



## R&D Project example: Multi-feeder system using RFID

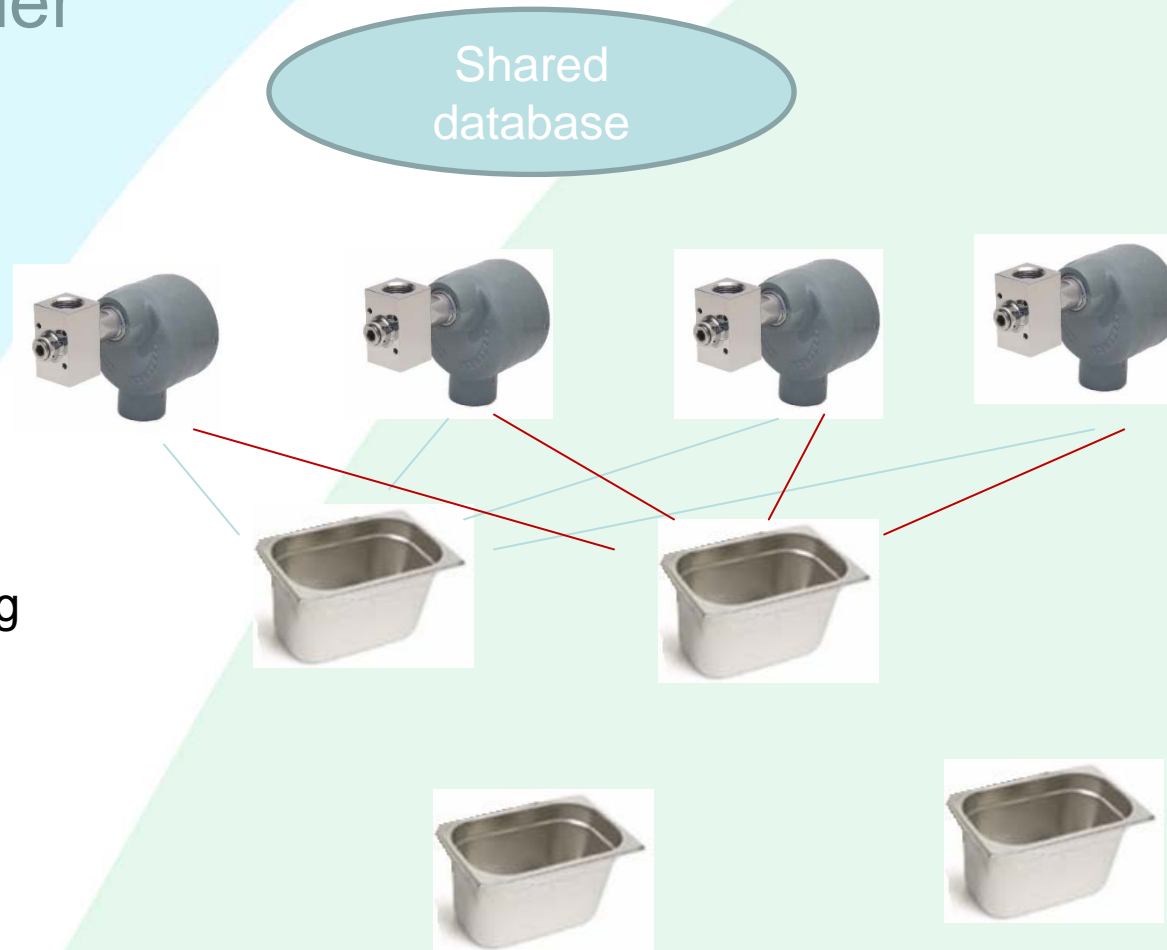
- What is multi-feeder
- Existing feeder system
- Aim of R&D project
- Results



# Multi-feeder

- Feeders
- Chemicals
  - Soil
  - Food

- Objects needing to feed
- Trucks
  - Humans
  - Animals





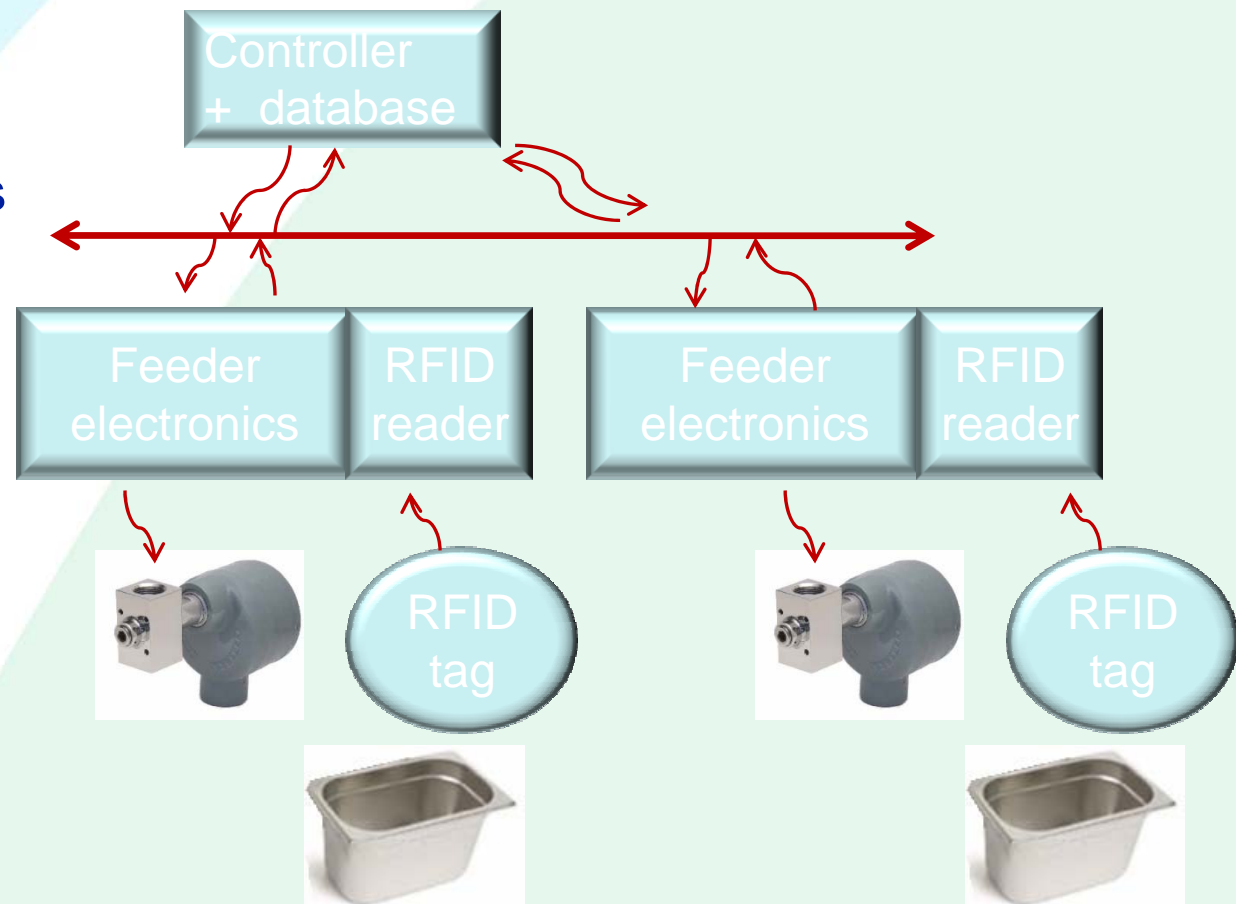
## Multi-feeder features

- Every object has its own predefined individual portions, which is saved into the shared database.
- All feeders serve all objects.
- Objects can fetch its portions bit by bit from various feeders.



## Existing automated feeder

- Simple feeder electronics reads RFID, sends it to the controller, waits for the answer and controls the feeder.
- Feeder unit has no user interface or display.





## Existing automated feeder controller

Programmable display unit:

- Very costly
- Database
- CAN bus interface
- Oversize functions





## Problems

- Too costly for 1-4 feeders
- RFID reader delivery problems
- Display unit delivery problems; new version has multiple price
- No possible to modify
- Uncomfortable use: Only display/controller unit has user interface.



## The aim of research

- Low-cost
- Simple to use
- Convertible functions

**High-level  
& powerful  
technology**

**Low-cost**



## The aim of research

- Low-cost
- Simple to use
- Convertible functions



**Smart  
technology**



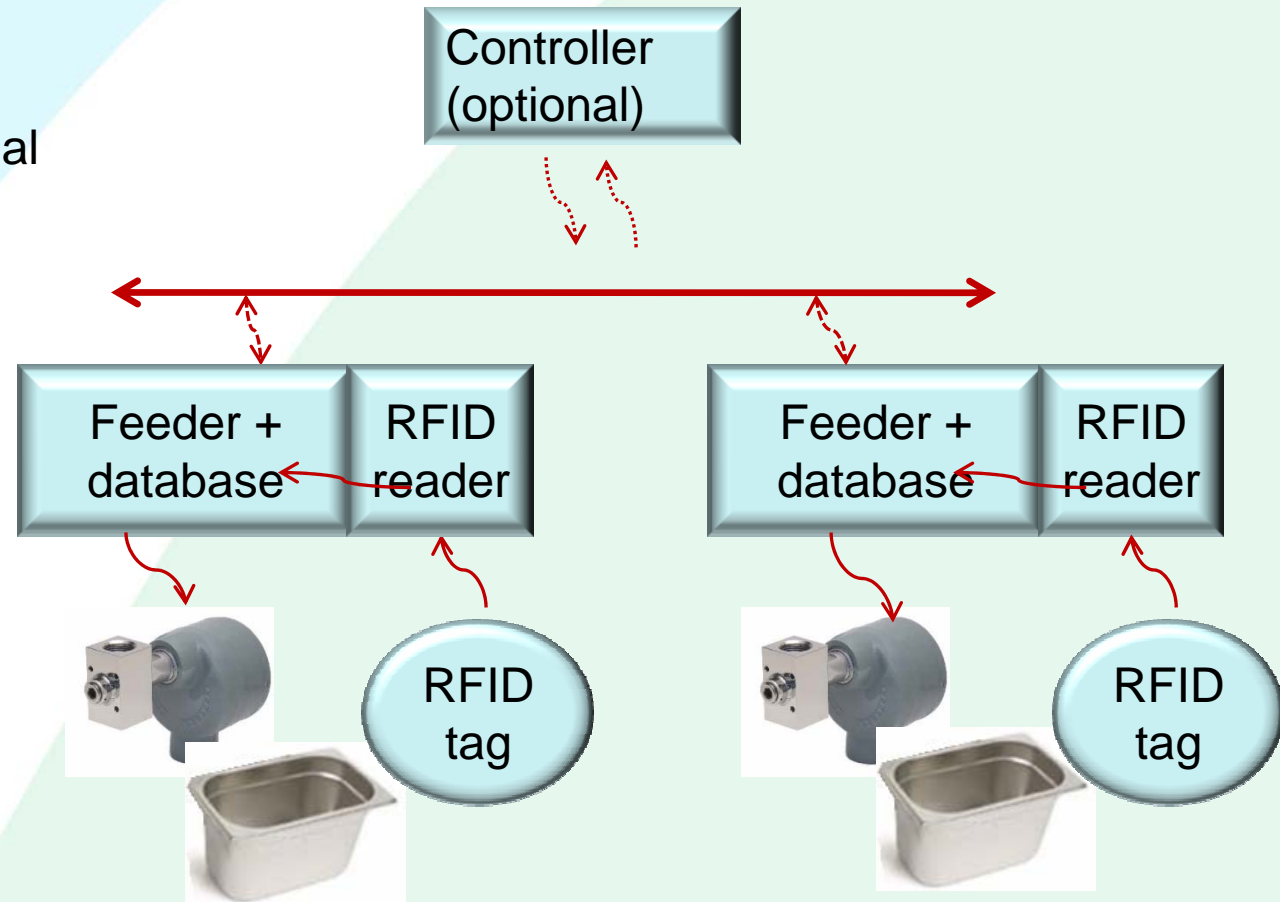
**Low-cost**





## Distributed intelligence – no controller

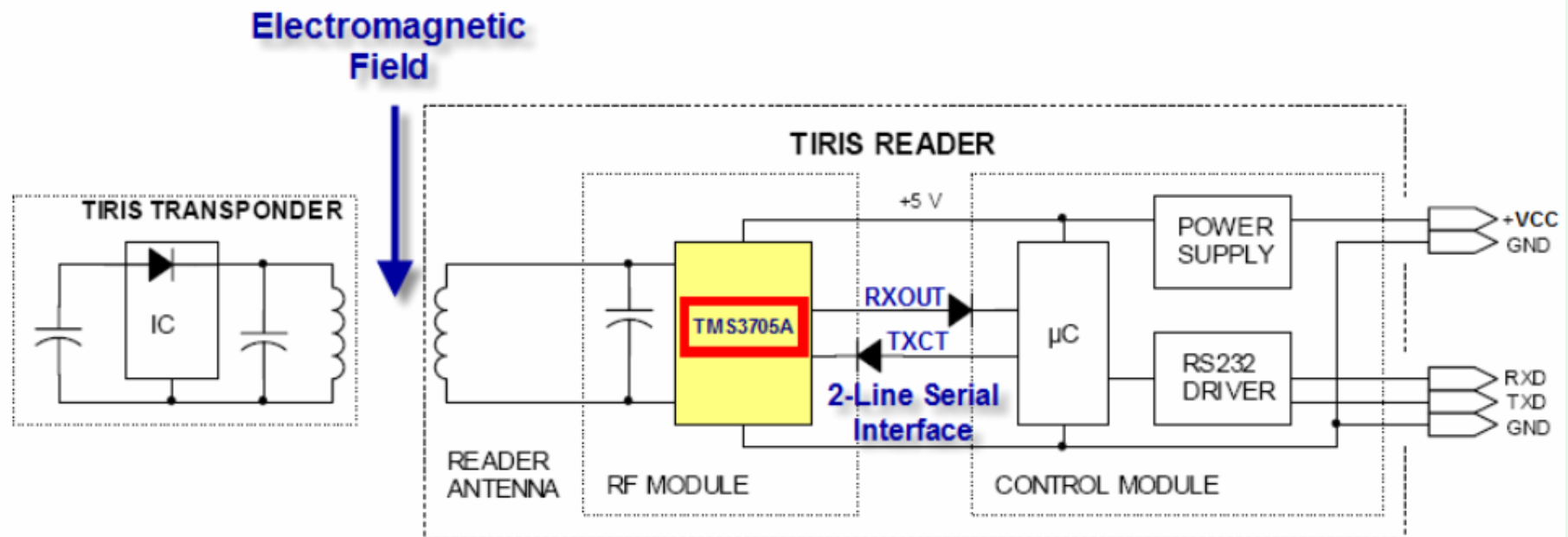
- All-in-one solution
- Multiple database – updated periodic to equal
- No 'black-boxes'





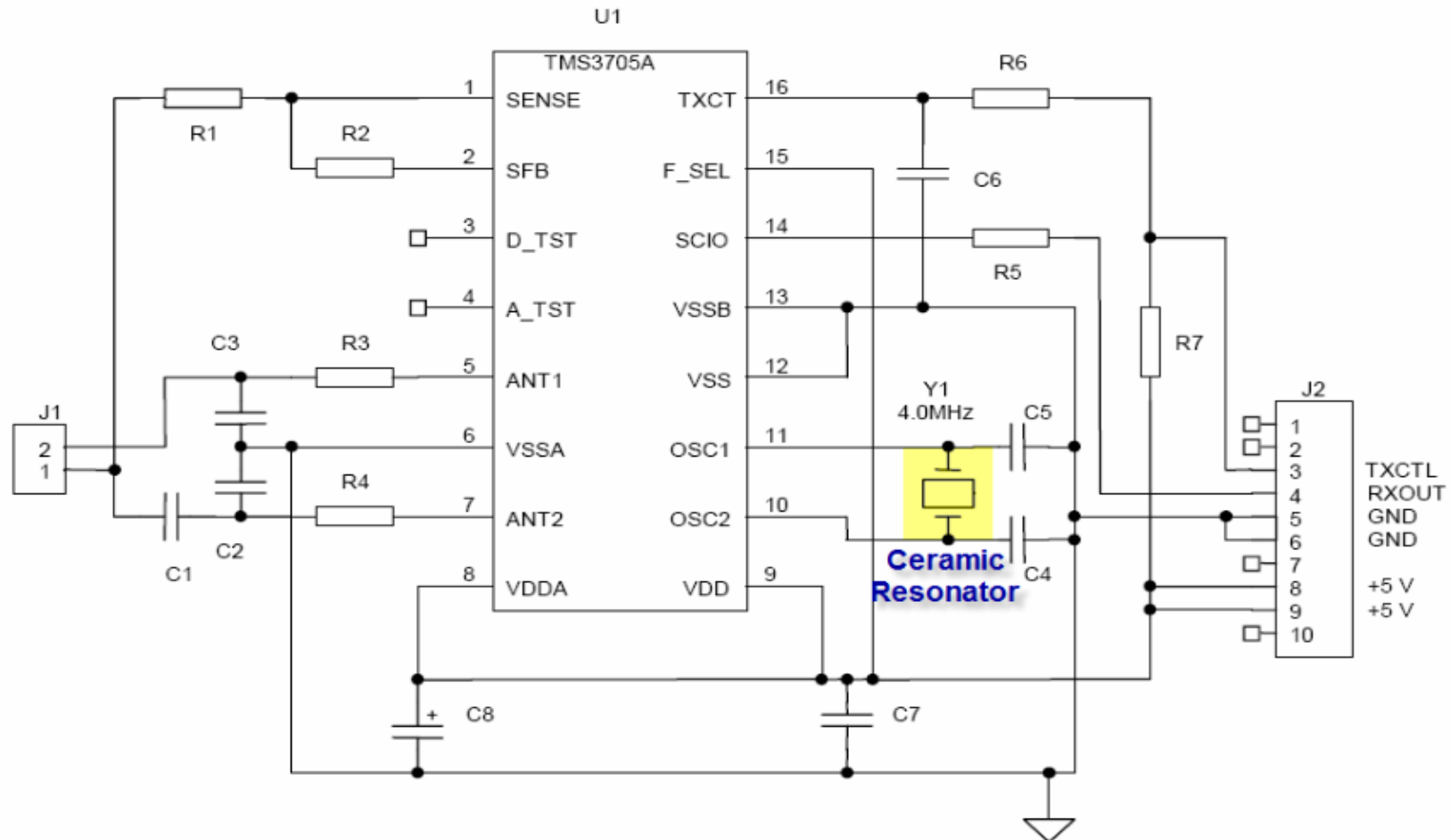
## Scheme of RFID system

- Reader and transporter are from Texas Instruments



(<http://www.docstoc.com/docs/10882379/team-Occupancy>)

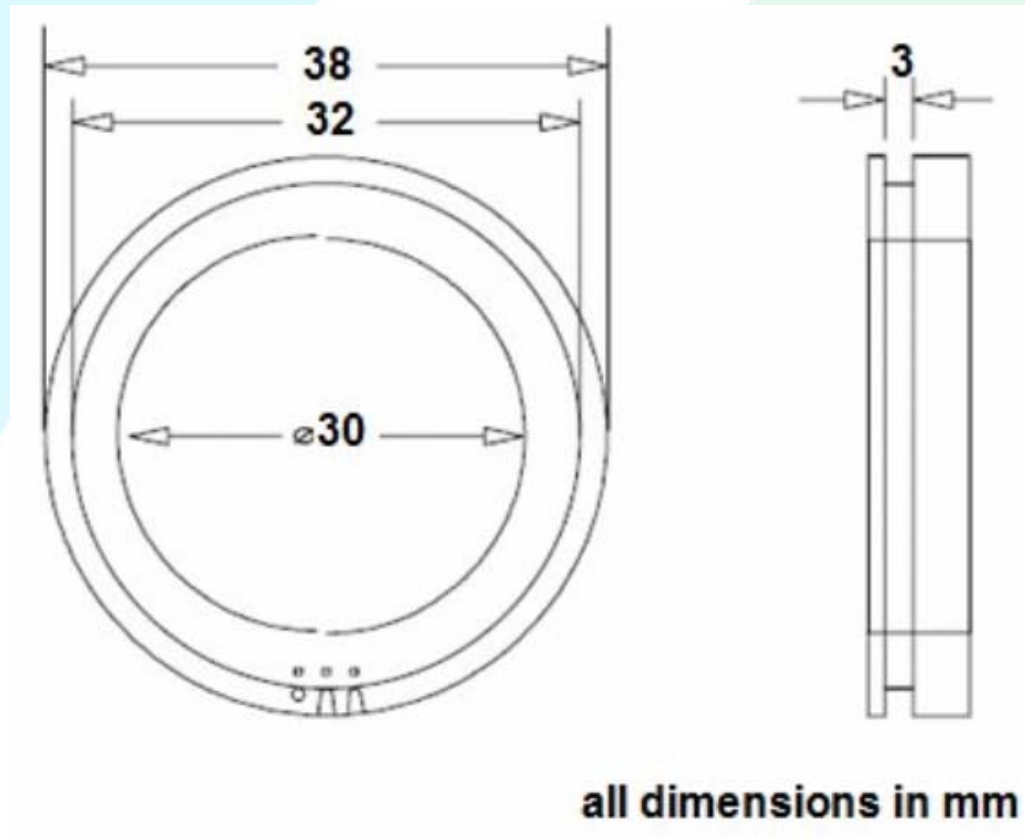
# RFID reader chip connection



(<http://www.docstoc.com/docs/10882379/team-Occupancy>)



## RFID reader antenna

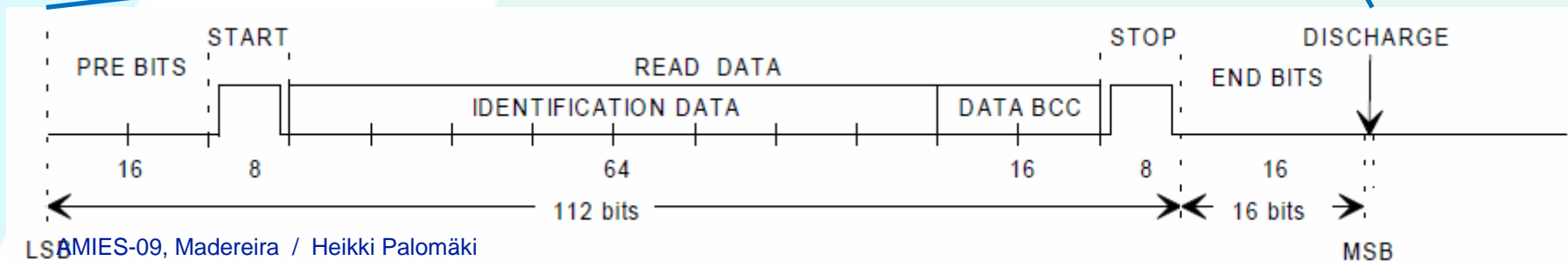
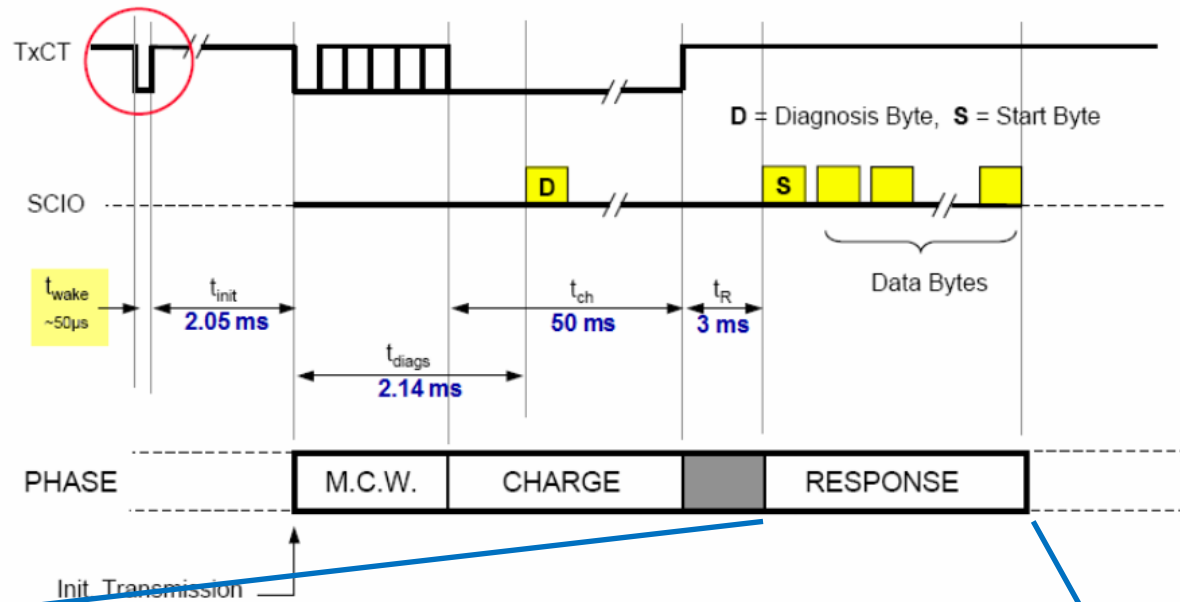


(<http://www.docstoc.com/docs/10882379/team-Occupancy>)



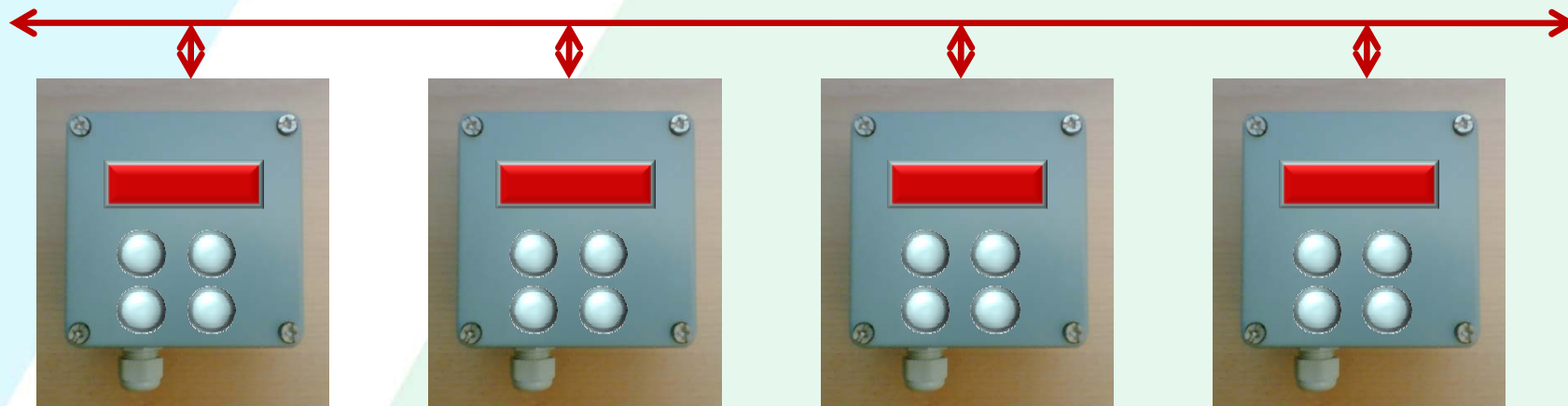
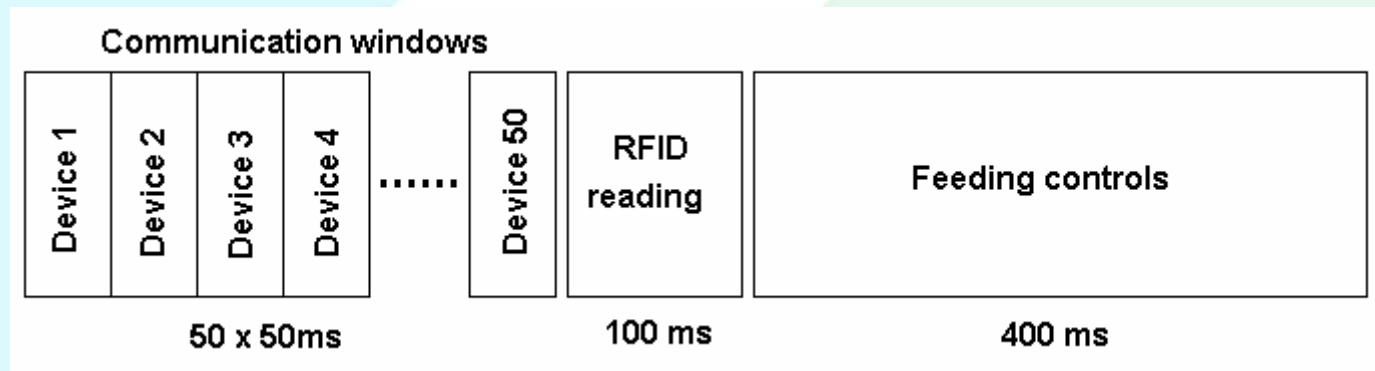
# RFID signals

Timing Diagram: R/O mode - With write to MCR



# Communication features

- Modified multimaster modbus





## Updating database

- Object list in database is scanned and updated to others
- The newest data is updated immediately

### Message frame

Address	Function	Length	New-cnt	Date & time	New-cnt	Object	RFID- code	Feed values
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### New-counter:

- 0: no data
- 1: oldest data
- 255: newest data



# Multitasking

- Software is based on ROSSI – multitasking operating system:  
<http://lompsa.seamk.fi/sulautetut>
- Task0: Low-power monitoring
- Task1: User interface
- Task2: Communication
- Task3: RFID -reading

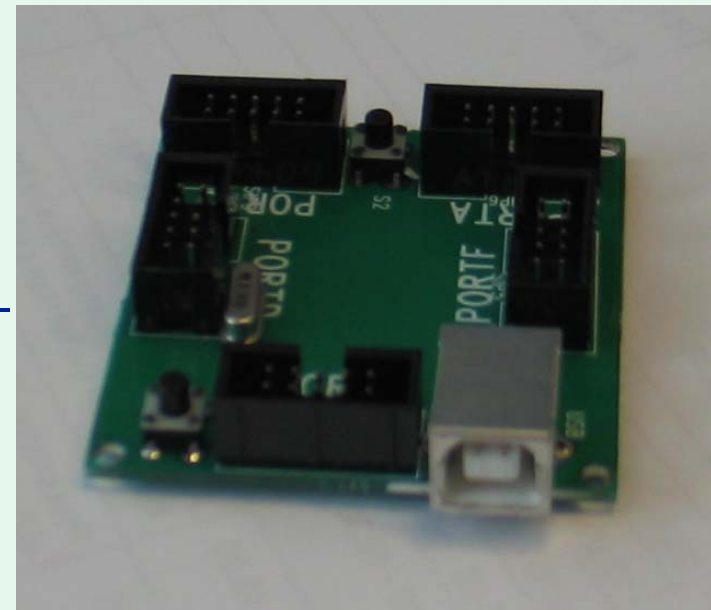
```
///  
/// TASK 0  
///  
int main(void)  
{  
  InitRossi();  
  CreateTask(task1, 1);  
  CreateTask(task2, 2);  
  CreateTask(task3, 3);  
}
```

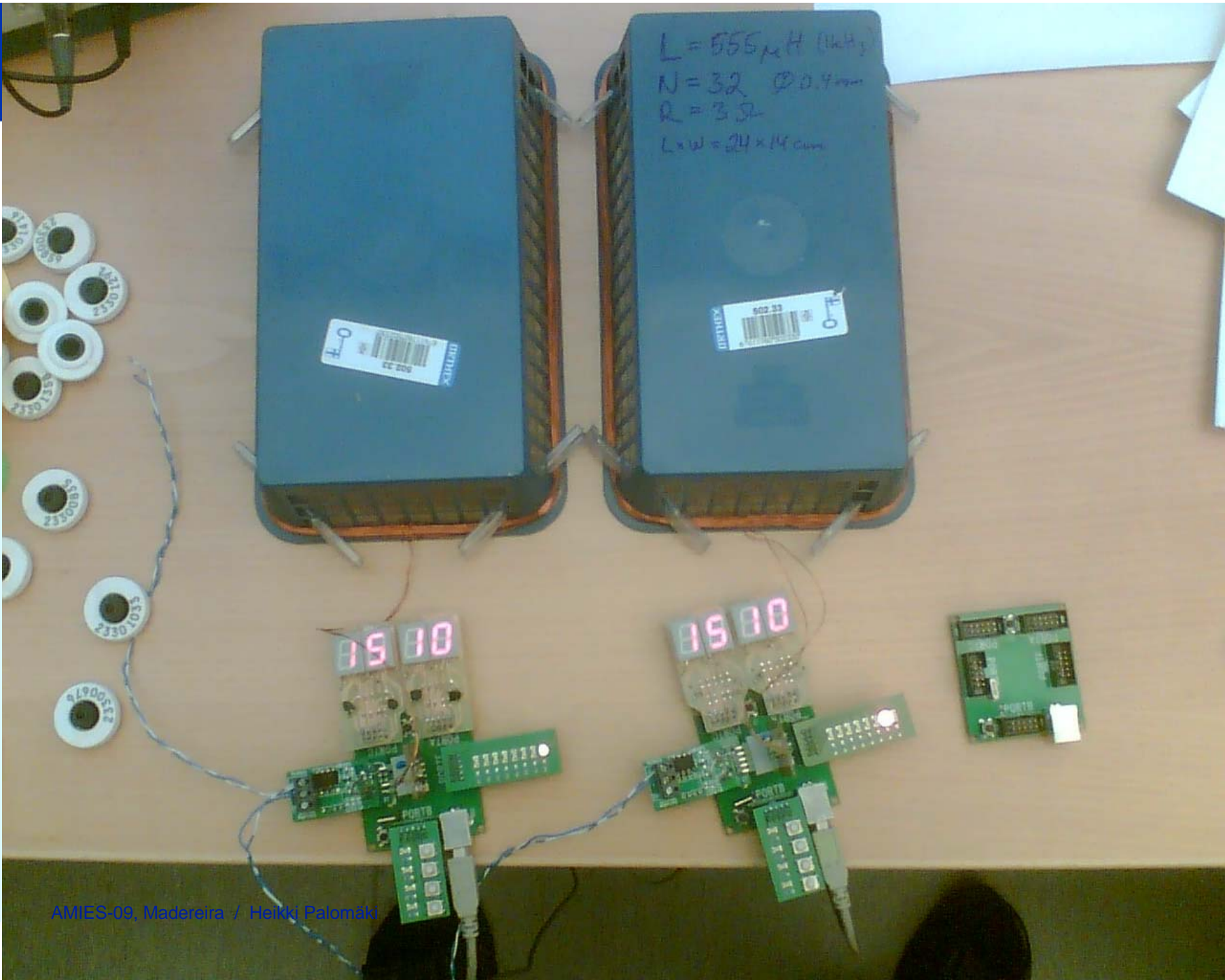




## Updating software

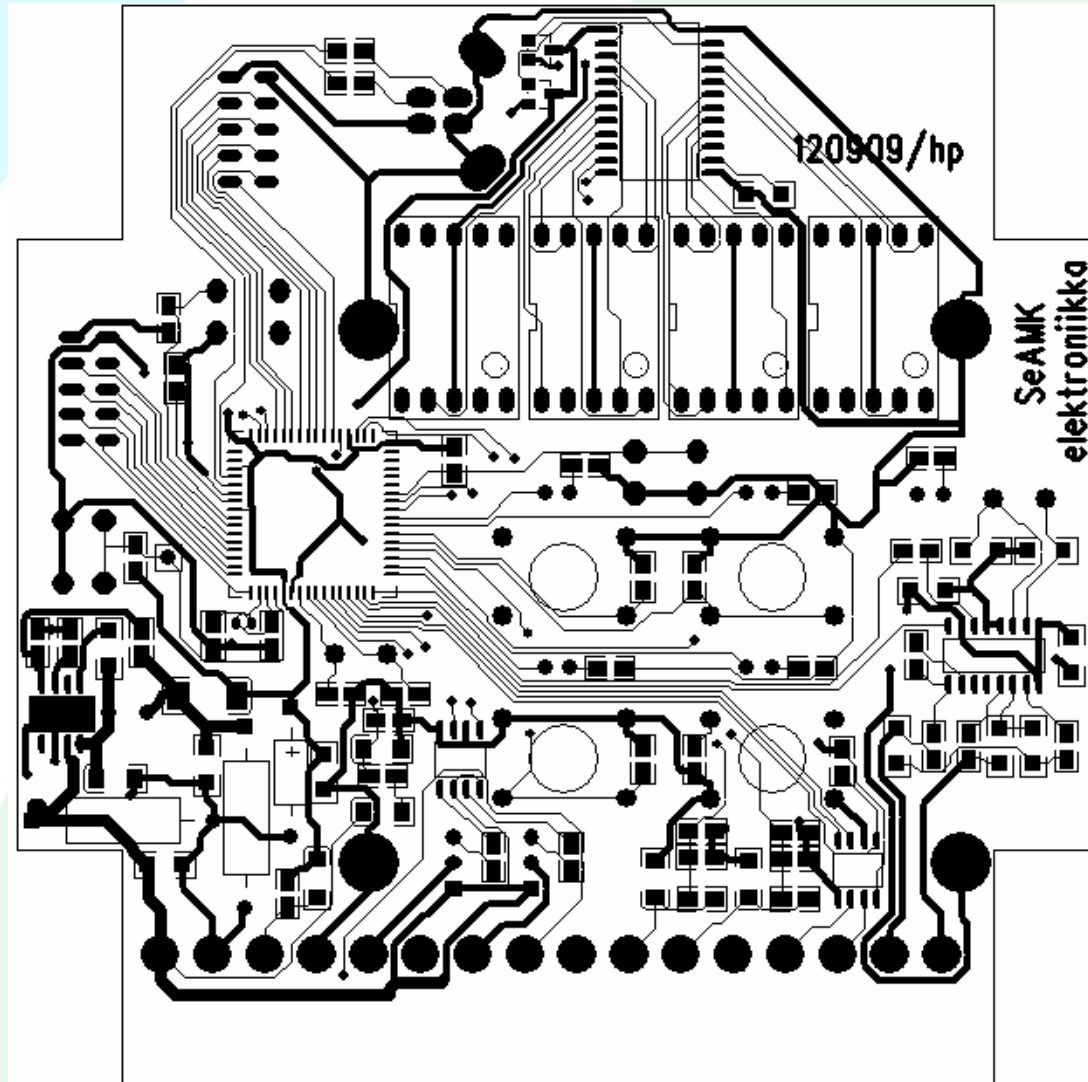
- Feeder is based on AT90usb647 (ATmega32u6)
- Software updating:
  - Put laptop via USB to feeder
  - Press HWB & Reset
  - Programming .hex .code with FLIP – software







## Final version





## Special features

- There is no any 'black boxes' in system.
- All sections are made by ourselves
  - RFID-reader connection and software
  - Microcontroller connection, switching power
  - Multitasking operating system
  - User interface and signal interface
- It is perhaps not the best way to develop new system, but ...
  - It is very interesting to make all from simple start
  - It is important to increase know-how in our university
  - All kind of modifications are possible



# Thank you !

## Any questions ?

More data:

RFID research project in University of British Columbia:

<http://www.docstoc.com/docs/10882379/team-Occupancy>

Seinäjoki University of Applied Sciences:

[http://seamk.fi/in\\_english.iw3](http://seamk.fi/in_english.iw3)

Embedded System teaching & projects:

<http://tekniikka.seamk.fi/sula>