Foreword

As a young engineer, twenty years ago, I made my first experience with INTERBUS-S and Sinec-L2DP, more known as PROFIBUS-DP. During these early days of fieldbus communication the big thing was to reduce all the cables on the factory floor only carrying a single signal from a sensor or to an actuator. The technology was cool and communication speed was almost incredible, 500 kbit/sec for INTERBUS and an amazing 1.5 Mbit for PROFIBUS.

Germany and especially Karlsruhe was the center of this new communication universe and we were many enthusiastic engineers who saw the potential – this new communication technology could open a door for new ways to make industrial machines and devices communicate with each other.

Now, twenty years later, we can conclude that industrial communication technology really made it possible to improve productivity, increase performance and make predictive maintenance in process automation and factory automation – because systems and devices learned to communicate.

The industrial automation market isn't quick to adopt new technologies, but modern communication is today a natural part in every automation project and it is long gone history when a screwdriver and "voltage meter" was the key things you needed to install and maintain an automation system. Today highly skilled communications engineers are making sure that our factories run according to plan. This task is not easy, today there is a long list of mature communication technologies, such as INTERBUS, PROFIBUS and CAN installed in machines and factories. Last few years we also seen the rapid adoption of Ethernet-based technology and wireless technology. Keeping up the knowledge of all these systems and technologies is not an easy task for a system integrator, device manufacturer, machine builder or an electrician, but we at HMS hope that this book gives a good understanding of these technologies and that it inspires engineers to learn more about our fantastic world of industrial communications.

I wish you a great read

Halmstad, Sweden, autumn 2011

Staffan Dahlström

CEO and co-founder of HMS Industrial Networks

Preface of the Editors

Dynamically developing technologies often result in a lot of similar products by different companies, which satisfy identical or similar market demands, but differ in terms of their technical implementation and product features. Different "form factors" in hardware, software, and operation are used as product features in order to grab an early market position and to generate market success over the competition via "time to market". This applies particularly to information technology products.

With fieldbuses, information technology came into play at the field level of automation. The development of fieldbus systems, which began around 1980, was a uniquely manufacturer-driven affair: one after the other fieldbus systems arrived on the market – Modbus, INTERBUS, PROFIBUS, CANopen, DeviceNet, ControlNet, and CC-Link – and this list is by no means complete. Attempts to standardize a uniform international fieldbus within the International Electrotechnical Commission, IEC, failed. None of the parties were prepared to withdraw support for their product.

Since 2000, industrial Ethernet has set out to compete with fieldbuses. A number of industrial Ethernet variants have also emerged, the best known of which are the market leaders EtherNet/IP, PROFINET, Modbus TCP, EtherCAT, POWERLINK, sercos, and CC-Link IE.

This book, which is an updated translation of the 2010 German book titled "Industrielle Kommunikation mit Feldbus und Ethernet", recounts the history of the different fieldbus and Ethernet networks from various points of view and describes the current status of the major systems. In compiling the material for this book, we focused mainly on factory automation. Communication systems with a focal point on process automation or building automation were not considered to avoid confusion and to keep the scope of the book reasonable.

There is not exactly a strict dividing line between factory automation and process automation, either. For example, although automobile manufacturing is a typical unit production process, its paint shop represents an area where process automation rules apply. On the other hand, the food-and-beverage and pharmaceutical industries, which are actually classified as process automation applications, also have typical unit-based operations in their packaging lines. These are sometimes referred to as "hybrid" applications.

This book also contains a few "hybrid" chapters. For example, the description of PROFIBUS includes a brief discussion of the process automation variant PROFIBUS PA. The chapters "Wireless – Status and Outlook" and "Device Integration with FDI" cover both process automation and production automation applications alike.

The structure of the book follows the historical development of industrial communication to a large extent. Introductory chapters, including one describing the failure of international standards organizations in the area of industrial communication, are followed by descriptions of the individual fieldbus systems that were selected for this book. This is followed by a description of industrial Ethernet systems. Current topics in wireless technology, engineering, and interface implementation round off the book.

One purpose of this book is to give readers interested in industrial communication an overview of the variety of systems, along with their differences and similarities. The target audience includes users and manufacturers of fieldbus and industrial Ethernet technology, product managers, sales engineers, system planners, startup engineers, and students, as well as developers that want to take a look beyond their own communication system.

The publishers would like to extend their gratitude to the participating authors for their willingness to contribute their time and expertise toward the creation of this book. We extend a special thank you to VDE Verlag and to the book's editor Bernd Schultz for his tremendous patience and technical support that contributed significantly to the success of the project, as well as to Thomas Carlsson for his thorough proofreading of the chapters.

Karlsruhe, Germany, September 2011

Prof. Dr. Frithjof Klasen
Dr. Volker Oestreich
Michael Volz