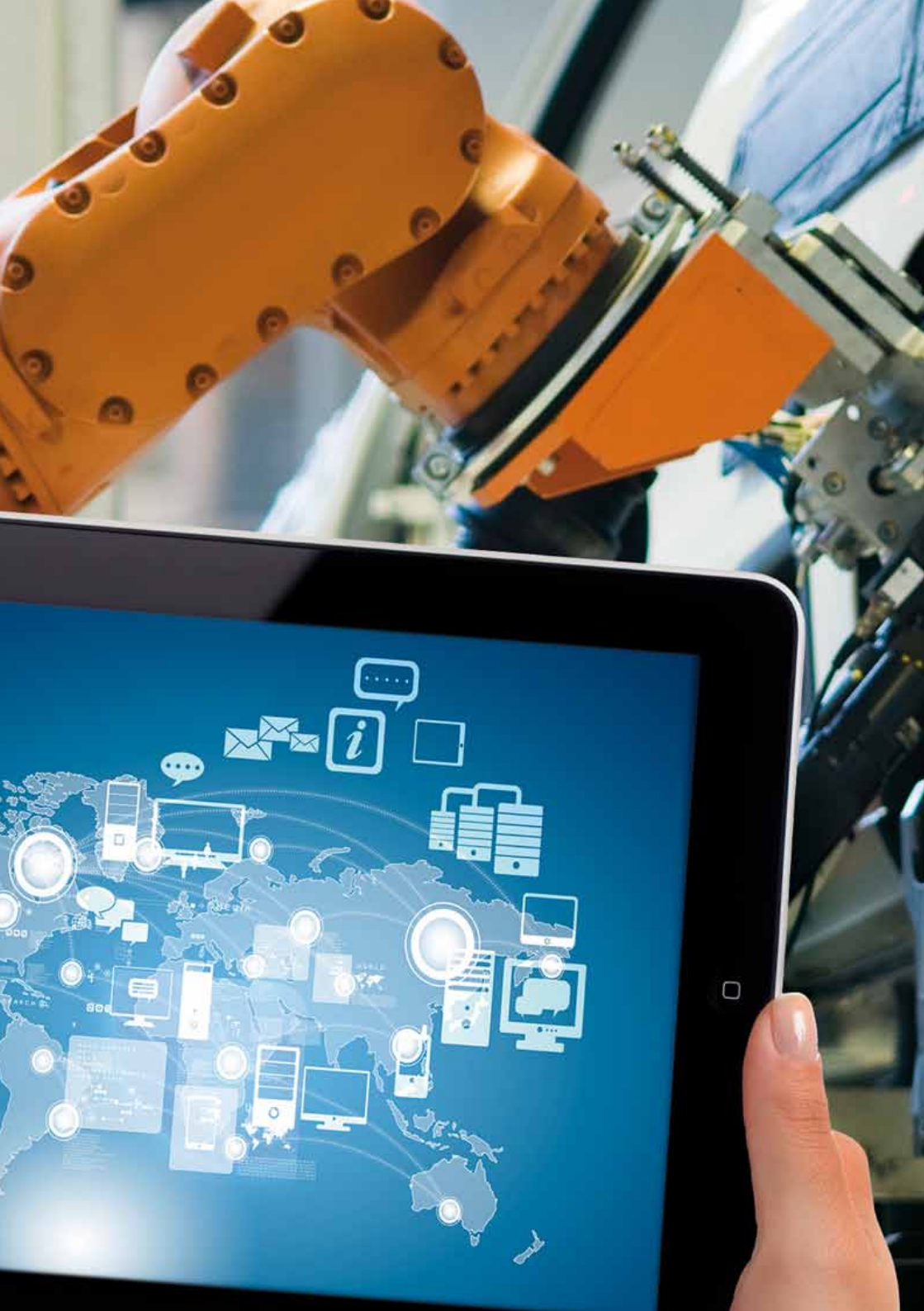
International Conference

INDUSTRY 4.0 IN PRACTICE

FROM VISION TO IMPLEMENTATION

May 12th-13th, 2015,
Radisson BLU Hotel Olümpia, Tallinn, Estonia



Dear Guest,

Welcome to the Industry 4.0 in Practice conference where we explore how to take this concept from a vision to implementation.

The event is dedicated to learning more about Industry 4.0 practices and forming lucrative relationships between manufacturers and ICT companies.

The conference is organised jointly between the Estonian Association of Information Technology and Telecommunications (ITL), the German Embassy in Tallinn, Enterprise Estonia and the Estonian Electronics Industries Association.

It is our great honour to host such an outstanding speaker line-up and an audience drawn from industry, the ICT sector and academia. Together we can transfer Industry 4.0 principles into practice faster!

We wish you an interesting and useful conference.

Christian Matthias Schlaga
Ambassador of Germany in Estonia

Jüri Jõema
CEO, Estonian Association of Information Technology and Telecommunications

Arno Kolk
CEO, Estonian Electronics Industries Association

Hanno Tomberg
CEO, Enterprise Estonia

Program for the Plenary Day

CHALLENGES IN THE NORDIC-BALTIC REGION

9.30

OPENING NOTE: **Estonian-German Co-operation Opportunities in the Fields of Industry and ICT**

Christian Matthias Schlaga, Ambassador of Germany in Estonia

9.45

EXPERT VIEW: **Industrie 4.0 – Market Developments in Germany and Opportunities for Estonian Companies**

Torsten Pauly, Representative in Finland, Estonia, Latvia and Lithuania, Germany Trade and Invest

10.05

PRACTITIONER VIEW: **ICT Related Challenges in Estonian Industry Based on the Wolf Group Experience**

Jaan Puusaag, Chairman of the Board, Wolf Group

10.30 **Networking Break**

INDUSTRY 4.0 OPPORTUNITIES

10.45

Welcoming Address

Toomas Hendrik Ilves, President, Republic of Estonia

11.00

What is Industrie 4.0 and How Will It Create New Growth?

Prof. Dr.-Ing. Reiner Anderl, Technical University Darmstadt, Chairman of the Scientific Council for the Platform Industrie 4.0 and a member of "acatech", the German Academy of Science and Engineering.

11.40 

Logistics Providers Integrating the Networked Industry 4.0

Prof. Dr. André Ludwig, Associate Professor, Kühne Logistics University

12.00 **Networking break**

INDUSTRY PERSPECTIVE

12.30 

The Internet of Things: Connected Smart Products – Connected Manufacturing

Dr.-Ing. Rainer Kallenbach, CEO, Bosch Software Innovations GmbH

13.00 

Industrie 4.0 – Possible Usage Cases in the Process Industry

Daniel AJ. Huber, President, ABB Automation GmbH

13.30 **Lunch**

ICT PERSPECTIVE

14.20 

How to Use Big Data in Industry 4.0 Implementation

Lauri Ilison, Head of Big Data and Machine Learning, Nortal

14.45 

Estonia's X-Road Architecture – How to Apply It in Industry?

Alar Jõeste, Project Manager, Cybernetica

15.10  

5G and Industrial Internet

Janne Peisa, Principal Researcher, Ericsson
Seth Lackman, CEO, Ericsson Estonia

15.35 

Industrial Internet Security – IoT and M2M

Matthew Johnson, CTO, Guardtime

16.00 Networking Break

CO-OPERATION OPPORTUNITIES

16.20 

How to Prepare People to Support Industry 4.0 Implementation?

Petri Kuosmanen, Professor of Machine Design, Aalto University

16.45 

Best Practices in Utilizing Industry 4.0 Principles

Fabian Quint, Researcher and Head of the section "Humans and Technology", SmartFactory / Kaiserslautern

CLOSING PANEL DISCUSSION

17.10 How to Remain a Competitive Industrial Country in 10 Years?


Christian Matthias Schlaga, Ambassador of Germany in Estonia

Kristen Michal, Minister of the Economic Affairs and Infrastructure, Republic of Estonia


Prof. Dr.-Ing. Reiner Anderl, Technical University Darmstadt, member of "acatech", the German Academy of Science and Engineering.

Jaan Puusaag, Chairman of the Board, Wolf Group

Moderator of the Plenary Day

Tiit Pekk, Chief Business Development Officer, Codeborne

18.00 End of the Day 1

DAY 2 - NETWORKING EVENT AND SITE VISITS

MAY 13TH, 2015, 9.00-11.00

Radisson Blu Hotel Olümpia, Tallinn

Enterprise Europe Network Brokerage Event "Smart Industry 4.0"

MAY 13TH, 2015, 11.15-16.00

Tallinn city centre and close proximity of Tallinn

Site visits to event partner companies and other interesting sites

OPTION 1

11.15 **Bus departs front of the hotel Olümpia**

11.35-13.30 **ABB manufactory**

ABB has been operating in Estonia since 1992 covering two main fields: sales (transmission network and distribution substation projects, medium and low-voltage products, automation projects and robots, maintenance services for industrial customers) and production (generators, motors, drives, renewables, switchgears, compact substations).

13.30-14.45 **Tieto**

Tieto is the largest IT services company in the Nordics providing full lifecycle IT services and global product development services. Through industry insight, technology vision, and innovative thinking, Tieto has over 13 000 experts in more than 20 countries.

15.00-16.00 **e-Estonia showroom**

Its purpose is to showcase the nation's ICT solutions all in one facility, providing visitors with hands-on examples of what they are and how they work.

16.30 **Back to the hotel**

OPTION 2

11.15 **Bus departs front of the hotel Olümpia**

11.25-13.45 **Ericsson manufactory**

Ericsson is a driving force behind the Networked Society – a world leader in communications technology and services. Ericsson's services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

14.00-15.00 **Nortal**

Nortal is an international high-end software development solutions provider in the public and private sectors with customers across Europe, Middle East and Africa. Nortal offers solutions for Manufacturing & Logistics, Energy & Resources, also e-Government, Telecom and Healthcare.

15.00-16.00 **e-Estonia showroom**

Its purpose is to showcase the nation's ICT solutions all in one facility, providing visitors with hands-on examples of what they are and how they work.

16.30 **Back to the hotel**

Welcoming Address

Toomas Hendrik Ilves, President, Republic of Estonia

Opening Note

Christian Matthias Schlaga, Ambassador of Germany in Estonia

Industrie 4.0 – Market Developments in Germany and Opportunities for Estonian Companies

Torsten Pauly, Representative in Finland, Estonia, Latvia, Lithuania, Germany Trade and Invest

30% of the industrial value of the EU is created in Germany. To maintain competitiveness the implementation of Industrie 4.0 is crucial. Baltic and Nordic companies are welcome to join the revolution and contribute in building the value chains of the future. Germany Trade and Invest supports foreign companies on that journey and Torsten Pauly works in Finland and the Baltic States to make it happen.

WHAT IS ESTONIA'S POSITION IN TERMS OF OPENNESS COMPARED TO THE ECONOMIES IN EUROPE'S KEY INDUSTRIAL COUNTRIES?

Estonia is one of the most open European economy in terms of trade, export and FDI. If you consider its share of export (66%), import (70%) and FDI (82%) to GDP then Estonia is even more open than compared to Germany.

WHAT IS THE SITUATION IN FINLAND REGARDING THE UTILISATION OF INNOVATIONS IN INDUSTRY?

Finland is very open to new innovations. There's a strong structural change going on in the economy at the moment, partially caused by the situation with Nokia. Finland has to find new export products as soon as possible. In that sense, the ITC sector and traditional industrial branches such as mechanical engineering have great potential.

HOW ARE INDUSTRIAL MARKETS DEVELOPING IN GERMANY?

Industrial markets in Germany are developing very dynamically and create many opportunities for foreign companies. I'm convinced that a foreign company with a good solution or product will find a favourable environment in Germany, demand for new technological innovations is very high, especially in the industrial sector.

WHAT ARE THE OPPORTUNITIES FOR SMALLER PLAYERS IN THIS

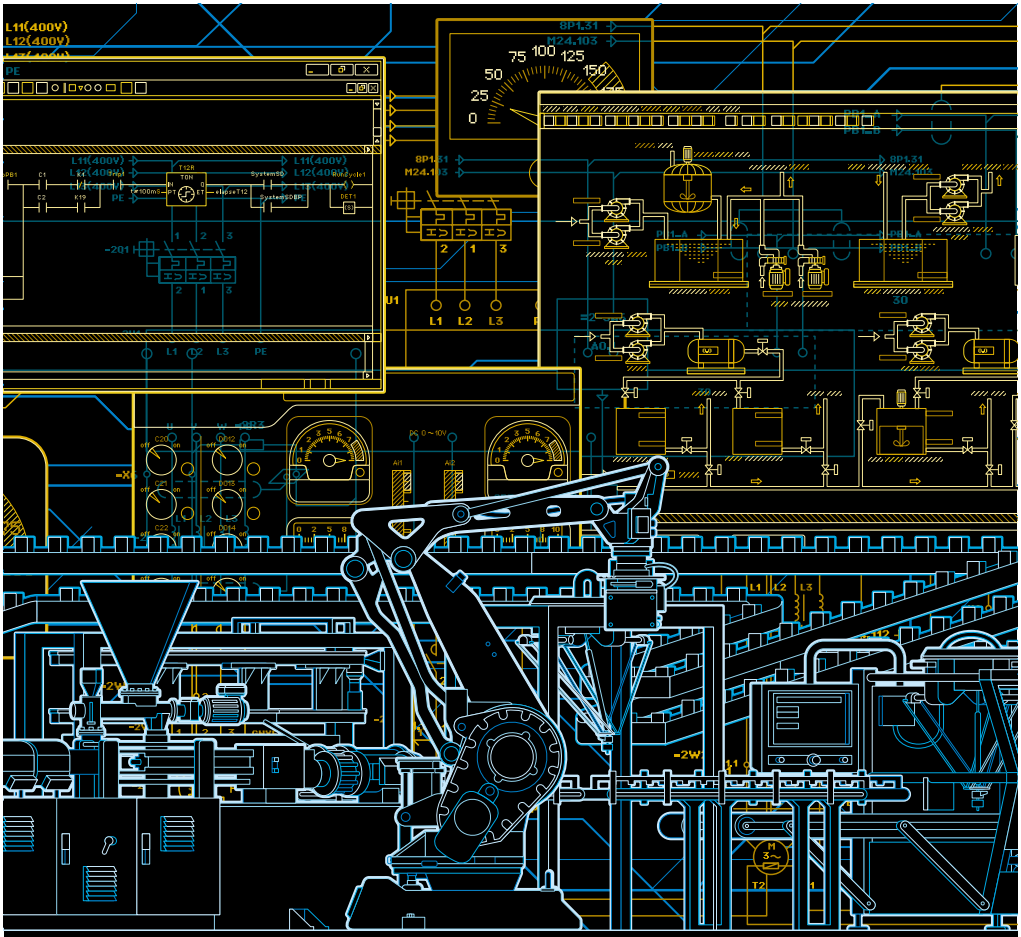
ENVIRONMENT?

About 3/4 of German manufacturing companies don't have more than 10 employees and the quality of the product matters much more than the size of the enterprise. Even though Germany is Europe's largest market and producer, concrete business is usually easy to identify once you are there. However, the key to success is finding the right location.

HOW COULD GERMANY TRADE AND INVEST HELP ESTONIAN MANUFACTURERS?

Germany is not only a big economy, but also an extremely decentralized one and this heterogeneity is often the most difficult challenge for Estonian companies entering the market. Germany Trade and Invest is there to help Estonian companies establish which is the best location. In this we also take into account legal and tax aspects or incentives, and as a public agency we offer our services free of charge.

Germany is Europe's largest market and producer, but success there is not connected to a company's size but with the quality of the products and solutions it offers. About 3/4 of German manufacturing companies don't have more than 10 employees.



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ICT Related Challenges in Estonian Industry Based on the Wolf Group Experience

Jaan Puusaag, Chairman of the Board, Wolf Group

Wolf Group unites the sales and production units of Krimelte, a leading European manufacturer of construction chemistry products and materials. The company's product portfolio consists of construction foams, adhesives, sealants, cleaning products, tools, construction chemicals and building materials for both professionals and home users. The production entities of Wolf Group are located in Estonia, Spain, Russia, and Brazil. Jaan Puusaag is a co-founder of the company, has won the Entrepreneur of the Year Award and been chosen as Business Leader of the Year by the Estonian Business School. In his presentation he will explore the challenges facing industrial enterprises based on his own experiences at Wolf Group.

WHAT ARE THE GENERAL CHALLENGES IN ESTONIA'S INDUSTRIAL SECTOR?

It is very difficult for me to speak for the whole industry as the challenges differ from company to company. But, if you ask the management of manufacturing companies, they would probably cite a lack of skilled workforce as the main challenge e.g. our market is so small that producers need to look outside and it might be difficult to find employees with an international scope of thinking.

On the other hand, if you ask the production unit manager the challenge is how to produce with maximum efficiency. Both are interested in accurate management information. Shortages of skilled international sales personnel can, to some extent, be compensated by the right CRM system.

Due to our geographical location there is much less flexibility in ordering raw materials for production. That means we need very precise information about what we require for the next week, as opposed to production in larger markets where it is possible to order raw materials on an hourly basis.

So, if we can at all generalise, one of the biggest challenges is a lack of accu-

rate management information systems.

HOW HAVE WOLF GROUP MANAGED THIS CHALLENGE AND WHAT HAVE BEEN THE LEARNING POINTS?

We have acquired and implemented an ERP system. That gives us accurate management information across the whole company, from different plants all over the World. For many the ERP system is mainly about accounting, for us it is about managing the full production cycle.

Implementing of an ERP system taught us that you can put too much attention on the acquisition cost or licence fee. This accounts for just half of the total investment, it is critical to understand the course and cost of implementing an ERP system together with any necessary adjustments. A second learning point is that you really need to understand what it is that you are buying from the service provider – many try to diminish the cost of implementation and make you believe that buying a licence covers the majority of the costs.

We've also tried to develop an ERP system from the scratch but it turned out to be too complicated to develop. Now we've taken the path of acquiring a ready-made software that has been adjusted to our needs. Adjustment and training are the key elements in implementation of an ERP system. It took us around 7 years to reach the level of results that we are fully satisfied with.

Last but not least we learned that there is no governmental support for implementing an ERP system. Although Estonia is heavily ICT oriented and there are many support systems that back ICT related investments, there are none for ERP implementation, despite it being considered the backbone of every manufacturing company.

WHAT ARE YOUR EXPERIENCES WITH INDUSTRY 4.0?

It is great that Germany is supporting such an initiative, although in relations with German entrepreneurs they have been rather conservative in their decisions. In our production we already use ICT to some extent e.g. our production line automatically sends information to the raw material supplier when the materials are getting low and it is possible to monitor production lines if these are working at low, high or optimal capacity.

I don't know if that is Industry 4.0, for us this is just ordinary work. Every new trend has to be explored, but for industry leaders it is very important also to keep their feet on the ground and concentrate on real activities that make production more efficient. For us the ERP system has been one of these.

> If we can at all generalise, one of the biggest challenges is a lack of accurate management information systems.

What is Industrie 4.0 and How Will It Create New Growth?

Prof. Dr.-Ing. Reiner Anderl, Technical University Darmstadt, Chairman of the Scientific Council for the Platform Industrie 4.0 and a Member of "acatech", the German Academy of Science and Engineering.

Prof. Dr.-Ing. Reiner Anderl is Director of the department of Computer Integrated Design in Mechanical Engineering at Technische Universität Darmstadt. Dr. Anderl is a member of the Zentrale Evaluierungs und Akkreditierungsagentur (ZEvA), a national accreditation agency, the PACE manager of Technische Universität Darmstadt, an adjunct professor at Viginia Tech and a full member and Vice President of the Academy of Sciences and Literature, Mainz. Dr. Anderl is also the member of "acatech", the German Academy of Science and Engineering which represents the German scientific and technology communities at home and abroad and has authored and co-authored more than 200 publications. At the conference Dr. Anderl will present a keynote speech about the Industrie 4.0 concept and how the will create new growth.

WHAT IS YOUR PARTICULAR INTEREST IN INDUSTRIE 4.0? HOW DID YOU GET INVOLVED WITH THIS TOPIC?

I'm a mechanical engineering scientist located in Darmstadt. I'm also a Professor at Technical University Darmstadt, specialising in information and communication technology in mechanical engineering. My background is in information modelling and I started my scientific career by developing a technology commonly known as STEP (Standard for the Exchange of Product data), widely spread in computer aided design systems today. I'm very interested in delivering the scientific fundamentals for Industrie 4.0

We are working on a new technology for Industrie 4.0 called cyber physical systems. One of our tasks is to deliver the fundamental technologies to define and specify cyber physical systems. In addition, we're trying to understand the parts and assemblies in the manufactur-

We realized that not only do we need more IoT (Internet of Things), but also IoS (Internet of Services) and IoD (Internet of Data) in production technology, because our systems are able then to interconnect and to communicate .

ing process as information carriers. This is very important because in Industrie 4.0 we enable parts and assemblies to communicate with other manufacturing resources. Lastly, we are participating in the development of a new safety solution for Industrie 4.0 based production.

ACATECH IS AT THE FOREFRONT OF RESEARCH REGARDING INDUSTRIE 4.0, WHAT IS THE ROLE OF ACATECH IN THIS MOVEMENT?

Acatech is a German Scientific Academy and stands for the German National Academy of Science and Technology.

Acatech working groups gather well-known professors and experts from German industry. I'm the Chairman of Acatech's network which deals with product development and production technology. Our main discussions revolve around the technologies of the future.

WHY IS INDUSTRIE 4.0 SO IMPORTANT FOR GERMAN INDUSTRY?

Technological breakthrough comes to production technology through cyber physical systems (IoT in the U.S.). We realized that not only do we need more IoT (Internet of Things), but also IoS (Internet of Services) and IoD (Internet of Data) in production technology because our systems are then able to inter-connect and communicate. This is a new quality in the production environment – to have both the manufacturing resources and produced parts as interconnectable systems able to communicate with each other. As a result the value chain is strongly improved, which is Industrie 4.0's key objective along with increased flexibility and changing of business models. New business mod-

els will redefine the manufacturing landscape worldwide.

HOW WOULD YOU DEFINE INDUSTRIE 4.0?

Industrie 4.0 is the technology to improve our value added chains and value added networks.

ARE THERE ANY PRACTICAL LINKS BETWEEN ACATECH'S ACTIVITIES AND ACTUAL APPLICATIONS IN MANUFACTURING?

Of course there are! Acatech has a strong profile in supporting industry, manufacturing is only one of the pillars supported by us. We are also working with alternative energy technologies and electro mobility. Many professors working in these areas are also members of Acatech. Acatech has a group consisting of representatives from industry and represented in the Acatech Senate, our main mission is to close the gap between science and industry.

IN A SMALL COUNTRY LIKE ESTONIA, WHERE MOST BUSINESS ARE SMES, ARE THERE OPPORTUNITIES FOR SMALLER PLAYERS TO BECOME PART OF THE INDUSTRIE 4.0 VALUE CHAIN?

In the end the value chains are always enterprise dependent. Each and every enterprise has to decide whether to accept this new technology or not. After having developed the technical specifications of Industrie 4.0 it is now time to bring technology in to practice. German Associations are very helpful and supportive on the road to practical introduction, a good approach is to contact the Associations and make use of their know-how.

DATA-CENTRIC SECURITY.

Deployed by governments since 2007, KSI products and services offer real-time detection and mitigation of cyberattack.

GUARDTIME SOLVES A 3 TRILLION DOLLAR PROBLEM IN CYBER SPACE

Guardtime is a global cybersecurity solutions provider that introduces a new paradigm of data-centric security to fill the gaps in the traditional perimeter-based protection. Guardtime's solutions are focused in real-time detection of compromise in digital assets and data, enabled by a proprietary digital signature technology - Keyless Signature Infrastructure (KSI).

For the first time in history it is possible to assure the digital assets in a scale required by today's connected world, without the need for trust in administrators, 3rd parties or cryptographic keys.

While a 100% prevention of cybercrime remains impossible, it is now possible to have a 100% detection and real-time mitigation of a system compromise.

SOLUTIONS AND APPLICATIONS

- CYBERSECURITY
- INTRUSION DETECTION
- INSIDER THREAT MITIGATION
- EGOVERNMENT ASSURANCE
- M2M SECURITY
- IOT SECURITY
- CLOUD INFRASTRUCTURE
- CRITICAL NETWORK INFRASTRUCTURE
- DATA-BREACH MANAGEMENT
- REGULATORY COMPLIANCE

Logistics Providers Integrating the Networked Industry 4.0

Prof. Dr. André Ludwig, Associate Professor, Kühne Logistics University

Prof. Dr. André Ludwig is Associate Professor for computer science in logistics at Kühne Logistics University, Hamburg, Germany. Previously he worked as Assistant Professor at University of Leipzig's Information Systems Institute. André is passionate about the Industry 4.0 framework and considers logistics the glue that keeps the value chain together. In his speech he will cover the influence of Industry 4.0 on logistics and give examples of smart logistics solutions in the 4.0 era.

WHAT IS THE RELATION BETWEEN KÜHNE LOGISTICS UNIVERSITY (KLU) AND KÜHNE + NAGEL?

Kühne + Nagel is one of the most successful logistics companies worldwide. The Kühne Foundation was founded in 1976 by the Kühne family and actively funds numerous research activities worldwide. The KLU is an independent, state-approved, private university in Hamburg that is funded by the Kühne Foundation.

Although we are independent in research and education, we are happy about our linkage to Kühne + Nagel and we do get a lot of support in various forms. At the same time we co-operate with other logistics companies and technology solution providers as well.

In my opinion contract logistics is an exceptionally interesting field. We are talking about logistics service providers that are deeply integrated into manufacturing and value creation networks. Besides transport, warehousing and handling, logistics service providers offer various value-added services including sequencing, quality control, packaging, etc as a part of the whole logistics ecosystem.

WHAT DOES INDUSTRY 4.0 MEAN FOR LOGISTICS AND THE VALUE CHAIN IN GENERAL?

Industry 4.0 has a number of principles such as decentralized intelligence coming from embedded systems, sensors in IT infrastructures and connectivity across our devices. It provides higher supply chain visibility and, based on

that, real time decision-making and executing business processes within/outside/across your company and the whole supply network in a more sophisticated way.

Actually we are no longer talking about Industry 4.0 but rather a 4.0 world, because these principles will impact all areas in our lives - from smart consumer products to smart buildings, smart manufacturing to smart logistics. Logistics service providers are part of the manufacturing and production value creation, they play a highly integrated role and have specific challenges to address. I will touch upon these challenges and example solutions in my presentation, it's a specific part of the overall idea of 4.0.

HOW ARE LOGISTICS PROVIDERS REACTING TO AND INTEGRATING THE NETWORKED INDUSTRY 4.0? WHAT KIND OF CHALLENGES ARE THEY FACING?

Integration is one of the biggest challenges and needs to be addressed in two different directions.

The first is process integration. Today many companies are still operating their logistics processes insufficiently, they are not flexible enough to reconfigure depending on changing customer demands and volatile markets. Reengineering processes would allow us to define logistics functions as pieces, which you can connect to each other and orchestrate depending on specific customer demands. Whenever a customer requests a certain additional service the logistics provider should be able to insert this additional service into the existing process landscape, by using plug and play for instance. Several models and execution environments can already be used for such solutions. This is the 'process view' and has a direct influence on the second challenge: organizing digital workflows across providers and the supply network.

Many interfaces in logistics systems have become outdated and still rely heavily on paperwork, manual documents and phone communication. In a highly automated decentralized world modeling and documenting needs to be handled differently. We need logistics platforms which allow an easy integration of existing heterogeneous systems, new interfaces for communication/exchange and applications supporting these platforms. On top of these integration platforms additional services can be offered.

Start-up companies are the frontrunners in this area and already challenging existing business models. For example a new company recently developed a freight exchange platform which automates most dispatching and forwarding activities. They provide detailed monitoring of existing carriers and freight capacities and automate real-time measuring of demand at any given moment.

WHAT ARE THE MAIN LINES OF INTEREST YOU ARE WORKING ON IN YOUR RESEARCH?

We are currently developing a platform, a so-called logistics service engineering and management platform. By monitoring different activities in logistics we created a structured map of the main logistics functions. The resulting map offers a clear description of the data necessary for triggering these services. Based on these services logistics pro-

> Industry 4.0 allows real time decision-making and executing business processes within/outside/across your company and the whole supply network in a more sophisticated way.

cesses can be designed, to provide customer-specific solutions for instance.

Such platforms will shape the future of logistics. The business model will switch towards integration and coordination. The focus will turn from concrete assets to managing all players and integrating them across the platform. At the end of the day we will still need carriers assets, but they need to be equipped with technology that can be monitored and integrated on demand. This will change the whole landscape of logistics.

HAVE YOU ALREADY SEEN SOME PRACTICAL USE OF YOUR RESEARCH/ PLATFORM?

The platform is still in the research stage and is not market ready just yet. We have been discussing our ideas with a number of logistics service providers and, of course, IT providers who already have useful platform services in their product range (modeling of processes, cloud based management systems, etc). These companies are currently evaluating a number of prototypes.

Our role is not to come up with products, but to come up with ideas. If you read the reports and agendas published by large logistics companies you'll see that the key topics are clearly connected to this integration and planning area. This proves that we are not the only ones thinking in this direction. There are also examples of smaller companies offering small pieces to this bigger development.

WHAT ELSE IS HOT RIGHT NOW IN THE WORLD OF LOGISTICS?

Another topic that I would like to bring up is virtualization, as we will come to a world where services and products are virtualized. For a shipper the identity of a transportation provider will not bare any meaning, you will be exclusively interested in the final outcome. It's very similar to the Internet, the same will happen in logistics. You will have an order, a platform with fully automated surveillance of the main transport channels, which will allocate a space for your freight and make sure you are maximizing your resources. Undoubtedly you'll have all the information and full control of monitoring, but the actual provider will become virtual.

Simultaneously, 3D printing will change the world of tangible products. The system will decide whether a product should be shipped or printed somewhere in a small factory.

Elion

Outsource your IT and make the Industry 4.0 step with ease

The Internet of Things: Connected Smart Products – Connected Manufacturing

Dr.-Ing. Rainer Kallenbach, CEO, Bosch Software Innovations GmbH

Dr.-Ing. Kallenbach has direct management responsibility for business planning, strategic portfolio management and technology, including product development. A PhD in cybernetics, Rainer Kallenbach has held numerous different posts at Robert Bosch GmbH, most recently as Executive Vice President of Corporate Sector Information Systems and Services. In his presentation he will share the best practices of Bosch Software Innovations in implementing Industry 4.0 principles.

WHAT IS THE ROLE OF BOSCH SOFTWARE INNOVATIONS GMBH WITHIN THE BOSCH GROUP?

Bosch Software Innovations GmbH is the software and systems house introducing technologies which enable the Group to participate in the Internet of Things (IoT). We are developing new IT-based services and IoT applications in the areas of connected mobility, connected industry and logistics (called "Industry 4.0"), connected energy, smart home and smart cities solutions.

WHAT DOES INDUSTRY 4.0 MEAN FOR BOSCH SOFTWARE INNOVATIONS GMBH?

We are working on a software platform and standard applications for our target areas. These are very practical programs in terms of Industry 4.0 which are already applicable in Bosch's manufacturing sites at approximately 250 locations worldwide. We're offering our platform and applications to external markets as well thus other companies will be able to implement our service packages for their own Industry 4.0 environments.

HOW IS BOSCH MAKING ITS PRODUCTS SMARTER?

Throughout the last years we have included miniaturized electronics, and in particular high-performance sensors, within many of our products. As a next step we will connect nearly all of our

electrically powered products to the internet. Together with powerful applications running at the back-end, they will allow for new, useful IT-based services. Our smart mechatronic products will become even smarter "cyberphysical systems": products connected to computer systems via the internet.

THE POWER TOOL IS ONE OF THE FIRST THINGS TO POP INTO MIND IN CONNECTION WITH BOSCH. WILL INDUSTRY 4.0 HAVE AN IMPACT ON BOSCH'S FAMOUS POWER TOOL RANGE?

Of course it will! Earlier this year at the Industrial Internet Consortium, our partners and us showcased an industrial cordless screwing tool connectable to other devices (as part of the "Track and Trace" project). The tool is connected to a back-end system enabling many functions for a worker using the tool in manufacturing. This is just an example prepared for industrial manufacturing, but you can also develop similar applications for other tools and target applications. You may expect many new things to come!

> Eventually all products using energy supplies will become smart products in the sense that they will be connected to the internet.

The World of Industrial Internet

tieto.com/industrial-internet

Industrie 4.0 – Possible Usage Cases in the Process Industry

Daniel AJ. Huber, President, ABB Automation GmbH

ABB has 5 divisions: Process Automation, Discrete Automation and Motion, Low Voltage Products, Power Products and Power Systems. Daniel Huber is responsible for ABB's Process Automation business in Germany, Austria and Switzerland. He will be sharing with us the ABB way of implementing Industrie 4.0 principles.

WHAT DOES INDUSTRIE 4.0 MEAN FOR ABB?

First of all, Industrie 4.0 is a German initiative and represents the digitalization of industry. At ABB we call it the Internet of Things, Services and People.

Digitalization of industry is regarded as the next industrial revolution by the German Government. Industrie 4.0 products will not appear suddenly, it's a step-by-step introduction. It all starts with smartphones and ends with cloud technologies.

Automation might also go into the cloud, which will be a big change for the automation industry. Classical control systems as we know them today will probably change in the future. We envisage smaller systems, functionality moving into cloud applications, big data and much more. On the control systems side ABB is the world leader therefore we will be part of this revolution.

WHAT IS THE PRACTICAL MARKET NEED FOR INDUSTRIE 4.0?

Everything will become more flexible. For instance, if you like muesli you can go to the internet and configure your own blend, or you can buy a bottle of coke with your name on it.

We don't have such discrete products in the process industry, but even with continuous products the size of production becomes smaller and more flexible. This helps to meet customer needs. That is why we talk about modular systems in the industry, you have to be much more flexible for smaller production sizes and product variations.

Additionally we will see much more data for automation and this amount of data presents new possibilities. The big discussion in Industrie 4.0 revolves around finding these possibilities. Undoubtedly security is important here as well and a lot of work is still needed in

that area.

YOU ARE ACTIVELY USING SEVERAL PRINCIPLES OF INDUSTRIE 4.0? DO YOU HAVE ANY EXAMPLES OF TANGIBLE BENEFITS FROM ABB'S PERSPECTIVE?

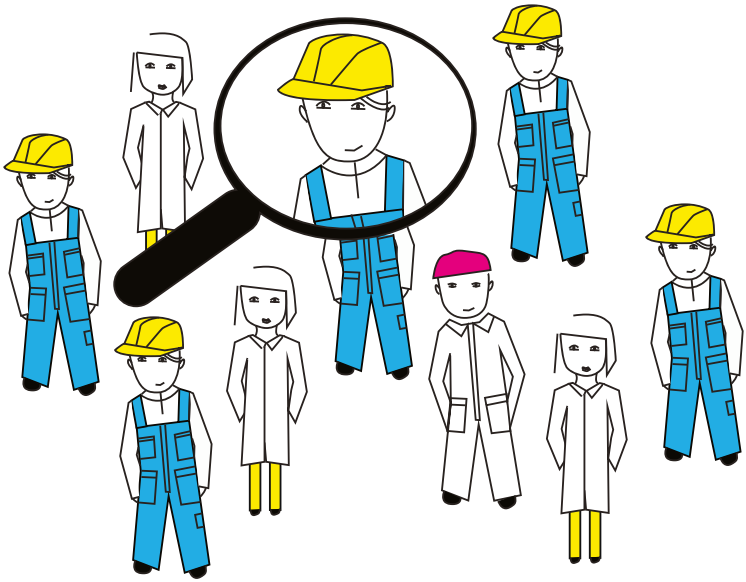
Device integration technology allows us to connect products from different vendors without additional engineering, so called "plug & produce". This reduces tremendously the engineering costs. You can't quite call it Industrie 4.0 but it's the first step in that direction. Next all devices will have direct internet connections.

Device integration technology allows us to connect products from different vendors without additional engineering, so called "plug & produce". This reduces tremendously the engineering costs.

IS ABB ESTONIA ALSO APPLYING SOME OF THE INDUSTRIE 4.0 PRINCIPLES?

To be honest I don't think so. Frankly speaking there are two countries currently following the big trend, Germany and the U.S, they are the driving forces. Other countries are involved in some activities, but from ABB's perspective the biggest influencers are still those two.

Who said that HR must be responsible for all the recruiting?



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How to Use Big Data in Industry 4.0 Implementation

Lauri Ilison, Head of Big Data and Machine Learning, Nortal

Nortal is an international high-end software development solutions provider serving the public and private sectors. Focusing on corporate Big Data and Machine Learning application development, consultancy, education and innovation, Nortal delivers mission-critical solutions in selected industries across Europe, the Middle East and Africa. At the conference Lauri Ilison will explain the role of Big Data in implementing Industry 4.0.

HOW TO USE BIG DATA IN INDUSTRY 4.0 IMPLEMENTATION?

There are several different approaches to defining Big Data, no single clear definition exists. The approach depends on the specific usage-case and objective, in Industry 4.0 Big Data is about:

Volume – integrated and fully automated production lines produce enormous amounts of data

Velocity – data is generated at high speed

Veracity – data is received from different machines, different formats as well as semi-structured data shapes.

The combination of Volume, Velocity and Veracity are the basis for the most common approach to Big Data.

In order to understand more about the background of Big Data we often tell the story about where it comes from. Years back – in 1998 when Google was established – they were not the first search engine. Lots of other search engines existed but they were all collecting links of websites and organizing those in link collection pages. Google took a contrarian path and introduced the value of the webpage – the page rank.

In order to create a page rank Google had to download all the webpages from the Internet to their datacenter. Google had to develop a solution for their search engine with minimal costs because they did not make money on those days, their money making Ad Words business model was only invented in 2003.

Google engineers developed technologies from simple and cheap servers storing internet size data. Results with

system architectures where published in several Google Research papers and in 2003 Google's famous paper on the Google file system was created.

At the same time another team was developing a search engine – Doug Cutting and his team developed Nutch Open Source (Apache Software Foundation) search engine technology. They had the same challenge – how to scale data storage and analytics? They found the paper and decided to fully re-invent the Google file system. In such a way the Hadoop file system was created.

In 2006 Doug Cutting and his team joined Yahoo, a competitor of Google, with the promise of being able to open source everything they do in Yahoo with Hadoop. In 2007 early adopters like Last.fm started to use Hadoop, in 2008 all major payers like Facebook, LinkedIn, Twitter and others started to use Hadoop to tackle their increasing data problems.

Nowadays Hadoop is used by every large organization who has issues with scaling data volumes. There is a trend that traditional data storage and management tools are replaced (offloaded) to Hadoop related technologies.

Additionally, as large scale internet companies started to use Hadoop, they also started to create new tools on top of Hadoop like SQL type languages, scripting, online-databases, Machine Learning tools, etc. Practically all of those are open-source and publicly available under Apache Software Foundation licensing.

In Industry 4.0, where every piece in the production value chain is generating or acting based on data, it is clear there will be lot of challenges around data volume, velocity and veracity.

HOW TO BEST APPLY BIG DATA IN INDUSTRY 4.0 IMPLEMENTATION?

In Industry 4.0, where every piece in the production value chain is generating or acting based on data, it is clear there will be lot of challenges around data volume, velocity and veracity.

Tools like Hadoop and its ecosystem components enable manufactures to adopt data intensive production regimes with reasonable cost and agile development speed. In the future manu-

facturers could use the data to see what is happening in the production process, discovering irregular behavior, predicting outages in production lines, material quality and defective products. The integration with value chain partners in supply and delivery channels make the whole ecosystem dependent on the data exchanged.

IS IT ONLY FOR LARGE MANUFACTURERS OR CAN THE SMALL ALSO BENEFIT, AND HOW?

The previously mentioned Hadoop related Big Data technologies are linearly scalable, meaning that users could start with small size installations and increase capacity gradually, adding more machines in to the clusters. In such a way initial prototypes could be turned into production ready solutions just by increasing the capacity. All the referenced open-source applications fit into gradually increasing hardware installations.

WHAT ARE THE BEST PRACTICES IN THE REGION AND WHAT IS THE FUTURE FOR BIG DATA IN INDUSTRY?

At Nortal we see a trend among our smaller and larger manufacturing customers that they are looking at solutions to leverage existing data to better understand their processes. Traditional technology solutions are considered to be replaced by Big Data technologies, optimizing costs in increasing data volumes, speeding up data collection, processing speed and applying machine learning algorithms for error detection. We see a clear move towards using data as strategic resource in manufacturing, this is one of the first steps in adopting Industry 4.0 principles.

Estonia's X-Road Architecture – How to Apply It in Industry?

Alar Jõeste, Project Manager, Cybernetica

Cybernetica has earned a reputation as a dependable provider of innovative e-Government solutions, one of them being X-Road. X-Road provides a distributed, secure, unified web-services based inter-organizational data exchange framework. X-Road is a technology that provides all the necessary components for integration of e-services.

X-Road is not only for governmental institutions, private companies are also welcome to offer their services and use X-Road for secure data exchange. Alar Jõeste has an extensive background in telecommunications and now works at the heart of X-Road at Cybernetica. He'll share his opinion on how X-Road could boost Industry 4.0 implementation.

COULD YOU BRIEFLY EXPLAIN, WHAT IS X-ROAD?

In Estonia X-Road is a data exchange platform connecting the communication of commercial and Governmental organisations. It has been in active service since 2001. To give an example, the Estonian State Portal eesti.ee is connected to X-Road and the services citizens use on the portal are all managed through the technology.

HAVE YOU MANAGED TO EXPORT THE PLATFORM TO OTHER MARKETS?

We have numerous international collaborations. We launched a project in Azerbaijan some years ago and together with the Estonian e-Governance Academy and Ministry of Foreign Affairs, Cybernetica managed to install X-Road in Palestine. We are currently working on a pilot project for Namibia. Finland has announced its intention to establish a national data exchange network based on X-Road technology. There has been a lot of interest from other countries as well but we have to keep in mind that X-Road is not just a system technology, it is also a set of organisational rules and ideology.

IS IT POSSIBLE TO INTEGRATE THE X-ROAD INFRASTRUCTURE TO INDUSTRY?

I believe X-Road's infrastructure principles can be applied in industry. The in-

frastructure is based on collaboration, it's a de-centralised distributed system with no central point for communication.

WHAT KIND OF PROBLEMS COULD X-ROAD SOLVE IN TODAY'S INDUSTRY?

Every organisation is able to apply a common set of services and, with the help of X-Road security methods, regulate access to chosen elements of the set. This framework could easily be used internationally, we could have a unified federation with X-Road representatives in each country or even in industry domains. Actually, X-Road can have several branches in each country, some could focus on Governmental and others on commercial organisations' communication.

Every organisation is able to apply a common set of services and, with the help of X-Road security methods, regulate access to chosen elements of the set. This framework could easily be used internationally.

DO YOU HAVE ANY CURRENT INDUSTRY PILOT CASES?

Cybernetica is participating in a pilot project with Elering, Ericsson and Estfeed. The idea is to establish a system for measuring data exchange between different organisations, from energy suppliers to marketing agencies, they could all share their data using the same standard. The content would be defined based on users and applications.


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5G and Industrial Internet

Seth Lackman, CEO, Ericsson Estonia

Ericsson is at the forefront of mobile telecommunications and in Industry 4.0 networking is everything. 5G will open up new speeds and quantities of data, and enable machines to be guided in real-time wherever they are in the World. Seth Lackman is CEO of Ericsson in Estonia and also a Board Member at the Estonian Association of Telecommunication and Information Technology. He is one of the leading figures supporting the introduction of Industry 4.0 to Estonian companies and urges both industrial and ICT companies in Estonia to benefit from Industry 4.0, also referred to as the Fourth Industrial Revolution. In their presentation, Ericsson will introduce the opportunities 5G provides for industry.

WHAT COULD BE THE OPPORTUNITIES FOR ESTONIAN COMPANIES REGARDING INDUSTRY 4.0?

Firstly, it depends on the type of company we're talking about, but there are several ways for an Estonian industrial company to make operations more efficient. For some it's an opportunity to optimise their logistics, for others an opportunity to cut their costs.

Here ICT companies like Ericsson have a huge role in transforming traditional industry. Ericsson aspires to be the leading partner in this context, we already see the digital transformation taking place and hope to play the key supporting role for industrial organisations.

WHAT KIND OF NEW FUNDAMENTAL FEATURES WILL 5G INTRODUCE?

Looking at telecommunications technology development in the last century, it took 100 years to connect 1 billion businesses and households and 25 years to connect 5 billion people through mobile technologies. The next step is connecting things. Ericsson envisions 50 billion connected devices by 2020, providing new ways of innovating, collaborating and socializing.

People have moved from 1G to 4G and, today, we are able to download hundreds of megabytes on our smartphones. 5G will bring even more speed and megabytes will be replaced by gigabytes. Speed enables users to share frequencies more efficiently, provide


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better internet quality and create resources for more connected devices.

Today 3 billion people are connected to mobile internet. By 2020 that number will jump to more than 8 billion. The same will happen with connected devices.

For industrial companies industrial internet will allow them to control machines in real-time. A Caterpillar located in Estonia can steer a machine in Paris for instance.

WHAT OPPORTUNITIES WILL 5G OPEN UP FOR THE INDUSTRY? HOW WILL IT SUPPORT INDUSTRY 4.0?

Industry 4.0's industrial internet will add more connected devices. It doesn't matter whether it's a smart product or a smart factory, they will all become a part of the value chain. 5G will give more mobility and opportunities to connect different devices.

ARE THERE ANY PRACTICAL CASES WHERE 5G HAS BEEN DEPLOYED?

5G is not available just yet, we are still on the road towards 5G. I believe 2020 is a possible benchmark for real usage cases. However, it is important to note that we do not have to wait until then to benefit from the technology – today 4G already enables huge potential in the area of industrial internet.

For industrial companies, industrial internet will allow to control machines in real-time. A Caterpillar located in Estonia can steer a machine in Paris for instance.

Industrial Internet Security – IoT and M2M

Matthew Johnson, CTO, Guardtime

Matthew Johnson is responsible for the direction of Guardtime's technology and Information Assurance solutions, technology roadmap, and service delivery. Guardtime is a global firm and is commencing its next phase of growth across a number of transformative initiatives including Attributed Networking, Cloud, Connected Vehicles, Mobility, Big Data, Defense, Internet of Things, and Trusted Computing and Storage. At the conference Matthew will share the security risks involved in Industry 4.0 and introduce technology that helps to mitigate those risks.

WHAT IS THE ROLE, OR POTENTIAL ROLE, FOR YOUR BUSINESS IN INDUSTRY 4.0?

Guardtime's Keyless Signature Infrastructure (KSI) technology and platform offerings are the only scalable solution to provide Industry 4.0 with a new form of portable instrumentation that focuses on data centric security and real-time tamper detection for industrial assets at the scale required.

The industry is asking who will be the ‚Google of the IoT revolution' as industrial, health and IoT sensors and applications are connected to the Internet.

At Guardtime we believe it will be us. Harnessing the power of an industrial blockchain for data centric monitoring, KSI provides proof of time, identity and integrity for data and M2M connections associated with IoT and Industrial devices. The proof is compact and portable and can be escrowed for later data verification without having to trust the service provider, an administrator, a secret or other traditional trust anchor.

This proof is also forensically indisputable. Data tagged with our technology takes on unique properties to prove a chain of custody through the data transformation lifecycle, and scales to the trillions of objects associated with these sensors as the data traverses multiple geographic boundaries - all without reliance on traditional trust anchors as described above.

Independently verifiable evidence makes it possible for Industrial and IoT

KSI Technology - A blockchain security technology that provides massive scale data authentication without reliance on centralized trust authorities for full accountability and real-time cyber attack detection.

providers to have a measure of insight into the integrity of their networks and data, it's current state, so that they can finally trust the security and state of these assets. Our technology makes it possible to continuously verify the state of tagged assets to make real-time decisions and judgments essential for incident response, rollback for continuity of operations and/or regulatory compliance.

WHAT ARE THE THREATS WHEN MACHINES TALK TO OTHER MACHINES?

Threats include man-in-the-middle attacks, implementation specific vulnerabilities, compromised credentials or secrets, misconfiguration or API vulnerabilities that when compromised can undermine the integrity of the device, the data or may be used as attack vectors into the networks to which the device(s) are communicating.

There is no instrumentation other than Guardtime's KSI, which addresses these threats to provide situational awareness as to the integrity of these interactions at the scale envisaged for Industry 4.0.

HOW TO ASSURE THAT THE INFORMATION SENT FROM ONE MACHINE TO ANOTHER MACHINE IN ANOTHER COMPANY WILL ARRIVE AS IT WAS INTENDED?

Guardtime's Keyless Signatures harness the power of a globally available industrial blockchain.

Machine information tagged with our technology can be signed at its origin and then verified as authentic with properties (and the important context) of time, identity and integrity. In this way operators and data controllers

have complete visibility into the data exchange layer as well as the data being generated by the devices themselves, ensuring integrity in communication through transmission.

Usage cases include mobility, connected vehicle, industrial data, big data analytics from large-scale sensor ingest and distribution, health monitoring, etc.

WHAT ARE THE BEST, OR WORST, PRACTICES PRESENT ALREADY?

The industry has been largely focused on perimeter defense and encryption. The problem with these approaches is that you can never be sure the security fence is working properly or has not been compromised. Also, Machine-to-Machine APIs have little to no reporting capabilities into traditional security event management systems maintained by a security or network operations center.

As an analogy, ‚these dogs don‘t bark when compromised‘. Without real-time integrity monitoring and situational awareness these APIs represent a fundamental vulnerability for Industry 4.0

By focusing on the data and continuously verifying changes in real-time with Guardtime KSI, regardless of the malware or application tamper activities an attacker might attempt, you now have real-time situational awareness into any integrity compromise.

Integrity of this M2M data is paramount and its protection has largely been lost in the discussion or conflated with encryption or confidentiality technologies. Confidentiality will not assure integrity, because if a secret or credential used for encryption is compromised you will have no idea what changed inside the network without instrumentation.

Guardtime‘s Keyless Signature Infrastructure is the technology enabler to give data immutable properties. It is impossible to manipulate data that has been tagged in the past without the signature failing validation. With this proof organizations can establish credible governance frameworks by which to protect their M2M layers.

WHAT CAN E-ESTONIA TEACH TO THE WORLD, OR SHOULD ESTONIA INSTEAD LEARN FROM OTHERS HERE?

The lessons learned implementing X-Road are noteworthy. The power of harnessing the industrial blockchain to address massive scale data authentication issues associated with Industry 4.0, while focusing on data centric security and tamper detection. Providing the benefits of independently verifiable evidence and extending that evidence globally in real-time so that organizations can react faster for incident response, continuity of operations, mission and safety assurance. Ensuring there is instrumentation available to finally make credible judgments into the integrity of globally connected networks, sensors, and the data those sensors generate.

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How to Prepare People to Support Industry 4.0 Implementation?

Petri Kuosmanen, Professor of Machine Design, Aalto University

Aalto University is all about cross-disciplinary projects and learning in practice, at Aalto science and arts meet technology and business. Students are encouraged and supported to excel both in their studies and their future careers. Implementing the Industry 4.0 concept requires people with cross-disciplinary skills and Aalto helps to prepare such people. Petri Kuosmanen is Professor of Machine Design and explores how to prepare people for Industry 4.0.

HOW TO PREPARE PEOPLE FOR INDUSTRY 4.0 IMPLEMENTATION?

Firstly, highlight all the benefits of this approach. A lot of hype has been circling around Industry 4.0 but it has to be explained in a more practical way. People have a right to be suspicious towards these new technologies. Promotion has to be backed up by strong arguments, both public and private sectors should understand what it is all about.

In addition to people already in the work environment, the next generation also needs more information. At Aalto we've invited secondary school students to visit our Mechatronics activities. One of the obvious reasons for doing so is getting the top minds in Finland to apply for Aalto but it's also about sharing information across all levels, from elementary to higher education. I see great excitement in the eyes of these kids when they see what we're working on, they become motivated to get better marks at school. It confirms my point above, showcase practical examples.

The Finnish tech industry has been very active in engaging young people, for example Technology Academy Finland organises various workshops and visits. I've heard about the idea of setting up an exhibition truck which would drive across Finland and showcase the tech to schoolchildren.

HOW TO ENGAGE STUDENTS IN INDUSTRY 4.0?

We should offer environments where students from different fields, say mechanical engineers and software engineers, could work together to optimise products and manufacturing processes

using all the available technologies. Mechatronics is a good example as it combines mechanics, software and electronics. All devices are connected to each other. In addition, it would be great if we could co-operate with industry during the studies.

THE IDEA OF AALTO UNIVERSITY ITSELF IS ALREADY QUITE CLOSE TO YOUR CONCEPT, IS IT NOT?

Here at Aalto we originally wanted to combine technology with art and business. In that sense Industry 4.0 lies more within technology disciplines. That doesn't mean we have to leave out business and art, one of the latest elements of Industry 4.0 is establishing new services. New business models become crucial when implementing the industrial internet, that is where the business part comes in. And as far as art goes, we still need industrial design in this mix.

How to retain older element of the workforce in these new conditions?

We have established a professional education program and courses for current industry workers (mainly engineers and managers). They can refresh their knowledge, which is important for speeding up change. These courses are part of Aalto's commercial program and, despite carrying a price tag, we still hope for them to become popular.

HOW DOES SMARTFACTORY SUPPORT A LIFELONG CAREER?

There are more challenges to be honest, because people have to update their skills in order to work with innovative technology. It's similar to the time when CNC machines were introduced. Now machines will be remotely operated and the number of sensors and data transfer are not limiting factors anymore. Those who can adapt the fastest to this new situation will prevail as the winners.

Lifelong learning is the biggest challenge, but it also makes you more flexible, which is certainly good career wise. Although people are skeptical at first

> By using industrial internet technologies and platforms it is still possible to engage even old machines to work as a part of a digital factory with just minor investments in technology. The biggest challenge lies in adopting new business models and educating people to survive in the new environment.

they are still aware of this trend and, in most cases, quite eager to learn new skills.

Last year our department finally established ADD LAB production facilities. We wanted to replace some of the old machinery with 3D printers and some staff members were hesitant at first. Later we invited our alumni for the May celebrations and offered them a chance to get acquainted with the new technology. They were inspired by the way Aalto was itself innovating. After seeing the alumni's reaction the faculty realised that this was a great step forward, they had been afraid industry people would laugh at our new 'toys' but after external acknowledgment this fear disappeared. Encouraged by this experience we have just invested into a Five-Axis Machining Centre, which is the most modern technology available.

WHAT ARE THE SMART ASSISTANT SYSTEMS TO SUPPORT YOUNG AND OLD IN THE FACTORY ENVIRONMENT? HOW TO CREATE AN ORGANIC WORKING ENVIRONMENT FOR BOTH?

There is no clear answer. A similar situation arises when 2D CAD systems meet 3D systems, in many cases this means some work with 3D systems and the rest with 2D systems. Sadly the older generation's experience is lost in such transformations, only a small part of the old brainpower moves to new technologies. There should be some assistance for both.

Best Practises in Utilizing Industry 4.0 Principles

Fabian Quint, Researcher and Head of the Section "Humans and Technology", SmartFactory, Kaiserslautern

Fabian Quint studied electrical engineering at the Technical University of Kaiserslautern. Today he works closely with *SmartFactory*KL located at the German Research Center for Artificial Intelligence (DFKI). *SmartFactory*KL is dedicated to turning the Industrie 4.0 vision into a reality. As a leading center of expertise and manufacturer-independent demonstration and research platform, DFKI develops innovative factory systems where the vision of Industrie 4.0 becomes reality today. Fabian Quint gives an overview of this progress.

WHAT IS SMARTFACTORYKL AND HOW DOES IT DIFFER FROM A TRADITIONAL FACTORY?

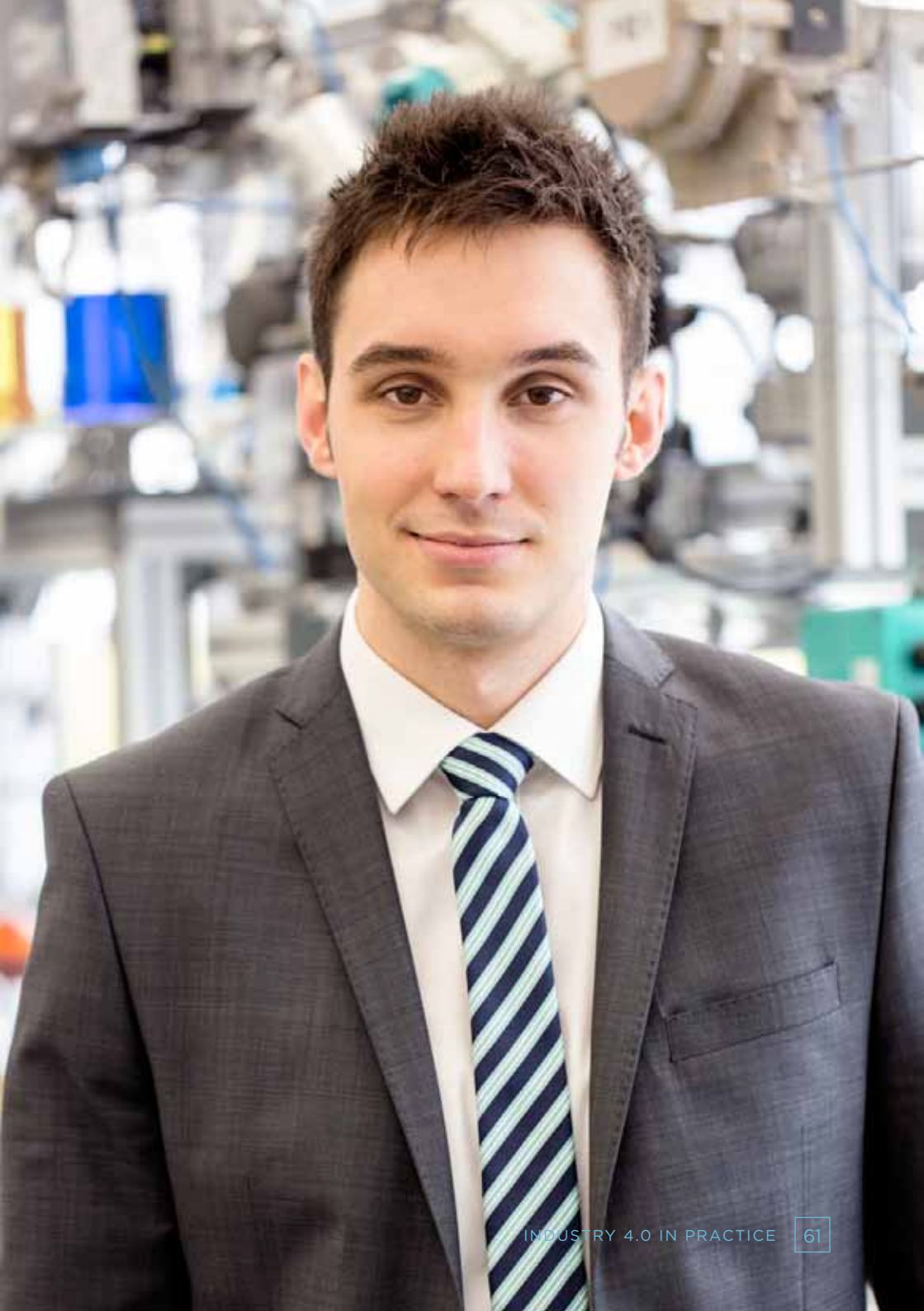
*SmartFactory*KL aims to bring research related topics to real life and present them on a broad basis with the help of our partner network. *SmartFactory*KL is a demonstration platform driven by several partners from the industry, who are partially competitors in their field. We bring these different players into discussion.

In order to bring these new ideas to life we showcase the possibilities we already have today, even if the actual implementation will happen in the next decade. We can already test and work on a prototypical basis, the required technologies are already available today and offer the possibilities to showcase all the paradigms of Industrie 4.0.

When it comes to Industrie 4.0 compatibility could be a harmful showstopper in the future. This is something that our industrial partners realize and is one of the reasons why their interest in us has been steadily increasing.

CAN YOU ELABORATE A BIT ON THE PRODUCTION SIDE?

Production is completely modular i.e. we have different encapsulated modules. Together with our partners we define standards across all levels, starting from mechanical and electrical standards to the very important information level standards. They enable the modules to plug & produce.



People turn to us in order to understand the future of the production line. We have actual examples which help to explain the often very distant theoretical elements of research. In order to understand, you have to see!

Modules can be combined into a production process in various configurations. It has to be as simple as possible. Modules are already carrying their own intelligence and are able to automatically configure themselves in different environments. As a result we can easily change the nature of our production line to accord with customer requests without additional configuration work, and allow affordable batch-size-one production.

DO YOU HAVE ANY EXAMPLES OF COMPANIES ALREADY USING SOMETHING CLOSE TO THE SHOWCASES OF THE SMARTFACTORYKL IN THEIR PRODUCTION?

We haven't reached a real production environment yet but several companies have similar programs for conducting internal research. Naturally it will still take some time before the concept becomes reality, because most production lines have a rather long lifetime. It won't change overnight, it's a progress, a step-by-step migration of the ideas presented in Industrie 4.0.

HOW HAS THE GERMAN INDUSTRY BENEFITTED FROM SMARTFACTORYKL?

Amongst the whole Industrie 4.0 program *SmartFactory*^{KL} is highly visible. With the latest project, the worldwide first manufacturer-overreaching Industrie 4.0 line, we were able to define a first set of standards and to enable realization. Industrie 4.0 has been the centre of discussion and criticism all around the world. The *SmartFactory*^{KL} has placed Germany as a pioneer in the field of Industrie 4.0 and demonstrated something real - valid ideas on both the

research and the industrial side. Accordingly a lot of people related to 4.0 use and incorporate our ideas, people turn to us in order to understand the future of the production line. We have actual examples which help to explain the often very distant theoretical elements of research. In order to understand, you have to see!

TRADITIONALLY FACTORIES ARE RUN BY PEOPLE. WHAT IS THE ROLE OF PERSONNEL IN SMARTFACTORYKL?

Future factories will definitely rely on human resources. Nevertheless, the requirements on people will change and demands will be higher and diverse. In the future workers will have to tackle several tasks at once and have a deep and profound understanding of how the concepts work. This means troubleshooting and decision-making on multiple levels.

Flexibility is also a key characteristic. This type of modular production line has more configurations which may change over the course of a day. People are still the best and most flexible entities in such conditions.

SmartFactory^{KL} pushes these human related topics further. We recently showed demos of the so-called 'Smart Operator' at this year's Hannover fair. We already have a lot of hardware and modalities today, we can use to achieve a better linkage between humans and the production line. We're steadily looking into new technologies such as smart watches, smart glasses, tablets and evaluating how they can provide substantial benefits for tomorrow's worker.

THE INDUSTRY AS SUCH HAS LATELY BECOME A PLAYGROUND FOR BIG COMPANIES WITH BIG RESOURCES. COULD INDUSTRIE 4.0 AND SMARTFACTORYKL'S CONCEPT POSSIBLY OPEN NEW OPPORTUNITIES FOR SMALLER ECONOMIES/ BUSINESSES?

The modular concept offers many advantages. here, making building a production line as easy and flexible as putting together LEGO bricks.

Say a business has several production lines and some of the module components, such as a laser, are very expensive and only pay-off if nearly 100% utilized. As you can use the same module across numerous production lines, based on your daily needs without additional configuration effort, production becomes more efficient and requires less investment.

As I mentioned we have standards on all levels meaning more independence, it doesn't matter which company provides the module as long as it complies with the set standard. You may have two modules from manufacturer A and a third from manufacturer B, they work together flawlessly, creating less dependence towards the manufacturers. Additionally, it opens new possibilities such as exchanging modules on a community basis, you get access to a bigger market and receive more opportunities.

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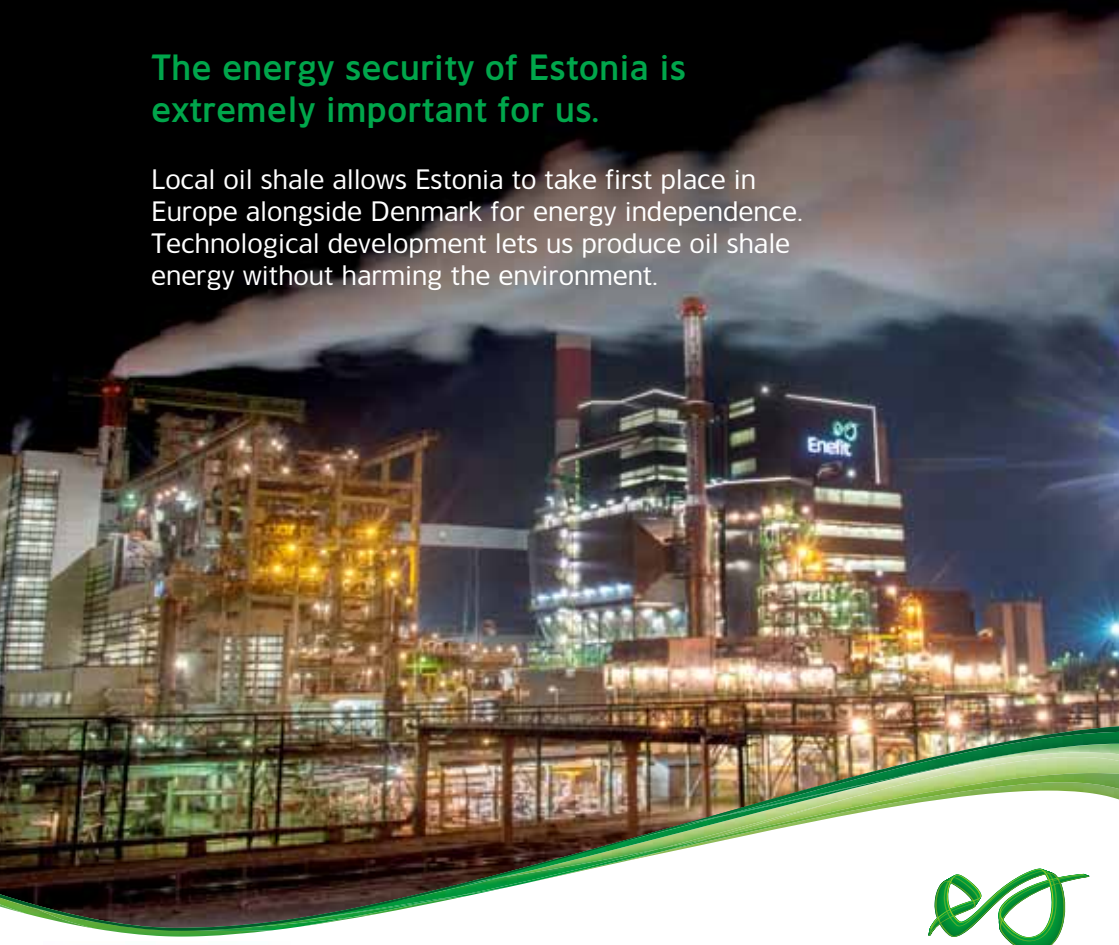

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ABB is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. ABB has been operating in Estonia since 1992 covering two main fields: sales (transmission network and distribution substation projects, medium and low-voltage products, automation projects and robots, maintenance services for industrial customers) and production (generators, motors, drives, renewables, switchgears, compact substations).

Tieto is the largest IT services company in the Nordics providing full lifecycle IT services and global product development services. Through industry insight, technology vision, and innovative thinking, Tieto proactively strives to inspire and engage our customers in finding new ways of accelerating their business. Tieto has over 13 000 experts in more than 20 countries.

Ericsson is a driving force behind the Networked Society – a world leader in communications technology and services. The Company's long-term relationships with every major telecom operator in the world allow people, businesses and societies to fulfill their potential and create a more sustainable future. Ericsson's services, software and infrastructure – especially in mobility, broadband and the cloud – are enabling the telecom industry and other sectors to do better business, increase efficiency, improve the user experience and capture new opportunities.

Nortal is an international high-end software development solutions provider in the public and private sectors with customers across Europe, Middle East and Africa. Nortal offers solutions for Manufacturing & Logistics, Energy & Resources, also e-Government, Telecom and Healthcare.

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With more than 63,000 employees at 1,000 locations in over 100 countries, the Kuehne + Nagel Group is one of the world's leading logistics companies. Its strong market position lies in the sea-freight, airfreight, contract logistics and overland businesses, with a clear focus on providing IT-based supply chain management services.

guardtime

Guardtime is an IT company that is solving the biggest problem in cyberspace. Born in Estonia, the first digital society, Guardtime's unique products and services are deployed as core components in solutions to prevent data loss of important digital assets, assure the integrity of the network, and verify enterprise behaviors even across the service providers.

Eesti Energia

Eesti Energia is an international energy company that operates in the energy market of the Baltic and Nordic countries. We offer energy solutions ranging from electricity, heat and fuel production to sales and customer service. Our unique experience of processing oil shale and our technology are held in high regard around the world.

Finesta

Finesta is the Estonian market leader in providing personnel services. When it comes to expanding your business to Estonia, starting up a new business or extending your capacity we can help you make it happen. Success is built by people. Finesta can help you to find the right people, at the right time and take your business to a new level.

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By combining broadband Internet and voice communications solutions with mobile solutions, we are able to provide a flexible and versatile service that constitutes a unique value offer on the Estonian market. In addition to that, we employ over 200 IT professionals who help customers map their needs and tailor suitable IT solutions for them. We also sell, rent and manage IT equipment and provide IT consulting and training services.


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