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.

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INCASE
European Regional Development Fund

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Project

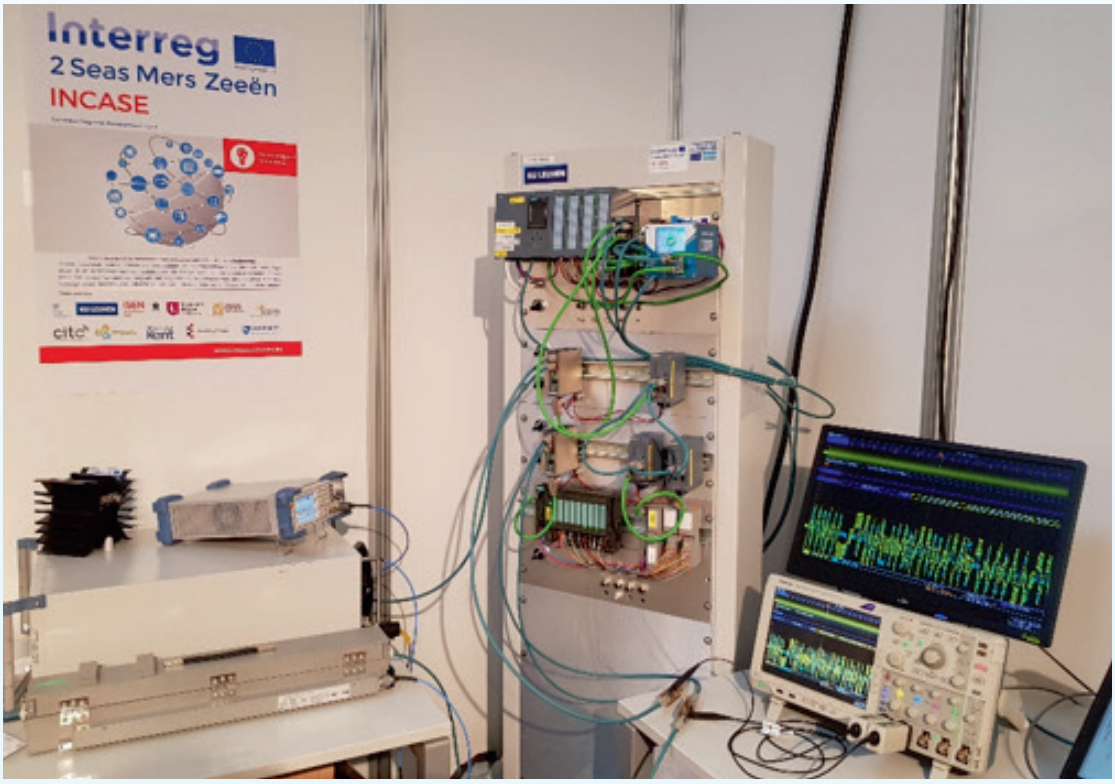
Load & errorgenerator

To test the robustness of industrial networks

What

Industrial data communications networks are designed to exchange network messages reliably and regularly ("deterministic") between the central PLC (Programmable Logic Controller) and sensors, actuators, electrical drives, HMI touchscreens, etc. These network messages (or "data packets") are typically exchanged every millisecond.

In practice, the robustness of such industrial networks is severely tested. Electromagnetic interference (EMI) on the communications channel (usually a wired connection) between multiple industrial devices may temporarily or permanently disrupt bits, bytes, entire network messages, or even the devices themselves. Examples of this are spot welding equipment that suddenly draws a large current, or cable connectors with corroded or worn contacts that become much more sensitive to EMI, etc.



Demonstration setup at Indumation 2019: EMI coupling on a redundant PROFINET network

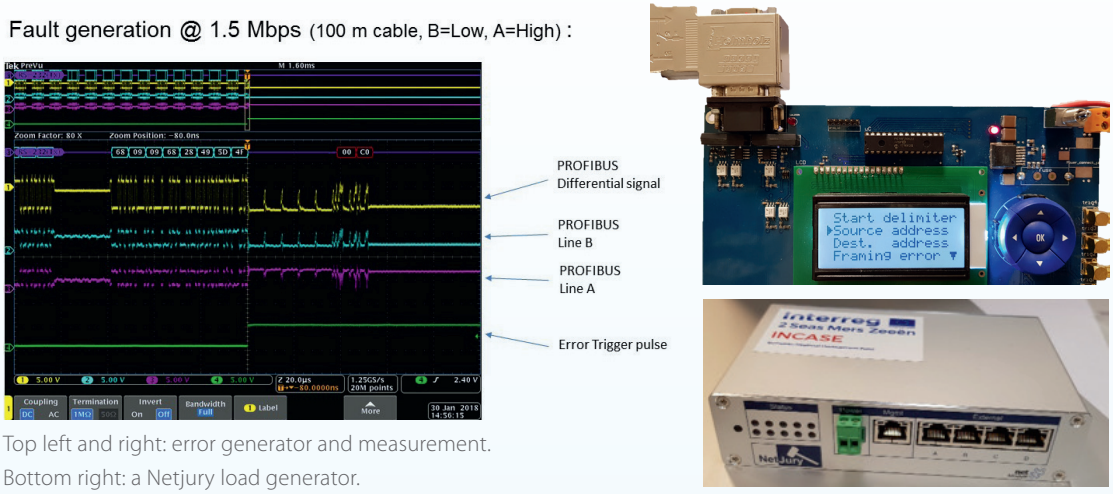
Besides, the network load itself may become too high, for example a camera that is activated by a motion sensor that suddenly transmits images over a network, file transport to a server, etc. Poorly designed network structures (or even network components) in large networks with many devices can also cause network overload.

Pilots (applications)

We measured and demonstrated the robustness of Ethernet (for PROFINET applications) and PROFIBUS DP. For example, at Indumation 2019, UGent coupled interference (left in the figure) on one path of a redundant PROFINET network of KU Leuven (middle, blue-green cables). The resulting voltage signals and decoded messages can be seen on the right.

The error generators have been designed to corrupt individual network messages in a controlled manner (time, number of times, source or destination address, etc.) to test the behaviours of the network components and the diagnostic devices. Yncréa and KU Leuven designed a fully configurable error generator for PROFIBUS DP based on FPGAs ("Field-Programmable Gate Array"). An example of the introduction of an error can be seen in the figure below.

The load generator does the same, but for a high or too high network load. In this case, additional - but not corrupt - network messages are introduced on the network.



Top left and right: error generator and measurement.
Bottom right: a Netjury load generator.

Conclusion

Error & load generators are designed both to test the robustness of networks and network components and to compare and test diagnostic devices. They are also valuable tools in hands-on workshops.

Companies reached through workshops and lectures

At workshops, seminars, and trade fairs, we reached 107 unique companies and 311 participants.

Contact persons: Philippe Saey, KU Leuven Technology Campus Ghent and INCASE scientific coordinator (philippe.saey@kuleuven.be), Prof. Jos Knockaert, UGent campus Kortrijk and project coordinator (jos.knockaert@ugent.be).

Interreg
2 Seas Mers Zeeën
INCASE
European Regional Development Fund

provincie Oost-Vlaanderen

west-vlaanderen
de gedreven provincie