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14-17 NOV, 2017 MESSE MÜNCHEN, MUNICH, GERMANY

## TechARENA: Smart Manufacturing



M. Arnold  
Managing Director  
PEER Group, Dresden, Germany



### Biography

Dr. Michael Arnold, Managing Director at PEER Group, has over 25 years industrial experiences in high-tech industries.

From 1981 - 1986 he studied Physics at the Friedrich-Schiller-University in Jena, Germany, where he obtained his PhD in 1994.

Michael gained broad experiences in system simulations, software design and development, optical inspection systems, and product development for the aerospace and defense industry. Michael has been involved with factory automation software solutions for the semiconductor and solar industry since 2001 in the Operations Manager position of TRW and since in 2003 as Managing Director of PEER Group GmbH in Dresden.

## The Industrial Internet (IIoT) Opportunity



D. Rudd  
Sr. Marketing Manager, Channels & Alliances  
GE Digital, Madrid, Spain



### Abstract

The industrial internet represents a never before seen potential for the European economy. We have the talent, knowledge and infrastructure to actively participate in the productivity revolution and the digital transformation must be at the core of this mission.

### Biografie

Mr. Rudd is a Sr. Marketing Manager, Channels & Alliances at

GE Digital Europe.

## IoT for SECS and Non-SECS Equipment in Semiconductor Backend Manufacturing



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### Abstract

The emerging of smart devices and smarter equipment accompanied by the trend of more and more IT infrastructure and services being connected through smart networks are pushing the industry development to a higher integration level between cyberspace and physical world. This Cyber-Physical Production Systems is making full use of IoT, where 4M are networked to synchronize inputs, in-process control and outputs data for a real-time execution control with higher confidence level.

Equipment being the lowest resource in the IoT chain plays a vital role in generating and consuming real-time data with minimum human intervention. However, over the last decades, focus has been mainly on SECS equipment and ignoring those with legacy or non-standard communication interface. Even till today, still many vendors are not compliant to SECS protocol and will not adopt the standard due to cost and hardware constraints. To overcome the challenge of getting this equipment connected and controlled in the IoT world, a different approach was adopted by factory which could cut down the dependency on the vendor. Infineon embarked this project with PeerGroup (factory automation software provider) to establish a flexible, extendable common Automation Framework to address these issues where individual Connectors are developed to connect to multiple communication protocols like SECS, XML, ftp, TCP/IP etc.. The connectivity opens up the channel for all SECS, non-SECS equipment and smart devices to be integrated seamlessly to factory CIM hosts with more data source and control capabilities that previously being deprioritised due to significant efforts required in IT application development and integration for non-standard protocols. With the improvement from this new approach, system analysts can now re-divert their focus and resources to work closely with production on the implementation in the shop floor and fully exploit the enriched data and control capabilities to drive Smart Manufacturing.

### Biografie

Graduated from Loughborough University, UK with Master of Science in Computer Integrated Manufacturing in 1996.

20 years of experience in delivering IT solutions to Backend (Assembly and Test) Semiconductor Manufacturing, ranging from equipment automation, factory automation, process control automation, material handling automation and manufacturing execution systems (MES). Responsible for the equipment automation strategy and roadmap development for overall Backend sites that spread across AP (Singapore, Malaysia, Indonesia, China) and EU (Germany, Hungary).

Currently driving Smart Manufacturing projects with strong focus in the area of connect & control using IoT and advanced analytics technologies.

## Beyond full automation



J. Rothe  
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GLOBALFOUNDRIES, Manufacturing Technology,  
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### Abstract

With the full automation of standard manufacturing scenarios, the focus in leading edge semiconductor manufacturing has moved to fab performance optimization, to reducing the remaining manual exception handling tasks for the manufacturing workforce and to prioritization of such tasks.

The key challenges to this endeavor are the identification of the most problematic exception cases, the implementation of fully or partially automated solutions for these and in developing prioritization methods for operators to address the most critical manual efforts in the right order.

Due to the ever-growing number of data sources as well as the sheer amount of data that is available for such analysis in a modern factory, new ways of addressing the analysis challenges are required. In addition, new process requirements drive increasingly complex dynamic run-path decisions and constraints. Such process complexity driven restrictions are detrimental to the ideal manufacturing flow.

On the other hand, elimination of all of these constraints – while potentially possible – requires significant effort. It is therefore of increasing importance to better understand the effect of these constraints on manufacturing performance to be able to focus on those constraints benefits of resolving these largely outweighs the corresponding effort.

In our presentation we will present several case studies addressing both the data analytics as well as the task prioritization methods GLOBALFOUNDRIES has developed to overcome these challenges.

### Biografie

Jan Rothe holds a PhD in computer science from the Dresden University of Technology. He joined Advanced Micro Devices in 2004 and in 2009 became a member of the Manufacturing Technology department, being responsible for high automation scenarios. Today he manages the Factory Solution Group with oversight of manufacturing systems for all 300mm factories at GLOBALFOUNDRIES, including Factory Flow and Operator efficiency solution development.

Dr. Rothe is an active member of the SEMI standards program and received a SEMI International Collaboration Award for leadership of an international SEMI task force.

## Database Infrastructure with Smart Software Layer For Semiconductor Manufacturing



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### Abstract

Finisar is a global technology leader in optical communications components and subsystems that enable high-speed voice, video and data communications. Finisar's facility in Texas is a gallium-arsenide (GaAs) based wafer fab that makes short-wave, infrared vertical-cavity surface-emitting lasers (VCSELs). Today, shipments are growing rapidly as the worldwide VCSEL market moves beyond lasers for optical communications to include high-power laser arrays used for 3D sensing applications.

The VCSEL manufacturing process at Finisar involves collecting a large amount of data generated at various process steps, multiple wafer probing steps, and burn-in testing. Data must be correlated for analyzing relationships between parametric results and yield. At Finisar we have developed a data infrastructure that takes advantage of a software layer between the data collection points and the database to validate data before it is recorded. If data does not meet the strict requirements imposed by the software layer, the software layer throws exceptions that can be handled appropriately depending on the context.

The database records all parametric data into binary large objects (BLOBs). These BLOBs are arrays of bytes that contain numeric information. Using a BLOB, a full set of wafer probe data with thousands of dies and many tests per die can be recorded in a single database row, which has positive implications for speed and database reliability. The software layer is used to interpret the BLOBs and transform them into a more human readable format.

The software layer is used in test software running on probers, data analysis and visualization software, automated processes running on timers, and in table-valued functions deployed to the SQL server. The software layer and the database work together to provide reliable access to process and yield data for analysis by engineers and managers.

### Biografie

David Kelly is a senior engineer and product engineering manager at Finisar Corporation in Allen, Texas, USA. David has been a professional in the semiconductor industry for 10 years. He received his Ph.D. in solid-state electrical engineering from the University of Texas at Austin in 2006. He has worked in a variety of areas including silicon-based process engineering, analog product engineering, reflective display chips, test engineering, and semiconductor data

infrastructure. His team is currently working on overhauling and expanding Finisar Allen's VCSEL fab data infrastructure to support the growing demands of the VCSEL market.

## Smart Manufacturing - The Digital Transformation Journey



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### Abstract

The Electronic Manufacturing industry is undergoing a dramatic change with Digital Transformation starting to impact every aspect from product design over realization operations and every associated business process including the end customer experience. New technologies incorporated into modules component types further suggest leveraging experience gained in the connected semiconductor industry to enable value creation in downstream likewise connected industry segments. This presentation will touch on some of the enabling elements to realize smart manufacturing concept in a manufacturing environment on its journey into a digitally transformed business where bi-directional connectivity and the realization of a Digital Twin are just two of the items critical to success.

### Biografie

Jorg Richstein joined Jabil Inc. in 2011 with 20 years of Design and Manufacturing experience in the T&M sector to lead the Jabil's Global Manufacturing Engineering Operations. He currently works as Sr. Director of Engineering Services in Jabil's Digital Solutions Group developing and industrializing advanced manufacturing processes. He is a thought leader of Innovation Initiatives, Creation, and monetization of IP as well as Digital Transformation and expanding corporate strategic core capabilities. For that he collaborates with academic institutions and serves as the IAB Vice Chair of the MIST Center (an NSF I/UCRC program). Jorg got his BS, MS and PhD in Physics from University of Dortmund. Before joining the T&M and EMS industry, he researched particle physics at CERN in Europe.

## **Dr. Production: How to quickly implement latest research on "Industry 4.0" in production**



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### **Abstract**

The semiconductor industry is a strong pacesetter in many technological aspects - last but not least in advanced data collection, data analytics and the use of data-driven production optimization. Other industries refer to this as "Industry 4.0".

The application of APC (Advanced Process Control) is state-of-the-art in many semiconductor production lines. And still, the race towards broader and deeper utilization of data in a "smart factory" is going on, striving towards predictive analytics and implementation of machine learning, e.g., in the areas of predictive maintenance or prediction of process and machine behavior.

Thus, there is an ongoing need to implement latest research results on "Industry 4.0" in production lines - and this affects not only current 300 mm fabs, but also 200 mm lines - and it affects not only the so called frontend-of-line, but also the backend.

In this presentation, an exemplary overview about both existing and evolving approaches for data-driven production optimization is given. This overview will be combined with a hint towards cost estimation and ROI for such solutions. A specific focus will be set on how to quickly implement latest research results in the domain of "Industry 4.0" in production: an approach for applied R&D will be presented, which facilitates turning a production machine into a "smart equipment" in a time frame of some months.

### **Biografie**

Martin Schellenberger received the diploma in electrical engineering in 1998 and a Ph.D. in electrical engineering in 2011, both from the University of Erlangen-Nuremberg, Germany. From 1998 to 2006 he was a Research Assistant with the Fraunhofer Institute of Integrated Systems and Device Technology (IISB). Since 2007 he is Group Manager at Fraunhofer IISB, responsible for equipment and advanced process control. His research interests include equipment development and optimization for semiconductor processes, manufacturing science solutions for quality control, predictive methods for process control, equipment automation and productivity enhancement.