



Networking for Communications Challenged Communities:
Architecture, Test Beds and Innovative Alliances
Grant Agreement: 223994

Kick off meeting

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Scenarios definition

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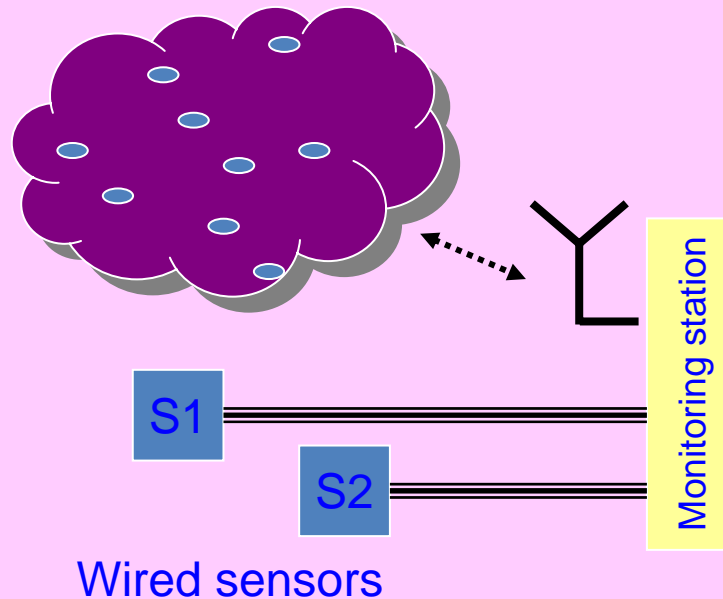
Main objective of the project

- **Be aware of the needs...**
- **Select the most suitable technology to deal with.**
- **Define a set of scenarios to evaluate the performance.**
- **Develop ad-hoc (partial) demonstrators**
- **Integration of different elements**

Involved Technologies (1)

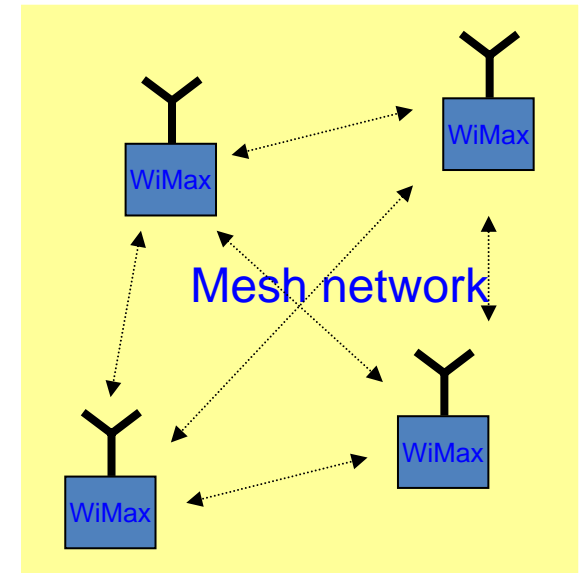
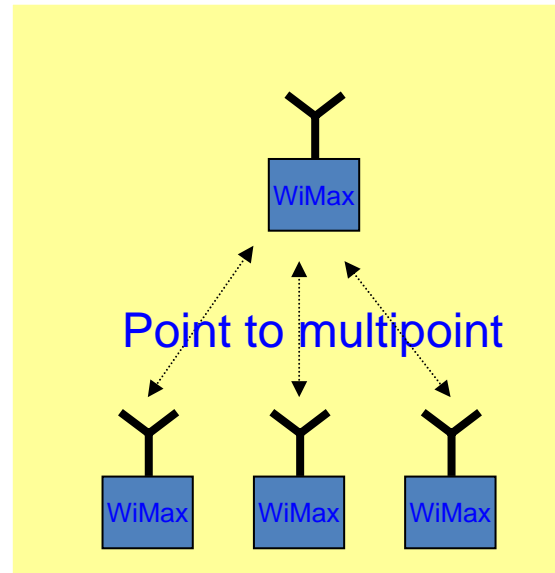
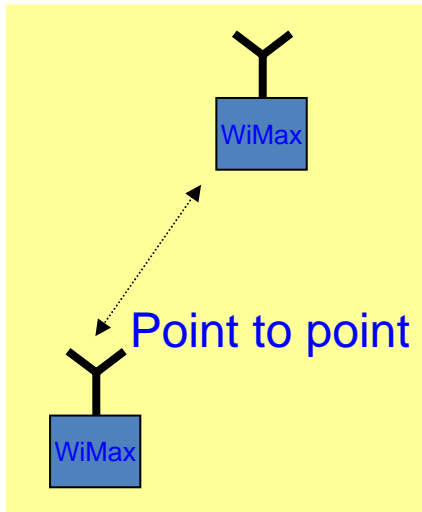
- **Sensor network (wired / wireless).**

Sensor Network



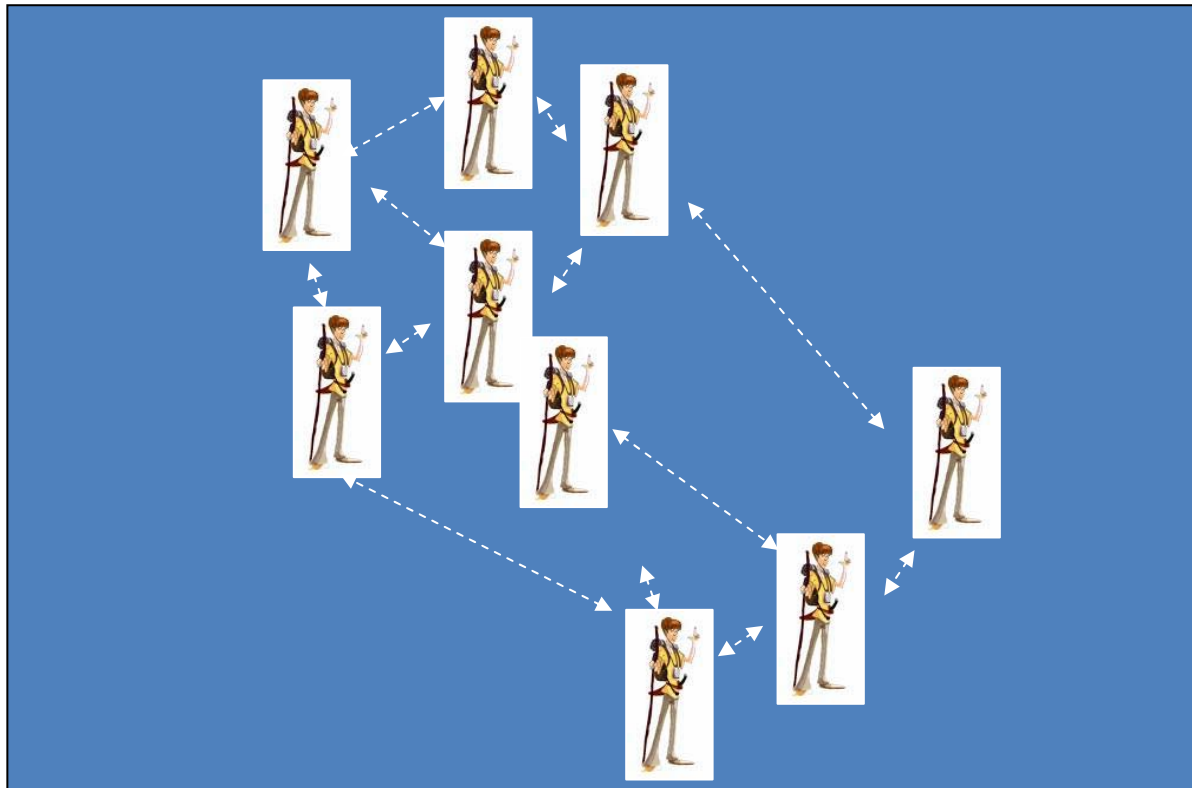
Involved Technologies (2)

- WiMAX:
 - Suitable scenario: high data rate and long distance link. Line of sight is not required
 - Currently there are no portable devices
 - Resources: several bands and flexible bandwidth
 - Links:
 - Point to point
 - Point to multipoint
 - Mesh network

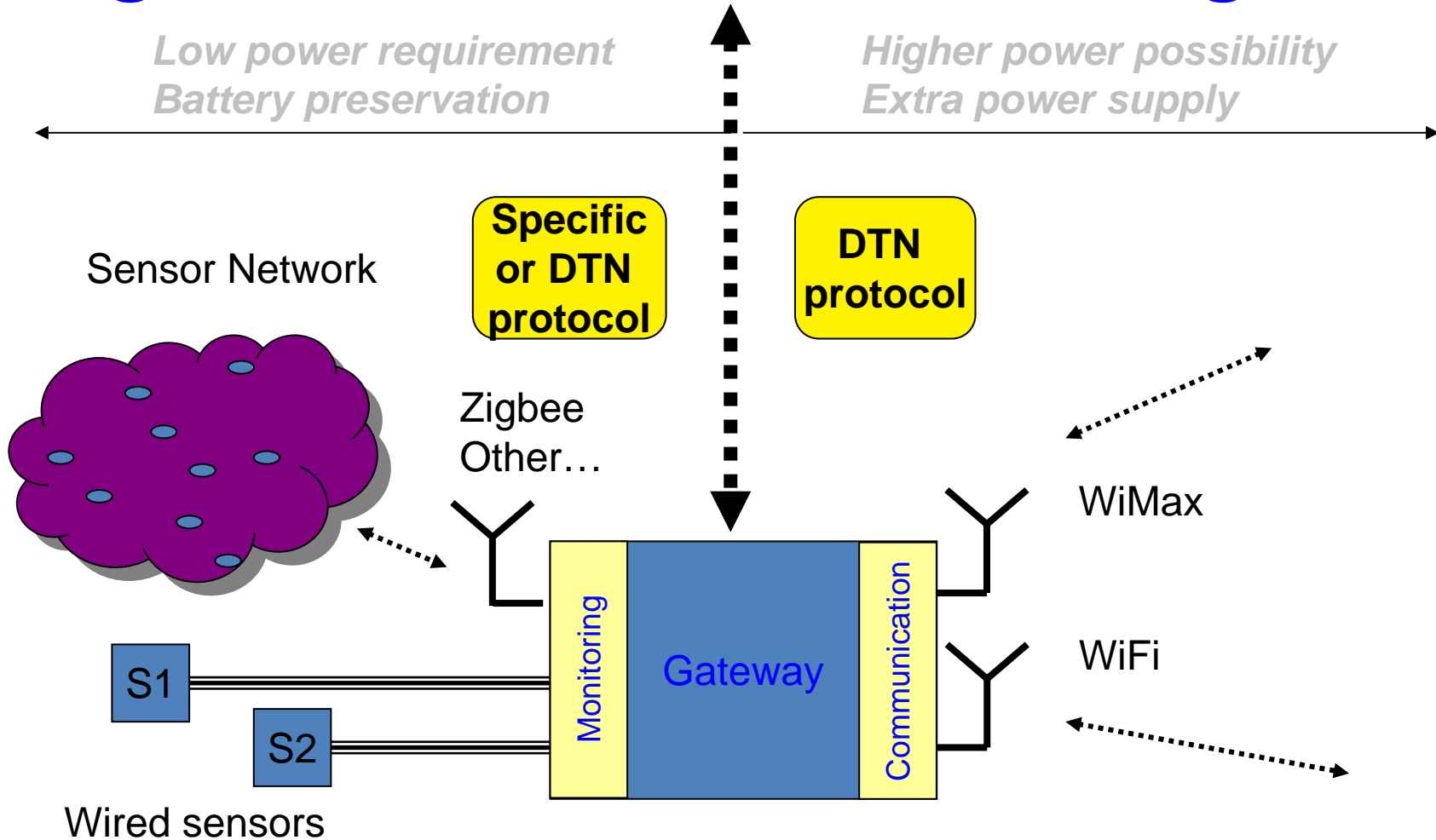


Involved Technologies (3)

- WiFi:
 - Suitable scenario: high/medium data rate and short distance link.
 - There are commercial mobile devices
 - Resources: standard architecture in the 2.4 GHz band
 - Links: Mesh network

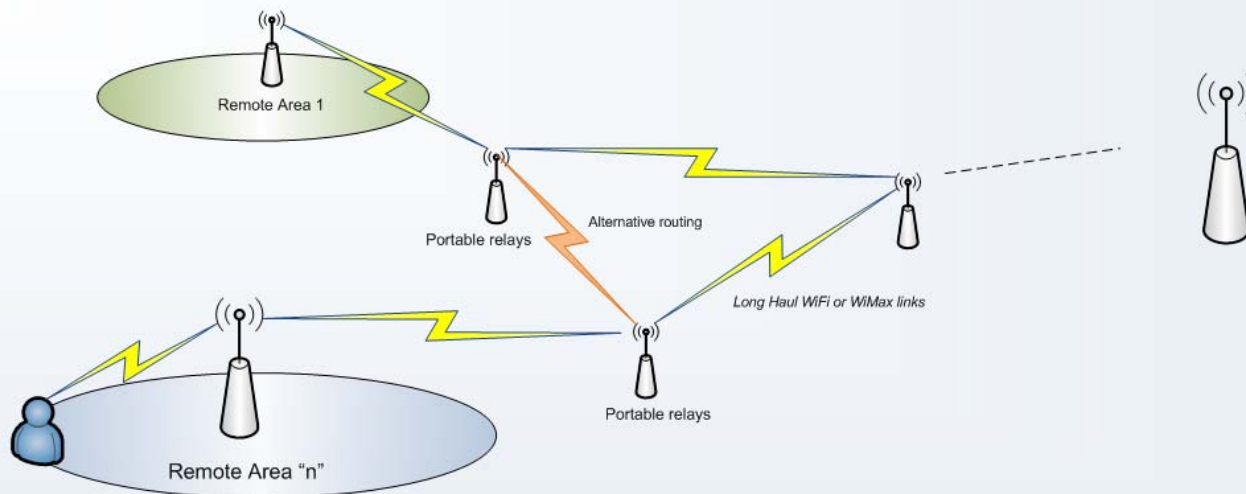


Integration of several technologies



First scenario. Internet access to remote places using WiMAX

- There are two phases:
 - Long distance point to point link.
 - How to increase coverage ?. Relationship between range and power
 - Required bandwidth ?
 - Propagation effect in the areas of interest: Line of Sight...
 - Short distance point to multipoint
 - Standard carrier (2.4 GHz) and equipments to reduce costs



Open questions. First scenario

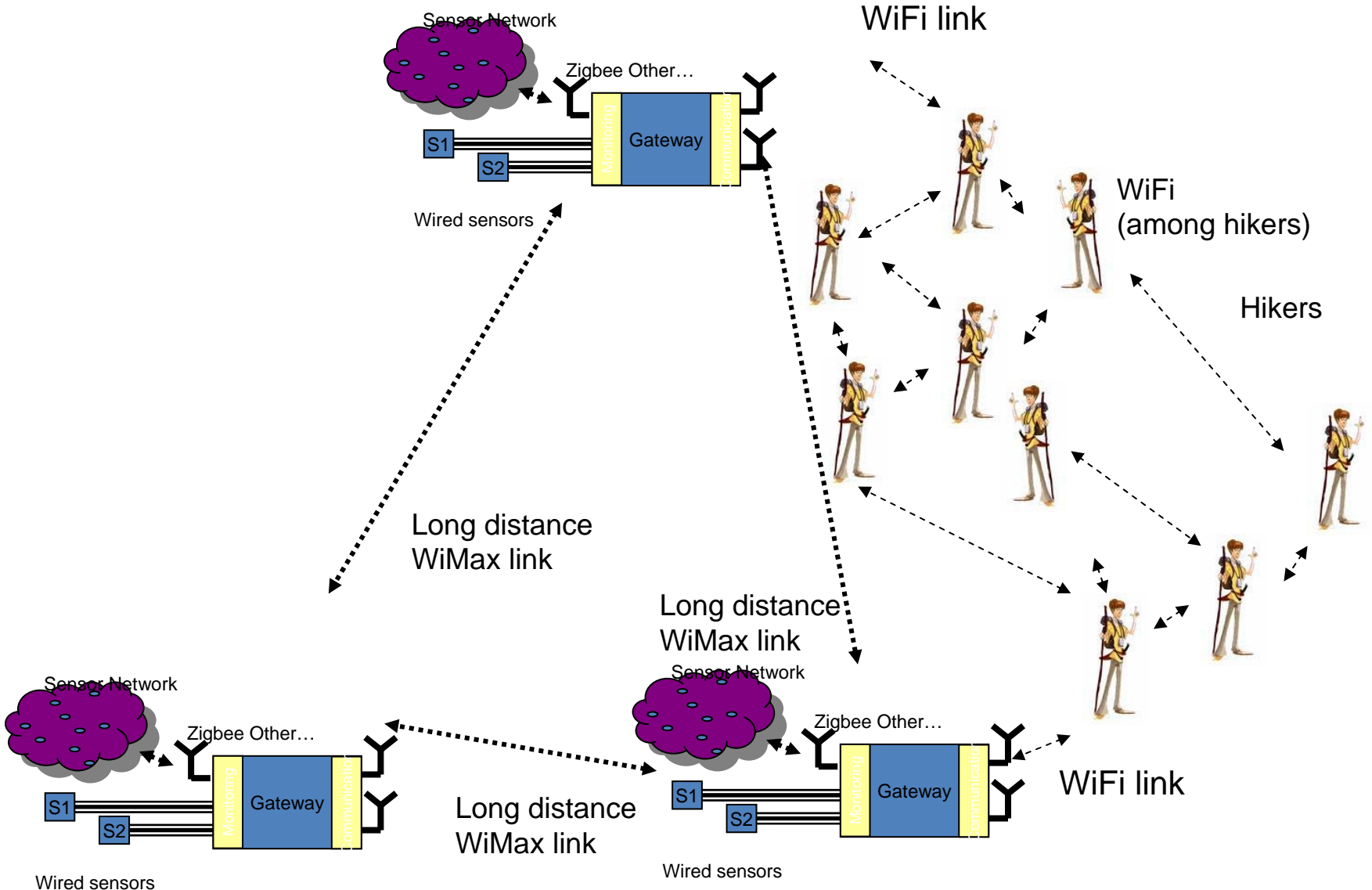
- Which bands and bandwidths may be used in those remote areas.
- Expected distance for the point to point link.
- Expected data rate for the point to point link
- Expected distance for the point to multipoint link.
- Expected number of users for the point to point link.
- Expected data rate per user for the point to multipoint link
- Infrastructure allowed... Density of base stations...

Second scenario.

Environmental monitoring

- There are two main functionalities:
 - Monitoring using wired and/or wireless sensors.
 - Wireless sensor network will be based on commercial products
 - Communication capabilities
 - Long distance / higher data rate using WiMAX as a mesh
 - Short distance / lower data rate using WiFi and hikers as mobile relays

Second scenario.Environment monitoring



Open questions. Second scenario

- Which bands and bandwidths (WiMAX) may be used in those remote areas.
- Expected distance among the stations
- Density of hikers and movement model
- Data rate generated by the sensors
- Type of sensors to be used. (if they are not standard included in commercial kits, specific HW is required...)
- Be careful with temperature!!
- Find an application for using distributed cheap sensors (motes) to complement more sophisticated meteorological stations...
- WiFi vs. Bluetooth for hikers??

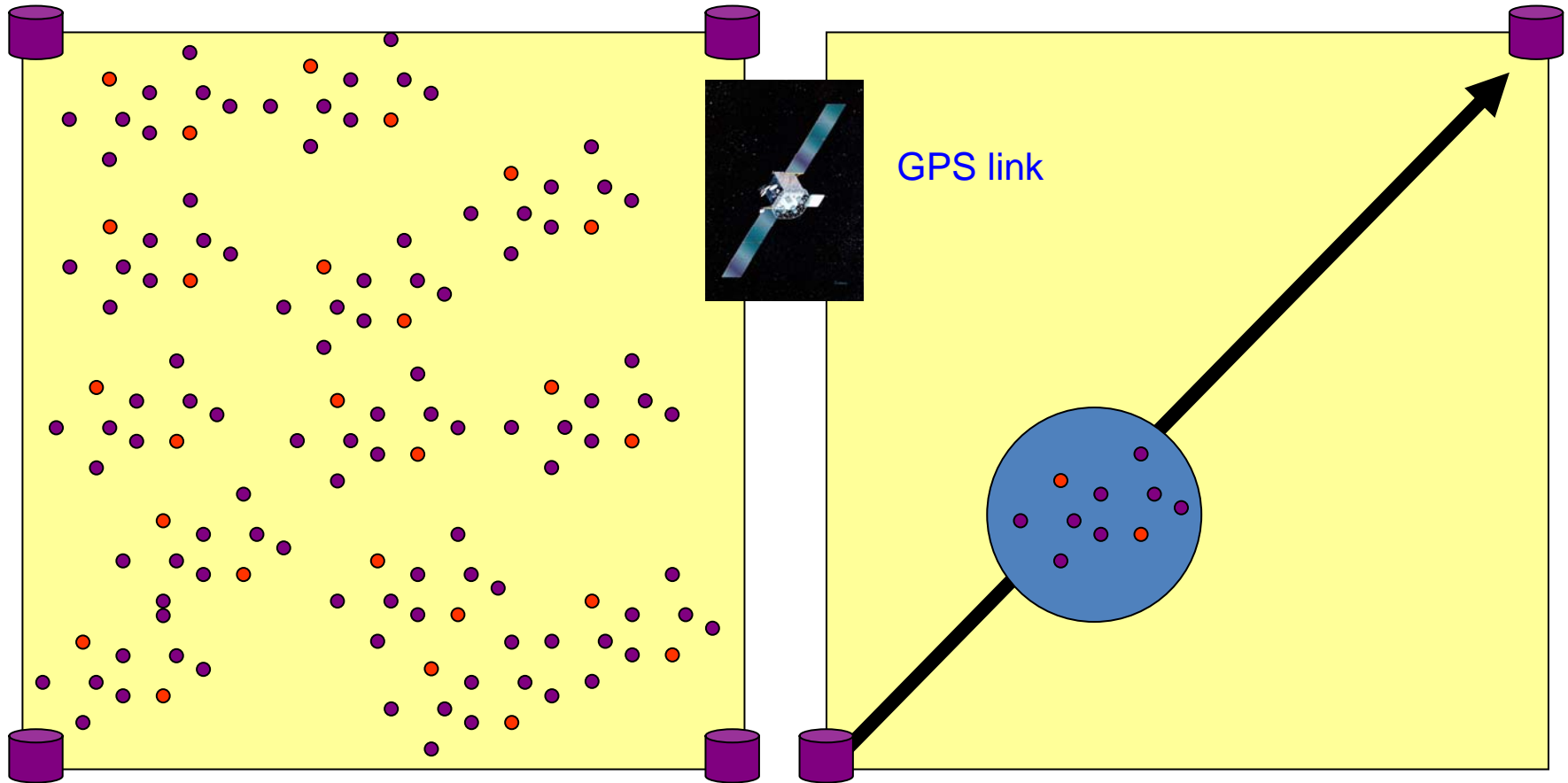
Third scenario. Herd positioning

- There are two main functionalities:
 - Position estimation using GPS and connectivity among the animals
 - We will develop our own ultra-low consumption transceiver.
 - We will propose efficient routing strategies among the animals
 - We have split the animals into two categories.
 - Primary animals: equipped with GPS / Microcontroller, memories and batteries
 - Secondary animals: equipped with a self-power system (powered by the animal movement)
 - Communication
 - From the secondary animals to the primary when power is available (when the reindeer makes a movement) transmitting its identification.
 - From the primary to the herder (static / dynamic base station or person) downloading the position and the identification of the set of animals that have contacted with them along the time
- Proposal of two specific test beds

Third scenario. Herd positioning

- Primary node
- Secondary node

Base station (mobile or static)



Testbed 1. Uncoordinated movement

Test bed 2. Coordinated movement

Open questions. Third scenario

- Test bed 1.
 - Area where the animals are kept.
 - Number of animals (primary and secondary)
 - Information required by the herders and intervals when it is required
 - Acceptable interval between batteries replacement.of primary reindeers
 - How often you want to have a position estimate.
 - How often you want to download the captured information
 - Be careful with temperature!!
 - Other movement model...For instance, is there any tracking (GPS) of animal movement or any study in this sense?
- Test bed 2.
 - Speed of walking.
 - Radius of the herd
 - Number of animals (primary and secondary)
 - Information required by the herders and intervals when it is required
 - Acceptable interval between batteries replacement of primary reindeers
 - How often you want to have a position estimate.
 - How often you want to download the captured information
 - Be careful with temperature!!
 - Other movement model...For instance, is there any tracking (GPS) of animal movement or any study in this sense
- Any other scenario of interest ?. For instance, describe the situation when an animal may get lost. Combination with static wireless sensor network deployed in certain critical areas.
- Wireless sensor networks for indoor applications...