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I S M B

Istituto Superiore Mario Boella



Infomobility Applied Research in Turin, Italy

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Gap-Charance, 13 September 2007

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Istituto Superiore Mario Boella

- One of the research institutions of the Torino Wireless District
- Created in 2000 through an agreement between Politecnico di Torino and Compagnia di San Paolo (banking foundation)
- Since then, industrial members joined ISMB (Motorola, ST Microelectronics, Telecom Italia, SKF)
- Mission: applied research in close cooperation with universities and industries

ISMB: an Applied Research Center where Academia and Industry work together

1. Cluster of ISMB/Politecnico/ industrial partners joint labs

- Antennas and Electromagnetic Compatibility
- e-Security
- Networking
- Photonics
- Radio Technologies for Multimedia
- Services & Applications
- Microsystems and Materials
- Satellite Navigation



2. Cluster of ISMB/industrial partners joint labs

- Accent: design center for microelectronics
- STMicroelectronics: Mesh Networks, e-Security and Galileo

Around 230 researchers
a. 130 ISMB
a. 100 Politecnico / industrial partners

Advanced Research relies on a network of International Cooperations

- Anderson School of Management (UCLA)
- Berkeley University
- UCLA Henry Samueli School of Engineering
- Ertico
- Winmec COnsortium (UCLA)
- Office of Outer Space Affairs of United Nations



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Infomobility

- The ability to provide information to users when they are “mobile”
- New communication paradigm, recent technologies
- Often takes benefit from the availability of position information (location-awareness)
- Wide number of potential applications

Infomobility: application areas

- Among the most common:
 - ITS (Intelligent Transport Systems)
 - Ad hoc / mesh networks, vehicular networks
 - Access to touristic and other cultural information
 - Communications in harsh environments and emergency situations (disaster areas, rescue teams etc)
 - E-health, e-Government

Infomobility challenges

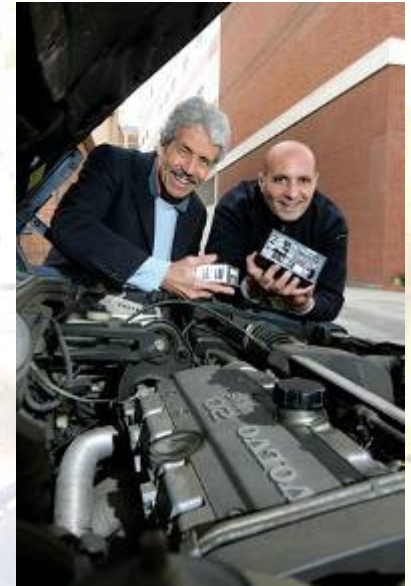
- Integrating many different competences and technologies is not an easy task: infomobility often requires cross-domain cooperation, something companies are not always prepared for
- The Torino Wireless district plays an important role with coordination and networking activities

Some projects examples

- Car to car communications (ad hoc networks, floating car data) to collect, process and redistribute information to vehicle drivers
- Galileo technology applied to traffic control/mgmt, emergency response etc
- Remote monitoring
- Smart Card / contactless applications

Joint Labs: an instrument to promote International Activities

- In 2006 ISMB and UCLA established a joint laboratory on car to car communications
- Co-funded by the Italian Ministry of Foreign Affairs
- Supports purchase of equipment and exchange of PhD students and researchers
- UCLA Campus and Torino public transportation used as a “distributed field trial”
- Funding confirmed for 2007 (renewed)
- Synergy with other projects on the same areas in both countries



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Project Goals

- Provide
 - A platform to support car-to-car experiments in various traffic conditions and mobility patterns
 - A shared virtualized environment to test new protocols and applications
 - Remote access to C-VeT through web interface
 - Potentially extendible to 1000's of vehicles
- Allow
 - Collection of mobility traces and network statistics
 - Experiments on a real vehicular network

Project Goals

- We plan to install our node equipment in:
 - 50 Campus operated vehicles (including shuttles and facility management trucks).
 - Exploit “on a schedule” and “random” campus fleet mobility patterns
 - 50 Commuting Vans
 - Measure freeway motion patterns (only tracking equipment installed in this fleet).
 - Hybrid cross campus connectivity using 10 WLAN Access Points .



Existing cooperations

- Local organizations (museums, historical sites, other research centers)
- National Universities (Florence, MICC)
- Telecom Italia
- International/Japan (Hitachi, ...)



Competences

- User Experience (modern 3D interfaces)
- Digital Content management (production, DRM etc)
- Digital Broadcast Technology (DVBT/H)



ICT in support of cultural heritage preservation and monitoring

- Project funded by Compagnia di S. Paolo
- Use of Information Technologies (with focus on wireless) for:
 - Monitoring of paintings and other objects during normal exhibition and transportation
 - Provide access to museums and historical sites through an interactive and immersive experience (particularly useful for youngsters)
 - Provide safety through advanced monitoring and surveillance solutions

Tele-monitoring for e-health



The wristwatch

Using suitable sensors, several parameters can be measured:

Personal parameters → skin temperature, heart beat rate, mobility

Environmental parameters → temperature, light

System parameters → removal from wrist, fault, radio coverage, battery level

Emergency Button



The base station

Data collected by the sensors are transmitted to a base station located up to 30 meters away. Transmission is currently based on a proprietary protocol over a 2.4 GHz channel. Future versions will be based on standard wireless sensor telecommunication protocols (Zigbee, IEEE 802.15.4). At any abnormal situation, automatically detection will be transmit to Services Operation Centre.



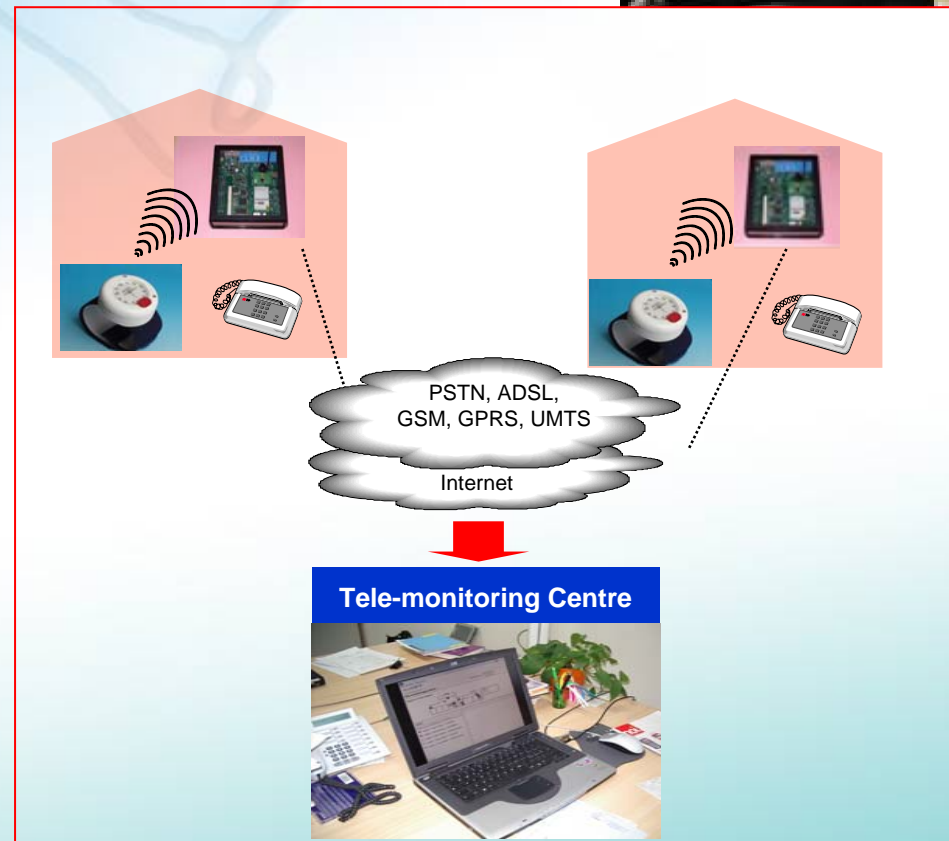
The Tele-monitoring Service Centre

The sensor data received by the service centre are checked against the patients' profiles. If a potentially dangerous situation is recognised, an alarm is sent to the operators.

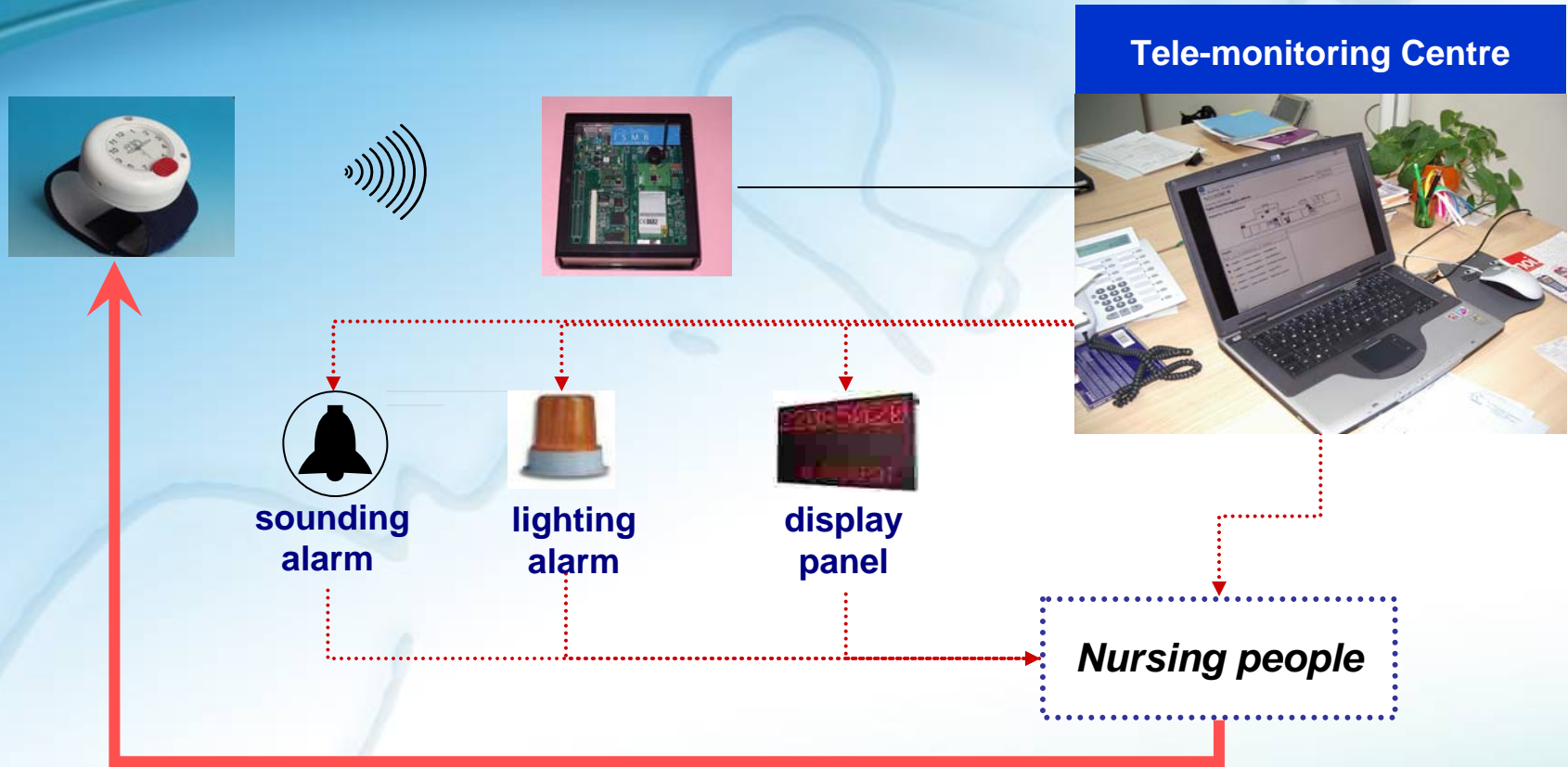
Services Scenario:

Nursing House

Home



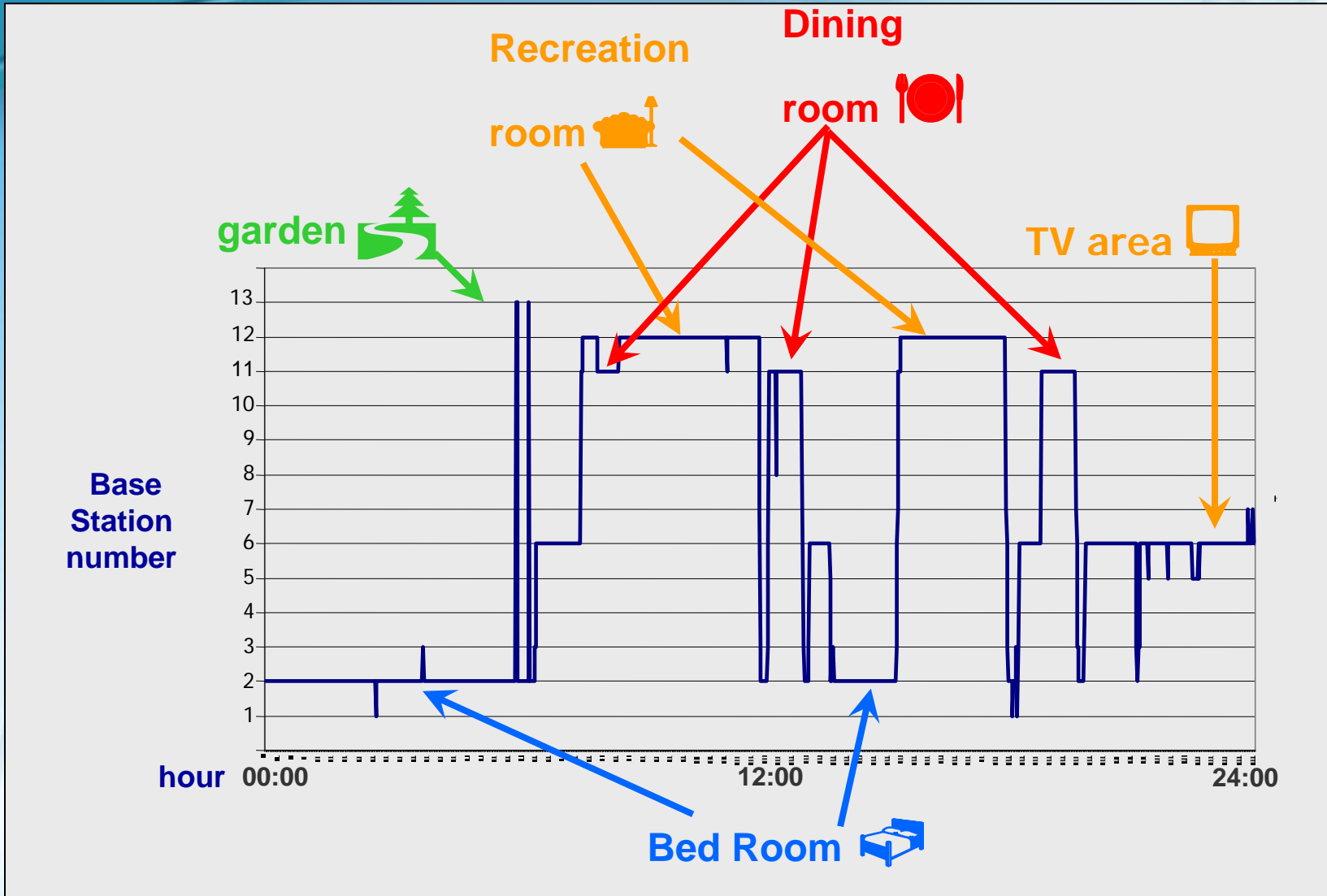
Nursing House Scenario



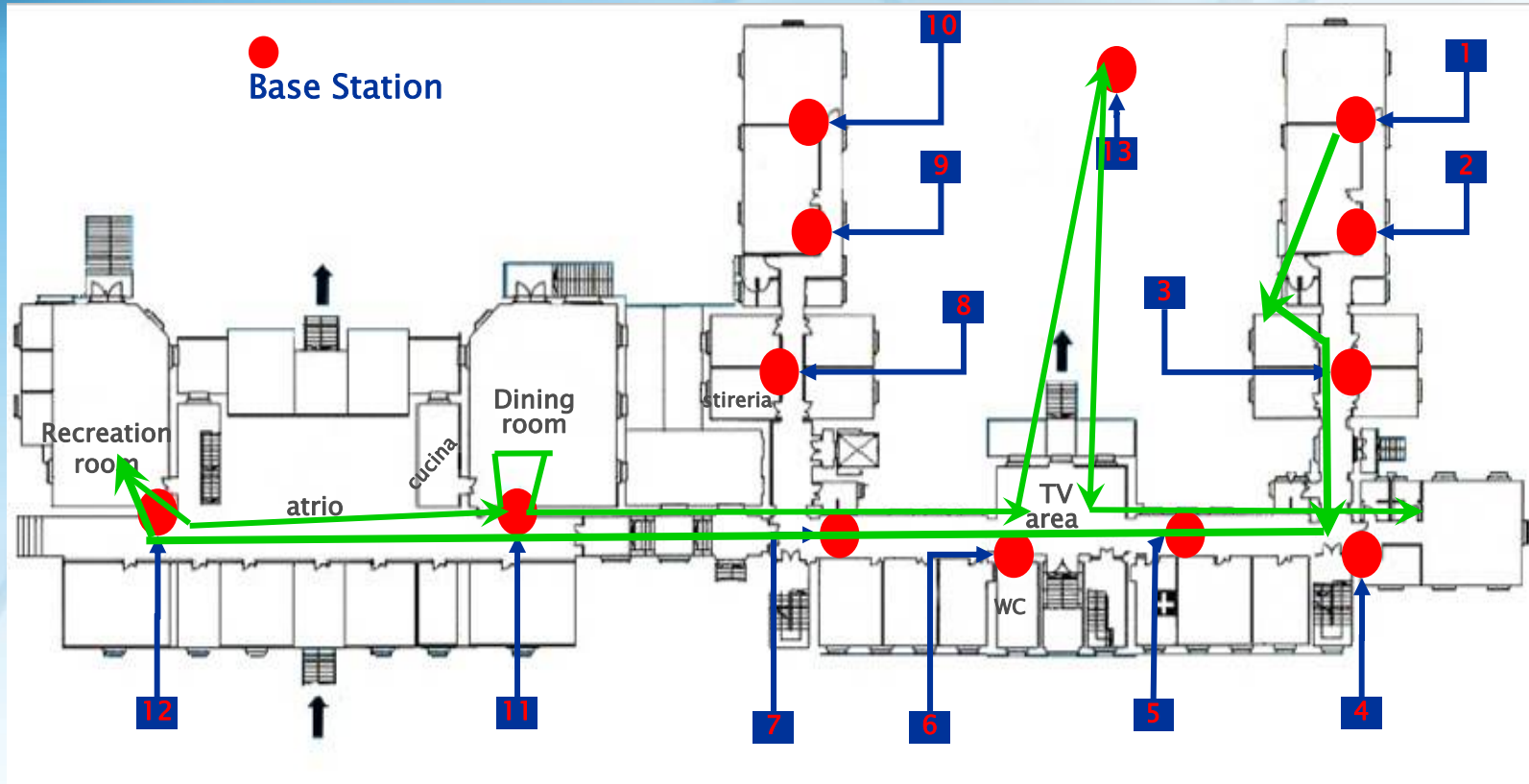
The system has been successfully tested and validated in field for a two month period in a Piedmont Nursing House with the active contribution of 10 elder people.
"This system is simple and useful" – a nurse –

Field Trial Results: Indoor Localization

"I know in real time where the guest is.."

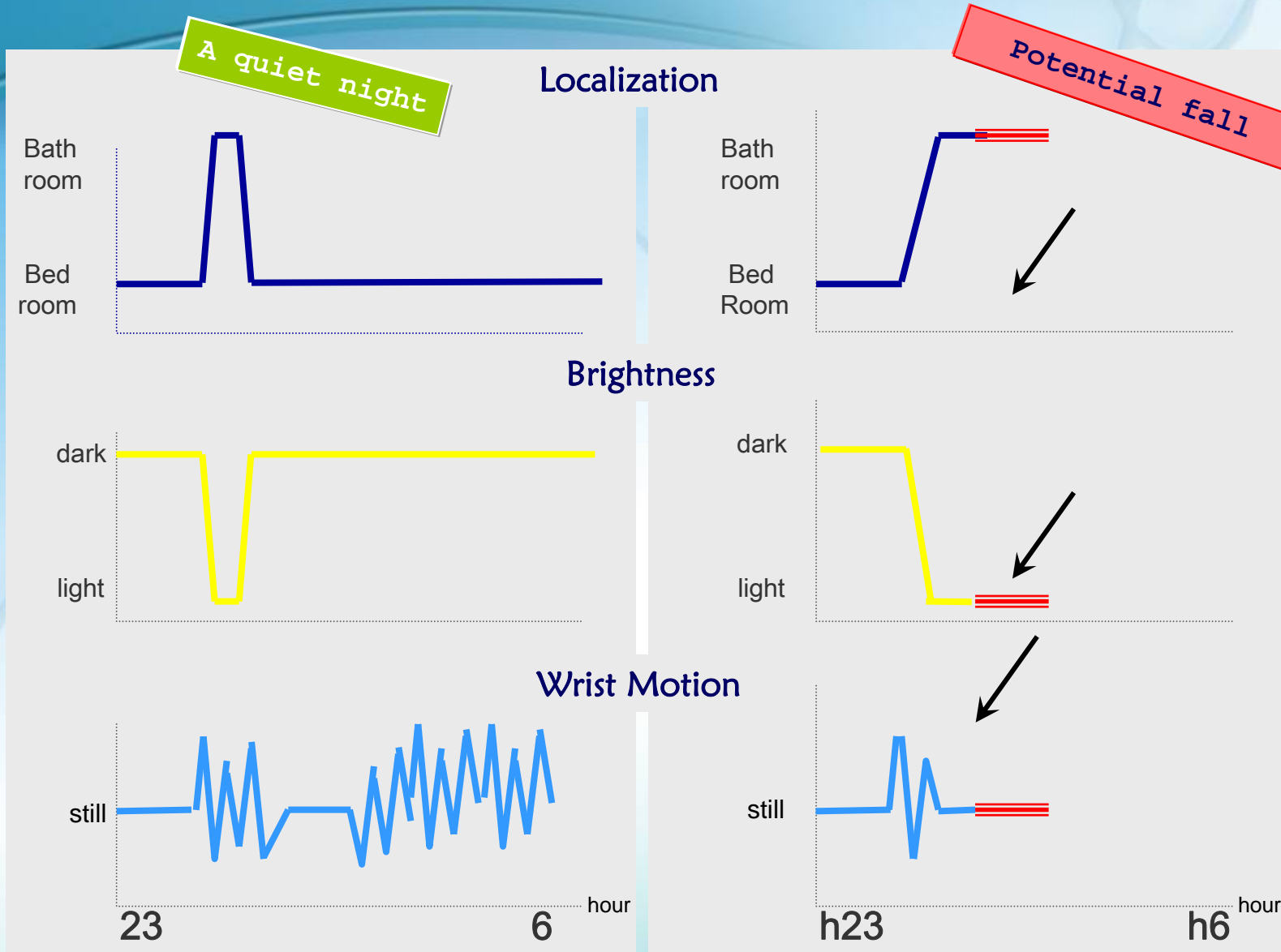


Mobility Tracking



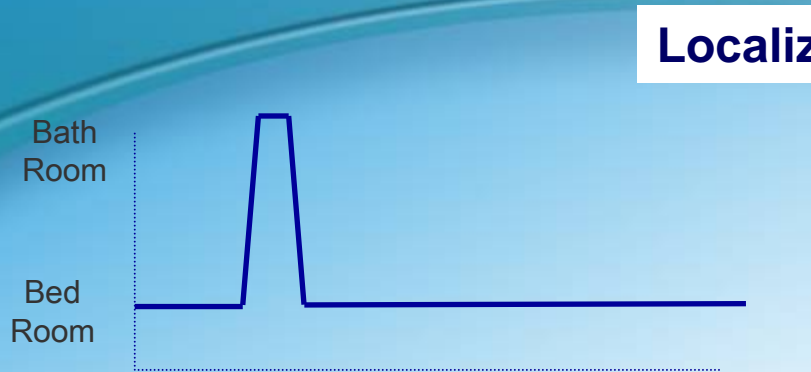
10 meters

Automatic Alarm Scenario



Field Validation

Laboratory Hypotesis



Data from the Field

