Merya RTLS ® Mobile

RTLS monitoring of people working at hazardous workplaces outside buildings (using GPS)
RTLS monitoring of people working at hazardous workplaces inside buildings (using Bluetooth)
Monitoring of motion and position, detection of immobility, lying position, and fall, emergency SOS button
Localization of people in real time - RTLS
Special mobile phones for monitoring in explosive environment (EX)

About the system

Merya RTLS mobile is a wireless system for monitoring people working at hazardous or standard workplaces, by using mobile phones with Android OS and RLH-Mobile security app. The technology is used for localization of people and objects in real time (RTLS) in form of 2D/3D visualization on a map base, in form of labels with their corresponding names. The system uses ground plan drawings of objects, or offline maps known as the service mapy.cz. The app in mobile phone uses integrated sensors to detect changes in the position of person (a lying person), person's immobility (a loss of consciousness, etc.), person's free fall, and SOS call for a help. Thanks to the monitoring, you can ensure the security of patients, elderly and disoriented people, children on their way to school, etc. Monitoring can be realized in individual areas of the object (building) and also outside of it. The localization accuracy inside the buildings depends on the number of detectors. The localization accuracy outside the buildings depends on the accuracy of GPS service. Merya RTLS provides signaling of a movement, or a stay in the dangerous area. The system displays the position of all persons either online, or historicaly from a record. Merya RTLS also provides a monitoring of persons in environments with the risk of explosion (EX), using a mobile phone with a certification for explosive environments.
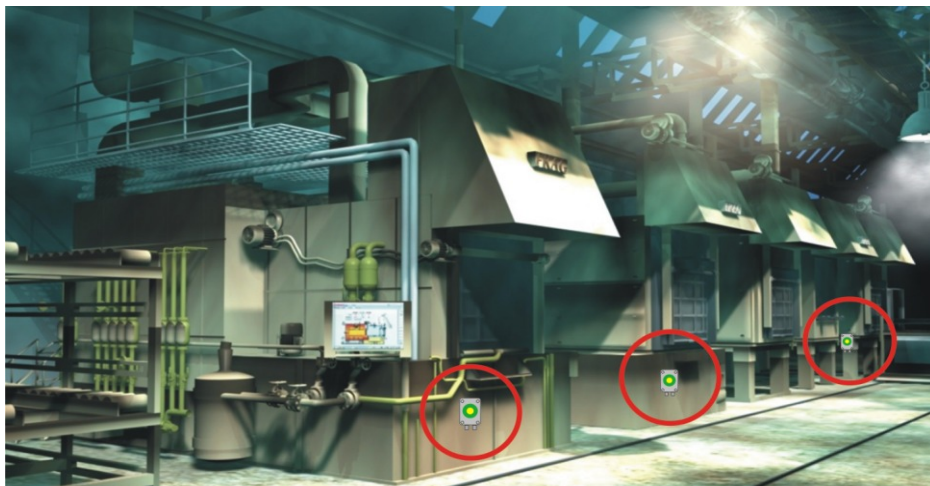
fig. A - Example of installation of RLS-05bt detectors in an industrial hall

Description of the RLH-Mobile app designed for mobile phones

RLH-Mobile app is designed for mobile phones with Android OS that are equipped with the necessary sensors. RLH-Mobile app is very simple and user friendly and consists of a single screen only. The program can be (not necessarily) set so that the phone is exclusively designed just for this app, and doesn't allow to perform other operations to common users. The "RLH-mobile" app is password-protected and without the password the app can't be turned off nor you can change its operating parameters. The app can detect a lying person (even if the person moves), person's immobility (in case of loss of consciousness, and the like), a free fall, and has a large "SOS" icon to call for a help in case of emergency. The app indicates these security avisos and alarms acoustically and by vibrations, and sends these states to the central unit. In case the person doens't respond to aviso, the system triggers alarm after a set timeout. Battery lifetime depends on the type of the phone, on the period of communication with the RLU central unit, and on the frequency of display's awakening from a sleep (e.g. during alarm). Mobile phone can be worn in a special case (not supplied) on a work suit.

RLH-Mobile app in a mobile phone

- monitoring the position of a person (outside, by GPS)
- monitoring the position of a person (inside the building, by BlueTooth)
- sensor for lying person
- sensor for person's immobility
- sensor for a free fall
- SOS button to call for a help in an emergency
- a local indication of "pre-alarm"
- detection of areas with a permission for device postponement
- user control of modes using NFC tags
- The manufacturer recommends using this type of mobile phone that has been tested: **Samsung Galaxy Xcover-4**
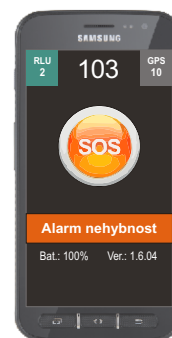
RLH-Mobile app in a mobile phone certified for use in EX environment:

⟨Ex⟩

- same features listed above

    The manufacturer recommends using these types of mobile phones:

    - **Sonim Ecom Smart-Ex 01**   certified for EX environment, Ex-Zone 1 / Division 1
    - **Sonim Ecom Smart-Ex 201**   certified for EX environment, Ex-Zone 2 / Division 2
    - **i.safe Advantage 2.0.**   certified for EX environment, Ex-Zone 1 / 21
    - **IS 730.2**   certified for EX environment, Ex-Zone 2 / 22

Regular communication with RLU central unit

The RLU-Mobile app nonstop periodically communicates with RLU central unit standardly via GPRS channel, and may also optionally communicate via WiFi network backup. The system can, online, indicate a fault state, in which the mobile phone or the app isn't able to regularly communicate with the central unit. This ensures a high reliability of the system. The surveillance of the entire system and the state of all monitored people can be carried out via common web browser within LAN network or the Internet. The Merya RTLS program enables to display the position of supervised people using 2D or 3D graphical visualization, online. Records of the above listed alarm situations, and also an information about the permission to stay in the individual areas (permitted or not permitted), are stored in the RLU central unit's memory.

Possible ways of alarm indication

- directly in mobile phone
- siren at the site of the incident
- on a computer screen in dispatch center (online table of people, 2D visualization - maps, 3D visualization - inside buildings)
- SMS, email messages (messages sent automatically from your phone app)
- HANDS FREE automatic call dialing   (automatically from your phone app)
- data transfer to dispatching (any computer) using SNMP communication
- turning of PTZ cameras

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Monitoring in an open area

In an open area, the localization of people's position is preferably carried out using GPS satellites. This position is forwarded to the central unit in regular communication messages. This allows the software to display the location and status of people on online maps (known as mapy.cz service). Persons are displayed on a map background in form of functional icons that characterize the state of person (immobility, horizontal position, free fall, SOS call, unauthorized stay in an area, etc.).
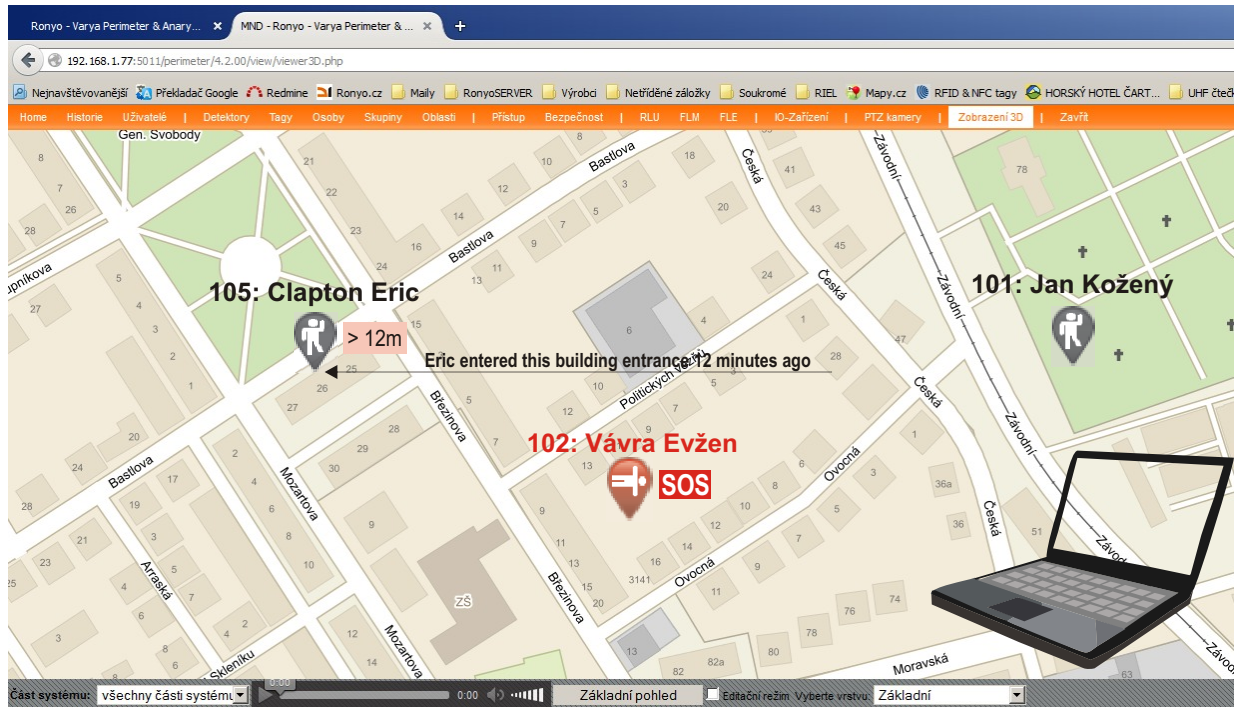
Virtual areas usable in 2D view

You can also define so-called virtual areas (using GPS coordinates) in the system. These areas can be named and e.g. you can use them to define when the programmable logic outputs of central unit should be activated (e.g. in case that there is at least one person in the area, etc.). These areas can also be used to log information into history, containing areas in which an employee moved and when. For example, the employee Jan Novák was in the area "povrchový důl Sokolov" from 7 am to 3:30 pm. These virtual areas aren't displayed yet in the 2D view agenda.
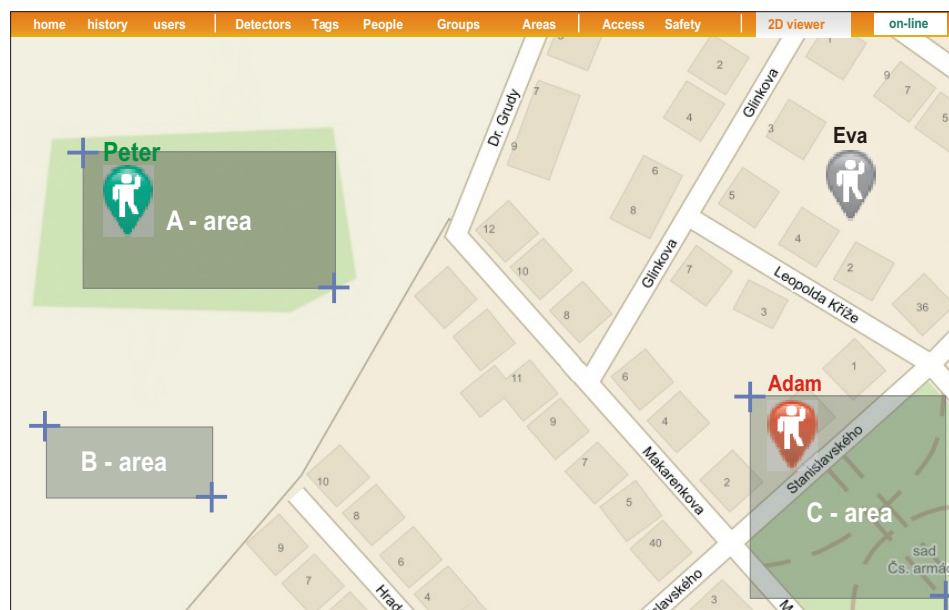

obr. 3B - Virtual areas in the system

Monitoring inside buildings

Even an absence of a signal from GPS satellites inside buildings isn't an obstacle for the system to locate the position of a person. This localization inside buildings is in fact carried out via RBT-02 or RBT-03 detectors (battery powered), equipped with a BlueTooth channel. The surveillance of the entire system and the status of all monitored persons is carried out in the same way as in the variant of monitoring in the open area. However, when used inside buildings, the Merya RTLS program uses a floor drawing plans of individual floors of (multi-storey) buildings (in PNG format) for a visualization. In case that detectors are placed on all floors of the building, the system can determine, which floor the seeked person or a person in distress is located on.
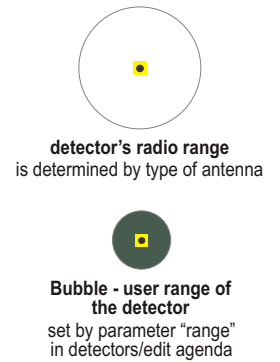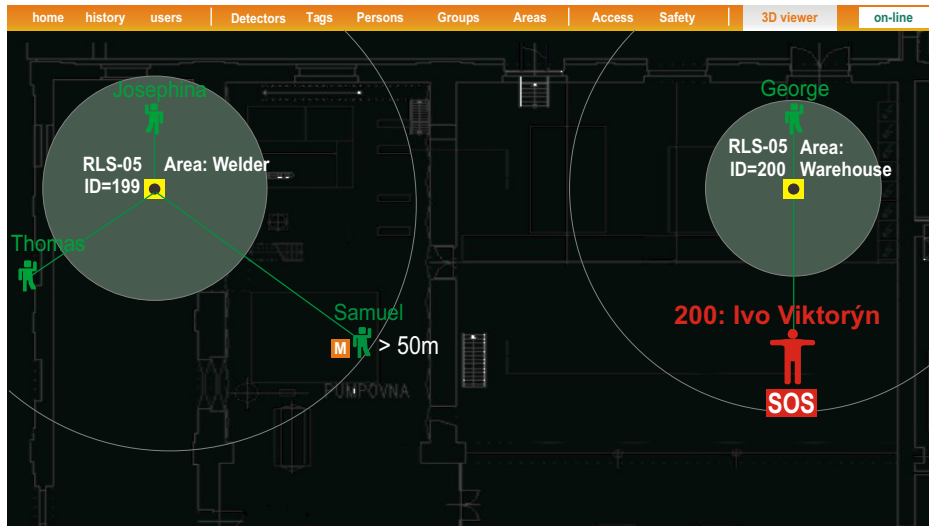
RBT detectors aren't connected to any bus. RBT detectors regularly transmit BlueTooth "beacons" into its surroundings. The app in mobile phone can detect nearest detector relatively to the phone, and periodically sends this information to the central unit, via GPRS or WiFi communication. The system can detect RBT detector failure (outage).
RBT-02 detectors are powered by a local power supply, e.g. from power adapter or centrally via cable.
RBT-03 detectors are **powered by battery** that has a capacity for at least 1 year of operation. RBT-03 detectors do not require cabling.
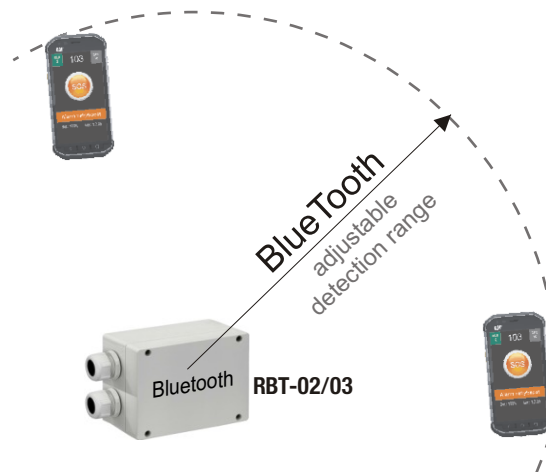

fig. B - determination of RBT-02/03 detector's detection range

manufacturer:

Ronyo Technologies s.r.o.
Česká 3195/47
700 30 Ostrava Zábřeh
Czech Republic
www.ronyo.eu

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RBT-02 detector

RBT detector is used for a local detection and localization of mobile phones that have the RLH-Mobile app running. The RBT detector has one relay output that indicates RBT module's functionality. Each RBT detector has its own unique serial ID number, that can't be changed. RBT-02 detectors standardly regularly transmit BlueTooth "beacons". These beacons are received and further evaluated by RLH-mobile app. The phone sends the result of analysis via GPRS communication directly to the RLU central unit of the Merya RTLS system.

fig. A - RBT-02 detector

fig. B - RBT-02 detector

features:

- a module for communication with RLH-Mobile app in mobile phone with Android OS
- BlueTooth technology - BT2, IP66 cover, -25°C / +70°C
- area detection radius towards mobile phone is adjustable
- 1 relay output
- antenna OUTSIDE-2400 +3dBm for long range communication (up to 70 m)
- 8-28 V power, average consumption = 6mA/12V

RBT-03 detector (powered by batteries)

RBT detector is used for local detection and localization of mobile phones that have a RLH-Mobile application running. The RBT detector has 1 transistor output that indicates the non-functionality of RBT module. Each RBT detector has its own unique serial ID number, which can't be changed. RBT-03 detectors standardly regularly transmit BlueTooth "beacons". These beacons are received and further evaluated by RLH-mobile app. The phone sends the result of analysis via GPRS communication directly to the RLU central unit of the Merya RTLS system.

fig. A - RBT-03 detector

fig. B - RBT-03 detector

features:

- a module for communication with RLH-Mobile app in mobile phone with Android OS
- BlueTooth technology - BT4, IP66 cover, -25°C / +70°C
- area detection radius towards mobile phone is adjustable
- 1 relay output
- integrated antenna for communication at distance up to 15 m
- power: 1x battery pack "BatPack RBT", 3.6V, 6.8Ah, lasts at least 1 year

manufacturer:

Ronyo Technologies s.r.o.
Česká 3195/47
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Czech Republic
www.ronyo.eu

Example of some detection features of the app

speaker + vibrator

immobility >70+30 sek

immobility detection

Server 2	105	GPS 10

SOS

immobility - alarm

Bat: 95%   Ver.: 1.6.01

speaker + vibrator

tilt >60+30 sek

tilt detection

Server 2	105	GPS 10

SOS

tilt - alarm

Bat: 95%   Ver.: 1.6.01

speaker + vibrator

2 sek

turning SOS call on

Server 2	105	GPS 10

SOS

Bat: 95%   Ver.: 1.6.01

Alarm modes of the system from the perspective of the supervised person

in an open space

normal	indication of immobility - aviso	indication of immobility - alarm
	sound + vibrator	sound + vibrator

v budovách s pomocí modulů RBT a FLQ

normal	indication of immobility - aviso	indication of immobility - alarm
Q FLQ expander / local siren	sound + vibrator — Q FLQ expander / local siren	sound + vibrator — Q FLQ expander / local siren

Normal
In normal mode the mobile must be constantly (for a set time) in motion and in proper (upright) position.

mode indication: Aviso
Aviso should alert the person that triggered this event. If the person eliminates the cause of this event (e.g. starts to move), the system then exits "Aviso" indication and won't enter the alarm mode.

mode indication: Alarm
In alarm mode, all the alarm scenarios are triggered. System can change the sound of local siren during alarm.

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Online state of employees in the company

In the software, in "Tags" agenda, there is an information available online, that reflects in which areas and zones the persons are located at and in what state are they, in terms of security watch.

fig. A - Online indication of tags' states in Merya RTLS software

History listing of movement and state of the person

Not only all alarm situations, but also all the movement of persons in the area along with a time data are stored into history. There are number of filters available.

fig. B - History listing of movement and state of Daniel Wallker on 15.3.2011

Merya RTLS integration to other supplementary SW systems

The Merya RTLS software enables integration to other superior SW systems. Communication with these superior systems is ensured directly by RLU central unit, which has an integrated standard configurable **SNMP-2** communication protocol. The RLU central unit then sends (in real time) detailed messages about alarm events, for example: person is lying, immobility, free fall, SOS call, person in the area, unauthorized stay in the area, passage through doors, incognito passage, etc. Some GPRS routers can receive these SNMP messages and automatically forward them as SMS message to a phone number. Thanks to this method, the number of types of these SMS messages is reduced to about 40.

As a further exemplary use of integration, it is possible to connect the RLU central unit with **Milestone** CCTV system's database. During alarm events, the RLU sends and stores (in the CCTV system's database) the description of event and the series of "strings", by which Milestone then enables to confortably search for videos of alarm event. Possible query: Find all videos in which the user "Koudelka" had detected an event "immobility" in the hall "A-expedition".

Merya RTLS also enables HW integration with other systems using FLE expanders with 16 logic outputs, FLQ expanders with 8 logic inputs, or using RLS personal tag readers that can send an information that tag was put near reader, to other systems, via standard Wiegand interface.

Architecture of a variant 1 - completely free of detectors

In this variant, the system need not have any detectors. Mobile phones with RLH-mobile app locally assess the status of the person (the phone holder. Mobile phones with RLH-mobile **communicate regularly via the GSM network with the RLU central unit** and send information:
- about the position of the monitored person outside the building (using GPS coordinates on the map)
- about the position of the monitored person in buildings (by displaying the RBT detector coordinates above the floor plan of the building)

In the case of an alarm situation (when motionless, fall, SOS call, etc.) is detected, the system announces an alarm.
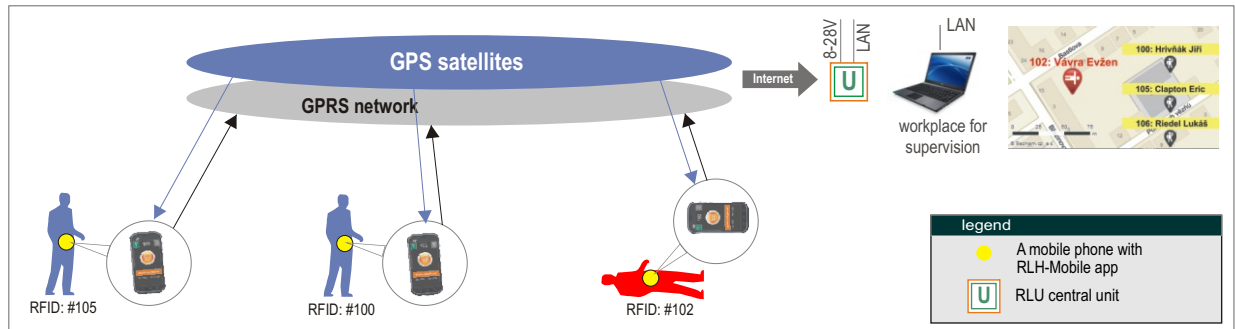
Architecture of variant 2 - detectors of type RBT (BlueTooth)

Mobile phones in buildings (where there is no GPS signal) can refine their position using RBT detectors. As a result, the system can provide information about the approximate position of the person with the phone on each floor of the building to make the search for a person requesting assistance effective. The phone that detects the alarm status will also send information via the GSM / GPRS channel to the central unit, next to which detector is within range, or. GPS coordinates when the phone is outside the building. Two types of RBTs are available:
- **RBT-02** detectors require 7-28V DC power supply. They have a larger radio range, up to 50-70m.
- **RBT-03** detectors are **powered by batteries** that have capacity for more than one year of non-stop operation. They have a shorter radio range - up to about 10m, according to obstacles.
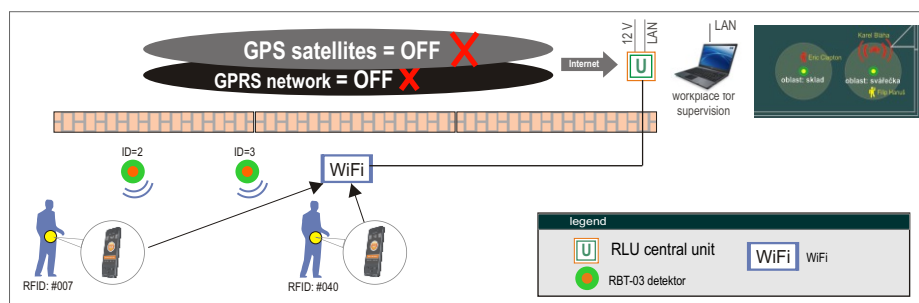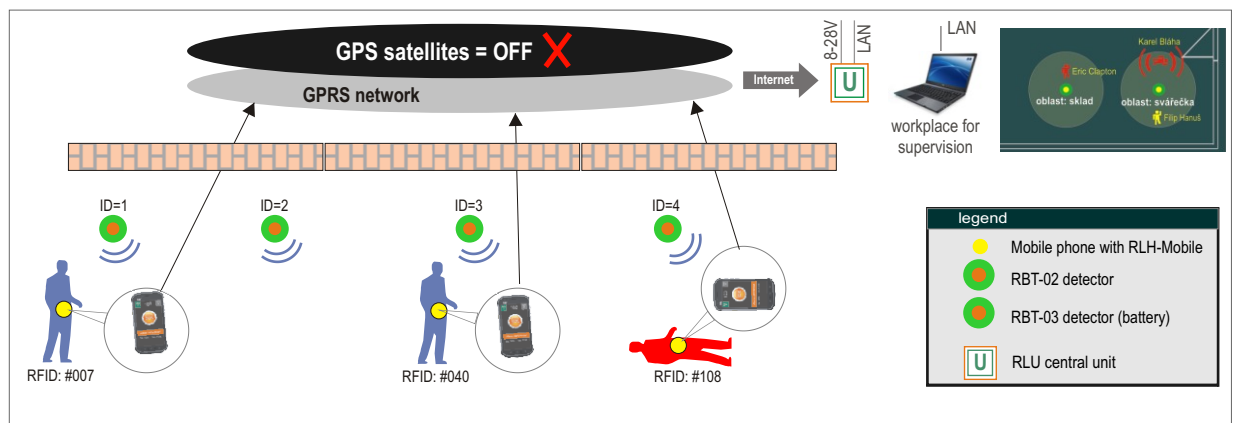

Fig. - Architecture using WiFi instead of provider signal.

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NFC tags for arm mode shutdown (interruption)

The phone has two basic modes: turn on / turn off the arm mode (detection of immobility, tilt, and freefall, and SOS button). These modes can be switched using NFC tags, for a convenience. Optionally, you can configure your phone to a special mode, that allows a re-setting of arm mode (exit Bypass) just by changing the position of the phone from a horizontal position into a vertical (+/- 40°) for at least 5 seconds.

putting nearby a tag

Disarmed

putting nearby a tag

Armed

in Disarmed mode:

- mobile may be immobile
- mobile can be in horizontal position
- "SOS" button doesn't work
- free fall isn't detected

putting nearby a tag

Disarmed

vertical position +/- 40°

>5 sek

operating position of the phone

Armed

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