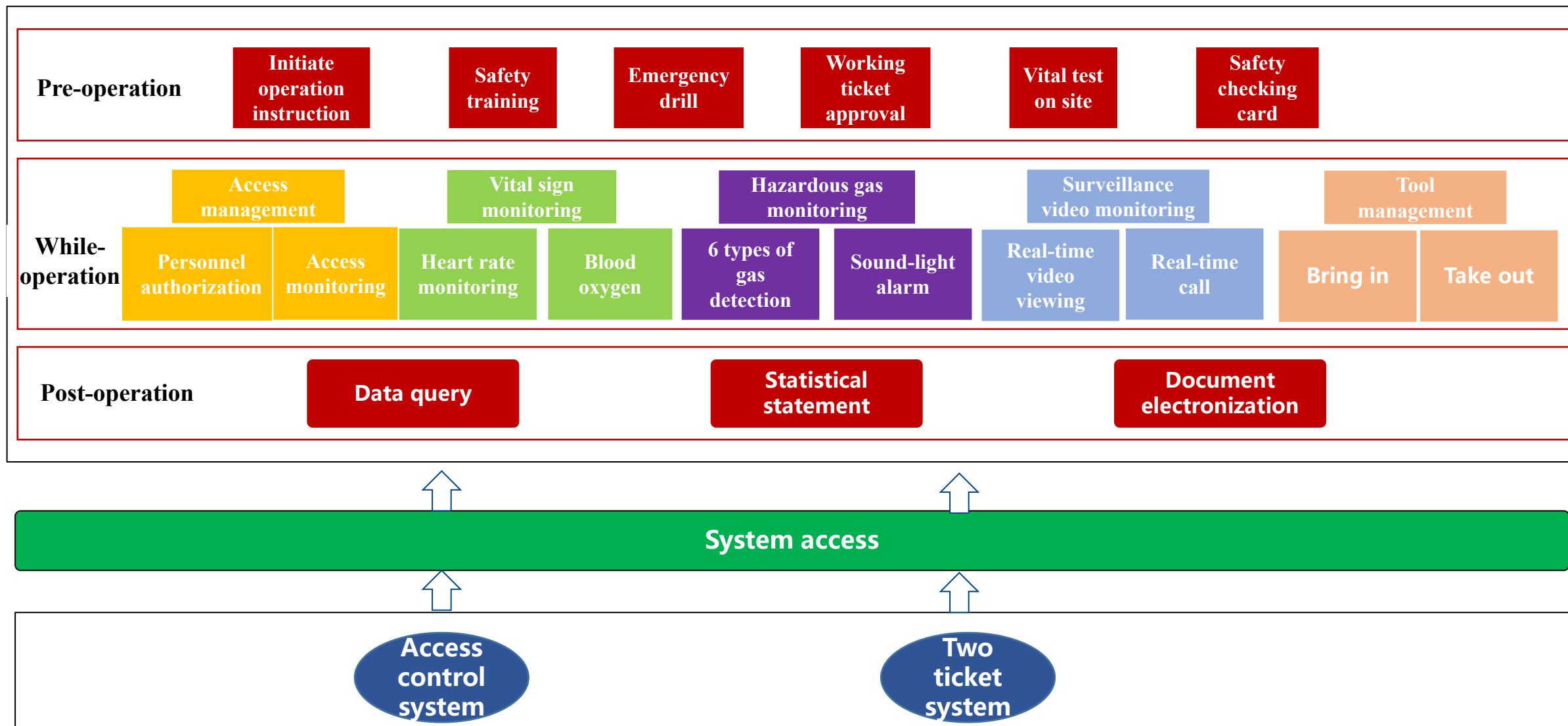
This product realizes the standard management of confined space operation through the pre-operation process control. In the operation, the smart reminder of personnel access, illegal entry, work overtime, overcrowding and tools loss is realized through the access monitoring equipment and smart watch. Through the gas detection equipment to monitor environmental anomalies and give reminders. Real-time view of on-site video and real-time call between remote managers and on-site operators can be realized through on-site video monitoring to correct abnormal operations; Through the tools scanner to achieve the tools brought in and taken out management, and give a reminder. After the operation, related files and information are automatically archived for subsequent information query. Finally, the control of pre, while and post operation of the confined space operation is realized.



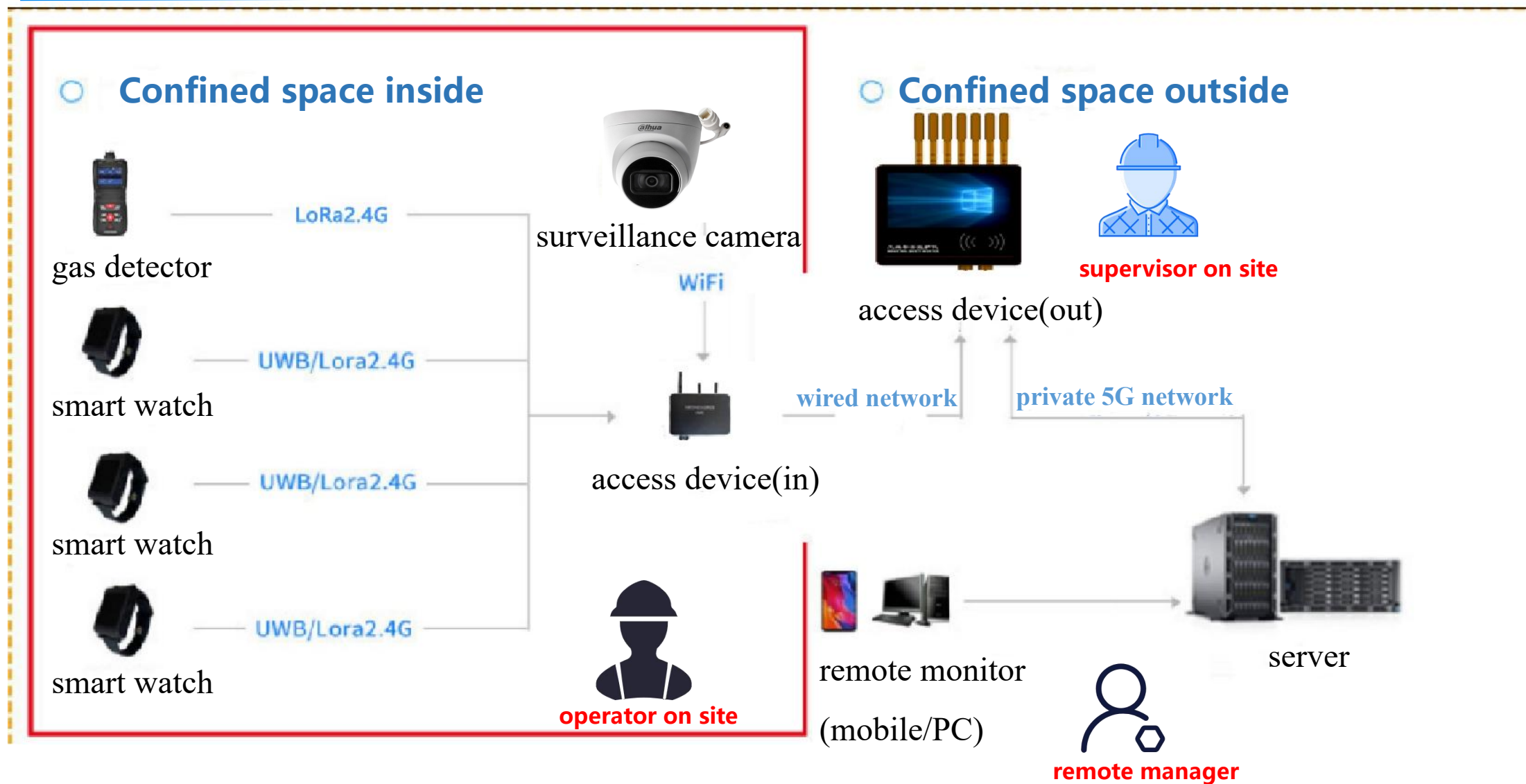
Platform Architecture



Operation Architecture



Deployment Architecture



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Product Display

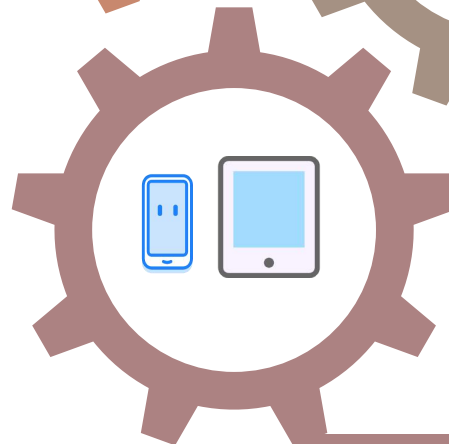
Confined space monitoring system:

- *Access monitoring device
- *Gas detector
- *Smart watch
- *Tool Scanner
- *Surveillance camera



Two-dimensional platform (WEB):

- *Workflow and tasks
- *Confined space equipment management
- *Confined space operation record query
- *Document management
- *Statistical statement



Mobile application (APP) :

- *Tasks
- *Record query
- *Statistical statement
- *Document query, equipment management

Two-dimensional Display Platform (Confined Space Monitoring Platform)

The confined space management and monitoring platform (Cloud) has three core modules: **operation initiation**, **real-time viewing**, **operation information record and file archiving**.

1



- Support online operation initiation
- Examination and approval

2



- Basic operation information
- Number of confined space workers
- Personnel vital signs
- Real-time environment information
- Abnormal alarm message

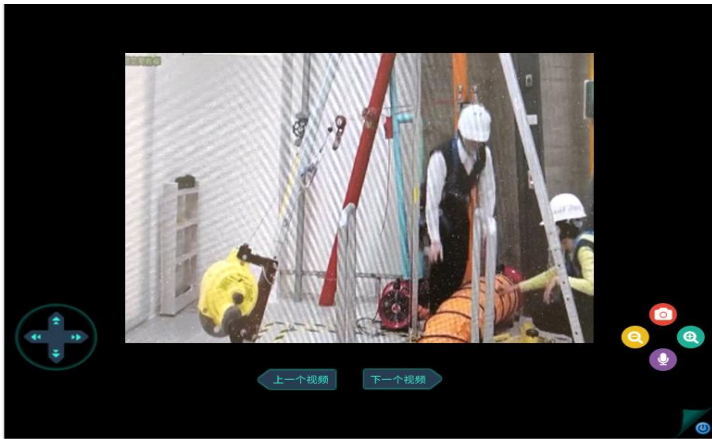
3



- Operation approval record
- Historical operation information
- Entry and exit records of personnel
- Historical information of operating environment
- Historical information of abnormal alarm message

Mobile Application (APP)

Through the mobile device (mobile phone or PAD), you can approve and query all information of confined space operations online, including operation location, operation quantity, numbers of operators, real-time alarm information, etc. At the same time, you can query real-time personnel entry and exit records, gas detecting information, and operation videos.



Hardware Description - Access Monitoring Equipment



Outside unit



Inside unit

Used in confined space signal transmission, personnel access management and abnormal alarm warning

Technical parameters

- Power supply: DC12V, the device supports both active and battery power supply, single battery power supply can meet 8 hours of continuous work;
- Communication mode: built-in UWB, LORA2.4G, Bluetooth, WIFI and other communication modules;
- Network access: support private 4G, 5G network, private LoRa network and WIFI;
- Screen size: 10.1 inches, resolution: 1280*800;
- Built-in server: cup8 core, 16G memory, 256G SSD;
- Reminder function: the device supports sound and light alarm;
- Explosion-proof grade: internal explosion-proof (EX ib iic T6);
- Protection level: IP66;
- Operating environment requirements: temperature -30~60°C, humidity 10%~70% no condensation;
- Installation mode: support magnetic attraction, stand, and wall hanging.

Hardware Description - Smart Watch



Used to monitor vital signs of operators and alert abnormal alarms



Function points

- Communication mode: real-time communication with access monitoring equipment through LoRa2.4G.
- Support time and power display.
- Support heart rate monitoring and abnormal alarm.
- Support blood oxygen monitoring and abnormal alarm.
- Support SOS one-button alarm.
- Abnormal alarm text display and vibration reminder.
- Built-in lithium battery, charge once will standby not less than 7 days, continuous use of not less than 24 hours.
- Explosion-proof rating (EX ib iic T4);
- Protection level: IP66
- Operating environment: -10~65°C, 10%~90% no condensation;

Hardware Description - Gas Detector



Gas detector

Used to detect hazardous gases in confined space.

Function points

- Communication mode: real-time communication with access monitoring equipment through LoRa2.4G.
- Detecting gas: support oxygen, carbon monoxide, hydrogen sulfide, combustible gas and other gas detecting and real-time sound and light alarm beyond the threshold, detecting gas type can be customized.
- Support the screen display of the current actual content of each type of gas, threshold, alarm status and alarm time
- Power supply mode: the device supports two power supply modes: active and battery, and the battery power supply can meet the continuous work for 10 hours.
- Display screen: 2.5 inch 320*240 color screen real-time display
- Explosion-proof grade: intrinsically safe Ex ia IIC T4;
- Protection level: IP68
- Working environment: -10~65°C, 10%~90% no condensation
- Installation mode: support magnetic attraction and portable wear

Hardware Description - Surveillance Camera



Surveillance camera (common type)

Used in confined space video surveillance

Function points

- Communication mode: support WIFI connecting to access monitoring device to display information
- Rotation angle: horizontal 350°, vertical 0°-90°
- Power output: PoE+ (802.3at), DC12V, 18W
- Power supply mode: the device supports two power supply modes: active and battery, and the battery power supply can continuously work for 8 hours.
- SD card: 256GB
- Size: $\Phi 125 \times 136.7\text{mm}$
- Weight: 650g
- Protection level: IP54, 4000V lightning protection, surge prevention, in line with GB/T17626.5 level 4 standard
- Installation mode: supports magnetic attraction, bracket, and strap

Hardware Description - Surveillance Camera



Surveillance camera (explosion-proof)

Used in confined space video surveillance

Function points

- Communication mode: support WIFI connecting to access monitoring device to display information
- Night vision Type: Infrared night vision
- Pixels: 5 million
- Zoom: Optical zoom
- Storage: 256g memory card
- Network: WIFI/4G
- Power supply: Built-in battery power supply, lasting 8 hours
- Waterproof rating: IP67
- Surveillance camera type: EX d IIC T4
- Installation mode: supports magnetic attraction, bracket, and strap

Hardware Description - Tool Scanner



Tool Scanner



Metal-resistant tag

Function points

- Supports Bluetooth 5.0 connection to access monitoring devices.
- NFC cards can be scanned at the frequency of 840 to 960MHz.
- Built-in polymer lithium battery, USB interface charging, full charge can be used continuously for 10 hours, standby for 7 days.
- The reading distance is not less than 3m.
- Interface communication rate 115200bps.
- Protection level: IP67.
- Installation method: magnetically attract to outdoor unit
- Tags can be installed by attaching or cable ties

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Benefit Analysis - Management Security Enhancement



Processed

management

Assignment application and relevant formalities for examination and approval.



Continuous monitoring

Continuous video surveillance
Continuous personnel monitoring
Continuous environment monitoring



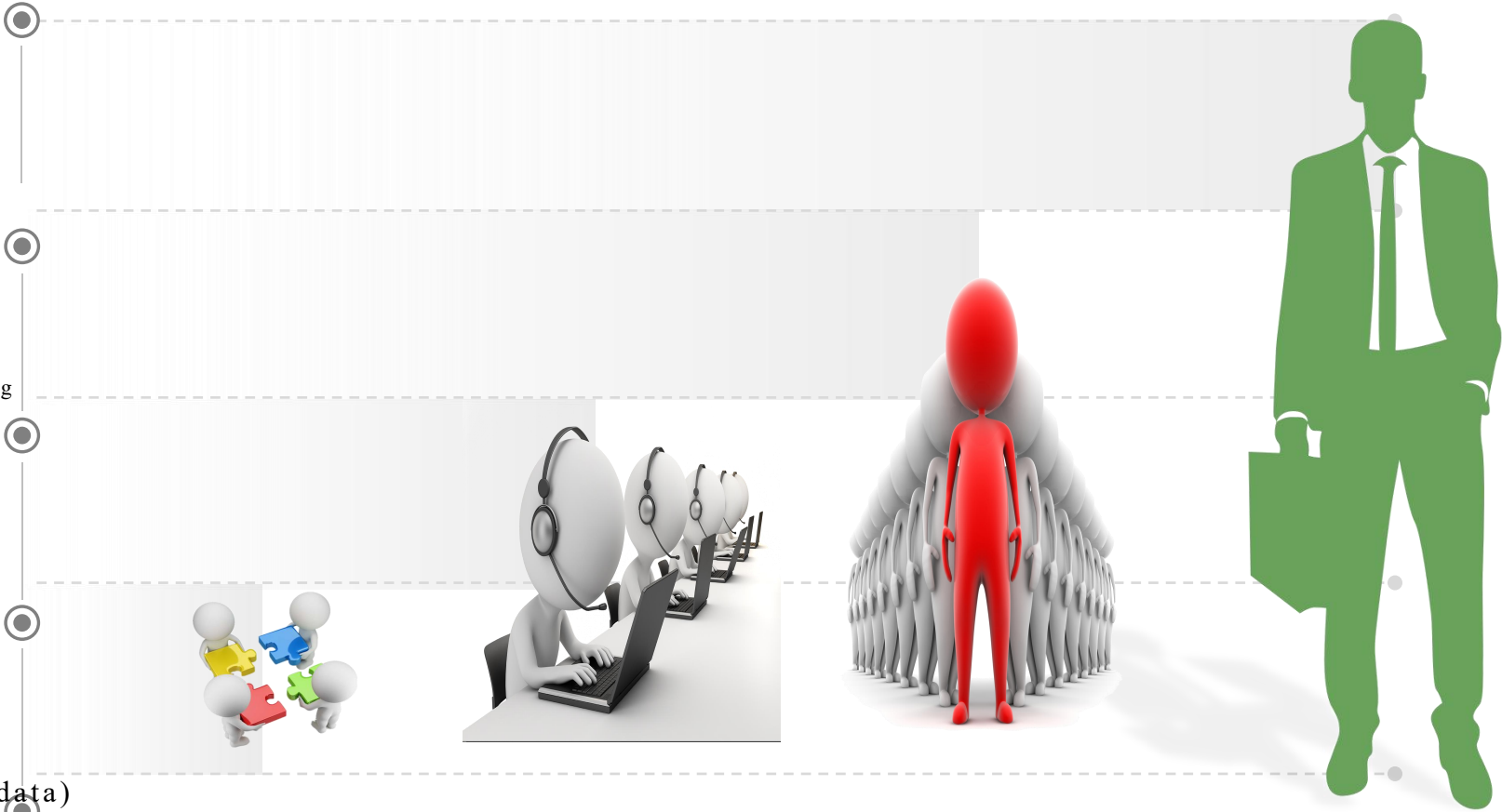
Alarm in seconds

Abnormal alarm of personnel, environment and operation, illegal operation



Intelligent tracing of accidents

Historical record query
Accidents tracing (video + data)
Define responsibility



Operation
procedure

Real-time
monitoring

Abnormality
warning

Accident
analysis

Benefit Analysis - Operator Safety Enhancement



Personnel access management

- Record personnel access;
- Unauthorized personnel entry will alarm;

Abnormal physical signs

Heart rate
Blood and oxygen



Proactively call for help and alert SOS

Abnormal behavior alert
Abnormal environment alert
SOS



Abnormality

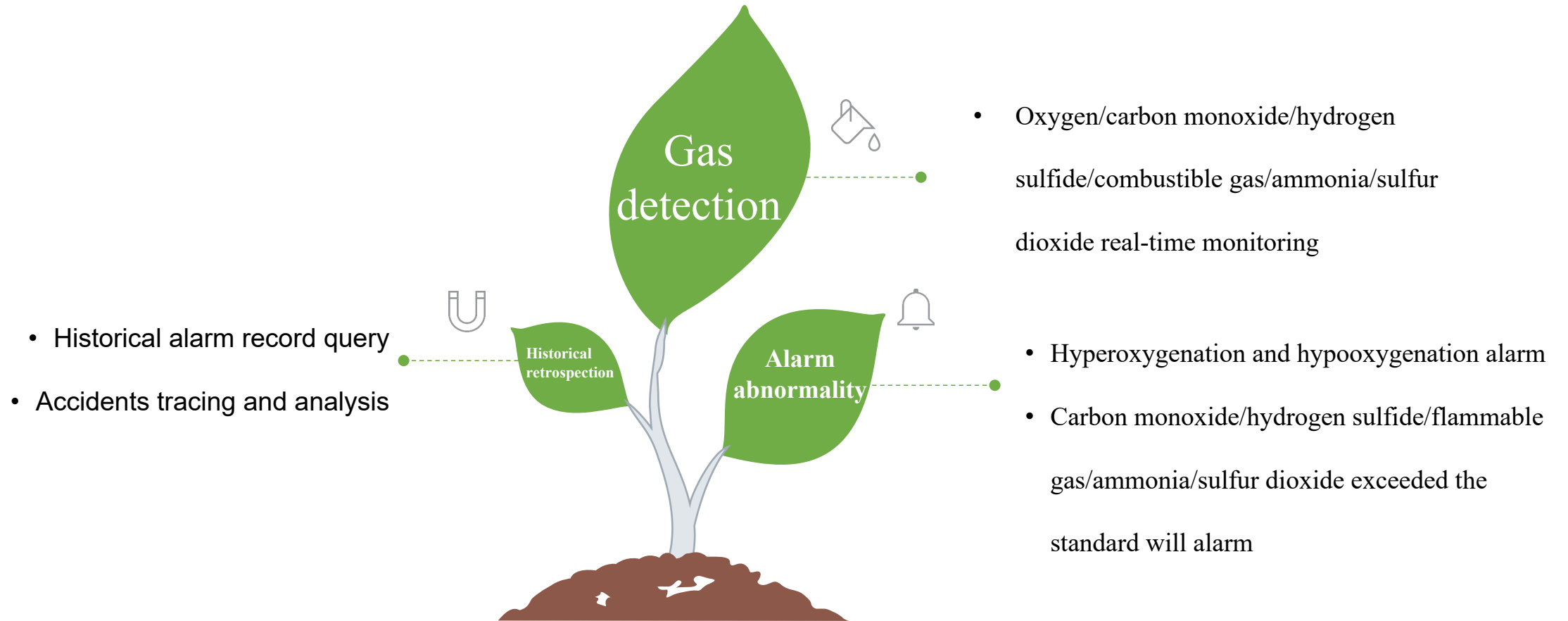
- Overcrowding
- Overtime
- Violations (safety helmet, smoking)

Remote command

Remote instruction
Violation reminder



Benefit Analysis - Environment Safety Enhancement



Benefit Analysis - Tools Safety Enhancement

