

## INCASE MISSION

Within the world of Industry 4.0, we develop test set-ups and demonstrators for sustainable technologies to prove the viability and applications of this technology. We introduce the technology to the industry by means of workshops and lectures based on own research and experience.

**Interreg**   
**2 Seas Mers Zeeën**

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European Regional Development Fund

[www.incase2seas.eu](http://www.incase2seas.eu)

## Project

# Networked control

## High-performance networks for local signal processing and control

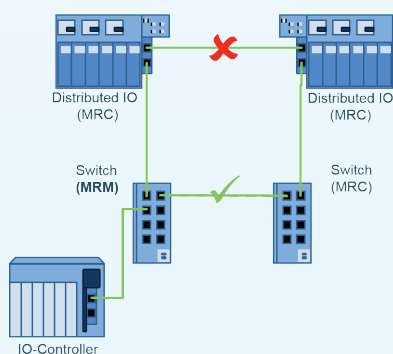
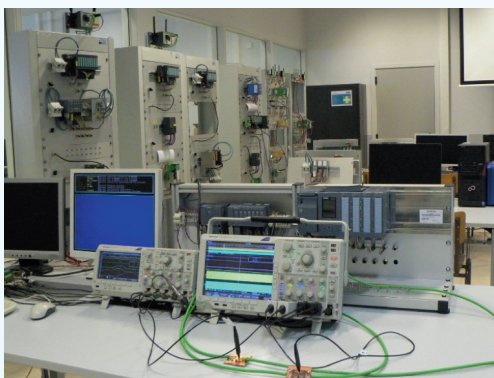


### What

Networks for industrial data communication are developed to exchange network messages reliably and deterministically between the central PLC (Programmable Logic Controller) and sensors, actuators, electrical drive systems, HMI touch screens, etc. These network messages (or “data packages”) are typically exchanged (in the order of) every millisecond, over and over again.

INCASE has focused on PROFINET as ethernet-based network for “networked control”. In-depth research was done on developing reliable PROFINET networks, troubleshooting and (permanent) diagnosis, increasing up-time using redundancy, etc. and, of course, protocol and configuration, using our own pilot installations and in collaboration with observer partners such as ArcelorMittal Ghent, Siemens, Phoenix Contact, Volvo Cars Ghent, etc.

The control part involves matters such as code generation for industrial PLCs by MATLAB: in this way, more advanced algorithms are speedily finding their way to the factory.



### Network Overview

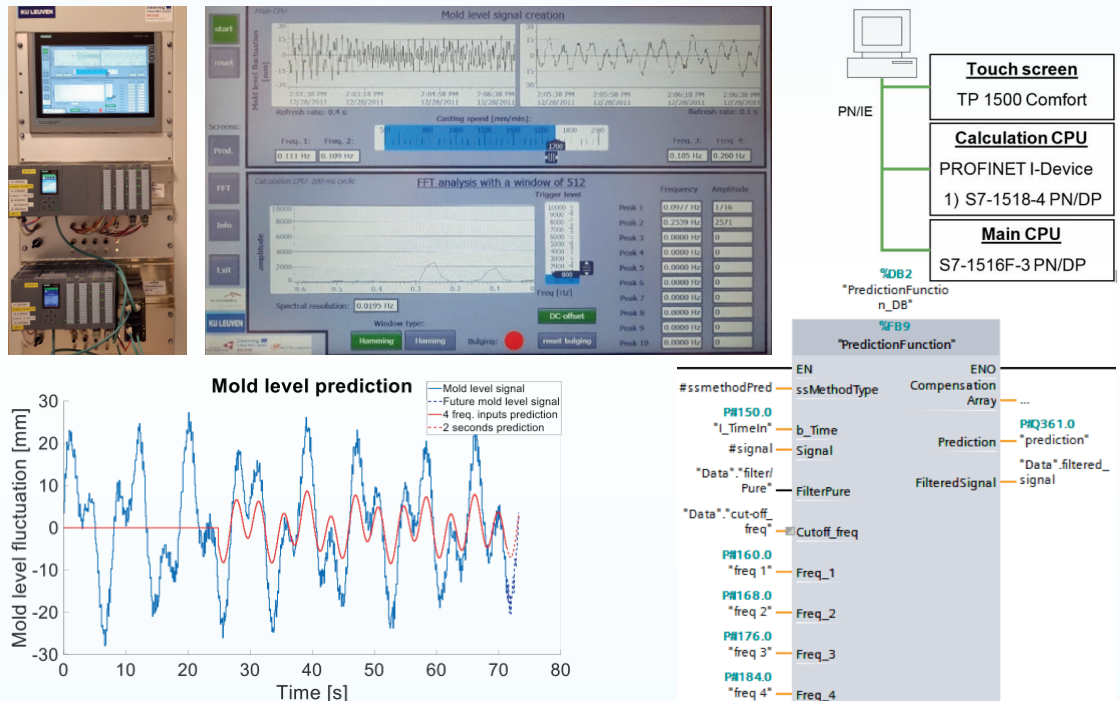
Current Time/Data 10/23/2014 14:11:26	Last Minute	Last Cycle 24h	History
Lost Nodes	0	0	0
High Priority Alarm	0	0	0
Low Priority Alarm	0	0	0
Packetjitter (%)	0	0	0
Missing RTC Packets	0	0	0
Loading Ratio	0:0	0:0	0:0
Update Rate min/max (ms)	- / -	- / -	- / -
Network Status	100	100	100
Network Loading min/average/max (%)	- / - / 0	- / - / 0	- / - / 0
Throughput maximal (Bytes/ms)	0	0	0
Error Telegrams	0	0	0
Connection Retries maximal	0	0	0
Start of Measurement	10/23/2014 14:10:50	10/23/2014 13:16:547	10/23/2014 13:16:547
Last SNMP Request		-	

(Clockwise) Test set-ups, network monitoring  
MRP redundancy for ethernet-based industrial data  
communication with the use of PROFINET



## Pilots (applications)

Besides numerous demonstrators for the actual network communication, a number of pilots have been developed where more complex algorithms in MATLAB-Simulink were converted into code that can be used in standard PLCs. An extensive case study was developed together with observer partner ArcelorMittal Ghent: a prediction algorithm for mold level fluctuations, combined with a frequency analysis for early detection of bulging is shown in the figure.



## Results/Conclusions

Robust network design, detailed analysis methods, permanent diagnosis, redundant networks, oversampling, etc. were thoroughly researched and introduced to the industry by way of hands-on workshops.

Advanced local signal processing and control with the aid of code generation by MATLAB were developed, tested and demonstrated.



## Number of companies reached through workshops and lectures

A vast range of demonstration actions were achieved: specialised lectures, study days in collaboration with the industry, in-depth 4-day hands-on workshops, etc. INCASE reached over 180 unique companies and 400 people.

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