A real-time low datarate protocol for cooperative mobile robot teams

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Contribution of this work

This demo presents **RoboMAC**, a new MAC protocol for communicating between mobile cooperating robots.

The main contributions of RoboMAC:

•It enables the **integration of robots with WSNs**, being specifically devised for low datarate communications.

•It provides **support to mobility**, combining clustering with a distributed topology management mechanism

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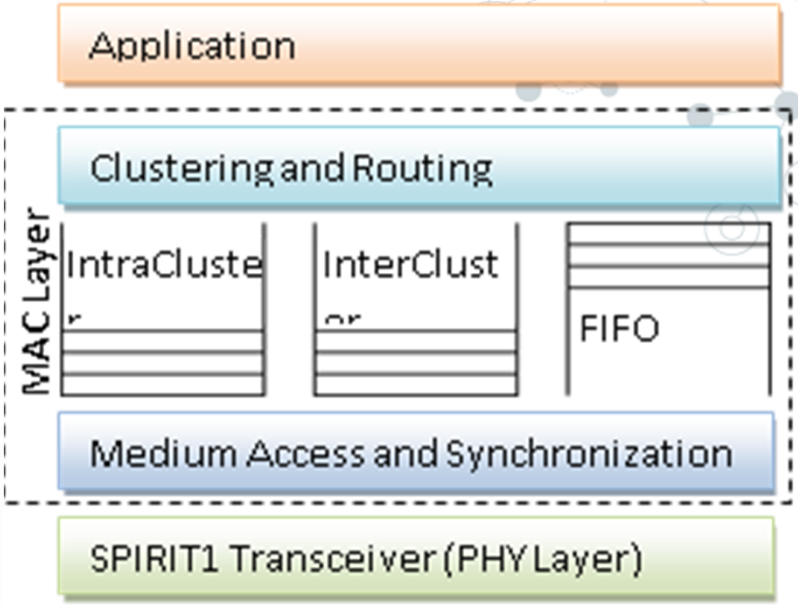
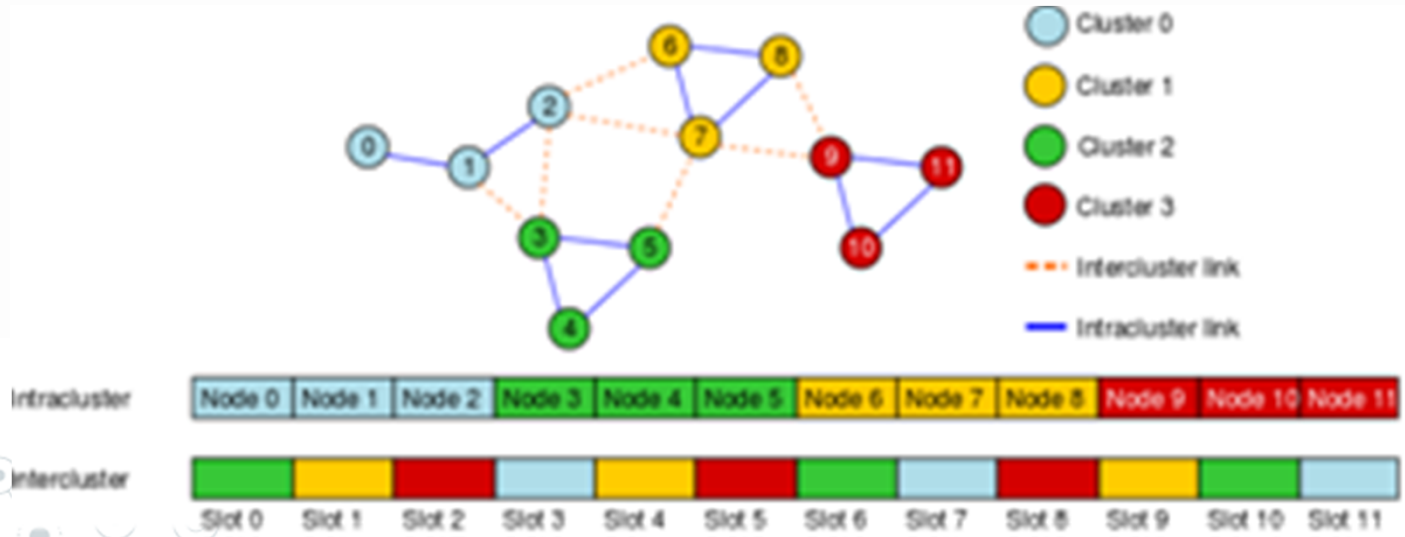
•It provides **scalable real-time communications** thanks to the combination of a TDMA-based mechanism with multichannel transmissions and clustering.



Multichannel Communication

- The nodes are organized in clusters, depending on their position in the network.
- Two transmission channels are used, one for intracluster communications, the other for intercluster ones.
- Intercluster communications are allowed between the nodes of two clusters when the relevant clusters do not have on-going intracluster communications.



Demo

Implementation on the STMicroelectronics STEVAL-IKR002V5 board, which is composed of a motherboard equipped with a STM32L1 family microcontroller (MCU) and the SPIRIT1 transceiver, which operates at 915MHz and provides a datarate of 250kbps.

Two simple and low cost robots equipped with:

-3 ultasonic sensors

-One IMU ST iNemo-M1 (Accelerometer, Gyroscope, Magnetometer)

-One 32-bit Microcontroller (Robot control)

Radio target search challenge

Aim reach a radio target.

No localization mechanisms.

Robots have to move one at time

The only feedback to reach the target is given by the RSSI value continuosly received in a beacon message from the target.

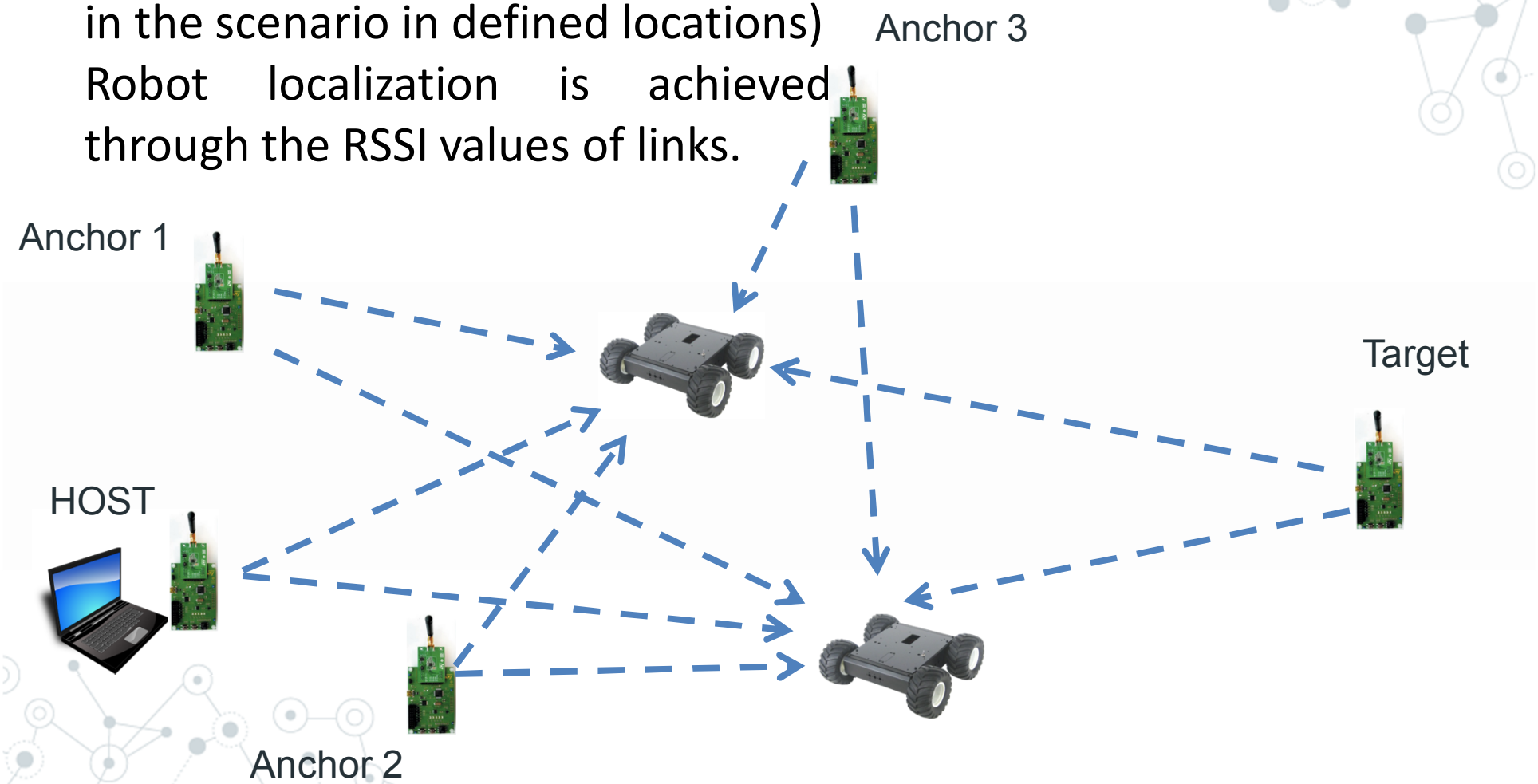
-Network cycle time (50 ms)
-No clustering

Radio target search challenge

Video 1

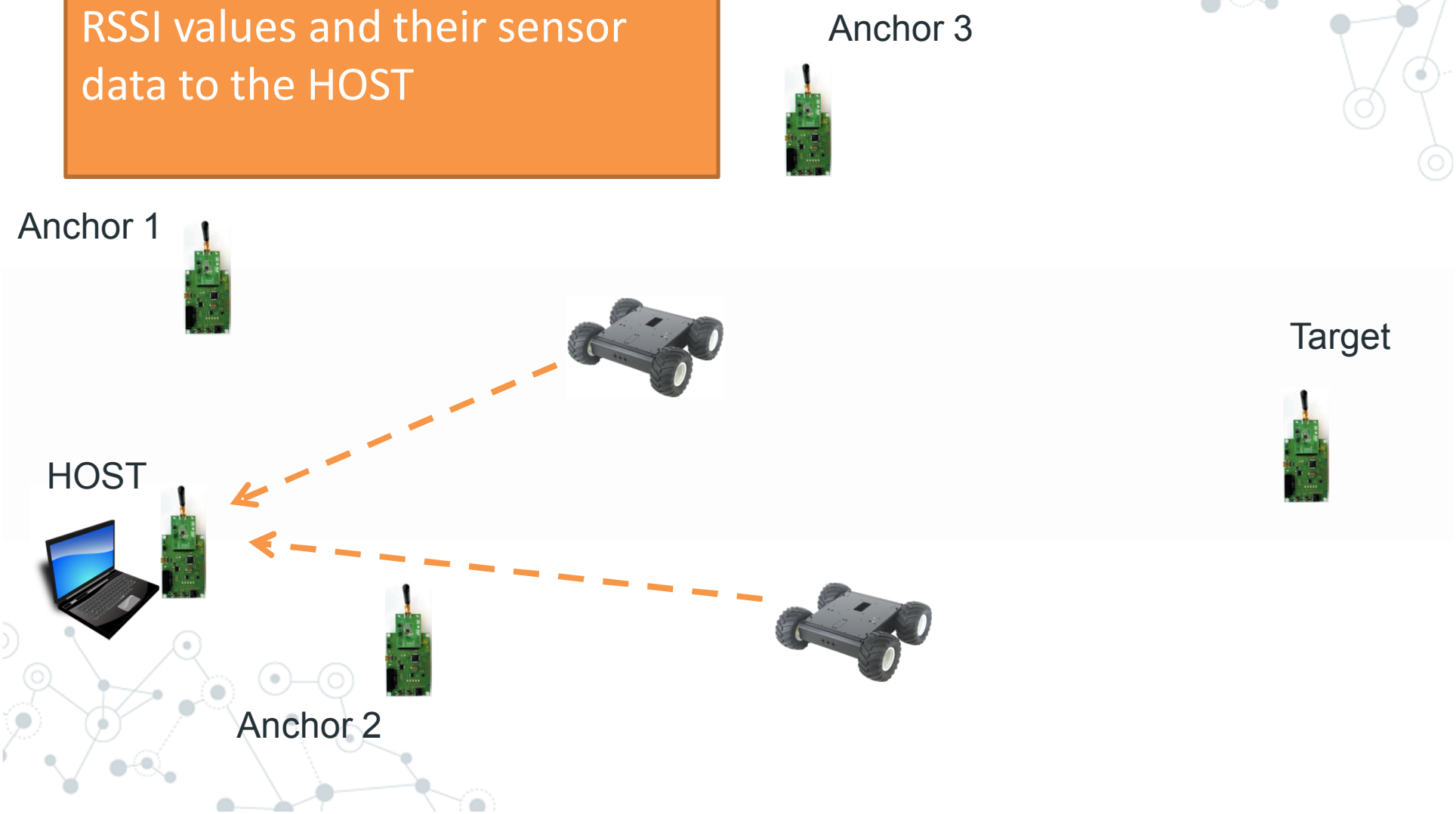
Radio target cooperative search

Localization (Four nodes are placed in the scenario in defined locations) Robot localization is achieved through the RSSI values of links.



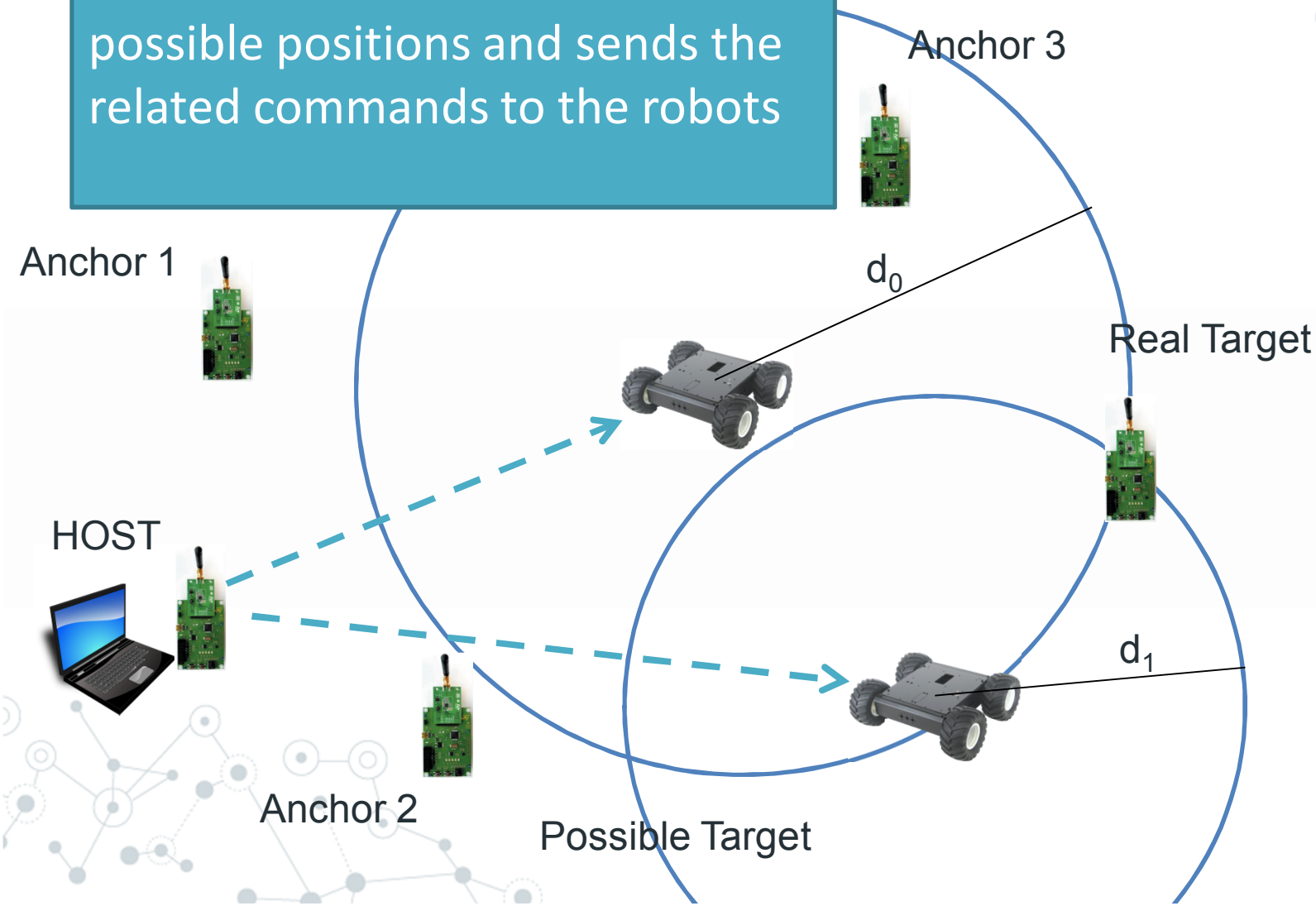
Radio target cooperative search

2. They transmit the received RSSI values and their sensor data to the HOST



Radio target cooperative search

4. The host calculates two possible positions and sends the related commands to the robots



Radio target cooperative search

Video 2

What’s next

- Reliability issues will be investigated.

- Improvment of intercluster slot scheduling mechanisms.

Thank you for your attention