#### Session title: Cloud Manufacturing: Architectures, Services and

#### Implementation in Production Control - CMFG

**Organisers**:

- Theodor Borangiu, University Politehnica of Bucharest, Romania (theodor.borangiu@cimr.pub.ro)

- Radu Băbiceanu, Embry-Riddle Aeronautical University, Florida, USA (babicear@erau.edu)

- Florin Anton, University Politehnica of Bucharest, Romania (florin.anton@cimr.pub.ro)

- Octavian Morariu, Research Centre in CIM and Robotics, Romania (octavian.morariu@cimr.pub.ro)

**Short presentation**:

Cloud manufacturing (CMfg) represents an evolution of networked and service-oriented manufacturing models, with specific focus on new opportunities in networked manufacturing enabled by the emergence of cloud computing platforms. CMfg provides service-oriented networked product development models and allows real time intensive computing of MES functions, in which service consumers are enabled to configure, select, and use customized product realization resources and services, ranging from computer-aided engineering software to reconfiguring manufacturing systems.

At the manufacturing execution system (MES) level, cloud computing adoption refers mainly to virtualization of MES workloads. While MES implementations are different and depend directly on the actual physical shop floor layout, the general MES functions are aligned with the set of functions defined by ISA-95.03 specification.

The MES activities that are justified to be performed in the Cloud are the computational ones globally addressing: production planning and product scheduling, resource allocation and monitoring, work in progress management, traceability of products and production tracking, quality management, a.o., depending on the specifics of each shop floor and production processes.

MES virtualization (the creation of a virtualized layer – the vMES) involves migration of MES workloads that were traditionally executed on physical machines to the data centre, specifically to the private cloud infrastructure as virtual workloads. From a virtualization perspective, two types of workloads are considered for the vMES: shop floor resources and intelligent products.

New MES designs in the Cloud and Industrial Internet of Things frameworks act in real time upon data collected on line data from shop floor devices. Data is reduced and aggregated through covariance of multiple metrics, and processed with machine learning algorithms to

predict resource behaviours, with the aim of dynamically reconfiguring controls, minimizing global energy consumption at shop floor level, predicting the unexpected and assuring preventive maintenance. New CMfg functions used data streaming and analytics techniques:

* Dynamic scheduling of manufacturing operations based on real time data and predictions derived from it for the near future.
* Dynamically learn the patterns of the signals monitored.
* Detect faults before service degradation occurs.
* Determine and learn the covariance between signals.
* Work on real time data streams from sensors rather than static data.
* Classify the current state of the manufacturing system as healthy or faulty.
* Execute automated corrective actions.

If, on one hand, the cloud computing architecture facilitates the intensive computational tasks needed by contextual manufacturing, shop floor resource and intelligent product streaming move, on the other hand, the intelligence to the edge of the shop floor’s IIoT platform.

The objective of this Special Session is to address the new CMfg, IIoT, edge computing and data analytics technologies from authors’ contributions in the research areas:

* Cloud manufacturing models, architectures and services
* MES virtualization techniques
* Industrial Internet of Things for manufacturing
* Resource streaming and data analytics
* Machine learning, prediction and anomaly detection
* Software-defined networking
* Edge computing in IIoT framework

**Keywords**: Cloud manufacturing, cloud services, resource virtualization, Industrial Internet of Things, edge computing, big data streaming, machine learning

**Important dates**:

* Proposals of Special Sessions: **February 23, 2018**
* Full paper submission: **March 12, 2018**
* Notification of acceptance: **March 26, 2018**
* Final, camera-ready paper submission: **April 16, 2018**
* Early registration and fee payment: **May 7, 2018**