

# **Academia-Industry Matching Event on the Mutual Impact of Industry 4.0 and High-Energy Physics**

## **Report of Contributions**

Contribution ID: 1

Type: **not specified**

## Welcome talk on behalf of HEPTech

*Thursday 15 March 2018 10:10 (10 minutes)***Abstract:**

The mutual impact of HEP and the concept of Industry 4.0 is an important open problem which merits a discussion on a variety of topics. Government organizations, academia and industry alike are expected to contribute valuable ideas to the debate. As a result, HEPTech has decided to organise a series of events focusing on the impact of Industry 4.0 on HEP and vice versa. The first AIME on this topic is being hosted by the Technical University of Kosice in Slovakia.

**About the speaker:**

Jean-Marie is the Chairman of HEPTech, the Knowledge Transfer network of HEP Institutions based out of CERN and covering 26 institutes in 16 Countries. Jean-Marie is a senior physicist and computer scientist at CERN in charge of the Collaboration Spotting (CS) project, a visualisation and navigation platform for large and complex datasets. It uses graphs and semantic and structural data abstraction techniques to assist domain experts in creating knowledge out of big data. A pilot has been developed for the compatibility and dependency relationships in software and meta-data of the LHCb experiment and for patent and scientific information analytics to identify leading industrial players in technologies that are strategic for the HEP research programme. In collaboration with the Budapest University of Technology and Economics and Wigner Research Physics Centre (Hungary), pilots on Pharmaco- analytics, neuro-science, IT-analytics and university ranking are currently under development.

Previously, Jean-Marie was the project leader of CRISTAL, a description driven software development dedicated to the tracking and assembly of the detector, including the full physics characterization of individual parts with a view to providing the static calibration data to be used for the reconstruction of the events in the L3 experiment at LEP. The software is currently used in industry as a versatile BPM platform.

**Presenter:** LE GOFF, Jean-Marie (CERN)**Session Classification:** Opening session

Contribution ID: 2

Type: **not specified**

## Welcome talk on behalf of Technical University of Košice

*Thursday 15 March 2018 10:00 (10 minutes)*

Opening talk by the Rector of Technical University of Košice

About the speaker:

Prof. Stanislav Kmeť was born in 1957 in Přerov. He graduated with honours at the Faculty of Civil Engineering at what is presently Technical University of Košice where he also defended his dissertation thesis in 1989. and received his Assoc. Prof. Degree in 1994. In 2000 he was inaugurated as a Professor in the field of Theory and Construction of Engineering Structures. During his career at the Faculty of Civil Engineering, prof. Kmeť has held the following positions: Deputy Head of the Department of Steel and Timber Structures, Vice-Dean for International Relations and Scientific Education, Dean of the Faculty of Civil Engineering, Vice-Rector for Development at TUKE and, since 2015, Rector of TUKE. He is the author and co-author of 4 books, 65 scientific and professional papers in domestic and international journals, more than 140 articles in scientific and professional conference proceedings, 36 projects that have been carried out, (among the most significant is the design and project of the statics of the unique bearing structure of Steel Arena stadium in Košice), and 50 expertise works and reports for industry. He is a member of a number of domestic and international committees, societies and organizations, as well as editorial boards of several domestic and international journals.

**Presenter:** Prof. KMET, Stanislav (Technical University of Kosice)

**Session Classification:** Opening session

Contribution ID: 3

Type: **not specified**

## Industry 4.0 from the perspective of Ministry of Economy of the Slovak Republic

*Thursday 15 March 2018 11:20 (20 minutes)*

### Abstract:

Slovak Republic as highly industrialised country has proceeded to grasp Industry 4.0 trends with several activities. MoE as a body responsible for support of industry and innovation will provide its view on this topic and elucidate state approach. Details will be provided about approved Concept of Smart Industry and progress with preparation of Action Plan of Smart Industry for the Slovak Republic.

### About the speaker:

Miriam Letašiová graduated from the University of Economics in Bratislava in the field of finance and banking. She also graduated from the Matej Bel University in Banská Bystrica, in the field of political science. In the years 2012 - 2016 she worked as Chief Executive of Eximbanka Slovakia and since 2012 she is also the president of the non-profit organization Heart of Slovakia. At present, she holds a position of Director General of the Business Environment and Innovation Section at the Ministry of Economy of the Slovak Republic.

**Presenter:** Dr LETASIOVA, Miriam (Ministry of Economy)

**Session Classification:** Opening session

Contribution ID: 4

Type: **not specified**

## Co-operation of the Slovak Republic with the European Organization for Nuclear Research - CERN

*Thursday 15 March 2018 11:40 (10 minutes)*

### Abstract:

CERN –European Organization for Nuclear Research with its seat in Geneva is the most important international governmental organization in the field of particle research and is the world leader in this field. Slovak Republic is a member state of CERN since its creation in 1993 and has a high reputation in this organization. The membership of Slovak Republic in CERN is of important acknowledging of quality of our research, of the level of our scientists and institutions in the field of high energy physics. Membership of Slovak Republic in CERN enables our scientists to participate on the fundamental and applied research of world importance and to have the entrance to unique devices, which are not available in Slovakia. Research realised in CERN is the driving force of development of new technologies.

### About the presenter:

Jakub Birka finished his university studies at the Faculty of social sciences of the University of St. Cyril and Methodius in Trnava in 2012. Between 2012 and 2014 he studied General English and College of Sport & Fitness in Sydney, Australia. From 2014 he worked as National contact point and expert in the Framework Programme Horizon 2020. In the second half of 2016 he started working as National coordinator of Horizon 2020 at the Ministry of Education, Science, Research and Sport of the Slovak Republic. Currently he works as Director of Department of International Co-operation in Science and Technology at the Ministry of Education, Science, Research and Sport of the Slovak Republic.

**Presenter:** BIRKA, Jakub (Ministry of Education of Slovakia)

**Session Classification:** Opening session

Contribution ID: 5

Type: **not specified**

## **HEP Research –driver, user or both in the relations with Industry 4.0**

*Thursday 15 March 2018 10:20 (20 minutes)*

**Abstract:**

The aim of this talk is to lay the foundation for discussions on the matter if research in high-energy physics (HEP) is a driver, a user or both, in relation to Industry 4.0.

It presents the current trends in HEP R&D areas and the priorities of the European Strategy for Particle Physics. The Industry 4.0 technologies are briefly described and their impact on HEP R&D is discussed, as well as the expected influence of the HEP research on the development of Industry 4.0 components.

The role of the HEPTech Network as a match-making tool between companies providing Industry 4.0 technologies and HEP research community is highlighted.

**About the speaker:**

Bojil Dobrev is the Director of the Scientific Research Centre at Sofia University, Bulgaria and the leader of the Industry 4.0 Special Interest Group at HEPTech.

**Presenter:** DOBREV, Bojil (Sofia University)

**Session Classification:** Opening session

Contribution ID: 6

Type: **not specified**

## Enhancement of Company Innovation Management and its Application in Slovakia

*Thursday 15 March 2018 10:40 (20 minutes)*

### Abstract:

Recent economic crisis and achieving the employment and growth targets of the Europe 2020 strategy requires a competitive industry that builds its competitiveness on innovation in all its forms: development and application of technologies at the technology frontier, new business and organisational models reaching out new geographic markets. The innovation capacity of industry depends not only on large enterprises with market power but crucially on ambitious entrepreneurs and small enterprises aiming for radical innovations and fast growth.

Despite of globalization processes SMEs are creating the majority of new job positions in the European economy. While major new drivers for SME innovation are hardly recognised by the public support provided, established support services assist mainly clearly defined technical projects within single enterprises. Public support pays much less attention to the creation of favourable ecosystem for SME innovation in which public enterprises, SME intermediaries, direct and indirect customers, end-users, suppliers and enterprises with complementary skills are encouraged to collaborate for radical innovation.

The new approaches in innovation management support are elements of a broader action to develop the ecosystem of innovation support to SMEs also in Slovakia. A highly specialised support services are now established at European level to complement existing national and regional services. Generally, the actions are designed to provide opportunities to enhance services through collaboration, peer-learning and uptake of new approaches.

### About the speaker:

Peter Kopkáš has been working at the Business Innovation Centre Bratislava since 2000. He earned his Ph.D. (Economic Theory) at University of Economics in Bratislava and he still lectures at the same university. His research activities are related to innovation management and economics of regulation. Peter is involved in many European projects dealing with SME support in innovation area.

**Presenter:** KOPKÁŠ, Peter (BIC Bratislava)

**Session Classification:** Opening session

Contribution ID: 7

Type: **not specified**

## Technology transfer platforms at the Technical University of Kosice

*Thursday 15 March 2018 12:00 (15 minutes)*

### Abstract:

The ambition of the Technical university of Košice is to be the central hub of the regional innovation ecosystem development based on internationally comparable outcomes in science, research and development in cooperation with industry. To reach this aim the existence of institutional platform is needed. This platform allows to create and facilitate transfer of new innovative ideas into practice. The central point of this platform is the university science park Technicom as an ecosystem integrating businesses, education, research and development. Start-up center TUKE and Incubator TUKE as well as Intellectual property rights department offer a broad spectrum of consultancies and advices. This platform gives our students, professors and people outside of the university great opportunity to make their professional dreams happen.

### About the speaker:

Anton Čižmár graduated at the Faculty of Electrical Engineering of Slovak University of Technology in Bratislava in 1980. During next period he has worked at the Technical university of Košice. His research is oriented to the field of digital modulation techniques and man machine communications. He held several academic positions as dean of the faculty, vice-rector of the university and in the period of 2007-2015 as rector of the university. Currently he manages at the university areas of innovation and technology transfer as its vice-rector.

**Presenter:** Prof. CIZMAR, Anton (Technical University of Kosice)

**Session Classification:** Opening session



Contribution ID: 8

Type: **not specified**

## CERN, Slovak Republic and Industry 4.0

*Thursday 15 March 2018 12:15 (15 minutes)*

**Abstract:**

Slovak Republic will soon celebrate its 25 years of its active presence at CERN. During these years, Slovak contribution was not only scientific work, but also several unique detector components and equipment for the construction of the Large Hadron Collider. The talk will discuss the effects of the Industry 4.0 trends on the technology transfer between CERN and Slovak Republic.

**About the speaker:**

Ivan Kralik has been working in the Slovak Academy of Sciences since 1989, his current position is a Leader of the Department of Subnuclear Physics. From 1991 he participated in several CERN heavy ion experiments. His current field of activity is the CERN ALICE experiment. He is a team leader of a cluster of 3 Slovak institutes from Kosice (IEP SAS, P. J. Safarik University and Technical University) participating in the ALICE experiment. He is also a Deputy Chairman of the Committee for Collaboration of Slovak Republic with CERN.

**Presenter:** KRALIK, Ivan (Slovak Academy of Sciences (SK))

**Session Classification:** Opening session

Contribution ID: 11

Type: **not specified**

## **Advanced medical applications as a challenge for development of new and compact lasers, Assoc. Prof. Ivan Buchvarov, Sofia University**

Speaker: Ivan Buchvarov , PhD, Assoc. Professor, Physics Department, Sofia University “St. Kliment Ohridski”, Bulgaria; Research Professor, ITMO University St. Petersburg, Russia;

### Abstract:

Since the discovery of lasers, they have been viewed as promising instruments for producing specific material states by selective manipulations that could not be realized by conventional incoherent addition of thermal or electronic energy to the material. Although the selective laser chemistry is still a dream, the selective control of material processing done by optimization of laser wavelength, pulse duration, pulse energy per unit area and laser average power is frequently used to move some contemporary technology beyond of its limits. The utilization of the unique mid-infrared (IR) laser radiation in hard and soft tissue and in materials research has produced and identified a wealth of high-impact applications and potential technology breakthroughs in these areas. Until now, mid-IR free-electron lasers are major laser sources which have been successfully used to demonstrate a number of new emerging technologies e.g. surgery with minimal collateral damage- brain surgery, optic nerve sheath fenestration, mid-IR laser enhanced trans-dermal drug delivery , mid-IR laser induced green fluorescence protein gene transfer and laser induced syntheses of new materials. Free-electron lasers are multimillion-dollar facilities with unique pulse characteristics and they are not accessible to the general public. Many of the above applications require optical pulses shorter than the characteristic thermalization time of the material, and pulse energies sufficiently high enough for material ablation. In addition, the average power of the laser has to be large enough to enable “high-throughput” and acceptable product yields.

A portable and cost-efficient alternative to the FEL providing high energy/average power tunable mid-IR radiation can be obtained based on all-solid state laser technology. Using a optical parametric conversion in combination with novel near-IR laser pump source near 1  $\mu\text{m}$  and new non-linear materials we have obtained high-power (>3 W) tunable laser radiation across the peak of the water absorption  $\sim 3 \mu\text{m}$  with an unprecedented energy level (>6 mJ) at a repetition rate of 500-1000 Hz. This laser system promises new capabilities for optimization of surgical treatments because the incision parameters (i.e. ablation profile, collateral cell damage etc.) depend on the structural properties and water content of the tissue. Thus the laser can be used to develop a minimally invasive surgery in a tissue-specific manner. Biocompatibility improvement of biomaterials by texturing with ultra-short laser pulses will be also considered. In addition prospective of development of new methods for laser induced syntheses of super hard materials will be presented.

**Session Classification:** Industry 4.0 in Medical applications

Contribution ID: 12

Type: **not specified**

# The detector control systems of large experiments at the LHC accelerator at CERN

*Thursday 15 March 2018 13:30 (20 minutes)***Abstract:**

The control systems of large experiments at CERN are based on SCADA systems and use commercial components. The deployed technologies and their implementation share the design principles with Industry 4.0. This talk will demonstrate these commonalities using the ALICE experiment as an example.

The ALICE experiment studies the characteristics of primordial matter under the conditions that existed only a fraction of second after the Big Bang. Elementary particles created in the collisions of Pb nuclei at the LHC are captured by a detector, weighing 11000 tons. A wide range of different detecting technologies has been deployed to allow for measurement of particle trajectories, type and momentum. A distributed system based on Siemens WINCC OA is responsible for safe and uninterrupted operation of this experiment. It is in charge of about one million supervised parameters. In this talk we describe the control system architecture, its components, hierarchical organization and the data flow.

In 2019 ALICE will undergo an upgrade. The control system will provide data for the ALICE O2 data processing facility. Compared to present requirements, the DCS will increase its data flow by a factor of 5000. About 100 000 condition parameters need to be provided to O2 each 50ms. In this talk we will explain how the detector control system will handle this amount of data.

**About the speaker:**

Peter Chochula has been working at CERN since 1997 where he specialized on research and development of silicon detectors for high energy physics experiments. Currently he works for control system of ALICE experiment as a deputy project leader, responsible for the overall system architecture. He supervises new developments assuring system compatibility with new ALICE data collection strategy after 2018. Peter graduated from the Comenius University in Slovakia and holds the PhD. degree in nuclear physics. Before joining CERN, he was employed by the Comenius University where he obtained an associate professor (docent) degree in the field of experimental nuclear physics.

**Presenter:** CHOCHULA, Peter (CERN)**Session Classification:** Cyber-Physical Systems

Contribution ID: 13

Type: **not specified**

## ELI Beamlines control system development

*Thursday 15 March 2018 14:30 (20 minutes)*

### Abstract:

The presentation gives an overview of development of distributed control system in ELI Beamlines. The spatial distribution of control system is natural and follows spatial conditions in ELI Beamlines building and controlled technology. The spatial distribution of control system is covered by network technologies used for communication. In principle the whole control system can be divided into two basic levels: Top level and local level. The top level control system provides high level monitoring without requirements to real time applications and gives also access for the users of the facility. On the other side the local control system has to be capable to provide real time feedback control and synchronization of devices used in the facility.

From the technology point of view the top level control system is based on standard server technologies. Technologies used for local control is divided into two areas: Industrial control (eg. vacuum system) and Advanced control

(eg. beam diagnostics and data acquisition). Both areas have specific requirements and technologies used. Combination of standard industrial technologies based on industrial fieldbus networks and Micro TCA for advanced control provide high flexibility for all applications in ELI Beamlines. Indivisible part of control system is Data acquisition system. The Data Acquisition system in ELI Beamlines is based on low latency networks (Infiniband, Omnipath) and must be capable to fulfill requirements for high volume in-line data processing.

Technologies, approaches and lessons learned during development of distributed control system in ELI Beamlines have similarities with potential applications in new approaches in the industry.

### About the speaker:

Pavel Bastl graduated in 1995 and finished his PhD study in 2001 at the Czech Technical University in Prague. His study was focused on Control systems and Mechatronics with application to control of redundant robots. He is currently with the Department of System Engineering at the Institute of Physics of the Academy of Science, which acts as the coordinator of the ELI Beamlines - the largest research project in the history of the Czech Republic.

**Presenter:** Dr BASTL, Pavel

**Session Classification:** Cyber-Physical Systems

Contribution ID: 14

Type: **not specified**

## The O2 project: a new computing system for the ALICE experiment

*Friday 16 March 2018 09:00 (20 minutes)*

### Abstract:

The ALICE experiment is the heavy-ion detector designed to study the physics of strongly interacting matter and the quark-gluon plasma at the LHC. After 10 years of operations, a new computing system called O2 (Online-Offline) is currently under development and is scheduled for production in 2021. Built on a microservices architecture and comprised of +100k processes running on 2000 nodes, it will require highly integrated infrastructure services in order to be operated by a small shift crew with high efficiency and limited training. To control the quality of the physics data being collected, and to ensure an in-memory data reduction by a factor of 35, several Machine Learning techniques are currently under investigation. This talk will present some of these topics and the ongoing work in the context of the O2 project.

### About the speaker:

Vasco Barroso joined CERN in 2005 as a Software Engineer, first in the Information Technology department and later in the Experimental Physics department. He led the development of the book-keeping facility for the ALICE experiment and later moved to the topics of control, configuration and monitoring. Currently he leads the design and development of the infrastructure services for the new ALICE Online-Offline computing farm.

**Presenter:** CHIBANTE BARROSO, Vasco (CERN)

**Session Classification:** Big Data - Cloud computing

Contribution ID: 15

Type: **not specified**

## Computing infrastructure for LHC data processing

*Friday 16 March 2018 09:20 (20 minutes)***Abstract:**

The talk will outline core components of the CERN computing infrastructure and how these are used for storing, analyzing and distribution of LHC data. We will especially focus on domains such as: Agile Infrastructure (resource provisioning, centralized monitoring and configuration management), Storage (disk and tape) and LHC Grid. Details will be given about individual building blocks also used elsewhere (outside CERN) for Big Data, Data Mining and Data Analytic which are essential technologies for the transition to Industry 4.0.

**About the speaker:**

Vladimir Bahyl joined CERN Information Technology Department in 2001 to work as a service manager for the scientific computing batch farm. He later moved into the storage group, where he is now responsible for the CERN's data archive, the largest in the domain of High Energy Physics. He also closely collaborates with major tape technology vendors for beta-testing, commissioning and running their equipment at CERN.

**Presenter:** BAHYL, Vlado (CERN)**Session Classification:** Big Data - Cloud computing

Contribution ID: 16

Type: **not specified**

## CERN - Unique devices manufactured in ZTS VVU Kosice, a.s.

*Thursday 15 March 2018 14:10 (20 minutes)*

### Abstract:

This presentation gives a picture of cooperation between a Slovak industry company and CERN from a point of view different from the research of elementary particles and also demonstrates what is necessary to do before physicists can start to work with their particle accelerator.

ZTS VVU Kosice a.s., the research and development company, with its more than a fifty-year history, was founded in 1976 as a division of the VSS Kosice, a well-known East Slovakia machinery giant. In 1981 the company was separated as an independent, state-controlled research and development institute with its trade name ZTS VVU Kosice a.s. In 1992 company became 100% privatized.

The main company's activities are developing and manufacturing equipment and devices for wide industry range, with special focus on robotics, transport system, processing of nuclear waste, etc. Collaboration with CERN as well as participation in Large Hadron Collider ( LHC ) building process are one of the most important company's activities. The cooperation with CERN started in 2001 and it is continuing up to present.

In the past fifteen years, ZTS VVU Kosice has successfully realized a few projects for CERN. As the result of this cooperation, the company was awarded the Golden Hadron prize in the category "The best machinery supplier" on the LHC project during the LHC building process. This presentation gives a brief overview of both the ZTS VVU - CERN cooperation and the products delivered to CERN. Going through the interesting images taken by ZTS VVU workers during the working process in the LHC tunnel, it will be possible to see the work which had preceded launching an amazing giant machine such as the LHC.

### About the speaker:

Ing. Dusan Cani is educated as electronics engineer and he is working for the ZTS VVU company as a research and development worker for control systems and electronics modules. Since 1982, as an electronics developer and project manager, he has participated in many projects realized by ZTS VVU Kosice. As a project manager he has also worked on all projects realized for CERN. He was the member of the team which installed both the very first and the very last cryomagnets in the LHC tunnel. He also worked for CERN on the study of the future generation accelerator - Compact Linear Collider.

**Presenter:** CANI, Dusan (ZTS VVU)

**Session Classification:** Cyber-Physical Systems

Contribution ID: 17

Type: **not specified**

## PMQ (Prediction Maintenance & Quality) –System of Industry Intelligence and Operation Excellence

*Friday 16 March 2018 09:40 (20 minutes)*

### Abstract:

Predictive maintenance software solutions from IBM access multiple data sources in real time to predict asset failure or quality issues so company can avoid costly downtime and reduce maintenance costs. Driven by predictive analytics, these solutions detect even minor anomalies and failure patterns to determine the assets and operational processes that are at the greatest risk of problems or failure. This early identification of potential concerns helps you deploy limited resources more cost effectively, maximize equipment uptime and enhance quality and supply chain processes, ultimately improving customer satisfaction.

### About the speakers:

Dominik Imrich graduated in Informatics at the University of Pavol Jozef Safarik in Kosice in 2016. Currently working in IBM as Data Scientist. During the studies, he participated in the simulation phase of the JEM-EUSO experiment - the detection of Ultra-High Energy Cosmic Rays for the ISS (International Space Station). - implementing pattern mining (customized kernels) over simulated data. At IBM, he was involved in predictive analytics for a large industrial company, identifying important factors causing an outage of the production line. Currently he is working for an external Swiss client in insurance sector (search engine, indexing, Watson Explorer Foundational Components, Elasticsearch).

Stefan Pero is part of IBM's Cognitive & Advanced Analytics practice and has strong Data Science and problem solving skills. Currently working as Cognitive Computing consultant and Data Scientist, specialized on Watson Explorer and Analytical solutions, model building, predictive analysis and automation, nowadays supporting Swiss clients on implementation of cognitive search engine based on Watson platform. He has a RNDr. (Doctor of natural sciences) in Informatics from the University of P. J. Safarik in Kosice and in his Ph.D. he focused on recommender systems in retail later in education domain linked with intelligent tutoring systems and problem solving.

**Presenters:** IMRICH, Dominik (IBM); PERO, Stefan (IBM)

**Session Classification:** Big Data - Cloud computing



Contribution ID: 18

Type: **not specified**

## Industry 4.0 –Slovakia reality

*Thursday 15 March 2018 16:20 (20 minutes)*

Subtitle: Optimization of production processes in Industry 4.0 - digital twin

**Abstract:**

This lecture will be oriented on presentation of current situation and trends of application of the Industry 4.0 in the Slovak Industry. It will also touch the cooperation between universities and the industry, and also the state activities in this field. Significant part of the presentation will be dedicated to challenges and opportunities, which are Slovak Industry is facing in the context of digitalization.

**About the speaker:**

Martin Morháč graduated at the Faculty of Mechanical Engineering faculty of Slovak University of Technology in Bratislava on 1982. In the same year he started at same faculty as a research worker focusing on automation control systems, with specialisation on the R&D. In 1989, he became a head of Division of Automation of Engineering Works at Bratislava branch of Inorga Praha. In the 1991 he co-founded SOVA s.r.o and has worked as the CEO since then (the company is named SOVA Digital a.s. today). At the same time, Mr. Morháč is actively involved in the work of Automotive Industry Association of the Slovak Republic, where he is leading the Commission for Research and Development.

**Presenter:** MORHAC, Martin (SOVA Digital)

**Session Classification:** Modelling and Simulation

Contribution ID: 19

Type: **not specified**

## Driving the Digital Enterprise for discrete industries

*Thursday 15 March 2018 14:50 (20 minutes)*

**Abstract:**

Siemens understanding of challenging market changes due to digitalization. Presentation of the holistic digitalization approach over the entire product life cycle. The focus of the presentation is on discrete industries.

**About the speaker:**

Marian Filka graduated from the Faculty of Electrical Engineering and Informatics at Slovak Technical University, Bratislava where he specialized in industrial automation. Since 2004, he has worked in Siemens Slovakia at the product department responsible for industrial automation. He is currently Director of Digital Enterprise of the Digital Factory and Process Industries and Drives division at Siemens.

**Presenter:** FILKA, Marian (Siemens)

**Session Classification:** Cyber-Physical Systems

Contribution ID: 20

Type: **not specified**

## Innovative automated logistics solutions

*Thursday 15 March 2018 15:10 (20 minutes)*

### Abstract:

Technological progress and changes in customer requirements have brought the need to change thinking and implementation of production and logistics activities. Mainly it involves interconnecting the systems, on-line information exchange, changes in production management and logistics, based on actual status and prediction of its behavior, or constant optimization of the system with the gradual use of artificial intelligence. And all mentioned above in line with Industry 4.0 which is gradually becoming an important part of the design and operational functioning of both production and logistics systems. The presentation will present an innovative logistics solution that is unique in terms of how it works and is implemented in the automotive industry. This solution has a wide range of its application.

### About the speaker:

Ing. Andrej Štefánik, PhD. was the coordinator of many international research projects focused on Virtual Factory, Digital Factory and 3D Laser Scanning in the CEIT company. He is the co-author of an interactive design planning system for manufacturing system design and co-author of the VisWizard for visualization of the solution results in augmented reality and a progressive Virtual trainer designed to educate and train maintenance and its activities of a modular robotic cell in a virtual reality environment.

He currently holds the position of Development Manager at CEIT.

**Presenter:** STEFANIK, Andrej (CEIT)

**Session Classification:** Cyber-Physical Systems

Contribution ID: 21

Type: **not specified**

# Common Solution Design Approaches for Industry 4.0

*Friday 16 March 2018 10:30 (20 minutes)***Abstract:**

With current acceleration of Industry 4.0, businesses from Industry sector frequently miss guidance in field of M2M and IoT solution design. To our teams, this fact became even more alarming with growing experience. In this presentation we would like to share this optics to support your digital strategy development.

**About the speaker:**

Ondrej Kubo is Application Architect experienced in IoT, Mobile and Portal solutions. In cooperation with his teammates from Interactive Experience practise, he can prepare full-stack solution design that can scale from PoC to production phase. His education in field of automation and telecommunications empowers him to introduce integration framework for cloud solutions with heterogeneous infrastructure. To incorporate advanced intelligence in delivered products, Ondrej leverages capabilities of IBM's Cognitive & Advanced Analytics practise in well-established cooperation.

**Presenter:** KUBO, Ondrej (IBM)**Session Classification:** Internet of Things

Contribution ID: 22

Type: **not specified**

## IoT Applications

**Presenter:** HELM, Slavomir (Bosch)

**Session Classification:** Internet of Things

Contribution ID: 23

Type: **not specified**

## Industrial IoT –MindSphere

*Friday 16 March 2018 10:50 (20 minutes)*

**Abstract:**

What Siemens offers for industrial IoT. Presentation of machine connectivity, data processing, archiving and data presentation. Use cases and new business models based on Industrial IoT.

**About the speaker:**

Marian Filka graduated from the Faculty of Electrical Engineering and Informatics at Slovak Technical University, Bratislava where he specialized on industrial automation. Since 2004, he has worked in Siemens Slovakia at the product department responsible for industrial automation. He is currently Director of Digital Enterprise of the Digital Factory and Process Industries and Drives division at Siemens.

**Presenter:** FILKA, Marian (Siemens)

**Session Classification:** Internet of Things

Contribution ID: 24

Type: **not specified**

## ThingSpeak - IoT Platform with MATLAB Analytics

*Friday 16 March 2018 11:10 (20 minutes)*

### Abstract:

ThingSpeak is an Internet of Things (IoT) platform that lets you collect and store sensor data in the cloud and develop IoT applications. The ThingSpeak IoT platform provides apps that let you analyze and visualize your data with MATLAB, and then act on the data. MATLAB and Simulink products support IoT systems by helping you develop and test edge node devices. Sensor data can be sent to ThingSpeak from Arduino, Raspberry Pi, BeagleBone Black, and other hardware. Sensor and historical analytics can be used for algorithm development. ThingSpeak lets you deploy your analytics to the cloud and perform online analytics, visualization and reporting.

### About the speaker:

Michal Blaho works as an application engineer for HUMUSOFT, MathWorks Distributor in the Czech Republic and Slovakia. He has a PhD in automation from the Faculty of Electrical Engineering and Informatics at Slovak University of Technology in Bratislava. His main interests include system modeling, control systems, low-cost hardware, and code generation.

**Presenter:** Dr BLAHO, Michal (Humusoft)

**Session Classification:** Internet of Things

Contribution ID: 25

Type: **not specified**

## **Effectivity of the application of experimental and simulation methods in the development of NVH measuring stations in industrial production (EoL Testing).**

*Thursday 15 March 2018 16:40 (20 minutes)*

### Abstract:

The competence center for acoustics and vibration (PED-VAU) of BSH in Kosice is a provider of services in the area of NVH development of drives, drive systems as well as complete devices for BSH company and for the parent company, Robert Bosch GmbH.

Evaluation of both acoustic and vibration properties of products by the subjective judgment (e.g. by an operator at production) is today insufficient and needs to be replaced by an objective measurement.

One area of PED-VAU activities is development of complete NVH measurement stations for the so called "End of Line Testing" of products in serial production. Complexity of activities includes derivation of a measurement procedure, sensors up to dynamic properties of a complete measurement system.

In the framework of development of NVH measurement stations there is a significant interconnection between experimental and simulation methods in the structure of the PED-VAU centre.

In so doing it is possible to considerably reduce development times and increase efficiency of development itself.

Complexity of the whole development chain will be presented on the example of one drive unit from Robert Bosch GmbH.

### About the speaker:

Otto Petráška graduated from TU Košice with Dipl. Ing. degree. Currently he is Manager of the competence center for acoustics and vibration at BSH PED in Kosice, Slovakia.

**Presenter:** PETRASKA, Otto (BSH)

**Session Classification:** Modelling and Simulation



Contribution ID: 26

Type: **not specified**

## Embedded Video Processing for Smart Camera

*Friday 16 March 2018 11:30 (20 minutes)*

### Abstract:

Smart Video Cameras present a modern Cyber Physical System suitable for acquisition and local processing of information in Industry 4.0 and other automation, control, or surveillance setup. The contribution will describe an embedded processing unit based on processors and programmable hardware (Xilinx Zynq with dual ARM and FPGA), interfacing and preparation of applications using such a system, example demonstrating exploitation in smart camera with HDR and object detection applications, and will discuss potential in cloud systems, security of such systems, and other aspects of such systems.

### Authors:

Pavel Zemčík, Martin Musil, Petr Musil, Svezozár Nosko

### About the speaker:

Pavel Zemcik is a Professor and Dean of Faculty of Information Technology, Brno University of Technology. Born in 1965, he specializes in computer graphics, image and signal processing, human-machine interfaces, and applications. He received his Ing. (M.Sc.) and Dr. (PhD.) degrees from Brno University of Technology in 1989 and 1995, respectively, where he has worked as a full Professor since 2012. He spent significant part of his professional life abroad, e.g. on an exchange at University of Bristol, UK, University of Surrey, UK, as a Researcher at Lappeenranta University of Technology, Finland, or as a visiting Professor at Penn State, Erie, Pa, USA.

**Presenter:** Prof. ZEMCIK, Pavel (Brno University of Technology)

**Session Classification:** Internet of Things

Contribution ID: 27

Type: **not specified**

## Modeling of nonholonomic multibody robotic systems using geometric mechanics methods

*Thursday 15 March 2018 17:20 (20 minutes)*

### Abstract:

The dynamics of multibody systems is in general described by complex nonlinear equations. These equations are often unsuitable for design and analysis of controls. The equations also provide little information on important dynamic properties like invariance of quantities. The latest knowledge in geometric mechanics provides effective means to formulate equations of motion as well as understanding of important properties of their dynamics. This approach uses the symmetry of multibody robotic systems which allows simplification of the equations of motion resulting from the invariance of these equations of motion from definite quantities. Presentations will show a specific example of motion and detailed information about the research group of prof. Gmíterko who are solving this problem.

### About the speaker:

Erik Prada has worked for ZTS VVÚ Košice, a.s. since 2016, first as a design engineer, then as a mechanical engineer, and currently as a project designer. In addition, since he joined the company he has participated in the preparation of projects MASYKO, Innovation Support in ZTS VVÚ KOŠICE, a.s, and INOTRANS as the main project manager. At the same time he has been collaborating with the Slovak Academy of Science PROMATECH institute in Košice on the preparation of strategic projects EXTREMAT and ICT4INDUSTRY4.0 within the Operational Programme Research and Innovation. Currently he is involved in the implementation of the project –Research and development of smart mobile robotic platforms and high-precision positioning systems for application in research, development and industry and in the commission of Construction of dry storage for spent nuclear fuel on the premises of Jaslovské Bohunice nuclear power plant. He has several years of experience in research projects in this country and abroad. Previously he has worked as a science researcher at the Faculty of Mechanical Engineering at the Czech Technical University in Prague where he was a part of an international post-doc team. He is considered an expert in the field of designing mechatronic systems and his specialization is the area of under-actuated robotic systems. During his research career he has participated in creating VEGA and KEGA projects and project grant foundations. He is the author and co-author of over 61 scientific publications in Slovakia and abroad. He is also one of the authors in four pending patents and a holder of several awards. Erik Prada also works as an external expert for Cluster for Automation Technologies and Robotics AT+R.

**Presenter:** PRADA, Erik (ZTS VVU, Cluster AT+R )

**Session Classification:** Modelling and Simulation

Contribution ID: 28

Type: **not specified**

## Computing for materials science at the European Spallation Source ERIC

*Thursday 15 March 2018 16:00 (20 minutes)*

### Abstract:

The European Spallation Source ERIC (ESS) is a European Research Infrastructure Consortium (ERIC) and ESFRI with 15 partner countries committed to the goal of collectively building and operating the world's leading facility for materials research using neutrons by the second quarter of the 21st Century. When in full operations, ESS will service thousands of materials scientists every year who will need computational modelling and simulations in order to be able to analyse and interpret the experimental data acquired at ESS. The set of computational techniques required is diverse and encompasses for instance fitting to phenomenological models, density functional theory calculations, machine learning, Monte Carlo ray-tracing techniques, and molecular dynamics specialized to specific scientific domains such as magnetism, protein crystallography, and engineering. This presentation will give examples of some of the techniques and present the challenges associated with providing such a diverse toolset for modelling and simulations. Moreover, it will be discussed how ESS addresses these challenges based on Pan-European collaboration with focus on improving the user experience of software which often carries with them significant technical debt.

### About the speaker:

Dr. Thomas Holm Rod is the Group Leader for the Data Analysis and Modelling Group at the European Spallation Source's Data Management and Software Centre. In this role, he is responsible for providing analysis and modelling software and services to the neutron scattering users of the European Spallation Source based on development in his own group as well as development from other neutron sources and universities. Dr. Rod was awarded a Ph.D. degree in computational physics in 2000 from Technical University of Denmark. In the following years, he applied and developed modelling and simulation methods for material research in both academic and commercial software development corporations in USA, Sweden, and Denmark, before he started to work for the European Spallation Source in 2011.

**Presenter:** HOLM ROD, Thomas (ESS)

**Session Classification:** Modelling and Simulation

Contribution ID: 29

Type: **not specified**

## Embedded Video Processing for Smart Camera

### Abstract:

Smart Video Cameras present a modern Cyber Physical System suitable for acquisition and local processing of information in Industry 4.0 and other automation, control, or surveillance setup. The contribution will describe an embedded processing unit based on processors and programmable hardware (Xilinx Zynq with dual ARM and FPGA), interfacing and preparation of applications using such a system, example demonstrating exploitation in smart camera with HDR and object detection applications, and will discuss potential in cloud systems, security of such systems, and other aspects of such systems.

### Authors:

Pavel Zemčík, Martin Musil, Petr Musil, Svetozár Nosko

**Presenter:** Prof. ZEMCIK, Pavel

**Session Classification:** Modelling and Simulation

Contribution ID: 30

Type: **not specified**

## Industrial Controls at CERN

*Thursday 15 March 2018 13:50 (20 minutes)*

### Abstract:

The industrial control systems at CERN are mainly based on off-the-shelf components present in many industries like oil and gas, electrical power, water treatment, pharmaceutical or food with fundamental constraints mainly due to the size, criticality and accessibility of the CERN installations. These components are deployed in all the layers of the classical automation pyramid and involve SCADAs (Supervisory Control and Data Acquisition) systems, industrial controllers as PLCs (Programming Logic Controllers) or IPC (Industrial PCs) and intelligent instruments. Their interface is ensured by standardised communication fieldbuses and protocols (i.e. Profinet, Ethernet/IP, OPC-UA···). The openness of those components allowed a customisation in form of standard frameworks which allows a more efficient development, deployment and operation of the control systems.

The talk will introduce the architecture, components and frameworks used at CERN within the context of the industrial controls, the organisation of the Industrial Control group to achieve the CERN challenges as well as introducing innovative concepts matching the Industry 4.0 initiative.

### About the speaker:

Dr. Enrique Blanco is a MSc in automation engineering and he received his PhD in systems and process engineering, from the University of Valladolid, Spain. He joined the European Center for Nuclear Research (CERN), Switzerland, in 1995. He is currently the head of the Control Systems Engineering section in the Industrial Controls and Safety Systems group at CERN, Switzerland and co-chairs the Controls Committee, a board to ensure common controls-wide strategy within the accelerator sector at CERN.

He has been the project leader of the UNICOS framework as well as of a number of control systems as the LHC Cryogenics or the Quench protection system among others. He provides technical expertise in several fields as process control, advanced control, optimisation, safety instrumented systems, industrial communications and formal methods applied to control systems.

**Presenter:** Dr BLANCO VINUELA, Enrique (CERN)

**Session Classification:** Cyber-Physical Systems

Contribution ID: 31

Type: **not specified**

## Demonstration Testbed for Industry 4.0 at Brno University of Technology

*Thursday 15 March 2018 17:00 (20 minutes)*

### Abstract:

As a part of the first-stage of Ricaip teaming project, a small demonstration testbed is being built at CEITEC Brno University of Technology. It will contain both additive and subtractive machinery technologies –3D SLS (Selective Laser Sintering) printer, and 3DOF CNC milling machine. Material and product movement is provided by means of standard and collaborative industrial manipulators, as well as omnidirectional mobile robots with Mecanum-type wheels. The control system is designed to be easy-to-extend and to be able to cooperate with other testbeds, as will be demonstrated by cooperation with Intemac company.

### About the speaker:

Ludek Zalud graduated at Faculty of Electrical Engineering and Communication (FEEC), Brno University of Technology in 1998, defended Ph.D. in 2002, became full professor at Brno University of Technology in 2016. He is currently lecturer at FEEC and the leader of Robotics and Artificial Intelligence group, and Senior Researcher at CEITEC Brno University of Technology. His professional interests are mobile and industrial robotics, reconnaissance robots, robots for extreme conditions, visual telepresence, self-localization, robot sensors, 3D slam, multispectral data-fusion, and bio-engineering applications of robotics in medicine.

**Presenter:** ZALUD, Ludek (CEITEC, Brno University of Technology)

**Session Classification:** Modelling and Simulation

Contribution ID: 32

Type: **not specified**

## Industry 4.0 with Tango Controls –open-source SCADA for science and industry

*Friday 16 March 2018 11:50 (20 minutes)*

### Abstract:

Industry 4.0 requires specific features from SCADA (supervisory control and data acquisition) software. These include among others high flexibility in terms of adjustment to concrete applications, hardware integration, support for variety of communication protocols. These requirements were present at large scale scientific infrastructures like synchrotrons, from the beginning. Tango Controls developed by community of European synchrotrons (among others ESRF, Soleil, Alba, Elettra, MAX-IV, Solaris) is response to these requirements. It is now mature yet constantly maintained and developed to follow present and future technologies and needs. While being open-source it provides quality which allow for 24/7/365 operation of the facilities. With its modularity, objectivity, distributed structure and variety of available tools is perfect for Industry 4.0 applications. The talk will give an overview of the Tango Controls related to Industry 4.0 and IoT.

### About the speaker:

Piotr Goryl is CEO of S2Innovation start-up company. The main company mission is to join scientific and industry world and its main expertise is related to Tango Controls ([www.tango-controls.org](http://www.tango-controls.org)).

For 7 years he has been Head of IT and controls at Solaris Synchrotron UJ (Krakow, Poland, [www.synchrotron.pl](http://www.synchrotron.pl)) working as both a manager and a developer. The Solaris, and more than ten other European synchrotron laboratories and scientific projects, is using Tango Controls for integration of control system and running experiments on beamlines (acquiring data from hardware, processing, archiving, visualising and remote controlling). He has found that the Tango Controls could also be useful for other scientific projects as well as for industry. He also expects that there are far more technologies developed in the scientific world, waiting to be applied outside of science. This experience has pushed him to move from the research facility and run the company.

**Presenter:** GORYL, Piotr (S2Innovation)

**Session Classification:** Internet of Things

Contribution ID: 33

Type: **not specified**

## Research activities of the Center of Modern Control Techniques and Industrial Informatics

*Friday 16 March 2018 12:10 (20 minutes)*

### Abstract:

This paper presents the activities of the Center of Modern Control Techniques and Industrial Informatics at the Department of Cybernetics and Artificial Intelligence of the Faculty of Electrical Engineering and Informatics, Technical University of Košice with the emphasis on research, teaching and technology transfer from academia to industry. The research and pedagogical activities of the Center are based on the 5-level pyramid model of the distributed control system, built in accordance with the Industry 4.0 concept. The talk describes a set of physical models of the Center of Nondestructive Diagnostics, which was built as part of the TTO Technicom project, as well as the joint results of TU Košice and CERN, achieved as part of the international research project "ALICE Experiment on the LHC in CERN: Studying the strongly interacting matter in extreme conditions".

### About the speaker:

Ján Jadlovský studied technical cybernetics at what is presently Faculty of Electrical Engineering (FEEI) at the Technical University of Košice (TUKE). In 1990, he defended his dissertation thesis on speech recognition and went on to work as assistant professor. In 1994, he defended his habilitation thesis which focused on distributed control systems. He has worked since as an associate professor at the Department of Electrical Engineering of FEEI, TUKE, Slovakia. He has been involved in basic research related to distributed control systems and supervised a number of bachelor, master and dissertation theses in this area. Most importantly, he has contributed to the development of a universal model workplace based on the five-level pyramid model of process control with a wide range of physical applications. Together with his team, he has developed and implemented a number of solutions for regional manufacturing companies using this model, in which his long-term goal of transferring research results into production was repeatedly achieved. Since 2012, he has been involved in the ALICE experiment of CERN in cooperation with the Institute of Experimental Physics of the Slovak Academy of Sciences based in Košice. He is the Team Leader of the TUKE research group within the ALICE collaboration. Presently, the TUKE research group is involved in the development of a new generation of the pixel detector using the distributed control systems methodology.

**Presenter:** JADLOVSKY, Jan (Technical University of Kosice (SK))

**Session Classification:** Presentation of the organizing institution



Contribution ID: 35

Type: **not specified**

## Slovakia and CERN: Collaboration in terms of Industry and Knowledge Transfer

*Thursday 15 March 2018 11:50 (10 minutes)*

### Abstract:

CERN is the world's largest particle physics laboratory. The cooperation with CERN is not only about fundamental research, in which has Slovakia long-term excellent performance during its 25 years long membership. There are also three other areas of cooperation, which is an important benefit for all Member States: Industry, Innovations / Knowledge Transfer and Education. The annual contribution of Slovakia to the budget of CERN may be returned to the Slovak economy in the form of purchases of supplies from the Slovak companies. There have been examples of successful Slovak companies in the past, showing the considerable potential of Slovakia, but there is still space for improvement.

CERN is also an important centre of innovation and know-how, bringing to the world amazing technologies and applications, without which our society cannot imagine life today, for instance www or different medical imaging diagnostics methods and cancer treatment, and many others. CERN is the biggest data centre in the world, where big data are being produced, collected and stored.

One of the core missions of CERN is education, reaching to students, teachers and wide public through multitude of tools, exhibitions and programs.

### About the speaker:

Barbora Bruant Gulejova holds advanced Master degree (RNDr) from Physics (specialisation in Plasma Physics) and Master in Management (both in 2004) from Comenius University in Bratislava. Afterwards (2004-2009) she did PhD in Thermonuclear Fusion at Plasma Physics Research Centre (CRPP), EPFL in Lausanne, Switzerland. Later she joined International Atomic Energy Agency (IAEA) in Vienna, where she worked for 2 years as a Scientific Editor and next 2 years she worked for an NGO in Geneva active in sustainable energy projects. In 2014 Barbora joined CERN, where she worked as a Head of community activities of HEPTech. Her active search for suitable Slovak node resulted in TUKE joining HEPTech since 2015. Since 2015 she worked at CERN Education, Communication and Outreach Group as a Coordinator and Development Leader of International Particle Physics Outreach Group. She is also Industrial Liaison officer (ILO), Knowledge Transfer Liaison Officer of Slovakia at CERN; and representant of Slovakia in CERN's Forum for Teachers and Students Educational Programmes.

**Presenter:** Dr BRUANT GULEJOVA, Barbora (CERN)

**Session Classification:** Opening session