

Project: a distributed alarm

On the basis of the previous labs you will now create a distributed alarm system working on the CAN network. All nodes are equal (i.e., there is not any master node), can work autonomously but also exchange information through CAN. The application of the node should run under μ C/OSII.

Each node of the alarm system will have to carry the following functionalities out:

- monitor the presence of intruders. You will have at your disposal an infra-red barrier that you can connect to a digital input of the microcontroller
- arm the system thanks to a secret code typed on the keyboard. For the moment, you can use the value B169. Functions to change this code are optional.
- if an intruder is detected while the system is armed, leave the possibility to disarm the system with the same code during the first 30s.
- if the system has not been disarmed within 30s, the alarm should start. You will get a buzzer or a flashing light that you can connect to an output port.

In a distributed system, each node must cooperate with the other members of the network:

- a node signals its presence when it appears on the network and repeats this message periodically at least every 5 seconds. This "heartbeat" enables to detect the disappearance of the node (failure or sabotage)
- if a node detects an intrusion, it must signal it so that all other nodes pass in the "alert" state, even if they haven't detected anybody
- (dis)arming a node should be propagated to all other nodes; there is no obligation to disarm at the node which has detected the intrusion

To facilitate the management of the communication, we propose that you use the following protocol:

- Each node sends only 1 object (CAN_ID) between 1 and 254. You need different types of messages, the type will be indicated by the data (see table)
- the alarm system is limited to 10 nodes whose CAN_ID is unknown a priori
- when a node boots, it has to find a free identifier, then signal its presence by broadcasting it regularly

Table of messages

Message type	CAN_ID	DATA
Heartbeat	node ID	0x01
Intrusion detected	node ID	0x02
Node has been armed	node ID	0x03
Node has been disarmed	node ID	0x04
Alarm started	node ID	0x05