

Session title: Complexity, Big Data and Virtualization in Service and Computing-oriented Manufacturing - CVSO

Organisers:

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Short presentation: This session approaches the trend of service orientation in the management and control of processes in manufacturing enterprises. The service orientation is emerging at multiple organizational levels in enterprise business, and leverages technology in response to the growing need for greater business integration, flexibility and agility. The Service Oriented Architecture represents a technical architecture, a business modelling concept, an integration source and a new way of viewing units of control within the enterprise. Business and process information systems integration and interoperability are feasible by considering customized products as "active controllers" of the enterprise resources – thus providing consistency between the material and informational flows within the enterprise. Service orientation in the manufacturing domain is not limited to just web services, or technology and technical infrastructure either; instead, it reflects a new way of thinking about processes that reinforce the value of commoditization, reuse, semantics and information, and create business value. The unifying approach of the contributions for this session relies on the methodology and practice of disaggregating siloed, tightly coupled business processes of the manufacturing enterprise level into loosely coupled services and mapping them to IT services, sequencing, synchronizing and automating their execution in distributed information systems.

If SOA is the conceptual framework for service orientation of manufacturing enterprise processes, then Service Oriented Computing (SOC) represents the methodology and implementing framework for embedded monitoring and control systems in Service Oriented Enterprise Architectures, and Service and Computing Oriented Manufacturing (SCOM) unifies existing advanced manufacturing models by centring them on internet/network, cooperative work and resource sharing, which creates premises for Digital Manufacturing.

The service-oriented multi-agent systems (SoMAS) approach is characterized by the use of a set of distributed autonomous and cooperative agents (possibly embedded in smart control components) that use the SOA principles, i.e. oriented by the offer and request of services, in order to fulfil industrial and production systems goals.

There is also a certain orientation of this special session towards complexity. Of interest is handling Big Data: to continue achieving high levels of productivity growth and agility, manufacturers will need to leverage large datasets to drive efficiency across the manufacturing value chain and to extend products with new services. Another challenge includes coping with the heterogeneous nature of industrial systems and their real time interactive nature in combination with competitive pressures (e.g. off-line plans are known to become invalid within minutes after arriving on the factory floor).

The large scale emergence in the last decade of various cloud solutions, ranging from Software-as-a-Service based solutions for business process management and implementation to very sophisticated private cloud solutions capable of high performance computing (HPC) and efficient virtualization, constitute the building blocks for engineering the next generation of flexible enterprise systems that can respond to environmental changes with great agility. These new technologies are adopted by manufacturing enterprises to advance in a new era of mass customization where flexibility, scalability and agility are the differentiating factors.

Cloud manufacturing (CMfg) was introduced as a service-oriented networked manufacturing model, focusing on studying the opportunities for networked manufacturing (NM) opened by cloud computing platforms. The cloud-based service delivery model for the manufacturing realm includes product design, batch planning, product scheduling, real time manufacturing control, testing, management, and other stages of a product life cycle.

In this context, papers are sought which describe MES virtualization as an intermediate layer in the manufacturing stack. Virtualization using private clouds brings many advantages on the manufacturing system reliability by allowing full system snapshots and backups and quick recovery in case of failures, as well as providing built-in redundancy. MES workload virtualization allows a separation or decoupling between the physical resources and the controlling information system.

The papers submitted for this session should address the following topics:

- Service Oriented Enterprise Architectures
- Vertical integration and Manufacturing Integration Framework (MIF and MSB 2.0)
- Servitization and Product-Service Extensions
- Service and computing oriented manufacturing
- Service-oriented multi-agent systems for manufacturing
- Modelling and computational framework for complex manufacturing enterprise systems
- Big Data and analytics for business optimization in the manufacturing value chain
- Cloud manufacturing
- MES virtualization using private cloud systems

Keywords: Complex manufacturing, Smart Enterprise, Service Enterprise Systems, Service-oriented MAS, Manufacturing Integration Framework, MES virtualization, Servitization

Important dates:

- Full Paper Submission: May 22, 2014
- Notification of Acceptance: June 22, 2014
- Final Paper Submission: September 8, 2014