To fit the renewed globalized economic environment, enterprises, and mostly SMEs, have to develop new networked and collaborative strategies, focusing on networked value creation (instead of the classical value chain vision), fitting the blue ocean context for innovative products and service development. On the other hand, the fast development of Internet of Things, FabLabs and new stand-alone manufacturing means (such as 3D printers) allow to bring production means closer to the consumer. This challenges new value chain organization and new digitized production model leading to the so-called “Industry 4.0” developed by leading industries in Europe, US and Asia.

This 4th industrial revolution takes advantage of the internet of Services, Internet of Things, Cyber-Physic system models to organise smart factories. These new production organization challenges IT development to provide agile and on-demand support. Most of the works are focused on Cyber-Physical systems challenges such as Smart Devices design, Wireless Networks integration, interoperability management, ... or on value chain organization, without paying attention on their impact on the Service \ Entreprise Architecture model.

To overcome this limit, we have developed a “Service Oriented Entreprise” strategy that takes advantage of the flexibility and agility provided by the selection / composition and orchestration abilities of the service oriented architecture and of Model Driven Engineering to enrich Entreprise Architecture models leading to different projects (Entreprise Urbanism, Interoperability management, Lean Service Bus, Governance as a Service model...). Our research strategy consists in organizing a holistic system to fit the Industry 4.0 challenge, integrating Cyber-Physical systems in Entreprise Architecture frameworks to set a consistent Industrial Information System.

Taking advantage of these previous results and on-going projects, this PhD research project aims at

(1) defining an extended Industrial Service model (paying attention on the non functional requirements (Quality of Service, Security, Production organization) integration and on interoperability constraints),

(2) integrating this Industrial Service model in Entreprise Architecture models

(3) use this model in a Models@run.time strategy to support a dynamic deployment / dynamic orchestration of industrial services associated to smart production devices depending on the context.

This PhD work will take advantage of on-going collaborations and projects and will be organized according to the following milestones:

- State of the art on the Model Driven Engineering, Cloud and service models, service-based and Internet of Things related technologies as well as on Industry 4.0 (standards and requirements) and Entreprise Architecture
- Requirements gathering and specification of an extended industrial service model and of the context model
• Specification of the selection / Composition / orchestration algebra associated to this formal service model
• Adaptation of the Entreprise Architecture models
• Proposition of the Industrial Service Models@run.time architecture

Research environment

This PhD work will be achieved in the Service Oriented Computing (SOC) research team of the LIRIS Lab. SOC team researches combine theoretical foundations and implementation works as well as technology transfer to promote the development of strategies 'as a service' induced by the development of Cloud Computing. To this end, we design architectures, models and algorithms to extend the service model, composition and orchestration mechanisms to fit both the classical “control driven” process organization and the new “data driven” vision provided by the web 3.0 vision. These works also address the Internet of Everything, Multi-cloud and Internet of Things challenges, paying a particular attention to the deployment constraints. Several Industrial and Collaborative projects provide a rich collaborative research environment.

Our works are presented via http://liris.cnrs.fr/equipes?id=62

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