

*Global Indoor LBS Solution Leader*

# Real Time Location Service Based Entrance Control and Security Solution

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# Problem

Just checking the entrance speed gateway system with RFID ID Card might bring serious security hole.



## Using the other's entrance pass

- Stolen or missed RFID pass tag
- Rent my pass tag to others
- Impossible to see and monitor these cases

## Opened Speed Gateway

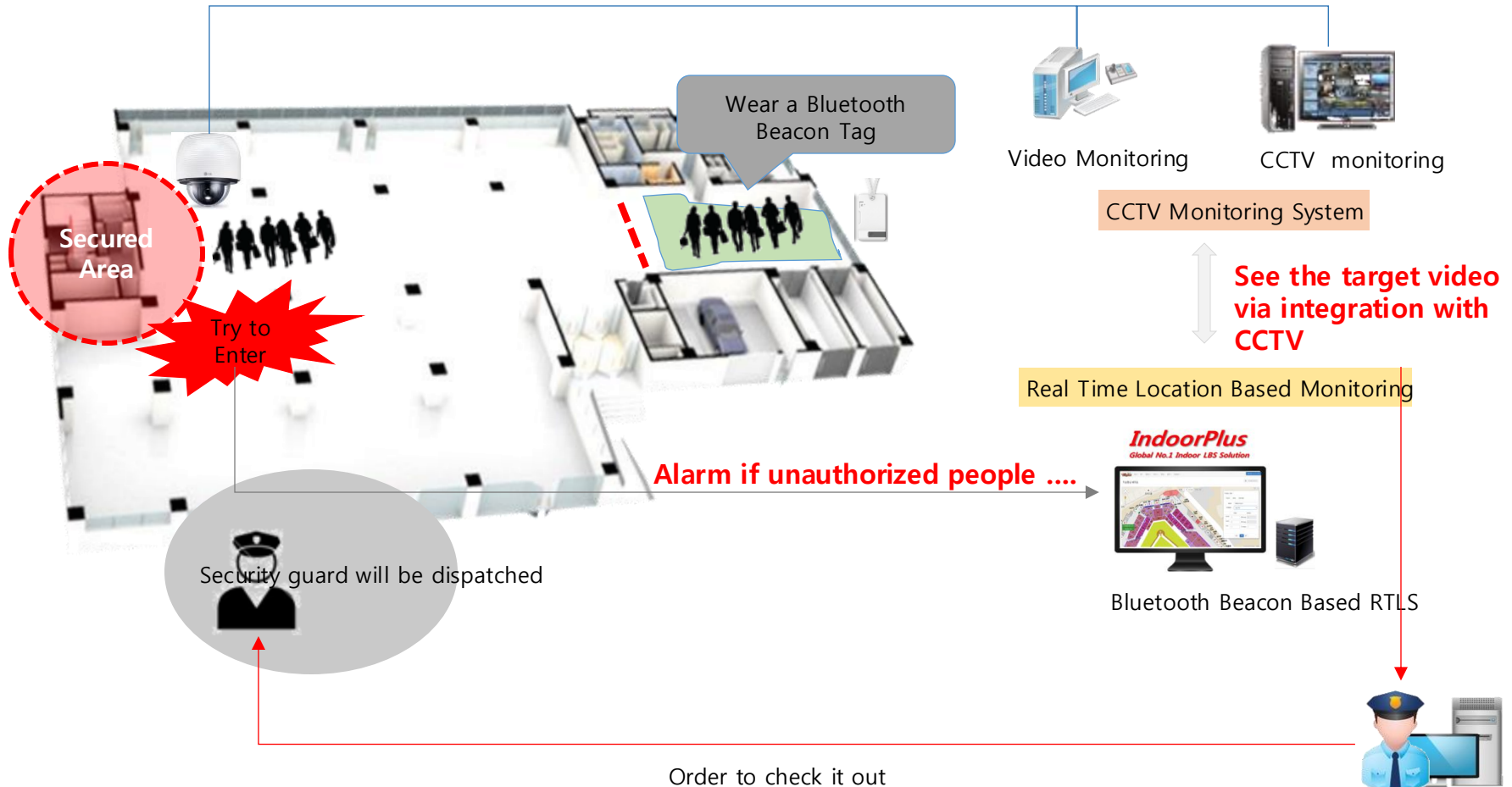
- During commuting hours, sometimes, it works as a open gateway
- For VIP, Executive members

## Once you enters, no way to control

- If someone succeeds in entrance, Out of Control

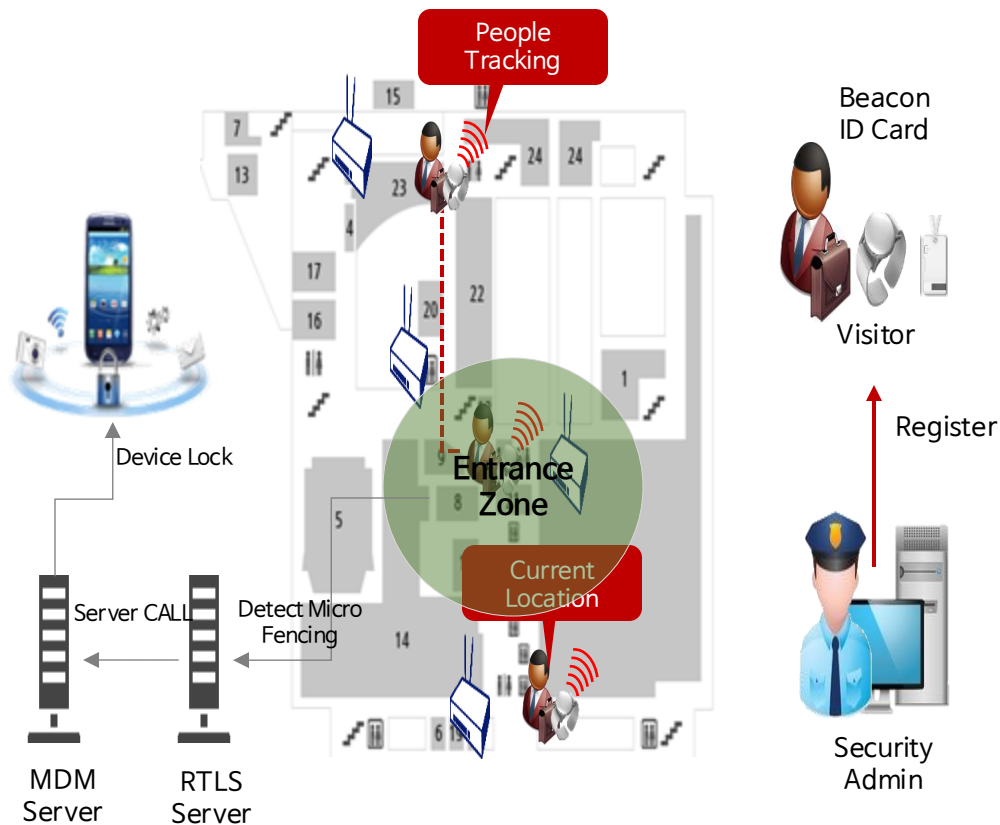
# Solution : Real Time Location Based Entrance Control and Security System

If you know the location of people, you can monitor most of human security hole. You can be notified about all of trials to enter into or leave from restricted area. If CCTV monitoring is integrated, you will have more powerful systems to track all.



# Solution : RTLS + MDM

If you have MDM (Mobile Device Management) system, you can leverage the effect of MDM through exact the location based some smartphone feature lock on/off.



Utilizing the microfence feature of IndoorPlus+ RTLS, it detects the entrance zone. Whenever people enters in, the MDM server integration will be activated and SmartPhone will be locked.



- AmorePacific is the largest Cosmetic Company of Korea (US\$ 4 Billions revenue in 2015). Growing success of its products in Asia.
- Improve Entrance Controls of factory to **increase the protection of confidential information**
  - ❖ 150 beacon scanners + 4,000 beacon tag
  - ❖ Check Entrance Zone
  - ❖ Whenever checks the entrance of employee, it locks some smartphone features with MDM Agent and Server
  - ❖ Lock succeeds up to 99%

# Required HW - Beacon ID Tag

Bluetooth Beacon ID TAG will replace the existing RFID ID TAG, or the ID Card Holder will have the Bluetooth Beacon Module. ( Battery will last for 1 ~ 2 years)



*It is a card Holder Type*



*designed for*



*Beacon is here*

# Required HW – Bluetooth Scanner

Deploy beacon scanners at indoor and outdoor if necessary.



<b>Name</b>	<b>Bi directional beacon scanner</b>
<b>Size</b>	161.8mm x 135mm x 28.74mm (W x H x D)
<b>Weight</b>	약870g
<b>Network</b>	10/100base T-Ethernet, Bluetooth4.0, LTE Extension
<b>OS</b>	Embedded Linux
<b>Security</b>	FHSS, PIN, ARIA, AES, BD Address,
<b>Power</b>	PoE support, DC 5v
<b>Range of Scan</b>	50~70m indoor, outdoor 200m with extension antenna
<b>Number of device per 1 sec scan time</b>	MAX 300 Bluetooth beacon tags/ 1 sec
<b>Configuration</b>	Support

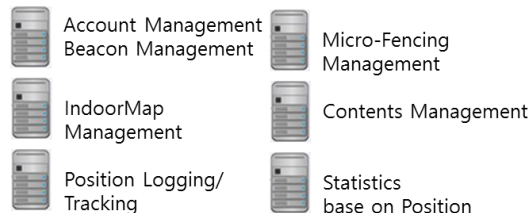
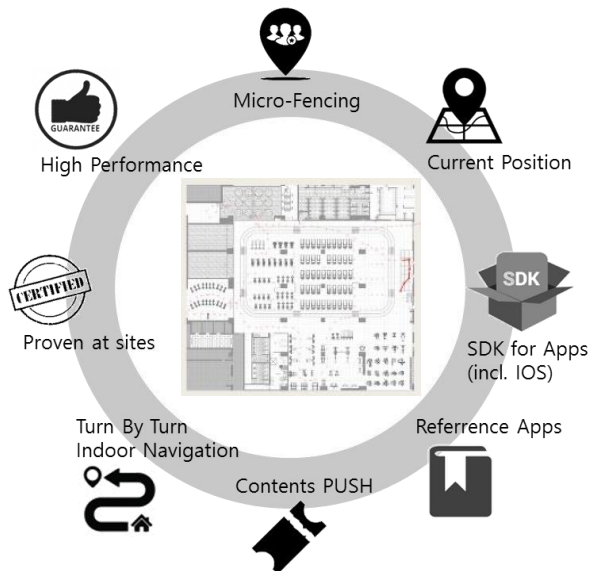


# Required SW

The People and Technology IndoorPlus+ RTLS (Real Time Location Service) Solution solves the problem of existing entrance and security control system with the leverage of exact accuracy of location tracking.

“ The outstanding performance in indoor location technology ”  
Selected as Korea TIPS (Tech Incubator Program for Startup)

IndoorPlus+ 



✓ location and object tracking with Bluetooth beacon tag

✓ support Sensor over Bluetooth Protocol such as Temperature, Humidity, and other sensors.

✓ Includes Massive Signal Data Handling processing required to support thousands beacon tag \* Hundreds beacon scanners

✓ 2~3m location accuracy

# IndoorPlus+ RTLS Reference

Within only one year after product launch , total 7 important dominant players in each industry select IndoorPlus+ RTLS. It proves the high performance of IndoorPlus+ RTLS



Fitness Center  
User Tracking



Asset  
Management



Workers Safety  
Management



Workers Location  
Tracking in Data  
Center



2015.June

Aug

Oct

Dec

2016. Feb

Apr

June

Aug



Passengers  
Location  
Tracking



Entrance Control  
with MDM



Korean Army Trainee  
Management with  
Health and Location



Winning  
Contract



# ARCHITECTURE

## List of IndoorPlus+ Components

IndoorPlus+ for RTLS Solution contains the 3 listed components.



### IndoorPlus+ Wearable Beacon IndoorPlus+ Beacon Tag

IndoorPlus+ Compatible beacon  
sends ID RSSI+Sensor Value

- iBeacon Compatible beacon
- All of 3<sup>rd</sup> party beacons are possible that implement non-disclosed reserved area protocol by P&T
- Need some customizing in case of other sensor values such as heart rates, skin temperature, or other sensors that doesn't have some standard rules.



### IndoorPlus+ Scanner Agent IndoorPlus+ APP Scanner

Do pre-processing with RSSI and Sensor Values, and send to RTLS sever by stable performance.

- Possible all of 3<sup>rd</sup> Party Scanners that implements IndoorPlus+ Server send/receive protocols.
- APP Scanner is a SmartPhone App works as a moving beacon scanner.
- IndoorPlus+ Scanner Agent does pre-processing of location algorithm, control management of beacon scanner, Adaptive Server Transmitter, Policy updates and Control and so on. It works on Embedded Linux OS.
- Scanner Agent is the part of IndoorPlus+ license. ( open HW board and 2 3<sup>rd</sup> party vendors licenses it)



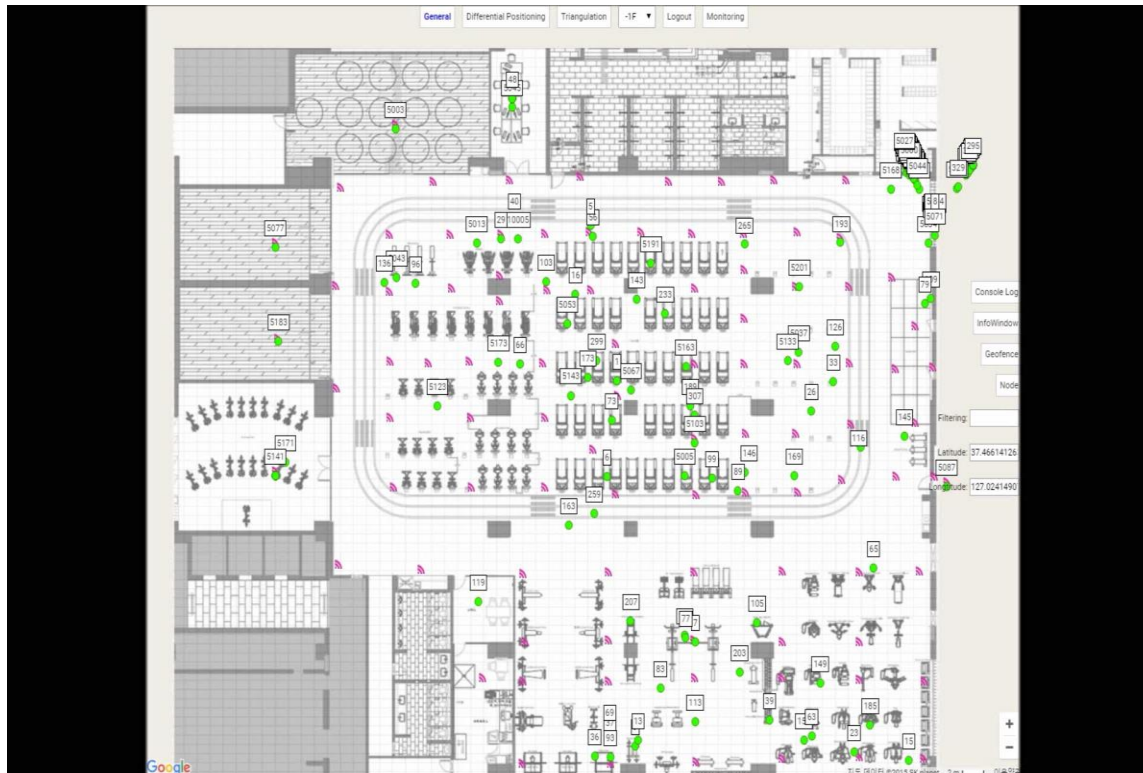
### IndoorPlus+ for RTLS Server SW

Filter, Refine, Normalize the signals from the beacon scanners. It makes real coordinates, and tagging of other supplementary sensor values.

- Mass Big size signal gathering/ Handling SW Engine
- Signal Filtering/Refinement Engine
- Pending patented location calculation Algorithm.
- Sensor Value Refinement Engine
- IndoorMap Management
- Geo-Fencing/PUSH
- Real Time location Dashboard
- Object Tracking/Heat Map/Foot Logging
- Beacon Management/Controls
- Beacon Scanner Policy/Distribution/Monitoring
- Other integration and customizing

# Working Video in Reference

4X speed Video. It checks users total exercise hours based on location staying time. Based on this, the total burning calories is automatically calculated.

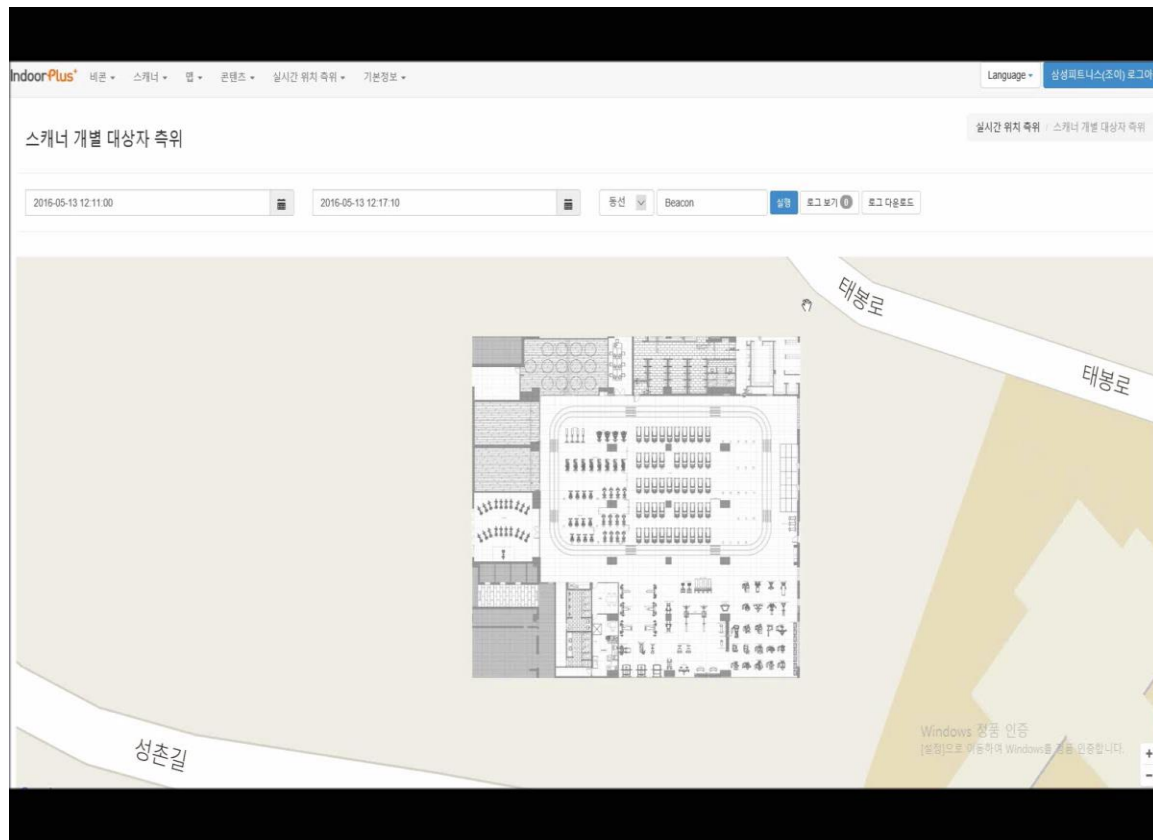


## DMC R&D Center in Samsung Electronics

- Big Size Fitness Center located in Samsung Electronics R&D Center
- Users burning Calories Automatic Check based on location tracking
- Concurrent 700 peoples are tracked in a real time.

# Working Video in Reference

4X speed video. It tracks and plays a certain user tracking path in a certain period.



## User Location Tracking Path Play

- Shows a certain user tracking path in a certain period
- Logging per 1 second
- Support Search & Comparison for a certain user tracking path history

# Working Video in Reference

Tracking Passengers in a ship for Safety and automatic Boarding/Leave Check

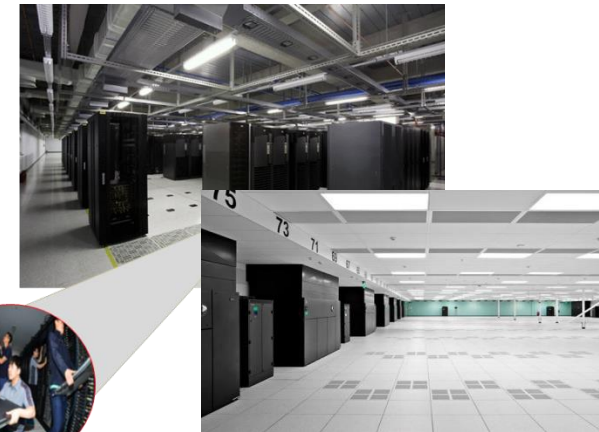
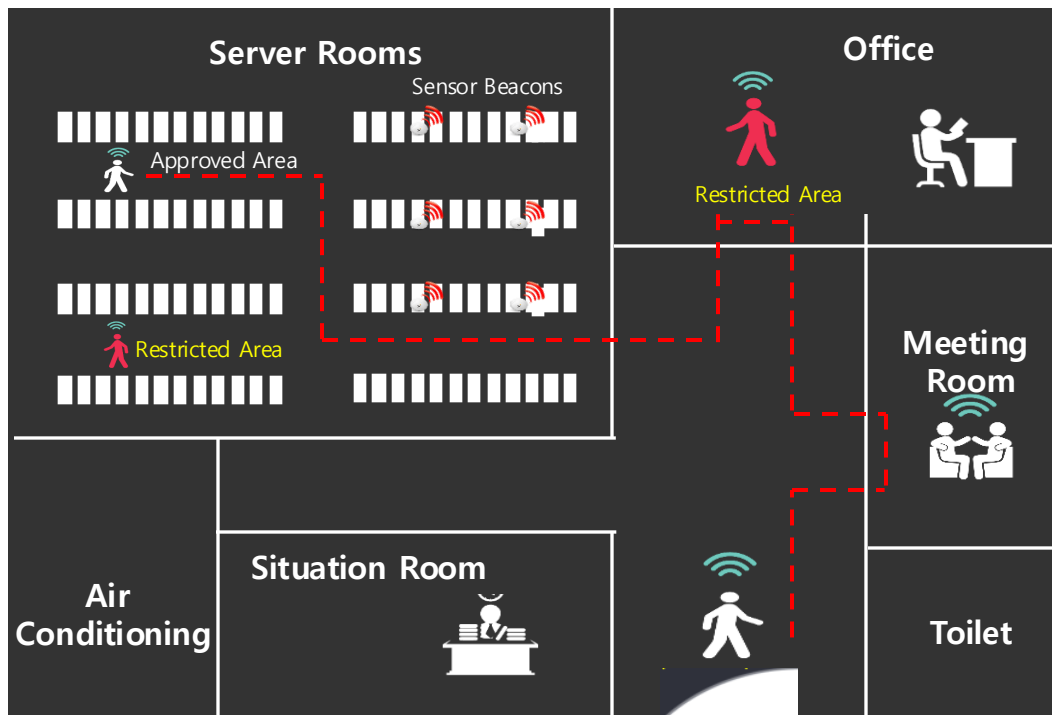


Passengers Tracking System in a IoT  
Smart Ship Project

- Automatic Boarding /Leaving Check
- Combo Tag with RFID and Bluetooth
- Passengers Tracking in a Ship
- Alarm if a certain people enters into a restricted area.

# Hyundai Motors Data Center Workers Tracking

With issuing a Bluetooth Beacon Pass, It tracks all of workers moving route in a data center. It alarms when a worker enters into a restricted area. Additionally, it let operator know where workers are if emergency case happens.



# Korean Army Trainee Smart Control System

With using a Bluetooth Military band (supports health check sensors), it can track all of soldiers location and health status in a real time.

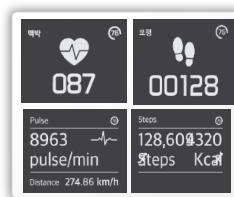
Pulse, Skin Temperature, Quantity of Training (Distance, Steps) , sends a Bluetooth signal periodically with this sensor values



- Alarm
- Time
- Date
- Stop Watch
- SOS button
- Whether to wear
- RSSI Location
- Message Check

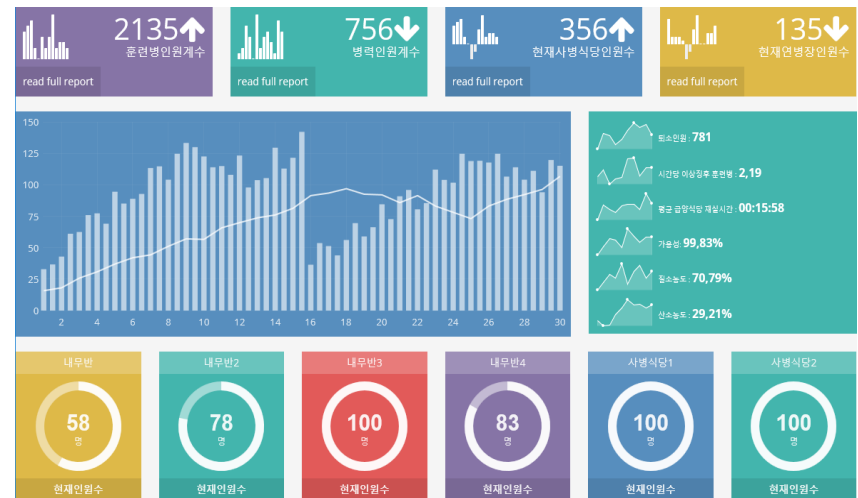


Bio and Health Sensor



Display

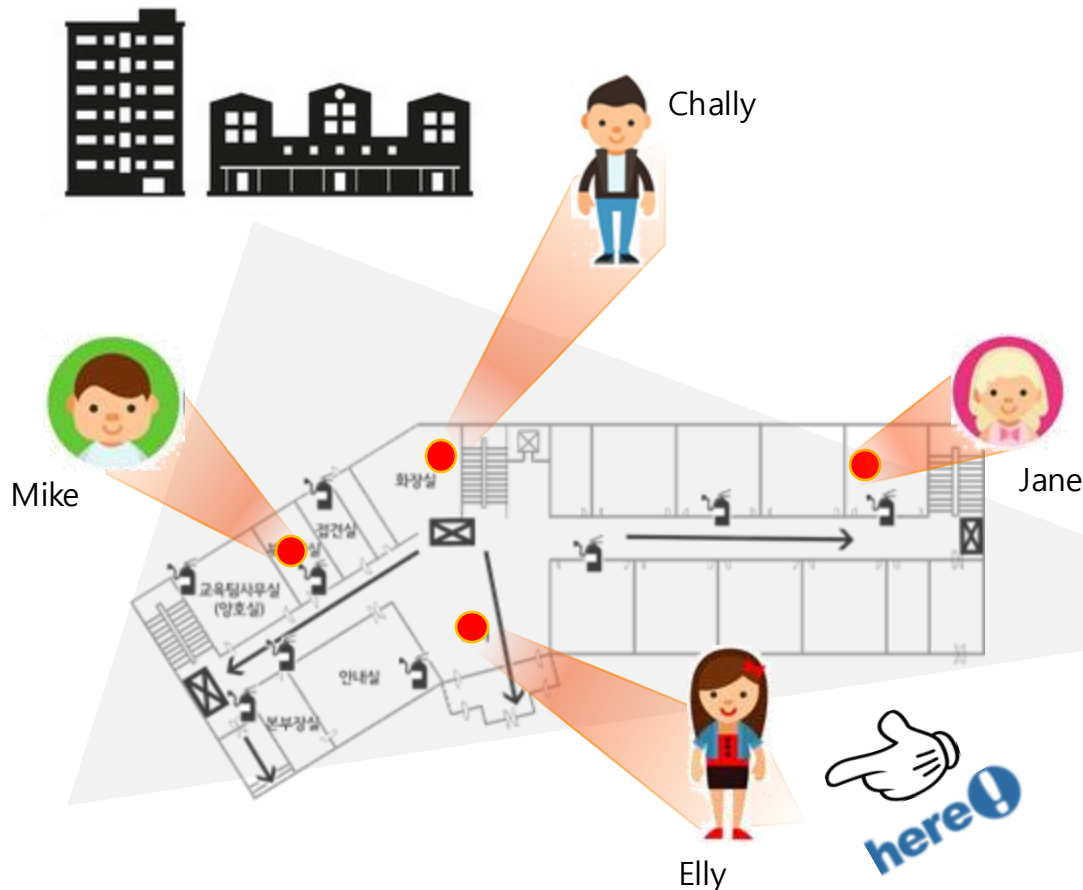
- Pulse Check
- Training Time
- Skin Temperature
- Speed Check



# Use Case Scenario(1)

*Where is?*

Know where he or she is in a real time



Elly is a person on the blacklist, We need to track her movement in this time.



Don't worry. IndoorPlus+ provides the feature where someone is in a real time.

Let me check  
Here she is!

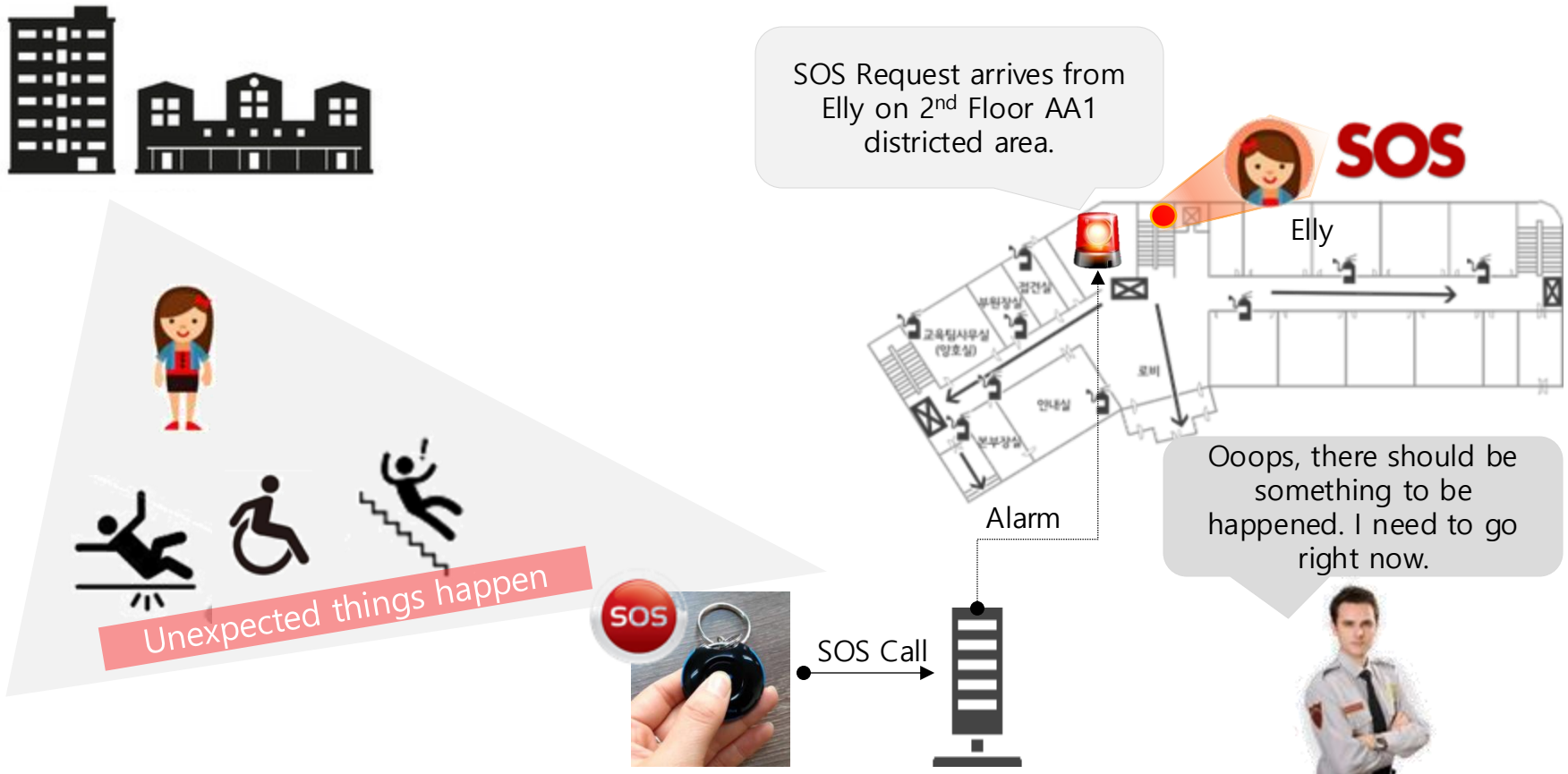




# Use Case Scenario(2)

*Help me right now !*

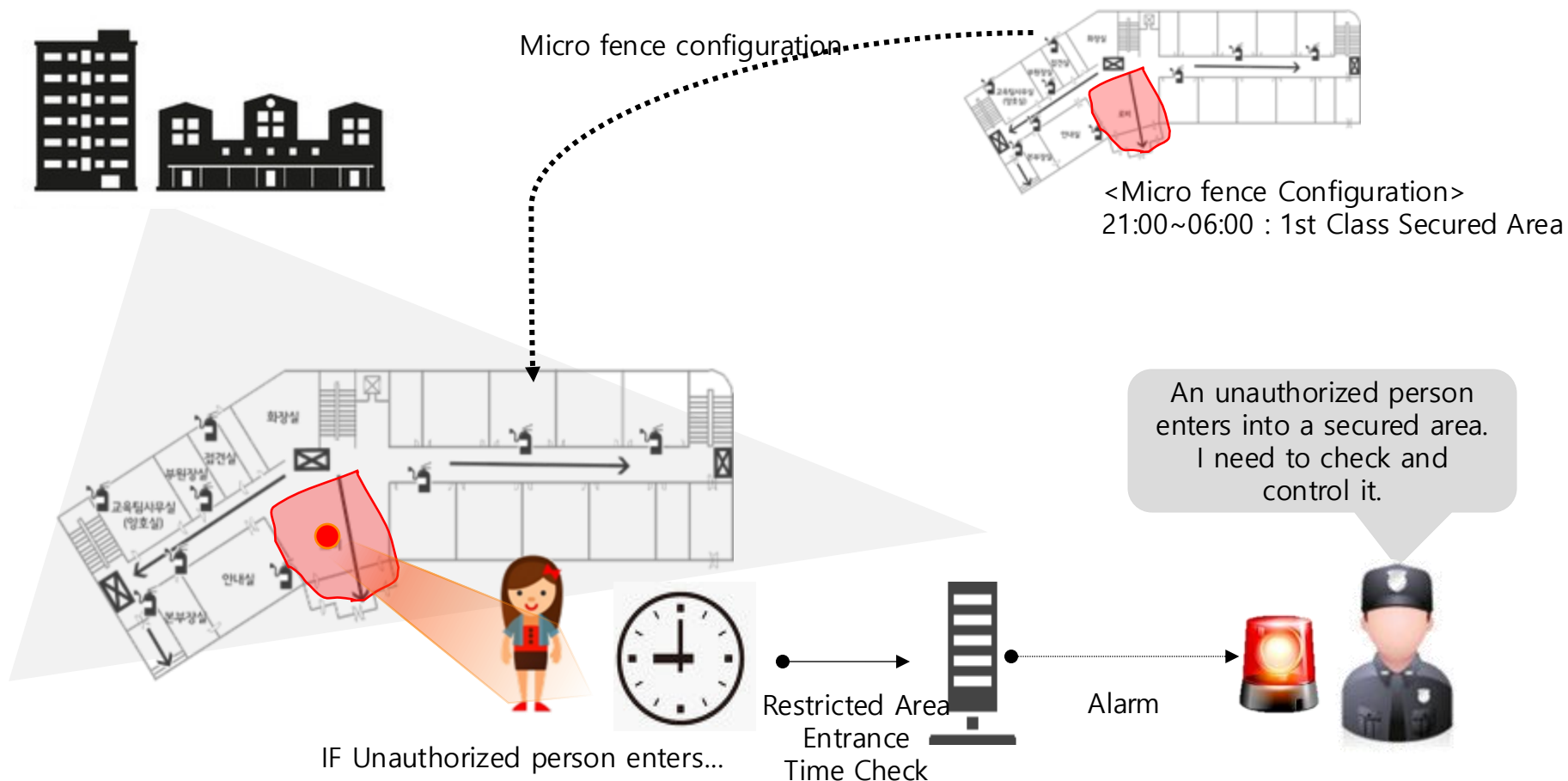
If there are some unexpected accident or others to be happened, people need to just press a SOS button in a beacon tag. It alerts the user location to system and security guidance.



# Use Case Scenario(3)

*Not allowed here and in this time!*

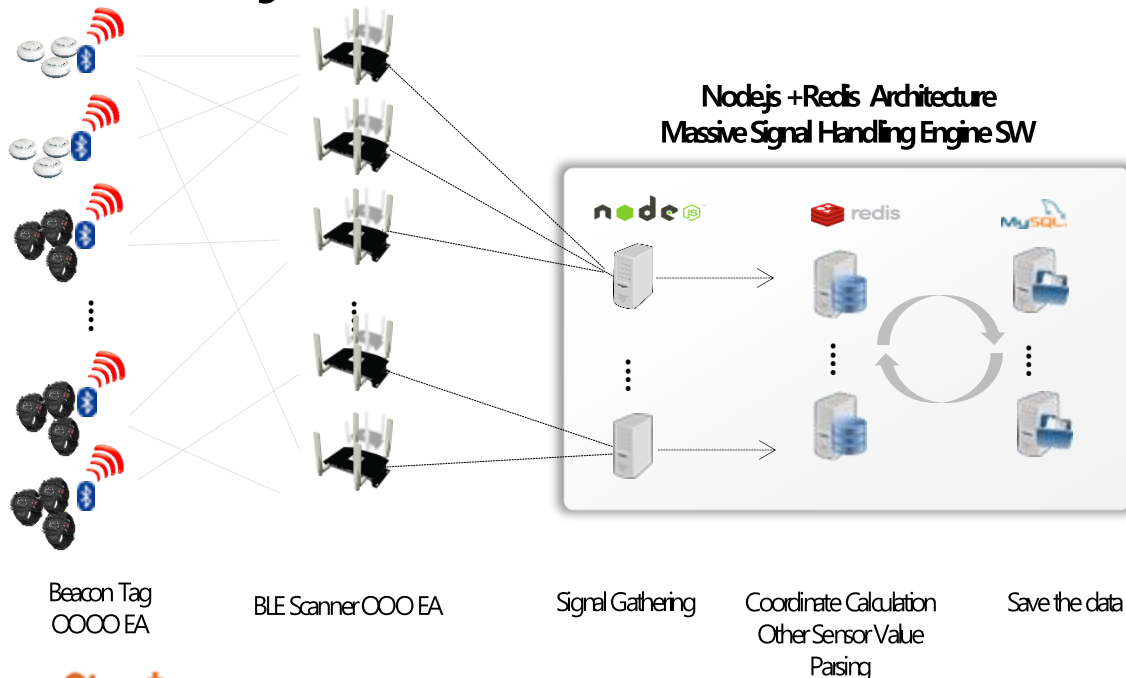
To prevent a security or safety accident , it need to configure some area as a secured or restricted area during a certain time. If someone enters into these kinds of area, location based RTLS system check and control it.



# Feature (1)

## Patented Location Positioning Algorithm

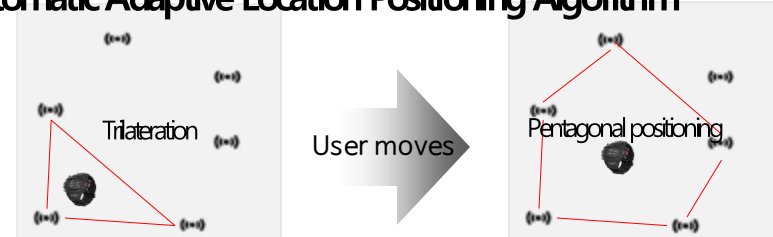
### ✓ Massive Signal Handling Engine + Spatial Recognition based Positioning



## Location Positioning Engine

✓ Automatically select the most appropriate positioning step that should be different in real world spatial area such as meeting room, hall, corridor. →

### Automatic Adaptive Location Positioning Algorithm



Gathered Signal / 1sec  
**More than 60,000**

Ex)  $3,000 * 10 * 2$  (assumes 3,000 beacon tag, 10 beacon scanners can catch this tag signal, every 500ms) = 60,000

Concurrent Node.js Handling Process **10 Units**

Optimized in the IoT System such as Asynchronous Signal TX/RX Handling with Node.js SW Load balancing (10,000/1 process)

Clustered Redis In-memory DB

Reduce the Transaction time using In memory DB during coordinate calculation

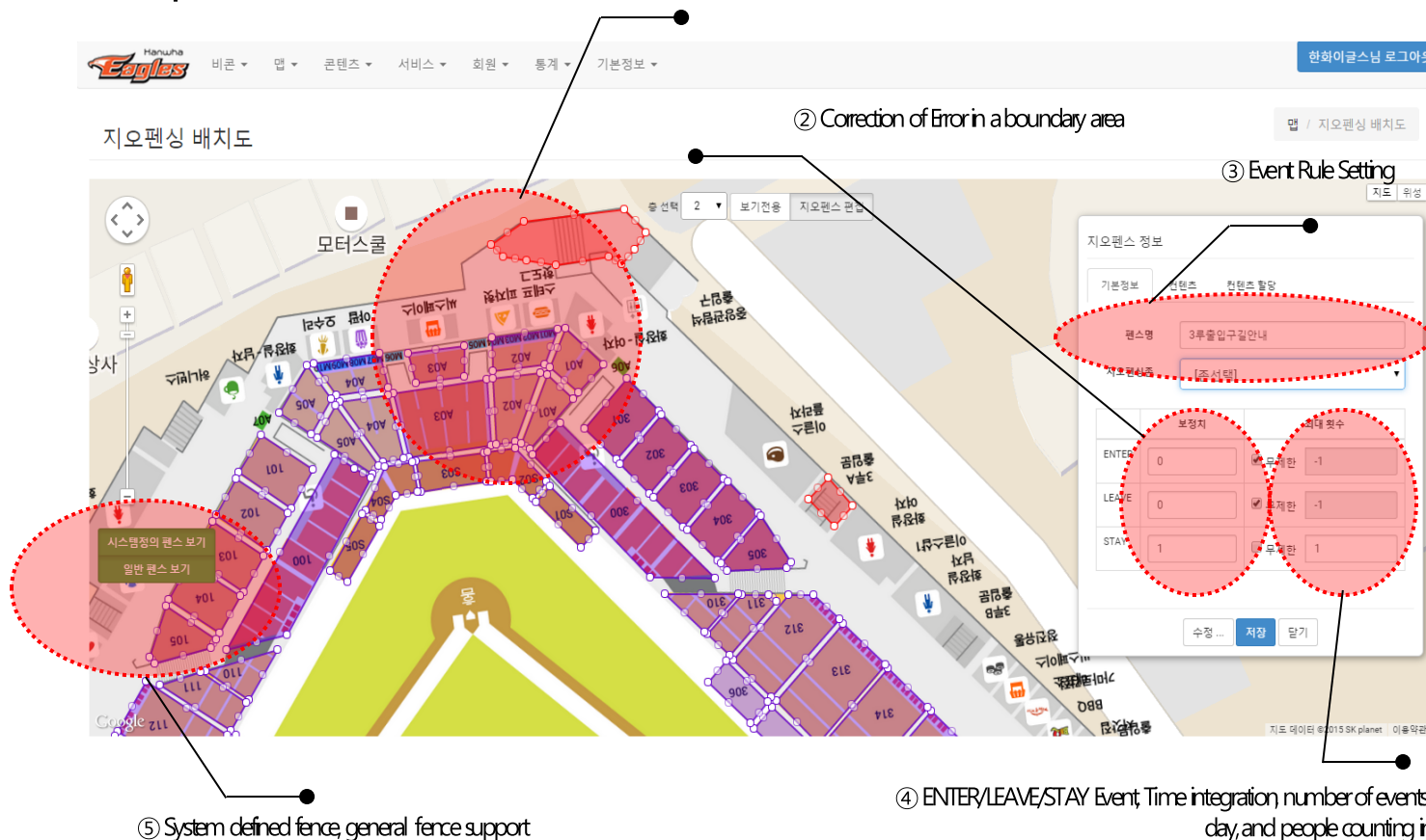
## Feature (2)

## Microfence

Configure virtual fence in the indoor area, and integrate the entrance/leave/staying time for secured area control and people counting.

✓ Real adopted case for micro fence

① support circular and various Polygon Type to fit for real world structure



# Feature(3)

Map

Using Google indoor & outdoor map, easy to be maintained. The geographic coordinates(latitude & longitude) are used to display each location.

PNU+ 비전 ▾ 앱 ▾ 콘텐츠 ▾ 통계 ▾ 기본정보 ▾ 부산대병원 관리자 로그인

야외 관리

층 추가
13F (13)
12F (12)
11F (11)
10F (10)
9F (9)
8F (8)
7F (7)
6F (6)
5F (5)
4F (4)
3F (3)
2F (2)
1F (1)
-1F (B1)

하 1 층 이름 1 이미지 파일 선택 수정 삭제

swLat 35.0997615  
swLng 129.017298  
neLat 35.1013715  
neLng 129.019666  
lat  
lng

Outdoor&Indoor Unified Map

Real geographic coordinates are used to calculate each distance

Floorplan

Floor Plan is supported

# Feature(4)

## Tracking route path recording & play

Provide spaghetti diagram, foot log, Heat Map, Replay for various tracking view

✓ Time line based each person route path

① various search option

The screenshot displays the IndoorPlus+ web application interface. At the top, there is a navigation bar with links like '바콘', '스캐너', '맵', '콘텐츠', '실시간 위치 추적', and '기본정보'. A search bar is present with the text '스캐너 개별 대상자 추적'. Below the search bar, there are filters for date (2016-05-13 12:11:00 to 2016-05-13 12:17:10) and a search button. A table of search results is shown with columns: No., UUID, targetName, beaconName, fenceName, lat, lng, floor, and regDate. A red dotted oval highlights a section of the table. Below the table, there is a map view showing a building layout with a red dotted oval highlighting a specific area. A red dotted oval also highlights the search filters and buttons at the top of the table.

No.	UUID	targetName	beaconName	fenceName	lat	lng	floor	regDate
38550	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.466265	127.02449	-1	2016-5-13 12:11:14
38564	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.466265	127.02448	-1	2016-5-13 12:11:16
38581	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.466264	127.024469	-1	2016-5-13 12:11:18
38597	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.466262	127.024456	-1	2016-5-13 12:11:21
38612	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.46626	127.024443	-1	2016-5-13 12:11:24
38627	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.46626	127.024429	-1	2016-5-13 12:11:26
38642	6F6E696F-6E5F-6461-7461-63656E746572	Beacon	Beacon		37.466260	127.024412	-1	2016-5-13 12:11:28

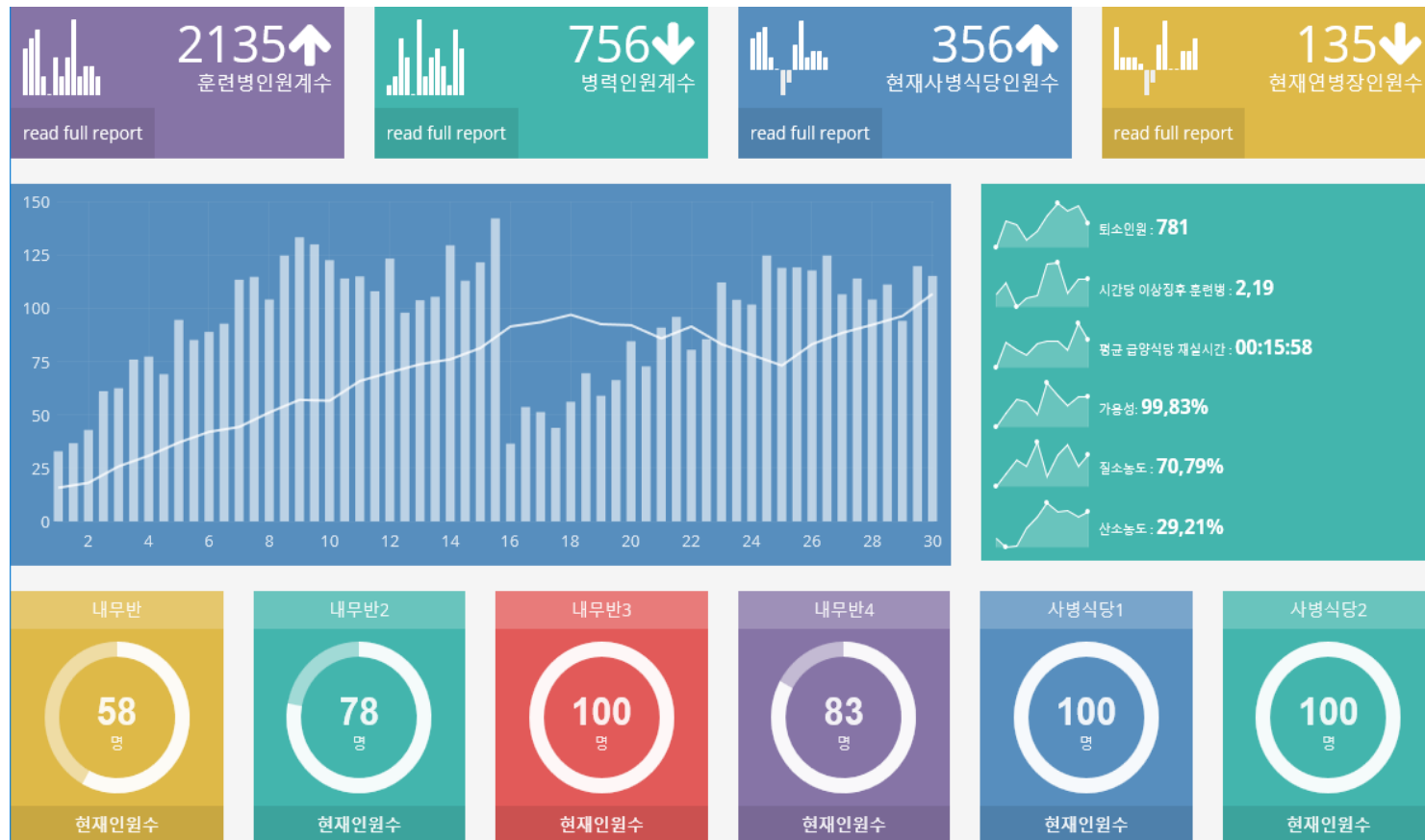
② Log table per each timeline and position per each log

③ Track record replay during time line

# Feature(5)

Dashboard

Location Info + Health Check info (option) + Tracking result summary + People count for each Zone and etc



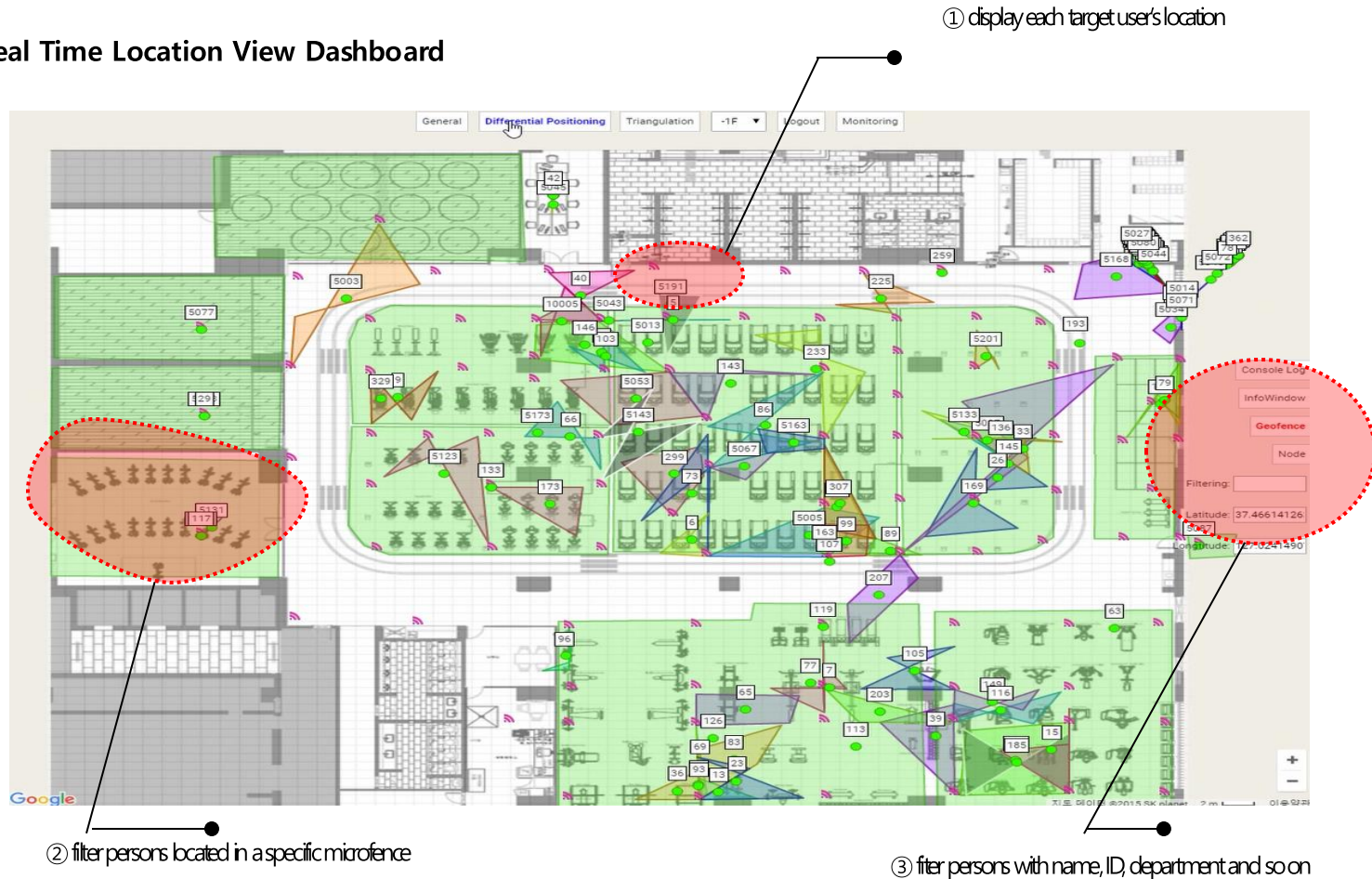


# Feature (6)

## Real Time Location VIEW

Display each target person to be tracked in a map

✓ Real Time Location View Dashboard



# Feature (7)

## Device & User Management

### Beacon Tag Device Management & Visitor or User management(Interfaces)

Members
10 records per page
Search:

이름	입소일	직급	모니터링상태	Actions
김기원	2016/02/01	훈련병	Banned	
김생	2016/01/21	훈련병	Active	
김성근	2016/03/01	훈련병	Pending	
김수현	2016/01/01	훈련병	Active	
김시원	2016/01/01	훈련병	Active	
김태균	2016/01/21	훈련병	Active	
송중기	2016/01/01	훈련병	Active	
안정환	2016/02/01	훈련병	Banned	
이동국	2016/03/01	훈련병	Pending	
홍길동	2016/01/01	훈련병	Active	

Showing 1 to 10 of 10 entries

주간 동향

- 92 신병
- 15 퇴소
- 36 신규인터넷
- 45 맥박이상자
- 112 재온 이상자
- 31 온등 부족 훈련병
- 93 의무실
- 256 신규 등록 웨어러블 수

훈련병 이상자 리스트

- Name: 홍길동  
Since: Jul 25, 2012 11:09  
Status: 맥박이상
- Name: 김수현  
Since: Jul 25, 2012 11:09  
Status: 재온이상
- Name: 장동진  
Since: Jul 25, 2012 11:09  
Status: 온등 결과부족
- Name: 송중기  
Since: Jul 25, 2012 11:09  
Status: 맥박이상

To Do List

- 신규 훈련병 면담 결과 기록 today
- 실시간 교육훈련 성과 100% 달성 today
- 급식 정보 입력 tomorrow
- 인터넷 편지 전달 tomorrow
- 급식 정보 입력 this week
- 인터넷 편지 전달 this week
- 급식 정보 입력 this month
- 인터넷 편지 전달 this month

화장실1
58명
현재인원수

화장실2
78명
현재인원수

세면대1
100명
현재인원수

목욕탕1
83명
현재인원수

휴게실1
100명
현재인원수

PX실1
100명
현재인원수

Beacon Tag Device Mgt

Check Device battery and live

User Managment

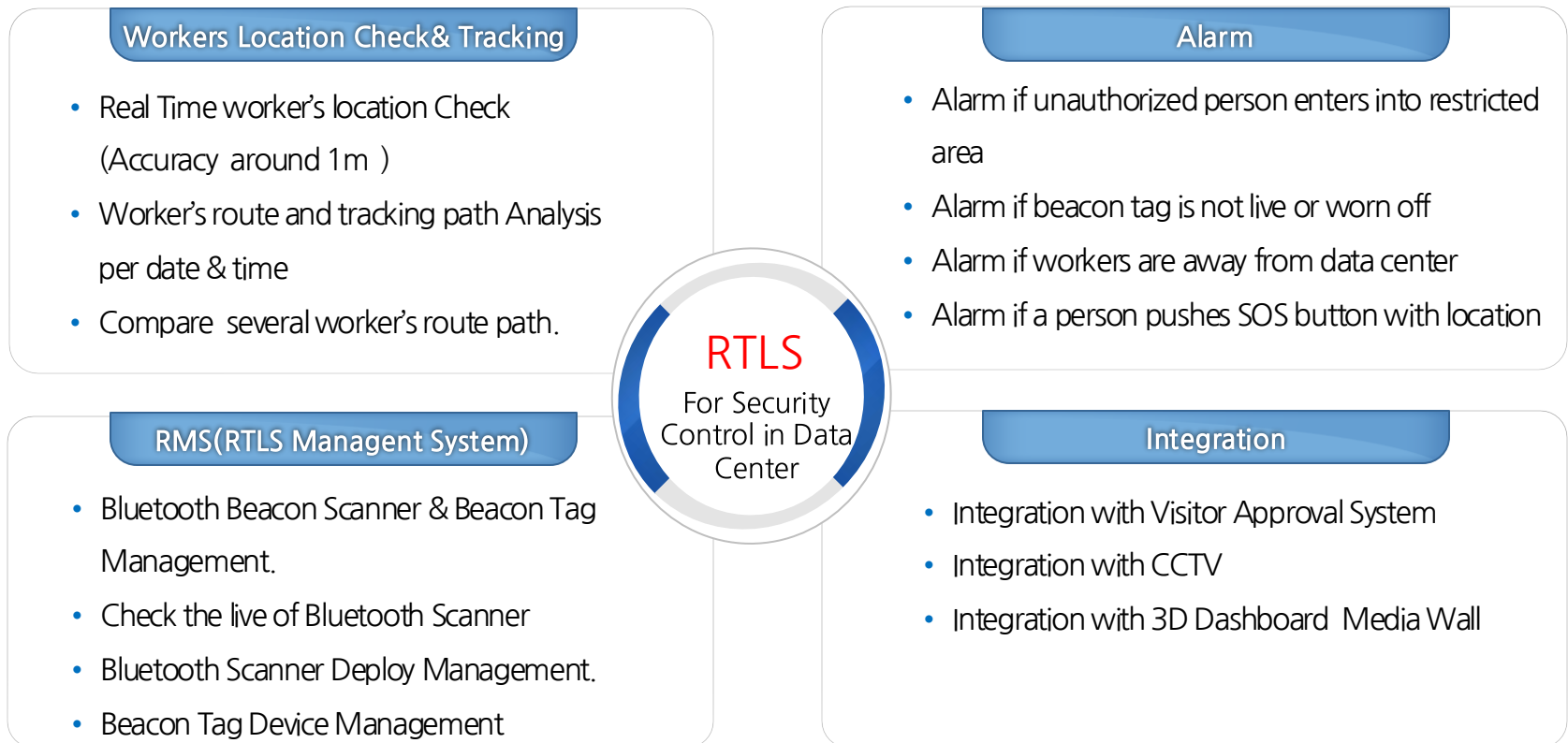
User profile including picture

# Details

## : RTLS in Hyundai Motor Data Center

# Feature Summary

## For Ultimate Security Check Real Time Location Service in Data Center



# How to approach it (1)

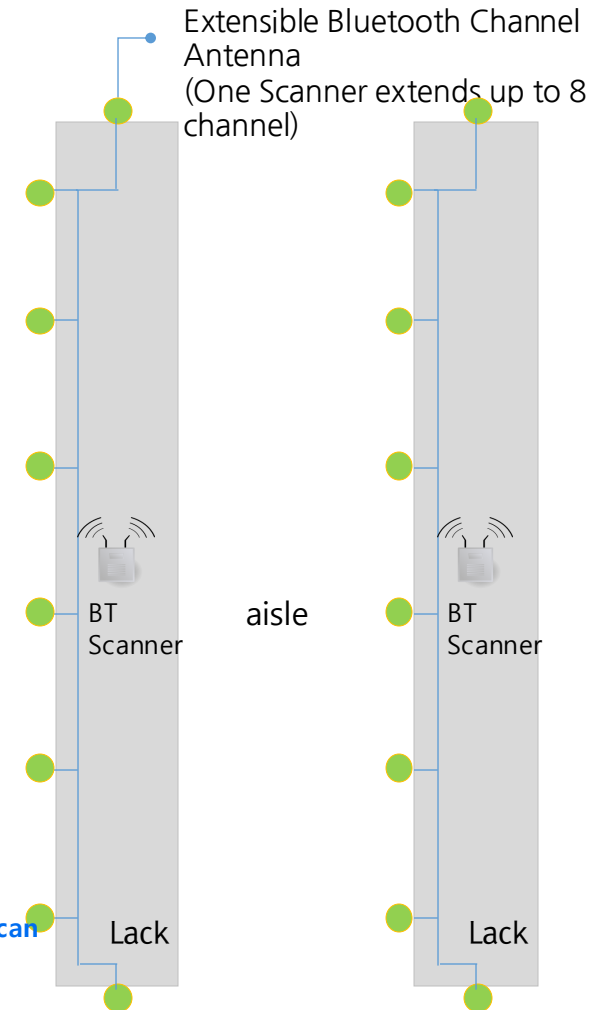
## Specific Location Positioning Algorithm for Data Centers

### 1) How to distinguish location at the between aisle and lack unit

#### ① Lack Deployed area



- If you need the location which lack unit the worker is....
- In the aisle, indoorplus+ location provides the around 1.5m accuracy with linear dot matching algorithm.
- Thanks to extension Bluetooth gathering channel up to 8, it can work such as a logically 8 Bluetooth scanner with only one physical scanner.



# How to approach it (2)

## Specific Location Positioning Algorithm for Data Centers

### 2) How to distinguish location at the open space

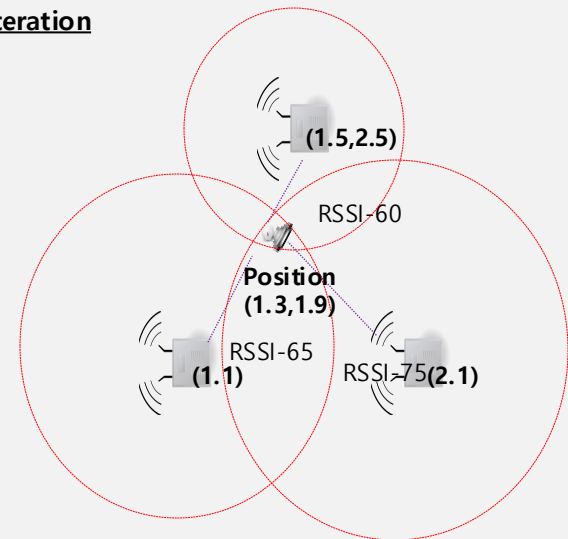
#### ② Open Space area



#### ③ Meeting or Situation Room



#### Trilateration



- Thanks to the patent Indoorplus+ location algorithm, the accuracy in the open area is around 3m
- Signal Filtering and Normalization, and the dynamic positioning algorithm such as Trilateration, and rectangular or any polygonal positioning, according to scanner deployed situation.

# Expected Effect(1)

*Why it needs?*

If you want to reduce the security hole, it is all about human.

## Problem

Human security hole exists : sometimes, malicious workers may destroy or pull out precious information through direct connection to Server in the Data Center

Admin(Operator) cannot control all of workers similar as one to one matching.

Workers can catch some valuable information via just looking around some restricted area

In case of disaster or emergency in data center, no one can know if all of people escaped or not



## RTLS Answer

1

**IndoorPlus+ blocks the entrance of non-allowed area with location tracking**

2

**IndoorPlus+ provides the continuous and accurate worker's moving route tracking as a evidence.**

3

**Indoorplus+ can locate if someone is in the center and where he is. Even it can provide SOS request through system.**



# Expected Effect(2)

*Why it needs?*

If you want to improve the productivity, RTLS also can be an answer.

## Problem

Operator or Security Guide has to patrol regularly in and out of data center. However, no ultimate way if they have done.

There are lots of facilities in data center, but the exact location of them are not matched with system due to human operation mistake.

Normally 99% is O.K but 1% mistake might bring some serious incident.



## RTLS Answer

1

**IndoorPlus+ provides the digital patrol management ledger in the important facility.**

2

**IndoorPlus+ updates exact the location of not only human but also each important assets.**

3

**Indoorplus+ can provide the working tension to decrease any mistakes.**

# Need More Information?

Contact to

[sphong@pntbiz.com](mailto:sphong@pntbiz.com) or [sales@pntbiz.com](mailto:sales@pntbiz.com)

Home page : <http://www.pntbiz.com>

Solution Page : <http://www.IndoorPlus.co.kr>

Facebook : <https://www.facebook.com/pntkorea>

Youtube Channel : [http://www.youtube.com/channel/UCjta-QWjrvGLDS\\_BpyV3C2w](http://www.youtube.com/channel/UCjta-QWjrvGLDS_BpyV3C2w)