Session 2: Architecture Design

- *Open Manufacturing Operating System (OpenMOS) for Intelligent Plug-and-Produce: Architecture Design and Cross-Cutting Concerns Regarding Safety and –Security*

  Chih-Hong Cheng, FORTISS-TUM, DE

Some of the Objectives
Industry 4.0 Modular Smart Factory

- WANT
  - introduce some freedom in the factory, where entities/machines can enter/leave at any time;
  - reduced pre-engineering;
  - smarter components / entities

- ALLOW
  1. plug-and-produce like plug-and-play
     - teach the robot how to make tasks by leading the robot
  2. vertical and horizontal connectivity a lower cost
  3. simplify the creation of new product lines

- Many of the required technologies **already exist** but need to be improved, for instance in terms of delivering them at lower costs to SMEs

Concepts

- **skills** – abstract the ability to perform some task; production is the execution of several skills
- **agent** – represents an entity in the cloud, as a virtual entity; can be connected; machine still deals with the real-time part
- **manufacturing service bus** – centralized communication mean

- At this point considers a flat model and not a hierarchical model of system-of-systems

Challenges for Architecture Design

- Discovery : when machine is plugged-in

  Harder to solve problems

  – understanding topological information because the machine needs to understand what is its role in the whole production line
  – reaching the cloud to talk with the smart virtual agent
- Machine Configuration

  Harder to solve problems

  – agree on a common language to be used among the entities and describe skills
  – perform semantic reasoning, starting for instance from a high-level specification and then configure the production line

- **Security & Safety** was not considered as a WP